# Property Rights and Social Institutions in Urban Africa:

## Experimental Evidence From a Land Formalization Program in the DRC

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July 2025

**Abstract**

Formal property rights to land remain rare in sub-Saharan Africa. We argue that social institutions play a central role in shaping citizens' demand for land formalization. When offered the opportunity to formalize their land, citizens weigh the costs and benefits of formal and informal institutional arrangements. We study a randomized land titling program in a large Congolese city that led to a substantial increase in both demand for and acquisition of land titles. Demand was more pronounced among citizens who participated more in social institutions and had closer ties to city chiefs. In turn, the program crowded out participation in social institutions and worsened citizens' evaluations of chiefs. These results challenge the view that social institutions are an effective substitute for formal land property rights in urban Africa and shed light on the conditions under which they are an asset or a constraint for formalization policies.

**Word Count:** 10,471

# 1 Introduction

Well-defined property rights are widely considered a cornerstone of economic development and political order (Acemoglu, Johnson and Robinson, 2001; Barzel, 2002; Boone, 2014; De Soto, 2000; North and Thomas, 1973). Insecure property rights make individuals fear expropriation, depressing incentives to invest (Demsetz, 1967; Field, 2005). Given the theoretical appeal of strengthening property rights, land titling programs have proliferated across the developing world.[1] However, despite these efforts, land formalization remains persistently low (Easterly, 2007), and formal titling does not appear to increase tenure security or agricultural productivity (Fenske, 2011; Jacoby and Minten, 2007; Lawry et al., 2017). This is particularly true in Africa, where 90 percent of land is not formally registered.[2] To explain these low rates of land formalization, some have proposed a demand-side explanation: communal land rights—and, more generally, social institutions—substitute effectively for formal land rights (Bromley, 2009; Deininger and Feder, 2001; Lawry et al., 2017; Sjaastad and Bromley, 1997).[3] According to this view, citizens do not demand formal land property rights because they can do without them.

In this article, we propose that social institutions play a key role in explaining the puzzle of low land formalization rates in urban Africa. Policies promoting formalization are invariably implemented against the backdrop of pre-existent social institutions, which may shape their take-up and effects (Acemoglu and Robinson, 2019; Boone, 2014; Migdal, 1988; O'Donnell, 2006; Wang, 2022). At the heart of the issue is whether formal and informal institutions are complements or substitutes (Helmke and Levitsky, 2004; Henn, 2022; Van der Windt et al., 2019). Formal property

[1] In 2005, the World Bank supervised a portfolio of more than $1 billion worth of land administration projects (Galiani and Schargrodsky, 2011).

[2] *The Economist*, Sep 12, 2020.

[3] For example, Lawry et al. (2017, p.16) find that the relationship between property rights and agricultural productivity is weaker in sub-Saharan Africa and argue that this "may be based on the fact that most farms in sub-Saharan Africa are held under customary tenure arrangements that provide tenure security."

rights to land—a signature of citizens' incorporation into the state and a core mechanism through which states render citizens legible and assert authority over territory (Barzel, 2002; Boone, 2014; Sánchez-Talanquer, 2020)—are a case in point. We leverage experimental variation from a large urban randomized land titling program to answer two questions: (1) How does citizens' participation in social institutions affect their demand for formal land titles? and (2) How does land formalization, in turn, affect citizens' participation in those institutions?

Studying the relationship between social institutions and formal titling presents substantial empirical challenges, since land titling is endogenous to economic development (Alston, Libecap and Mueller, 1999), social norms (Platteau, 1996), and political considerations (Albertus, 2015, 2021; Boone, 2014, 2018; Hassan and Klaus, 2023). While there is recent evidence that communal institutions may susbsitute for formal land rights (Honig, 2022; Le Rossignol, Montero and Lowes, 2024),[4] the empirical record remains mixed. A convincing test would require observing both *(i)* the adoption of formal titles at different levels of participation in social institutions and *(ii)* the causal effect of formalization on engagement with social institutions. While this can be challenging—and a key reason for the divergent conclusions of the existing literature—our empirical context and experimental design allow us to do both.

The second reason is theoretical. While scholars have debated whether informal institutions substitute for or complement the state (Brenner, 1976; Gottlieb, LeBas and Magat, 2021; Henn, 2022; Migdal, 1988; Van der Windt et al., 2019; Wilfahrt, 2018), few studies approach the question from the perspective of the costs citizens face. Building on recent work that emphasizes citizens' strategic choices among institutional arrangements and the costs imposed by informal institutions (Lust and Rakner, 2018; Lust, 2022), we propose an analysis of citizens' decision to formalize their land centered on the trade-off between the costs and benefits of formal and informal institutions.

[4]Le Rossignol, Montero and Lowes (2024) document a negative cross-country correlation between the success of titling programs and communal land rights. Drawing on data on Zambia and Malawi, Honig (2022) presents evidence that citizens embedded in customary institutions are less likely to demand land titles.

The substitution argument—whose empirical base lies primarily in rural areas—typically assumes that the benefits of social institutions outweigh their costs, making formal property rights redundant (Harris and Honig, 2023; Honig, 2022). Yet this perspective often neglects that social institutions can also impose significant costs on citizens and create ties of dependence (Lust and Rakner, 2018; Platteau, 2012). We argue that this institutional trade-off is context-specific. Specifically, it looks different in urban settings, where land values are higher and the benefits of social institutions are likely weaker.

This article presents a systematic analysis of the relationship between land titling and social institutions in an urban setting in a large developing country and study both the demand for titles and their downstream effects on social institutions. In collaboration with the Provincial Government of Kasaï Central, we designed a randomized land titling program in the city of Kananga, in the Democratic Republic of Congo (DRC), where only 16 percent of citizens have a formal title to their land. The program was implemented by the government's cadastral and land titling offices. To our knowledge, this was the first successful land titling RCT in an urban setting. Households eligible and interested in a land title were randomly assigned to treatment and control groups. The treatment group was offered large reductions in the monetary and transaction costs of acquiring a land title. Whereas citizens routinely pay $1,000 or more for a title in Kananga, the titling program capped household outlays at the official price of $100. Moreover, government officials and program staff visited participants at their homes, reducing the transaction costs of obtaining a land title and avoiding the need for frequent trips to government offices. The control group had the option to obtain a land title as per the status quo.

The program significantly boosted demand for land titles. It caused a 44 percentage point (pp) increase in the probability that households initiated the formalization process, and a 13.7 percentage point increase in the actual receipt of a formal land title. The slippage between initiation and receipt of a title reflects a combination of poor coordination across government offices and deeper institutional factors that create weak incentives for bureaucrats. In the control group, only a few citizens attempted to get a title, and almost none were successful during the two-year study

period. The large increase in take-up reflects citizens' high valuation of titles and the high costs of accessing the state under the status quo (Fredriksson, 2014; Rizzo, 2022).

Because we observe both take-up and causal effects of land titling, this empirical setting allows us to adjudicate between competing arguments about the relationship between formalization and social institutions. We first investigate which citizens are more likely to demand and acquire a formal land title. While our analysis of heterogeneous take-up is not strictly causal, it sheds light on how citizens' participation in social institutions shapes demand for land titling. The substitution argument predicts that citizens who participate more in *horizontal* social institutions—such as churches and mutual aid societies—will have a lower demand for land titles. Our results are inconsistent with this prediction. Citizens who participate more in social institutions display a higher demand for land titles but are not necessarily more likely to obtain them. We find similar results when studying take-up by *vertical* institutions. We focus on connectedness to urban chiefs, local elites who are key stewards of social institutions in Kananga and across sub-Saharan Africa. Citizens with closer connections to chiefs are also more likely to demand a land title, though not more likely to obtain one. We also find evidence that chiefs' political connections have a negative effect on citizens' likelihood of obtaining a formal title.[5] Our evidence on take-up appears to align with a logic of complementarity.

We then examine the causal effects of the land titling program. While a logic of complementarity predicts that the treatment group would display greater participation in social institutions, we find that, on average, the program crowded out citizens' participation in horizontal social institutions and worsened their evaluation of city chiefs. This pattern is more consistent with a logic of substitution.

Taken together, our results reveal a distinctive logic of land formalization in urban areas that diverges from standard accounts of substitution or complementarity. Instead, they suggest that

[5]This finding is consistent with the notion that informal protection is a political tool (Janvry et al., 2014; Larreguy, Marshall and Trucco, 2018) and evidence of misalignment between citizens' and chiefs' preferences over titling.

social institutions are not perfect substitutes for formal land rights: in the absence of alternatives, citizens participate in social institutions. However, when an alternative becomes available, they exit them. Where formal institutions are costly, formal land rights may provide an institutional bypass, allowing them to exit the informal equilibrium (Prado and Trebilcock, 2018). This view can account for both of our empirical results: *(i)* citizens facing a higher cost of social institutions exhibit greater demand for titles as a way to exit them, and *(ii)* citizens randomly offered to formalize their land subsequently lower their engagement with social institutions. All told, by showing that land formalization shapes and is shaped by social institutions, our results affirm a deeply political conception of land property rights (Bates, 1987; Boone, 2014).

This article contributes to three strands of literature. First, we contribute to a large literature on the interaction between formal and informal institutions focusing on how states extend their reach in contexts of overlapping or competing authority structures (Brenner, 1976; Cheema, Khwaja and Qadir, 2006; Gottlieb, LeBas and Magat, 2021; Henn, 2022; Migdal, 1988; Van der Windt et al., 2019; Weigel, 2020; Wilfahrt, 2018). Concerning land titling, previous studies have shown that informal institutions can substitute for formal land property rights in rural areas (Honig, 2022; Harris and Honig, 2023). We build on and expand this literature in several ways. First, unlike observational studies, we leverage a large urban land titling field experiment that allows us to estimate credible causal effects on participation in social institutions. Second, we observe take-up and causal effects in the same empirical setting, allowing us to adjudicate between competing arguments about how informal institutions affect land formalization. Third, we study both vertical and horizontal social institutions, whereas most past work focuses on only one or the other. Finally, we observe both the initiation and completion of the titling process at the individual level, which enables us to separate the factors that foster or hinder the demand for—and the ultimate acquisition of—titles.

Second, this article speaks to the literature on the role of local elites in governance in low-capacity states. Scholars have recently explored the importance of such elites in governance (Acemoglu, Reed and Robinson, 2014; Baldwin, 2016; Baldwin and Raffler, 2019), law and conflict

resolution (Acemoglu et al., 2019), and land administration (Banerjee and Iyer, 2005; Boone, 2014; Goldstein and Udry, 2008; Honig, 2017, 2022). In the context of land politics, scholars have proposed that chiefs, as representatives of customary institutions, have a vested interest in maintaining their power within those institutions and would therefore oppose titling (Honig, 2022). By contrast, our findings suggest caution in exporting arguments about the role of chiefs in land titling from rural areas to urban ones.

Finally, this paper adds to the literature on the effects of land titling programs (Besley, 1995; Di Tella, Galiani and Schargrodsky, 2007; Djankov et al., 2020; Field, 2005, 2007; Galiani and Schargrodsky, 2010; Goldstein and Udry, 2008; Goldstein et al., 2018; Hornbeck, 2010). Previous land titling field experiments have focused on rural areas (Goldstein et al., 2018), while the best evidence on urban titling comes from quasi-experimental research in slum and squatter communities in Peru and Argentina (Di Tella, Galiani and Schargrodsky, 2007; Field, 2005, 2007; Galiani and Schargrodsky, 2010). We present, to our knowledge, the first experimental estimates of the social effects of land titling. Specifically, we provide field-experimental evidence from a city-wide land titling program that crowded out participation in informal institutions. This evidence suggests that formal property rights have the potential to alter social relationships (Bates, 1987). While recent findings from survey experiments suggest that titling may dampen the cooperation benefits of social institutions (Harris and Honig, 2023), our results cast doubt on the idea that the cooperation benefits of social institutions are so strong that citizens would refrain from titling. Citizens' exit from the informal equilibrium suggests that titling is an attractive option in contexts where the benefits of formalization outweigh those of social institutions.

## 2 Social Institutions and Land Formalization

Formalization efforts invariably interact with social institutions—socially embedded rules and roles that govern relationships and structure activities within a community (Harris and Honig, 2023; Lust, 2022; Lust and Rakner, 2018). To guide our analysis, we distinguish between two

types of social institutions: horizontal and vertical, depending on whether citizens hold obligations *vis-à-vis* individuals of similar or higher social standing (Lust and Rakner, 2018; Harris and Honig, 2023). Neighborhood or church networks are examples of the former; customary authorities—organized hierarchically—are examples of the latter. While these institutions may appear prima facie different and display wide variation, they share two characteristics. First, they help provide collective goods and informal insurance, as documented in diverse contexts such as Nigeria (Akinola, 2008; Udry, 1990), Zambia (Baldwin, 2016), Tanzania (De Weerdt and Dercon, 2006), India (Townsend, 1994), the Philippines (Fafchamps and Lund, 2003), and China (Tsai, 2007; Xu and Yao, 2015). Second, social institutions are costly, often requiring fiscal and in-kind obligations from citizens. In other words, they involve social extraction (Lust and Rakner, 2018; Olken and Singhal, 2011).

## 2.1 The Substitution Argument

Social institutions are often identified as a crucial factor behind variation in preferences for formal titling and frictions in the implementation of titling programs (Boone et al., 2021). Some argue that such institutions, together with communal land rights, provide sufficient tenure security (Deininger and Feder, 2001; Easterly, 2007; Honig, 2022).[6] According to this view, social institutions and formal land titles are substitutes. Furthermore, introducing formal titling might decrease the insurance pool, causing potential titleholders to avoid acquiring titles to maintain membership benefits and avoid sanctions (Harris and Honig, 2023). Empirically, the substitution argument implies that citizens who participate more in social institutions will have weaker incentives to formalize their land. Guided by the theoretical purchase of this argument, we pre-registered this hypothesis in our analysis plan. Yet, informed by our fieldwork and a richer conception of social institutions, we argue that the substitution argument is insufficient because it downplays the cost of social extraction. Scholars advancing this argument tend to assume that the costs of social institutions are

[6] Deininger and Feder (2001, p.314) write that "formal documentation (i.e. titling) is not crucial where customary tenure systems provide sufficient security."

negligible (at least relative to the benefits). Yet recent research has highlighted that this assumption may not hold in many settings, given the high costs of social extraction. These costs are at times pecuniary—payments, in-kind or labor contributions—and at times psychological, since these institutions create ties of social dependence (Lust and Rakner, 2018; Migdal, 1988; Platteau, 2012).

## 2.2 Formalization as an Institutional Bypass

Acknowledging that social institutions are costly implies that citizens face trade-offs when presented with the option to formalize. This trade-off involves *(i)* how they weigh the benefits of informal insurance against the costs of social extraction and *(ii)* the availability of alternatives. We argue that, in settings where social institutions are costly, social institutions are not perfect substitutes for formal land rights. Instead, land formalization can provide an institutional bypass—an alternate institutional regime that provides citizens with a pathway around the existing institution without changing it (Prado and Trebilcock, 2018). Citizens participate in social institutions for a combination of perceived benefits and social obligations, and as long as they do not have access to alternatives. A lack of alternatives could reflect an absence of options or the fact that options are inaccessible in practice—for example, if the price of a formal land title is prohibitively high. In the absence of institutional alternatives, participation in social institutions is a self-enforcing equilibrium. However, when an institutional alternative is made available that expands citizens' choice set, they will evaluate the costs and benefits of formal and informal institutions and switch accordingly. The presence of such alternatives has the potential to alter the self-enforcing equilibrium.

## 2.3 Empirical Implications

We argue that making formal land property rights more accessible by reducing their price and transaction costs can be thought of as an institutional bypass. In our context, given the cost and weaker insurance benefits of social institutions relative to formal titles, citizens will prefer to for-

malize their land when offered the chance. Specifically, those who participate more in social institutions—and bear their costs more acutely—will be more likely to demand formal land titles. Upon formalization, the informal insurance afforded by social institutions is no longer needed and, to avoid their costs, citizens will seek to exit the informal equilibrium. This argument entails two empirical implications:

- **Heterogeneous take-up:** Citizens who participate more in social institutions are more likely to demand formal land titles.
- **Crowding-out:** Citizens' adoption of formal land titles crowds out participation in social institutions.

This argument yields distinctive predictions, different from those that can be derived from alternative ways of conceptualizing the relationship between formal and informal institutions. Note that if social institutions were costless, citizens could enjoy the benefits of both formal and informal institutions (complementarity) or remain in the informal equilibrium (substitution). Specifically, the substitution argument predicts that higher participation in informal institutions leads to lower demand for formal land titles. In turn, if formal and informal institutions are complements, then higher participation in the latter predicts higher demand for land titles—without crowding out participation in social institutions. By contrast, our argument predicts that formalization will cause *both* higher demand by individuals who are more engaged with informal institutions and the crowding-out of informal institutions. In what follows, we inform our argument by introducing the logic of horizontal and vertical institutions and by describing their operation in our setting.

## 2.4 Horizontal Social Institutions

Networks and groups outside of formal state structures play a vital role in public life in Africa (Chazan et al., 1999; Gulliver, 1971; Hyden and Williams, 1994). Horizontal social institutions facilitate risk sharing, provide social insurance, and support collective action (Akinola, 2008;

Kpessa-Whyte, 2018; MacLean, 2010; Ostrom, 1990). Access to scarce resources—chiefly land—is determined by membership and status within these institutions (Berry, 1989, 1993).[7] Social institutions may confer tenure security in the absence of formal titles (Bromley, 2009; Durand-Lasserve and Royston, 2002; Lawry et al., 2017; Deininger and Feder, 2001; Honig, 2022). In D.R. Congo, local actors—such as chiefs, family members, churchgoers, neighbors, and friends—typically take part in defensive coalitions to advance ownership claims against property threats (Peyton, 2020).

While participation in social institutions may confer benefits, it comes at a cost. Cooperation in these institutions is founded on reciprocity (Kpessa-Whyte, 2018; MacLean, 2010), creates ties of mutual dependence (Harris and Honig, 2023), and exerts distributive pressures. To enjoy the gains from cooperation, citizens must comply with institutional rules. Participation in informal institutions typically requires monetary obligations and is enforced through social and economic sanctions and control (Barkan and Holmquist, 1989; Dercon et al., 2006; Lust and Rakner, 2018; Migdal, 1988). Furthermore, some of these institutions encode egalitarian norms that penalize investment (Kennedy, 1988; Platteau, 2012).

These costs create an incentive for citizens to seek out alternatives. For example, citizens often resort to coping strategies such as concealing assets, migrating, or changing religious denominations to mitigate these pressures (Platteau, 2009, 2012). Moreover, the cost of social institutions is likely higher in urban settings. First, the market value of land is higher in urban areas (Lall, Henderson and Venables, 2017).[8] Second, in such areas, the insurance benefits of horizontal institutions are likely lower, and customary institutions are less prominent (Honig, 2022), depressing the status of chiefs and thus also the benefits to citizens of maintaining social links to them. There-

[7] Scholars have documented a variety of institutional arrangements to manage land (Boone, 2014; Bromley, 1989; Goldstein and Udry, 2008; Le Rossignol, Montero and Lowes, 2024; Ostrom, 1990).

[8] In our sample, properties of eligible respondents located inside the borders of the former colonial city of Luabourg have an average value of $5,902. Estimates of property values come from machine learning and computer vision algorithms as described in Section 6.1.

fore, incentives to formalize land and exit informal institutions should be stronger in urban areas. Section 3.2 provides an estimate of the cost of participating in such institutions in Kananga. As a result, we expect that citizens' participation in social institutions increases the demand for formal land titles.

## 2.5 Vertical Social Institutions

In sub-Saharan Africa, traditional and urban chiefs play an important role in local governance (Baldwin and Raffler, 2019; Baldwin and Holzinger, 2019; Logan, 2009), contributing to public goods provision (Baldwin, 2016), participating in the administration of justice (Sheely, 2013), and exerting control over land (Baldwin, 2014; Boone, 2014; Honig, 2017, 2022). Urban chiefs, a common institution in Francophone Africa, frequently play complementary roles *vis-à-vis* the formal state (Henn, 2022), are endowed with authority stemming from customary legitimacy—the institution was modeled on the village chieftaincy—and enjoy high levels of trust (Logan and Katenda, 2021). In the context of land titling, two characteristics of chiefs are worth highlighting: *(i)* their connections with citizens and *(ii)* their connections with politicians and political alignment. Comparative evidence indicates that chiefs selectively provide protection and tenure security (Goldstein and Udry, 2008; Honig, 2017, 2022) in exchange for rents and state recognition of their neo-customary status (Acemoglu, Reed and Robinson, 2014; Boone, 2014). Previous work has emphasized chiefs' role as development brokers with the capacity to deliver collective goods (Baldwin, 2013). However, informal protection afforded by chiefs comes at a cost: it is provisional and contingent on chiefs' incentives and, therefore, may be used to build clientelistic relationships that foster citizens' dependence (Janvry et al., 2014; Mattingly, 2016; Larreguy, Marshall and Trucco, 2018). In our context, because of their position as intermediaries between citizens and the provincial government, city chiefs have multiple principals. As a consequence of this dual position, they face competing demands. This generates distinctive predictions for the demand for and the acquisition of land titles.

- **Demand:** We expect citizens who are closer to chiefs to be more likely to demand formal

land titles. First, consistent with the notion of chiefs as development brokers, citizens may see them as a vehicle to obtain a land title or to speed up the titling process. Second, according to our argument, the protection afforded by social institutions—including chiefs—is costly, giving citizens closer to chiefs further reason to seek formalization. By contrast, the substitution argument predicts that connections to chiefs should lower demand for titles.

- **Acquisition:** Whether chiefs facilitate or block titling depends on their incentives. In rural areas, there is evidence that chiefs embedded in customary institutions would oppose titling programs that threaten to erode their power (Honig, 2022). In urban settings like the one we study, chiefs' incentives are likely driven by politics rather than customary status. We thus predict that chiefs who are closer to power might attempt to stifle the titling process either to avoid retaliation by government officials or to preserve clientelistic ties.

# 3 Land and Social Institutions in Kananga, D.R. Congo

## 3.1 Land Formalization and Tenure Regime

The D.R. Congo is the fourth most populous country in Africa and one of the poorest. It is considered a low-capacity "fragile state," with tax-to-GDP ratio ranking 188th of 200 countries. Less than 1 percent of land is formally registered (Huggins et al., 2004). Kananga, the capital of the Kasaï Central Province and the setting for this study, is a city with roughly 1.6 million inhabitants—the fourth largest in D.R. Congo—and an average monthly household income of $106 (PPP$168). Because of its size and urban form, Kananga can be considered a typical city in Francophone Africa, with an administrative center built around the colonial city of Luluabourg, and an expanding, patchwork-like periphery (Baruah, Henderson and Peng, 2021).

Citizens of Kananga are well aware of the legal benefits of land titles. Titles are highly valued, and some citizens undertake great efforts to obtain one, sometimes paying high legal fees.[9]

[9]Language is reflective of this high subjective valuation. During our focus group interviews, citizens would

However, very few citizens—only 16 percent, according to our baseline data—have a formal land title.[10] This low rate of formalization reflects the fact that the current procedure for obtaining a title is difficult and costly.[11] Citizens seeking to obtain a land title face byzantine administrative procedures and a range of informal fees. There are at least six distinct steps in the titling process, each of which represents a potential bottleneck. During focus group interviews, some citizens reported hiring a lawyer to help them with the process. To keep the process moving, citizens must pay a range of "administrative fees" for tasks such as measuring the plot, producing an array of intermediate documents, and installing cornerstones. Some citizens report paying up to $1,000 for a land title, when the official price is around $100. These delays and failures are not merely bureaucratic but reflect informal rent extraction and discretionary enforcement, as highlighted in focus groups and consistent with broader evidence on land administration in the DRC (Peyton, 2020) [12]

The absence of formal land ownership creates a wide range of problems for both citizens and the government. On the government's side, the dearth of property ownership information inhibits tax collection and public goods provision (Weigel, 2020). In turn, citizens face the risk of expropriation—over 25 percent of respondents in our sample reported experiencing at least one property dispute, and over 60 percent knew at least one person who did. Lastly, while banks in Kananga accept land titles as collateral for loans, the vast majority of the population is effectively barred from the formal financial sector given the scarcity of official land titles.

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usually mention that the land title that carries the highest legal weight, known as *Certificat d'Enregistrement*, is "unattackable"—as it is officially described in Congolese law. See Peyton (2020) for qualitative evidence on the demand for titles in D.R. Congo. Ferree et al. (2022) show that citizens in Malawi value land titles regardless of the authority granting them.

[10]Across sub-Saharan Africa, only 2 to 10 percent of land is privately held. Comprehensive land registries and legal markers of land ownership are extremely rare (Boone, 2014; Deininger, 2005).

[11]See SI Section B for more details on the history of land titling in DRC.

[12]Land values have been increasing in Congolese cities. In our sample, among respondents eligible for the land titling campaign, the average property value is $5,700.

## 3.2 Horizontal Social Institutions

Citizens of Kananga participate in several overlapping sets of horizontal social institutions. In urban areas, churches and burial societies serve as a nexus for risk sharing (Auriol et al., 2020; Dehejia, DeLeire and Luttmer, 2007; Dercon et al., 2008). As in many parts of Africa, religious institutions of several denominations feature prominently in Kananga. Church attendance is high: 64.5 percent of citizens in our sample report attending every day, and 24 percent report attending multiple times per week.[13] Citizens also participate in mutual aid societies and rotating savings and credit associations (ROSCAs). Other horizontal obligations include monetary contributions to community events such as weddings and funerals.

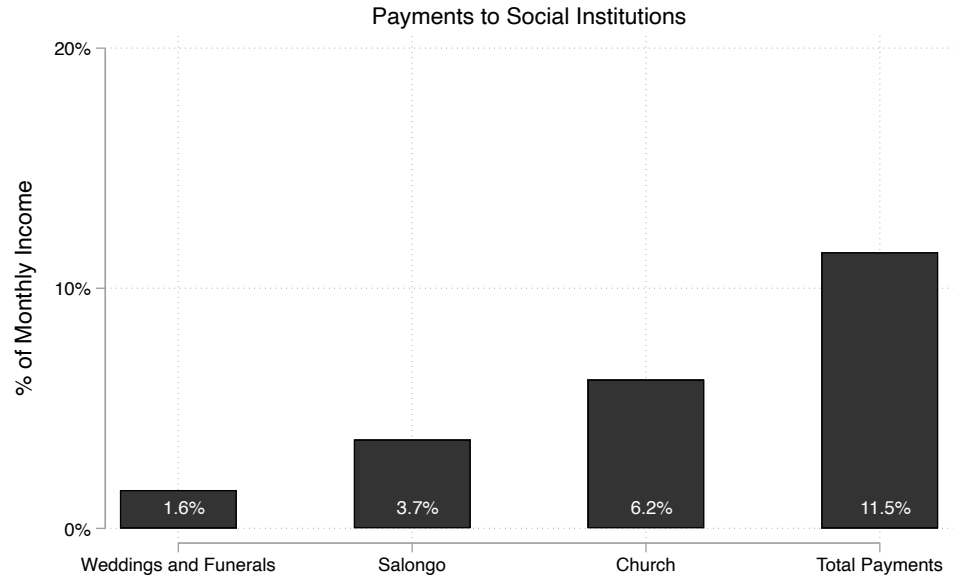
### 3.2.1 Quantitative Evidence on the Cost of Social Institutions

The costly nature of social institutions appears salient in our setting. First, citizens of Kananga typically make monetary or in-kind payments to horizontal institutions. Payments to churches, weddings and funerals, and an informal labor tax known as *salongo*—during which citizens help repair roads, bridges, and other local public goods—amount to roughly 11.5 percent of citizens' monthly income (Figure 1).[14]

[13]There is some evidence that citizens obtain insurance by participating in religious institutions (Kapepula, Konshi and Weigel, 2022).

[14]These are conservative estimates obtained by winsorizing each measure of expenditure and income by trimming the highest and lowest 5th percentiles. For comparison, the fraction of monthly income spent on transportation—one of the main expenditures of citizens in Kananga—amounts to about 11.4 percent.

**Figure 1:** Payments to social institutions as a percentage of citizen's monthly income




*Notes*: Each column represents the expenditures in each category as a fraction of monthly income. All measures of expenditure and income are winsorized by trimming the top and bottom 5th percentile of observations.

Second, horizontal institutions in Kananga do not appear to provide an effective substitute for secure land rights, as citizens frequently experience tenure insecurity. Moreover, there is no correlation between participation in such institutions and a range of indicators, including tenure security, access to health care, education, or having a retirement fund (SI Table D.3).[15]

### 3.2.2 Qualitative Evidence on the Cost of Social Institutions

Qualitative evidence from focus group discussions helps illuminate the logic and cost of contributions to social institutions. These discussions reveal three characteristics: (*i*) progressivity; (*ii*) social sanctions; and (*iii*) asset-concealing behavior. In general, contributions are associated with a "spirit of solidarity" deemed characteristic of Congolese culture. Focus group respondents also

[15]However, there is a negative correlation between participation in social institutions and experiencing hunger, which can be interpreted as suggestive evidence of an insurance function. Considering the full sample, participation in social institutions is positively correlated with some such outcomes, but predicts a *higher* frequency of land disputes.

point to an insurance motive: contributions are typically triggered by external circumstances such as weddings, mourning, damaged ravines, community needs, and natural disasters. Contributions are usually raised through door-to-door soliciting, especially by local notables or people linked by social ties. Furthermore, not everyone is expected to contribute equally—the expectation to contribute is driven by a progressivity norm, and door-to-door solicitations tend to target wealthier households. Notably, some respondents mention that wealthier citizens tend to hide their assets ("salary is secret"). In this context, a land title may be seen as a wealth-signaling asset. While respondents emphasize that citizens are not expected to contribute beyond their means, they describe social consequences for failing to contribute, including mistrust, losing community ties, gossip, and ostracism. One respondent emphasized that those who do not contribute "will not be trusted by the community"; another one mentioned losing community ties and isolation from community events. Yet another respondent highlighted a "burden of conscience"—especially among people with financial means.

## 3.3 Vertical Social Institutions: City Chiefs

As in many urban areas of Francophone African countries, in Kananga local elites known as city chiefs (*chefs d'avenue*, *chefs de quartier*, *chefs de localité*) are a distinctive social institution. These chiefs are local notables whose main responsibilities include: (*i*) mediating local disputes, especially over property, and (*ii*) helping maintain local infrastructure through *salongo*.

While nominally integrated into the state apparatus[16] city chiefs share many characteristics with customary chiefs in terms of their activities, nomination process, and social standing. Chiefs are nominated by elders in the neighborhood—typically for being longstanding and respected residents—and then rubber-stamped by the government. Chiefs have indefinite and often life-long tenure, which at times passes through families, and deposition is very rare.[17] Chiefs do not

[16]The position was formally created in 1972 after a national law abolished traditional authority, seeking to integrate chiefs to the state apparatus (Nzongola-Ntalaja, 1975).

[17]The average city chief in Kananga had worked in the position for 10 years, and 19 percent of chiefs inherited the

receive regular salaries, and most hold other remunerative positions, e.g., as teachers or pastors. The main benefit of being a chief is the status it confers.

# 4 Intervention Description

## 4.1 Formal Land Titles

In collaboration with the provincial government of Kasaï Central, we subsidized the three main land titles in the DRC: *Certificat d'Enregistrement* (CE), *Contrat de Location* (CL), and *Acte de Vente Notarié* (AVN). These are listed in decreasing legal weight. All three titles grant higher tenure security. The program randomly offered households the opportunity to obtain one of these three formal titles at the prices listed in Table 1 below.[18] The reduced prices imply a substantial subsidy. Given that citizens pay up to $1,000 for the CE, the title with the highest legal value, an average subsidized price of $75 implies a 92.5% price decrease. Field activities began in July 2017 and continued until February 2020 (SI Figure A.1).

The magnitude of the subsidy offered through the program is comparatively large. The costs of registering property in Africa are the highest in the world—estimates range from 9 percent (Lall, Henderson and Venables, 2017) to about 15 percent (Toulmin, 2009) of the property value. Given that the average price for a *Certificat d'Enregistrement* offered during the program was 75 USD, and the average property value in the eligible sample is about 2,900 USD, the cost of a title represents 2.5 percent of the average property value—closer to the cost of registering property in Europe (2.8 percent) (Lall, Henderson and Venables, 2017).

**1.** ***Certificat d'Enregistrement.*** The CE represents the government's formal recognition of a property owner's rights to their plot of land. The acquisition of a CE requires that the land is

position from a family member.

[18]For each treated respondent, we also randomized the magnitude of the subsidy, creating three price levels for each land title. This paper does not exploit the variation induced by the random subsidies.

sufficiently put to use—10 percent of the plot must contain buildings made of solid materials. Having a CE implies that the property owner faces no legal challenges to their property rights.

**2. *Contrat de Location*.** A CL also entails the government's recognition of the owner's right to the land. However, the CL is a contract with the government whereby the property owner is expected to make annual payments over the course of three years. At the end of this period, if the land is sufficiently put to use, the government will grant the owner a CE.

**3. *Acte de Vente Notarié.*** An AVN constitutes proof of the acquisition of a plot but does not offer legal protection. The notarization of an AVN renders it a legal document, which can prove useful if the owner plans to sell the plot and may carry more legal weight in case of a land dispute.

**Table 1:** Average subsidized price of each formal land title

| DOCUMENT | AVERAGE PRICE |
|---|---|
| Certificat d'Enregistrment | 75 USD |
| Contrat de Location | 40 USD |
| Acte de Vente Notarié | 20 USD |

*Notes*: This figure displays the average price levels for each land title concerned by the program.

## 4.2 Eligibility

The initially eligible population, as determined by the Land Titling Office, consisted of citizens in possession of at least one formal land title, including some from the colonial era. Thus, the intervention allowed citizens *(i)* to update their legacy titles by obtaining a title currently recognized by the state or *(ii)* to upgrade their title by obtaining a title with higher legal weight (for example, an upgrade from *Acte de Vente* to *Certificat d'Enregistrement*). Following a change in the eligibility criteria decided by the government, we restricted our sample based on baseline characteristics. The new sample included 483 households. Although this eligibility restriction was costly in terms of sample size, it did not hurt balance (Table 2) and focused the analysis on the population relevant for understanding the demand for land titling in urban Africa. The initially eligible sample is balanced across owner and household characteristics (SI Table H.1). While attrition was slightly

higher among control households, we do not find that attriters substantially differed in their characteristics across treatment groups (SI Table H.2). Our main results are robust to attrition-weighting and to including controls selected by the double LASSO algorithm (Belloni, Chernozhukov and Hansen, 2014) (SI Figure H.1). We discuss eligibility and attrition in more detail in SI Section H.

## 4.3 Randomization

Randomization was implemented at the household level among households who were eligible and interested in the program. Units are households located in polygons (or neighborhoods). Each polygon was defined using satellite imagery to approximate the finest administrative unit, the *localité*, using boundaries such as roads, ravines, and other natural features easily identifiable from the ground (SI Figure J.1). There are 364 neighborhoods in Kananga. After completion of baseline surveying in a given polygon, we randomly assigned treatment within that polygon, ensuring that an equal proportion of respondents were assigned to treatment and control. Survey teams then revisited households assigned to the treatment group and invited them to participate in the titling program, distributing flyers with information about each formal document offered during the program (SI Figure J.2). At a later stage, due to government demands to increase the speed at which we registered participants, we adopted an alternative approach by embedding the randomization procedure directly into the baseline survey. The randomization achieved balance: only 1 of 17 variables in Table 2 (years of education) is imbalanced, as one would expect under random assignment.[19]

[19] See SI Section G for more details on the randomization protocol.

**Table 2:** Descriptive Statistics and Randomization Balance

| | Control | | | Treatment | | | Difference in Means |
|---|---|---|---|---|---|---|---|
| | Observations | Mean | SD | Observations | Mean | SD | |
| Age | 228 | 54.43 | 15.91 | 254 | 55.65 | 15.00 | 1.215 |
| Female | 229 | 0.26 | 0.44 | 254 | 0.20 | 0.40 | -0.053 |
| Years of Education | 229 | 10.72 | 3.54 | 254 | 11.45 | 3.62 | 0.724** |
| Household Size | 228 | 6.33 | 4.08 | 254 | 6.78 | 4.52 | 0.447 |
| Years Residing in Kananga | 194 | 45.75 | 19.77 | 234 | 46.98 | 17.85 | 1.231 |
| On Electrical Grid | 229 | 0.03 | 0.16 | 254 | 0.05 | 0.21 | 0.021 |
| House Near Ravine | 227 | 0.20 | 0.40 | 254 | 0.19 | 0.39 | -0.014 |
| Predicted Property Value (USD) | 219 | 2630.96 | 3872.13 | 244 | 3144.73 | 3707.23 | 513.776 |
| Monthly Income (USD) | 227 | 123.48 | 445.77 | 254 | 123.08 | 230.83 | -0.408 |
| Recent Expenditure (USD) | 228 | 3.99 | 19.85 | 254 | 3.37 | 5.90 | -0.616 |
| Business Owner | 229 | 0.22 | 0.41 | 254 | 0.19 | 0.39 | -0.029 |
| Trust in Provincial Government | 215 | 2.56 | 1.24 | 241 | 2.44 | 1.27 | -0.118 |
| Political Party Member | 229 | 0.30 | 0.46 | 254 | 0.33 | 0.47 | 0.025 |
| Frequency of Land Disputes | 229 | 0.95 | 6.04 | 254 | 0.66 | 1.46 | -0.286 |
| Helps with Community Security | 229 | 2.22 | 9.55 | 254 | 1.28 | 3.47 | -0.943 |
| Ever Paid Property Tax | 229 | 0.37 | 0.48 | 254 | 0.44 | 0.50 | 0.066 |
| Affected by Militia Violence | 227 | 0.35 | 0.48 | 253 | 0.41 | 0.49 | 0.055 |

*Notes*: This table shows averages at baseline for the treatment and control groups. The last column is the coefficient of a bivariate regression of treatment assignment each variable measured at baseline. Militia Violence refers to a fighting that broke out in 2017 between the national government and *Kamuina Nsapu* militias, leaving thousands dead and hundreds of thousands displaced.

## 4.4 Land Title Production Process

The production of the land titles issued during the program comprised the following steps:

**1. Technical visit.** Respondents assigned to the treatment group were invited to sign up for a technical visit by agents from each division involved in the program: the provincial cadastral and land titling offices. Agents were accompanied by an enumerator to ensure compliance with the randomization protocol. During this visit, cadastral agents measured the plot, drew a sketch, and determined the number of required cornerstones. They then produced a set of official intermediate documents describing the technical and legal aspects of the plot, including information on the full list of previous owners, the materials used to build the compound, and so forth. This step was an important source of attrition. In many cases, properties were determined to be ineligible for an official land title for technical reasons.[20] Other respondents dropped out even before the first visit

[20]This happened for a variety of reasons, including proximity to a ravine, indirect street access, insufficient area, or insufficient construction on the plot. See SI Section H.

due to a loss of interest or long waiting times.

**2. Cadastral office.** A typist at the cadastral office was responsible for producing an official document—*procès verbal*—based on the reports created during the technical visit and writing a transmission letter describing the title requested, the contents of the file, the respondent's personal details, and reproductions of the plot sketches. A cadastral agent reviewed and signed the document, verifying that it reflected their observations during the visit. The head of the cadastral office then examined the file and determine the respondent's eligibility for the requested title. If no issues were detected, the cadastral office transferred a copy to the titling office. This step was also a source of attrition and delays: by the time the files reached the titling office, many respondents had moved, sold their plot, or lost interest.

**3. Land titling office.** Each file was sent for legal review to the land titling office, the government office in charge of matters related to land law, which determined whether the plot satisfied the technical requirements to be eligible for the title selected by the respondent. This step was a significant source of discretion by titling officials, who studied the full history of a plot's ownership and verified the authenticity of signatures contained in existing documents. Files were often rejected due to issues with these documents—the most common reason was insufficient proof of ownership by the former occupant.

**4. Title payment and official signature.** The land titling office then produced a document detailing the amount to be paid to the provincial tax ministry. Respondents took this document to the bank, paid the fee, and in return obtained a receipt, which they brought back to the land titling office and attached to their file. The head of the land titling office then signed the official copies of the titles, which were delivered to respondents by enumerators. Finally, cadastral agents visited the plots to install the cornerstones.

# 5 Data

Our data come from the following sources:

**1. Respondent baseline survey.** We administered surveys at baseline to 4,343 randomly selected households—12 per neighborhood—between July and December 2017. Independent enumerators randomly sampled compounds using skip patterns while walking down each avenue in a neighborhood: e.g., visit every $X$th property in the neighborhood, where $X$ was determined by the estimated number of properties and a target of 12 per neighborhood. The survey instrument covered a range of topics, including demographics, property characteristics, governance, public goods, experience with taxation and other payments to the state, city chiefs, political beliefs, and participation in social institutions. Following a change in the eligibility criteria decided by the government, we restricted our sample based on baseline characteristics. The new sample included 483 households. Although this eligibility restriction was costly in terms of sample size, it did not hurt balance (Table 2).

**2. Respondent endline surveys.** Two surveys were conducted after the titling program. Round 1 was implemented between March and September 2019, and Round 2 between December 2019 and February 2020. These surveys contained questions about tax compliance, use of formal and informal sectors, property disputes and tenure security, saving and investment behavior, participation in social institutions, and views on and engagement with the government and city chiefs.

**3. Chief survey.** We administered surveys to over 1,000 city chiefs, measuring a set of characteristics including education, official duties, relationships with city authorities, knowledge of citizens in their jurisdiction, power over land allocation, past experience collecting taxes, preferences for redistribution and public goods, and the organization of *salongo*. We matched chiefs to citizens based on who respondents reported to be their chief during the endline survey, using unique identifiers.

**4. Administrative data on land titling.** We use administrative data from the cadastral and land titling offices of the Provincial Government of Kasaï Central. These data contain information on all landowners who opened a file, regardless of whether they completed the process and received a title. We define two variables:

- **Initiation of titling process**. An indicator of whether households initiated the land titling process during the study period. Importantly, this was a costly step individuals that needed to undertake by *(i)* scheduling a technical visit from government land surveyors to their house and *(ii)* being present during this visit so that the government agents could open a file for the household. For the control group, this variable was measured by bringing a list of all control respondents to the titling office and verifying whether there was any record of a file being started.

- **Receipt of land title**. An indicator of whether households received a land title during the study period. We merged the government's administrative data on recently finalized titles with our household surveys. We also coded this variable as 1 if a respondent—whether in treatment or control—reported obtaining a new title at endline since the start of the land titling program and was able to show the title to an enumerator.

# 6 Results

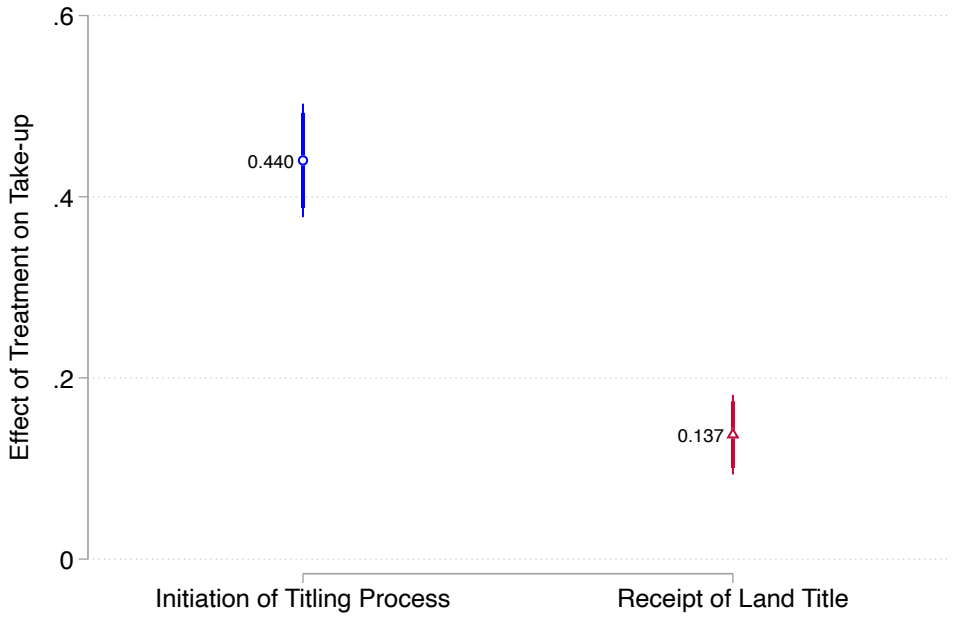
## 6.1 First Stage: Effects of the Titling Program on Land Formalization

We first study the effect of assignment to the land titling program on the probability that citizens formalize their property. As noted above, we examine whether citizens initiated the titling process and whether they ultimately received a title within the time window considered. We estimate the following equation:

$$Y_i = \beta_0 + \beta_1 Program_i + u_i \tag{1}$$

where $Y_i$ denotes our two measures of take-up, $i$ indexes households and $Program_i$ is an indicator for citizens randomly assigned to the program. We report robust standard errors throughout, as randomization was conducted at the household level.

**Figure 2:** Treatment effects of the land titling program on initiation of the titling process and receipt of land titles




*Notes*: ITT estimates from Equation 1. Thicker and thinner lines are 90 and 95 percent confidence intervals, respectively. $N = 483$. See SI Table C.1 for more details.

Assignment to the land titling program caused a 44 pp increase in citizens' efforts to initiate the titling process (Figure 2). Citizens assigned to the program were 13.7 pp more likely to obtain a title during the period considered (from July 2017 to July 2019). Very few individuals in the control group attempted to open a file in the titling office.[21] By contrast, when selected by the door-to-door titling program, nearly half of citizens initiated the titling process by scheduling a visit from government land surveyors. This stark difference suggests that the monetary and transaction costs of obtaining a title were binding constraints on land formalization prior to the program.[22] Next, we study whether the demand for and adoption of formal land titles depend on socioeconomic

[21] Two individuals in the control group initiated the titling process (0.87 percent), and one individual in the control group obtained a land title during the study period (0.44 percent). Thus, the treatment effects represent, respectively, a 5,000 percent and a 3,100 percent increase.

[22] SI Figure F.1 shows the distribution of titles delivered by the program.

factors. We estimate heterogeneous effects of treatment assignment on our two measures of take-up—initiation and completion of the land formalization process—using the following equation:

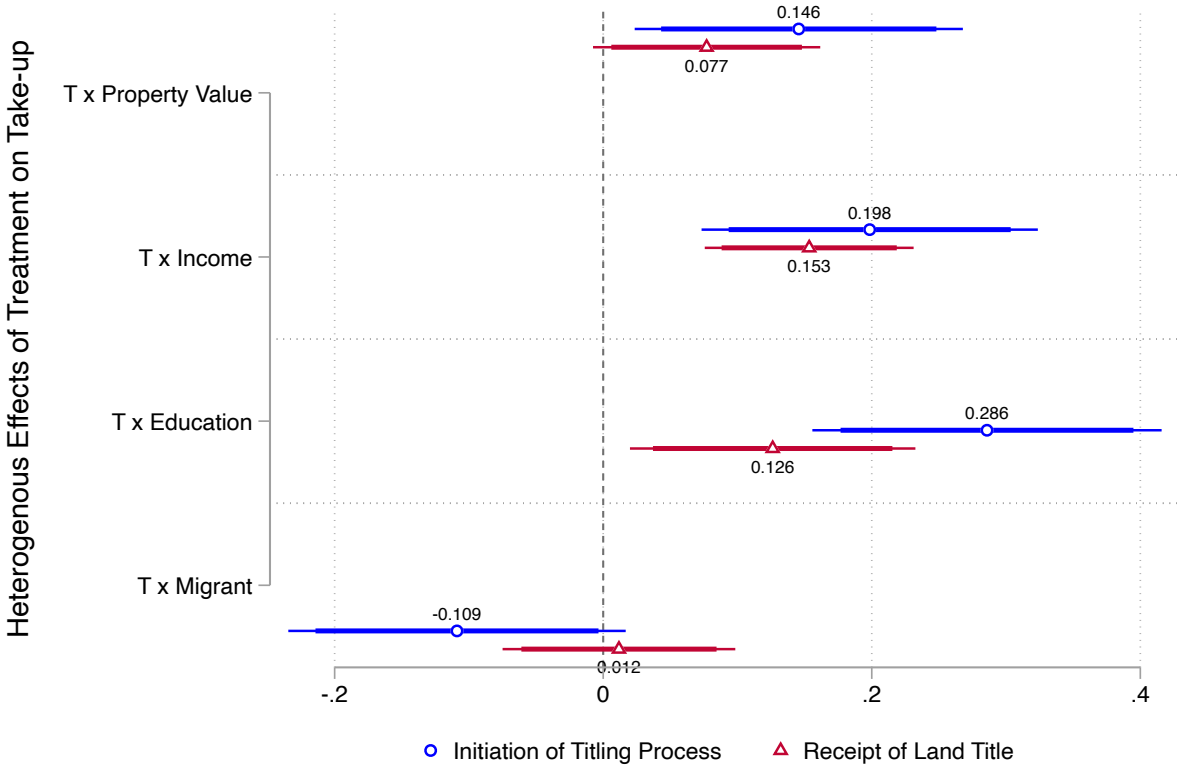
$$Y_i = \beta_0 + \beta_1 \text{Program}_i + (\text{Program}_i \times \mathbf{Z}_i)\beta_2 + \mathbf{Z}_i\beta_3 + u_i \tag{2}$$

where $Y_i$ denotes our two measures of take-up, and $\mathbf{Z}_i$ is a vector of individual or household characteristics.[23] The estimates in Figure 3 confirm that socioeconomic factors—income, education, and property value—have a large and positive effect on the likelihood of formalization, consistent with economic models of land property rights (Alston, Libecap and Schneider, 1996; Miceli, Sirmans and Kieyah, 2001).[24] Notably, for every significant coefficient in this figure—property value, income, and education—there is a gap between demand and actual completion of the formalization process, which likely reflects the bureaucratic obstacles mentioned in Section 4. The analysis also reveals that migrants are marginally less likely to demand a land title, possibly because they participate less in—and are thus less dependent on—social institutions.

[23] Since the elements of $\mathbf{Z}_i$ are not randomly assigned, each characteristic is interacted with the treatment indicator. Property values were estimated using machine learning and computer vision algorithms. Education and predicted property value are balanced in the analysis sample but show imbalance in the initially eligible sample. See SI Section H for details.

[24] Estimates of property values come from machine learning and computer vision algorithms based on a training set of nearly 2,000 randomly selected properties evaluated by the top expert in the provincial cadastral office.

**Figure 3:** Heterogeneous treatment effects of the land titling program on initiation of the titling process and receipt of land titles, by socioeconomic characteristics




*Notes*: OLS estimates from Equation 2. Point estimates represent the interaction term between assignment to the program and dichotomous measures of respondents' and households' characteristics. Thicker and thinner lines are 90 and 95 percent confidence intervals, respectively. See SI Table C.2 for more details.

## 6.2 Heterogeneous Adoption of Titling: Land Formalization is Moderated by Social Institutions

In this section, we test the first empirical implication of our argument by studying what types of citizens were more responsive to an exogenous offer to formalize their property. All specifications are based on Equation 2 and include interactive controls for income, gender, education, and predicted property value. Our estimates thus show how the treatment effect of assignment to the titling program varies across individuals with different levels of pre-treatment participation in social institutions. While participation in social institutions is not randomly assigned—and therefore

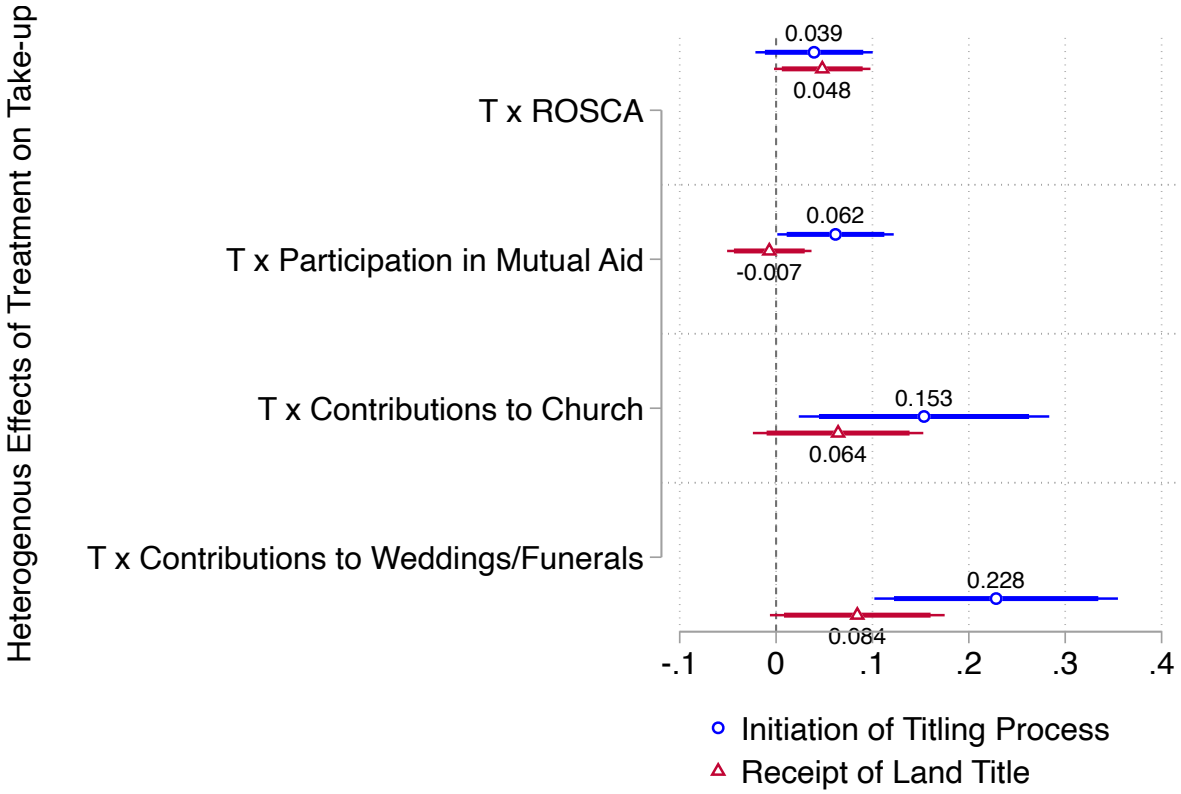
the estimates do not have a fully causal interpretation—these results offer insight into how social institutions shape demand for land titles.

### 6.2.1 Horizontal Social Institutions

We now study heterogeneous take-up of titling conditional on citizens' participation in horizontal social institutions. We consider four of the most important such institutions in Kananga—participation in ROSCAs, participation in mutual aid societies, and contributions to churches, as well as to weddings and funerals. Participation in all but one of these institutions significantly moderates the demand for titles—but none predict completion of the formalization process (Figure 4). This is consistent with the idea that these institutions impose a cost on citizens, such that greater participation increases demand for formalization.

The results are less consistent with a host of alternative interpretations (SI Section E). First, social networks could diffuse information about the program and help citizens learn about it, leading to higher demand. However, participation in social institutions predicts interest in the titling campaign *before* its onset (SI Section E.1). Note that the fact that participation in social institutions predicts demand but not completion does not support a social capital interpretation, in which such networks help citizens navigate the titling process and obtain a title. Second, social preferences—altruism, reciprocity, and envy—are not predictive of take-up (SI Section E.2). Lastly, we examine the role of trust in formal and informal institutions (Ribar, 2023) and find it does not predict demand or acquisition of titles (SI Section E.3).

**Figure 4:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by participation in horizontal social institutions.




*Notes*: OLS estimates from Equation 2. Point estimates are the interaction term between assignment to the program and dichotomous measures of respondents' participation in ROSCAs, mutual aid societies, contributions to church, and contributions to weddings and funerals. All specifications are estimated using OLS and interactively control for income, gender, and education. Thicker and thinner lines are 90 and 95 percent confidence intervals, respectively. See SI Table C.3 for more details.

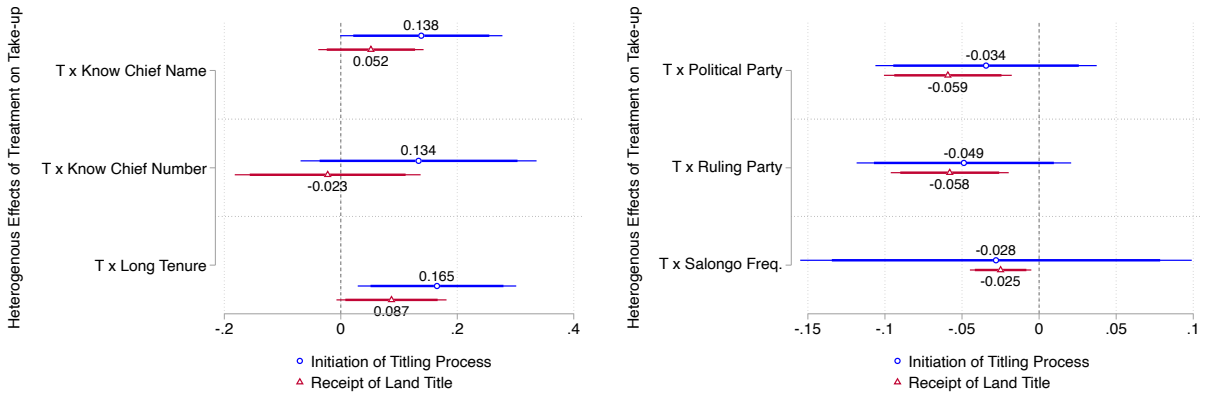
### 6.2.2 Vertical Social Institutions

**Connections to chiefs.** We now study the heterogeneity of the treatment effect along measures of citizens' connections with chiefs by exactly matching each respondent to the person they report to be their chief using unique identifiers. Connections to chiefs are generally predictive of demand for titles, but not of land formalization (Figure 5, left panel). Treated citizens who know their chief's name are more likely to initiate the titling process. The coefficient on knowing a chief's phone number is positive but imprecise. The same is true for citizens whose chief has enjoyed long tenure in the neighborhood—more than ten years—which makes them well known to citizens.

Notably, trust in chiefs does not predict demand for or acquisition of land titles (SI Table E.3). Thus, in contrast to the substitution view, which predicts that citizen-chief connections would lead to lower demand for titles, these results support the idea that citizens may view chiefs as brokers who may be well-positioned to deliver benefits (Baldwin, 2013).

**Chiefs' political connections and power**. Chiefs' political connections and power may also affect the demand and success of formalization. Notably, none of these characteristics are predictive of demand, but they do affect whether citizens in fact obtained a land title (Figure 5, right panel). Chiefs who are party members decrease the likelihood of citizens obtaining a land title—the effect is more pronounced for those affiliated with the ruling party, the PPRD. Moreover, citizens whose chiefs are more active in the organization of *salongo*—a proxy for chiefs' social power—are less likely to succeed in obtaining a land title. While citizens may think that chiefs can help them obtain a title, the fact that politically connected and more powerful chiefs stifle titling suggests a divergence between citizens' and chiefs' incentives, consistent with the idea that chiefs may be offering protection in the context of clientelistic relationships (Acemoglu, Reed and Robinson, 2014; Janvry et al., 2014; Peyton, 2020).

**Figure 5:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by citizens' connections to chiefs and chiefs' political connections and power.




*Notes*: OLS estimates from Equation 2. Point estimates are the interaction term between assignment to the program and dichotomous measures of citizens' or chiefs' characteristics. All specifications are estimated using OLS and interactively control for income, gender, and education. Thicker and thinner lines are 90 and 95 percent confidence intervals, respectively. See SI Table C.4 and Table C.5 for more details.

## 6.3 Reduced-Form Effects of the Titling Program on Social Institutions

This section tests the second implication of our theory: that the titling program will crowd out—rather than reinforce—participation in social institutions. We present reduced-form effects of the program on participation in horizontal and vertical social institutions using Equation 1 ($Y_i$ denotes outcomes of the titling program). We measure outcomes at two points in time. The first endline survey (Round 1) was conducted from May to August 2019, immediately after the delivery of most land titles. A second endline survey (Round 2) was conducted from December 2019 to February 2020, an average of 6–8 months after title delivery.

The estimates in Figure 6 show that the program had a negative impact on participation in and evaluation of horizontal and vertical social institutions—the latter becoming marginally significant in Round 2. The two top coefficients show the reduced-form effect of the program on an index comprising participation in mutual aid societies, ROSCAs, contributions to churches, and contributions to weddings and funerals. The bottom coefficient corresponds to an index of views on chiefs—measured only in Round 1—and participation in *salongo*.[25] As shown in Figure 7 (left panel), the crowding-out effects are concentrated in participation in mutual aid societies, ROSCAs, and church contributions. For example, the program caused roughly a 6 percentage point decrease in the probability that an individual takes part in a mutual aid society—a 24 percent decrease. Treated citizens also view chiefs as less responsive, less important, and worse overall—and they participate less in *salongo* (Figure 7, right panel). Interestingly, these sizable effects appear despite the relatively short time elapsed between title delivery and outcome measurement. Notably, the program did not alter citizens' evaluation of the provincial government, although they deem it less responsive, and it made citizens more willing to appear legible to the state (SI Table D.1).

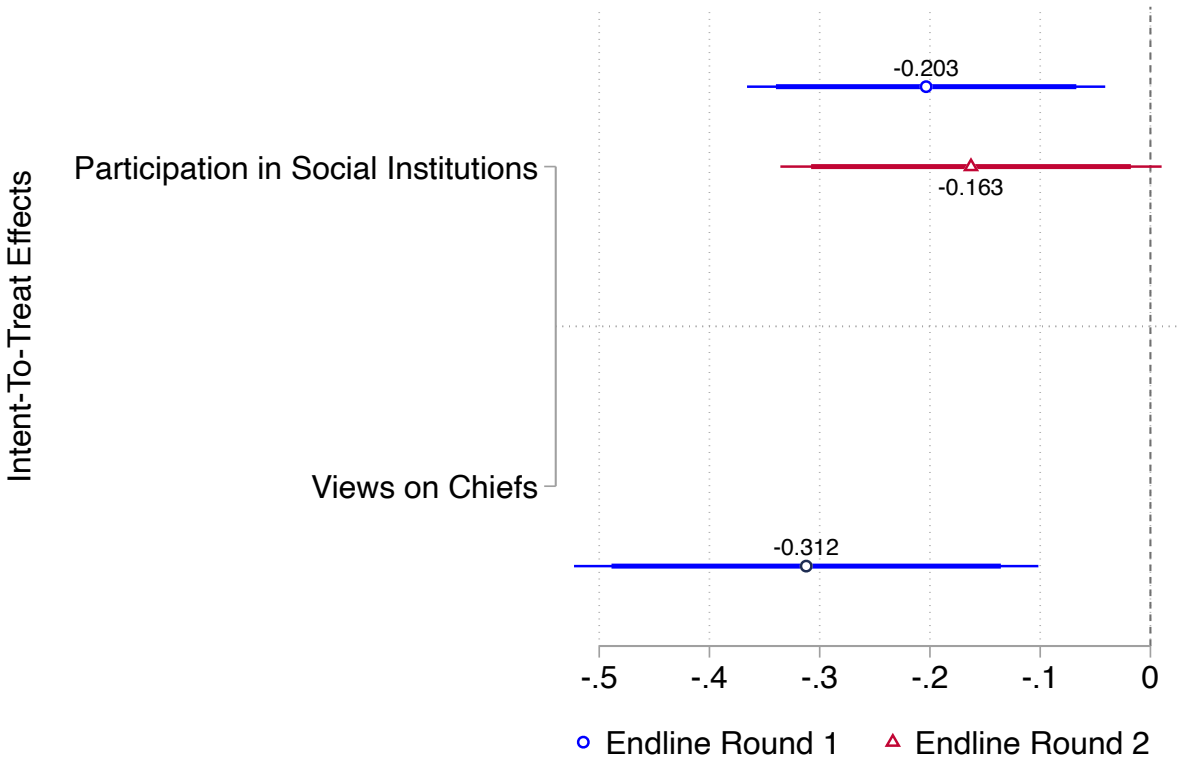
These crowding-out results are, to our knowledge, the first evidence of the social effects of land titling: formalization erodes participation in local social institutions. By contrast, the program

[25] SI Tables C.7 and C.8 show treatment effects for each index component.

shows no effects on citizens' perceived tenure security (SI Table D.4).[26] It also had no effect on civic participation, engagement with formal or informal authorities, or beliefs (SI Table D.2). Instead, it affected participation in key social institutions that entail monetary costs and social obligations. While we cannot fully rule out the possibility that these crowding-out effects reflect reduced liquidity, note that *(i)* these are ITT effects that obtain independent of obtaining a title, and *(ii)* results on social institutions that most clearly entail financial obligations are mixed—with no significant effects on contributions to weddings and funerals. These findings are consistent with recent work documenting how the introduction of microfinance crowds out participation in social networks (Banerjee et al., 2024) and how state welfare decreases caste-based insurance and depresses interactions among co-ethnics (Dixit, 2025). Overall, these results challenge the idea that land titling and social institutions are complements. Instead, they suggest that citizens prefer formalization over social institutions, consistent with the idea that treated citizens exit the informal equilibrium.

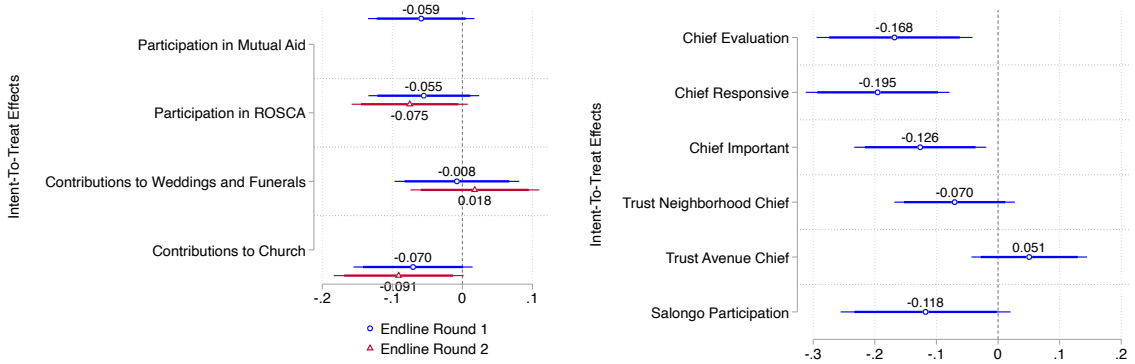
[26]However, the short-term nature of the outcomes does not allow us to systematically study the economic effects of the titling program. This time frame is shorter than the one used in most studies of land titling. Indeed, investments are unlikely to materialize in a short time period. For example, Field (2005) measures investment outcomes one to four years after a titling intervention in Peru, whereas Galiani and Schargrodsky (2010) measure human and physical capital investment between nine and eighteen years after the natural experiment they study. Table D.2 shows the effect of the program on additional pre-registered outcomes.

**Figure 6:** Reduced-form effects of the program on indexes of participation in social institutions and views of chiefs




*Notes*: ITT estimates from Equation 1. The two top rows display estimates of a regression of a standardized index of participation in social institutions. The bottom row displays estimates of a regression of a standardized index of citizens' views of chiefs and citizens' participation in and evaluation of *salongo*. All specifications are estimated using OLS and control for income, gender, and education, as well as for baseline measures of the outcome when available. Thicker and thinner lines are 90 and 95 percent confidence intervals, respectively. Views on chiefs were measured at endline 1 only. See SI Table C.6 for more details.

**Figure 7:** Reduced-form effects of the program on participation in social institutions and views of chiefs




*Notes*: ITT estimates from Equation 1. Point estimates are standardized coefficients. All specifications are estimated using OLS and interactively control for income, gender, and education. Thicker and thinner lines are 90 and 95 percent confidence intervals, respectively. Views on chiefs were measured at endline 1 only. See SI Table C.7 and Table C.8 for more details.

# 7 Conclusion

Studying a randomized land titling program in a large Congolese city, this paper offered a systematic analysis of the interplay between formal land titling and social institutions in urban Africa. We presented novel field-experimental evidence on formal property rights adoption in a low-capacity state. By documenting both high latent demand and significant implementation frictions, this paper provided insight into how transaction costs, the incentives of local elites, and social institutions shape citizens' land tenure formalization. Citizens who participate more in horizontal social institutions and who are more closely connected to city chiefs were more—not less—likely to demand a land title. We also showed evidence that more powerful and politically connected chiefs can stifle land titling. Our results reveal a distinctive logic of land formalization in urban areas, where the costs of social extraction exceed the benefits provided by social institutions. In doing so, they complement and expand on recent work on titling in rural areas (Honig, 2022). When urban dwellers are offered the opportunity to formalize their land, they seek to exit the informal equilibrium. We document negative causal effects of the land titling program on participation in social institutions:

treated citizens engage less with horizontal social insurance and view their chiefs more negatively.

While we study a formalization program in a specific city, land titling remains a significant challenge in Africa and elsewhere, and the social institutions we examine are present across the developing world (Bouman, 1983; Baldwin and Holzinger, 2019; Lust, 2022). As urbanization proceeds at a sweeping pace in Africa, cities face formalization bottlenecks. From a policy perspective, the marked increase in take-up induced by the program indicates that carefully designed reforms aimed at simplifying the land titling process and reducing bureaucratic discretion can significantly expand formalization. Beyond the specific Congolese context, our findings suggest a generalizable mechanism: when social institutions are costly and formal alternatives become more accessible, citizens opt out of informal arrangements. This has implications for understanding variation in the take-up of formalization interventions across low-capacity settings. While our analysis identifies a distinct logic of land formalization in urban Africa, future work should more precisely specify the scope conditions that underpin institutional substitution or complementarity.

Lastly, by showing how citizens recalibrate their institutional choices when formal alternatives emerge, our findings advance our understanding of state-building as a relational process (Migdal, 1988; Wang, 2021) shaped not only by institutional supply but by citizens' embeddedness in competing arenas of authority (Lust, 2022).

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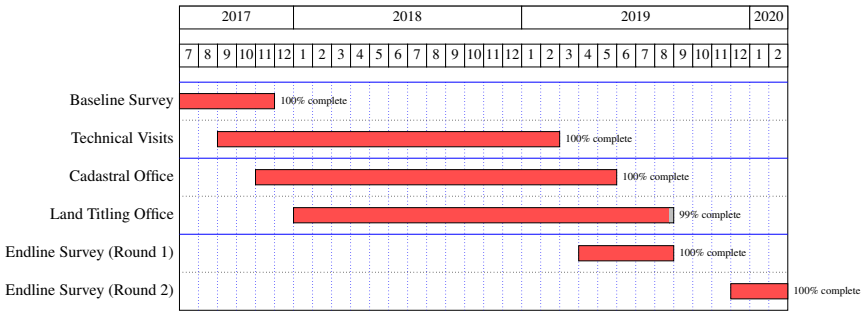
# Supplementary Information

## Contents

# A Intervention Timeline

**Figure A.1:** Timeline of the intervention.




# B Additional Details on Land Tenure in the DRC

The Congo Free State had a dual system of land rights, whereby "vacant" land belonged to the state, and land occupied by the native population was governed according to customary rules. During the subsequent Belgian Congo era, only Europeans were allowed to hold formal land titles. The process involved the surveying and registration of land in official land records. During this period, there was a single official document: the *Livret de Logeur*. The indigenous population was only allowed to hold temporary occupation rights in urban areas (Leisz, 1998). Upon independence, indigenous Congolese were allowed to own land, and holders of colonial titles were required to prove that land was being put to productive use. During Mobutu's presidency, Law 73-021 of 1973 declared that all land belonged to the state while granting temporary or perpetual rights of use. New land documents were created, including the *Droit de Concession Perpétuelle*, currently known as the *Certificat d'Enregistrement*. Landowners who already possessed a *Livret de Logeur* were allowed to obtain a *Certificat d'Enregistrement* by requesting a conversion at the city council. However, many citizens failed to complete the conversion due to financial constraints and, as a result, now hold outdated documents with no legal value. Citizens who did not possess any legal documents could still request a *Contrat de Location*. This document has less legal weight than the *Certificat d'Enregistrement* and is a contract between the owner and the government, as explained in Section 4.

# C Full results

## C.1 Program Take-up

**Table C.1:** Treatment effects of the land titling program on initiation of the titling process and receipt of land titles

| | Titling Initiation | Titling Completion |
|---|---|---|
| | (1) | (2) |
| Treatment | 0.440*** | 0.137*** |
| | (0.032) | (0.022) |
| Observations | 483 | 483 |
| $R^2$ | 0.26 | 0.07 |
| Control Mean | 0.01 | 0.00 |

*Notes:* ITT estimates from Equation 1. Estimates of a regression of initiation of the land titling process (column 1) and acquisition of a land title (column 2) on assignment to the land titling program. All specifications are estimated using OLS. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## C.2 Heterogeneous Take-up of Titling

**Table C.2:** Socioeconomic predictors of land formalization

| **Panel A. Initiation of Titling Process** | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Treatment | 0.337*** | 0.302*** | 0.328*** | 0.476*** |
| | (0.046) | (0.047) | (0.037) | (0.050) |
| × Property value | 0.146** | | | |
| | (0.062) | | | |
| × Income | | 0.198*** | | |
| | | (0.064) | | |
| × Education | | | 0.286*** | |
| | | | (0.066) | |
| × Migrant | | | | -0.109* |
| | | | | (0.064) |
| Observations | 483 | 483 | 483 | 483 |
| $R^2$ | 0.32 | 0.33 | 0.34 | 0.32 |
| Control Mean | 0.01 | 0.01 | 0.01 | 0.01 |
| **Panel B. Receipt of Land Title** | | | | |
| | (1) | (2) | (3) | (4) |
| Treatment | 0.081*** | 0.036* | 0.083*** | 0.110*** |
| | (0.026) | (0.019) | (0.021) | (0.032) |
| × Property value | 0.077* | | | |
| | (0.043) | | | |
| × Income | | 0.153*** | | |
| | | (0.040) | | |
| × Education | | | 0.126** | |
| | | | (0.054) | |
| × Migrant | | | | 0.012 |
| | | | | (0.044) |
| Observations | 483 | 483 | 483 | 483 |
| $R^2$ | 0.12 | 0.14 | 0.13 | 0.12 |
| Control Mean | 0.00 | 0.00 | 0.00 | 0.00 |

*Notes:* OLS estimates from Equation 2. Panels A and B report, respectively, the heterogeneous effects of assignment to the land titling program on initiation and completion of the titling process. Columns display coefficients of the interaction term between program assignment and dichotomous measures of respondents' property value (column 1), income (column 2), education (column 3), and migrant status (column 4). All specifications are estimated using OLS and control for income, gender, education, and property value. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

**Table C.3:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by participation in horizontal social institutions

| **Panel A. Initiation of Titling Process** | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Treatment | 0.210*** | 0.215*** | 0.150** | 0.119* |
| | (0.064) | (0.064) | (0.065) | (0.064) |
| × ROSCA | 0.044 | | | |
| | (0.030) | | | |
| × Mutual aid society | | 0.062** | | |
| | | (0.031) | | |
| × Church | | | 0.157** | |
| | | | (0.064) | |
| × Weddings and funerals | | | | 0.222*** |
| | | | | (0.064) |
| Observations | 483 | 483 | 483 | 483 |
| $R^2$ | 0.36 | 0.36 | 0.36 | 0.38 |
| Control Mean | 0.01 | 0.01 | 0.01 | 0.01 |
| **Panel B. Receipt of Land Title** | | | | |
| | (1) | (2) | (3) | (4) |
| Treatment | 0.005 | 0.000 | -0.021 | -0.031 |
| | (0.031) | (0.032) | (0.036) | (0.033) |
| × ROSCA | 0.049* | | | |
| | (0.025) | | | |
| × Mutual aid society | | -0.007 | | |
| | | (0.023) | | |
| × Church | | | 0.065 | |
| | | | (0.045) | |
| × Weddings and funerals | | | | 0.082* |
| | | | | (0.047) |
| Observations | 483 | 483 | 483 | 483 |
| $R^2$ | 0.16 | 0.15 | 0.15 | 0.16 |
| Control Mean | 0.00 | 0.00 | 0.00 | 0.00 |

*Notes:* OLS estimates from Equation 2. Panels A and B report, respectively, the heterogeneous effects of assignment to the land titling program on initiation and completion of the titling process. Columns display coefficients of the interaction term between assignment to the program and dichotomous measures of respondents' participation in ROSCAs (column 1), mutual aid societies (column 2), contributions to church (column 3), and contributions to weddings and funerals (column 4). All specifications are estimated using OLS and interactively control for income, gender, education, and property value. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

**Table C.4:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by citizens' connections with city chiefs

| **Panel A. Initiation of Titling Process** | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treatment | 0.134* | 0.187*** | 0.109 |
| | (0.072) | (0.062) | (0.072) |
| × Know Chief Name | 0.137* | | |
| | (0.071) | | |
| × Know Chief Number | | 0.135 | |
| | | (0.103) | |
| × Established Chief | | | 0.164** |
| | | | (0.069) |
| Observations | 352 | 354 | 354 |
| $R^2$ | 0.33 | 0.33 | 0.33 |
| Control Mean | 0.01 | 0.01 | 0.01 |
| **Panel B. Receipt of Land Title** | | | |
| | (1) | (2) | (3) |
| Treatment | -0.017 | 0.005 | -0.042 |
| | (0.034) | (0.028) | (0.035) |
| × Know Chief Name | 0.047 | | |
| | (0.045) | | |
| × Know Chief Number | | -0.019 | |
| | | (0.081) | |
| × Established Chief | | | 0.086* |
| | | | (0.048) |
| Observations | 352 | 354 | 354 |
| $R^2$ | 0.11 | 0.11 | 0.12 |
| Control Mean | 0.01 | 0.01 | 0.01 |

*Notes:* OLS estimates from Equation 2. Panels A and B report, respectively, the heterogeneous effects of assignment to the land titling program on initiation and completion of the titling process. Columns display coefficients of the interaction term between assignment to the program and dichotomous measures of whether respondents know their chiefs name (column 1), whether respondents know their chief's phone number (column 2), and whether the chief was appointed more than 10 years ago (column 3). All specifications are estimated using OLS and interactively control for income, gender, and education. Sample size is lower because the sample is excludes citizens who report to be chiefs at baseline. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

**Table C.5:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by the political connections of city chiefs

| **Panel A. Initiation of Titling Process** | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treatment | 0.264*** | 0.267*** | 0.264*** |
| | (0.055) | (0.055) | (0.056) |
| × Political party member | -0.037 | | |
| | (0.036) | | |
| × Ruling party member | | -0.055 | |
| | | (0.035) | |
| × Salongo frequency | | | -0.028 |
| | | | (0.058) |
| Observations | 354 | 354 | 354 |
| $R^2$ | 0.31 | 0.31 | 0.31 |
| Control Mean | 0.01 | 0.01 | 0.01 |
| **Panel B. Receipt of Land Title** | | | |
| | (1) | (2) | (3) |
| Treatment | 0.023 | 0.028 | 0.025 |
| | (0.022) | (0.023) | (0.023) |
| × Political party member | -0.059*** | | |
| | (0.021) | | |
| × Ruling party member | | -0.060*** | |
| | | (0.019) | |
| × Salongo frequency | | | -0.024** |
| | | | (0.010) |
| Observations | 354 | 354 | 354 |
| $R^2$ | 0.12 | 0.12 | 0.10 |
| Control Mean | 0.01 | 0.01 | 0.01 |

*Notes:* OLS estimates from Equation 2. Panels A and B report, respectively, the heterogeneous effects of assignment to the land titling program on initiation and completion of the titling process. Columns display coefficients of the interaction term between assignment to the program and dichotomous measures of whether the chief is a member of a political party (column 1), whether the chief is a member of the ruling party (column 2), and frequency of *salongo* organization (column 3). All specifications are estimated using OLS and interactively control for income, gender, and education. Sample size is lower because the sample is excludes citizens who report to be chiefs at baseline. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## C.3 Reduced-Form Effects of the Titling Program

**Table C.6:** Crowding out horizontal and vertical institutions (indexes)

| | Social Institutions(R1) | Social Institutions(R2) | Views on Chiefs |
|---|---|---|---|
| | (1) | (2) | (3) |
| Treatment | -0.203** | -0.163* | -0.312*** |
| | (0.083) | (0.088) | (0.107) |
| Horizontal Institutions (baseline) | 0.338*** | 0.361*** | |
| | (0.046) | (0.051) | |
| Views on Chiefs (baseline | | | 0.146*** |
| | | | (0.051) |
| Observations | 483 | 420 | 354 |
| $R^2$ | 0.21 | 0.24 | 0.07 |
| Control Mean | 0.06 | 0.02 | 0.16 |

*Notes:* ITT estimates from Equation 1. Columns 1 and 2 estimate the ITT effect of assignment to the land titling program on a standardized index of citizens' participation in and contributions to horizontal social institutions. Columns 1 and 2 estimate the ITT effect of assignment to the land titling program on a standardized index of citizens' participation in and contributions to horizontal social institutions comprising: (1) participation in ROSCAs, (2) participation in mutual aid societies (only measured at endline 1), (3) contributions to church, and (4) contributions to weddings and funerals on assignment to the land titling program and the same index measured at baseline. Participation in mutual aid societies is excluded as it was measured only in endline round 1. Column 3 estimates the effect of assignment to the program on a standardized index of respondents' views on chiefs comprising (1) citizens' overall evaluation of chiefs, (2) whether citizens think that chiefs are important or responsive, (3) citizens' level of trust of avenue chiefs, (4) citizens' level of trust in neighborhood chiefs, and (5) citizens' participation in *salongo*. All specifications are estimated using OLS and control for income, gender, and education, property value, as well as for baseline measures of the outcome indexes. Sample size in Column 3 is lower because the sample is excludes citizens who report to be chiefs at baseline. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

**Table C.7:** Reduced-form effects of the titling program on citizen participation in horizontal social institutions

| | Mutual Aid (R1) | ROSCA(R1) | ROSCA(R2) | Church(R1) | Church(R2) | Wed/Fun(R1) | Wed/Fun(R2) |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Treatment | -0.059 | -0.055 | -0.075* | -0.070 | -0.091* | -0.008 | 0.018 |
| | (0.039) | (0.040) | (0.042) | (0.043) | (0.047) | (0.045) | (0.047) |
| Mutual aid (baseline) | 0.319*** | | | | | | |
| | (0.053) | | | | | | |
| ROSCA (baseline) | | 0.372*** | 0.324*** | | | | |
| | | (0.048) | (0.052) | | | | |
| Church (baseline) | | | | 0.221*** | 0.177*** | | |
| | | | | (0.052) | (0.058) | | |
| Wed/Fun (baseline) | | | | | | 0.141*** | 0.222*** |
| | | | | | | (0.048) | (0.050) |
| Observations | 483 | 483 | 420 | 483 | 420 | 482 | 420 |
| $R^2$ | 0.12 | 0.17 | 0.17 | 0.14 | 0.11 | 0.06 | 0.10 |
| Control Mean | 0.29 | 0.36 | 0.32 | 0.52 | 0.55 | 0.46 | 0.38 |

*Notes:* ITT estimates from Equation 1. Each column displays the ITT effect of assignment to the land titling program on respondents' participation in social institutions: participation in mutual aid societies (column 1), membership in ROSCAs (columns 2-3), contributions to church (columns 4-5), and contributions to weddings and funerals (5-6). Sample size is lower in some columns because of missingness in some of the participation variables in round 2. All specifications are estimated using OLS and control for income, gender, education, and property value, as well as for baseline measures of the outcomes. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

**Table C.8:** Reduced-form effects of the titling program on citizens' evaluation of chiefs and *salongo*

| | Evaluation | Important | Responsive | Trust Neig. Chief | Trust Ave. Chief | Salongo Participation. |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Treatment | -0.168*** | -0.126** | -0.195*** | -0.070 | 0.051 | -0.118* |
| | (0.064) | (0.054) | (0.059) | (0.050) | (0.048) | (0.070) |
| Responsive (baseline) | | | 0.079 | | | |
| | | | (0.067) | | | |
| Evaluation (baseline) | 0.070 | | | | | |
| | (0.067) | | | | | |
| Trust Ave. Chief (baseline) | | | | | 0.148** | |
| | | | | | (0.059) | |
| Observations | 233 | 272 | 272 | 306 | 354 | 306 |
| $R^2$ | 0.07 | 0.04 | 0.05 | 0.09 | 0.05 | 0.05 |
| Control Mean | 0.67 | 0.76 | 0.71 | 0.75 | 0.70 | 0.67 |

*Notes:* ITT estimates from Equation 1. Each column displays the ITT effect of assignment to the land titling program on respondents' views on chiefs: citizens' overall evaluation of chiefs (column 1), whether citizens think that chiefs are important (column 2) or responsive (column 3), citizens' level of trust of avenue chiefs (column 4) and neighborhood chiefs (column 5), and an index of citizens' participation in *salongo* (column 6). All specifications are estimated using OLS and control for income, gender, and education, as well as baseline measures of the outcome when available. The sample excludes citizens who report to be chiefs at baseline. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

# D Additional Results

## D.1 Effect of the Titling Program on Views of the Provincial Government

**Table D.1:** Effect of the program on views of the provincial government

| | Gov. Performance | Gov. Responsivenes | Gov. Corruption | Erased Tax Code |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Treatment | -0.020 | -0.093** | -0.035 | -0.075** |
| | (0.034) | (0.043) | (0.049) | (0.038) |
| Gov. Performance (baseline) | 0.067* | | | |
| | (0.041) | | | |
| Observations | 441 | 483 | 420 | 483 |
| $R^2$ | 0.05 | 0.02 | 0.05 | 0.07 |
| Control Mean | 0.17 | 0.36 | 0.49 | 0.49 |

*Notes:* ITT estimates from Equation 1. Each column displays the ITT effect of assignment to the land titling program on respondents' views of the provincial government: government performance (column 1), government responsiveness (column 2), corruption (column 3), and an indicator of whether respondents erased a tax code written with chalk for the purpose of a tax collection campaign. All specifications are estimated using OLS and control for income, gender, and education, as well as baseline levels of the outcome when available. Sample size is lower in some columns because of missing values in some of the outcome variables. See Appendix I for variables' definitions. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## D.2 Additional Reduced-Form Effects of Land Formalization

**Table D.2:** Effects of the land titling program on additional outcomes

| | Participation(R1) | Participation(R2) | Authorities(R1) | Authorities(R2) | Spillovers(R1) | Spillovers(R2) | Beliefs(R1) | Beliefs(R2) |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Treatment | -0.043 | -0.052 | -0.025 | -0.046 | 0.003 | -0.003 | -0.083* | 0.000 |
| | (0.044) | (0.049) | (0.046) | (0.049) | (0.043) | (0.043) | (0.046) | (0.050) |
| Observations | 483 | 420 | 483 | 420 | 483 | 420 | 483 | 420 |
| $R^2$ | 0.04 | 0.05 | 0.01 | 0.01 | 0.10 | 0.13 | 0.02 | 0.01 |
| Control Mean | 0.39 | 0.57 | 0.54 | 0.62 | 0.37 | 0.29 | 0.52 | 0.95 |

*Notes:* ITT estimates from Equation 1. Each column displays the ITT effect of assignment to the land titling program on political participation (columns 1-2), likelihood of contacting formal authorities over informal authorities fo conflict resolution (column 3-4), spillovers on other types of formalization (column 5-6), and traditional beliefs (column 7-8). All specifications are estimated using OLS and control for income, gender, and education. Sample size is lower in some columns because of missing values in some of the outcome variables in endline round 2. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## D.3 Horizontal Social Institutions and Tenure Security

**Table D.3:** Correlates of horizontal institutions

| | Land Disputes | Hunger | Well-Being | Health Access | Educ. Access | Pension | Affected by Conflict |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **Panel A. Titling program sample** | | | | | | | |
| Social Institutions | -0.014 | -0.082* | 0.115 | 0.005 | 0.103 | 0.024 | 0.001 |
| | (0.044) | (0.047) | (0.087) | (0.072) | (0.076) | (0.023) | (0.047) |
| Observations | 483 | 483 | 142 | 190 | 191 | 191 | 480 |
| $R^2$ | 0.03 | 0.05 | 0.17 | 0.06 | 0.04 | 0.02 | 0.03 |
| Control Mean | 0.29 | 0.46 | 0.39 | 0.40 | 0.62 | 0.01 | 0.35 |
| **Panel B. Full sample** | | | | | | | |
| Social Institutions | 0.077*** | -0.073*** | 0.084*** | 0.030 | 0.082*** | 0.002 | 0.056*** |
| | (0.014) | (0.016) | (0.016) | (0.025) | (0.026) | (0.006) | (0.015) |
| Observations | 4326 | 3870 | 3379 | 1626 | 1628 | 1625 | 4284 |
| $R^2$ | 0.01 | 0.05 | 0.09 | 0.01 | 0.02 | 0.01 | 0.01 |
| Control Mean | 0.29 | 0.53 | 0.29 | 0.34 | 0.54 | 0.01 | 0.37 |

*Notes:* OLS estimates. Each column displays the coefficient of the regression of a specific outcome on a standardized index of participation in horizontal institutions. Panel A: Program eligible sample. Panel B: full sample. All specifications are estimated using OLS and control for income, gender, and education. Sample size is lower in some columns because of missing values in some of the outcome variables. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

### D.4 Effect of the Titling Program on Perceptions of Tenure Security

**Table D.4:** Effect of the Titling Program on Citizens' Perceptions of Tenure Security

| | Invest(R1) | Invest(R2) | Land Disputes Own (R1) | Land Disputes Own (R2) | Land Disputes City (R1) | Land Disputes City (R2) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Treatment | -0.120 | 0.013 | -0.011 | 0.047 | 0.055 | 0.005 |
| | (0.073) | (0.080) | (0.042) | (0.042) | (0.043) | (0.046) |
| Observations | 191 | 166 | 482 | 419 | 481 | 418 |
| $R^2$ | 0.09 | 0.09 | 0.15 | 0.22 | 0.08 | 0.08 |
| Control Mean | 2.90 | 2.24 | 0.86 | 0.91 | 2.65 | 2.35 |

*Notes:* ITT estimates from Equation 1. Each column displays the ITT effect of assignment to the land titling program on respondents' perceptions of tenure security: planning to invest in the compound despite not having a title (columns 1-2), number of land disputes in the household (columns 3-4), and number of people the respondent knows who experienced a land dispute (columns 5-6). $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## E Alternative Explanations

### E.1 Information-sharing

Here, we consider the possibility that participation in horizontal social institutions might affect the demand for land titles through information-sharing. Citizens often learn about welfare programs through social networks. Even though only citizens assigned to treatment received information about the program, this information could have potentially spilled over to citizens in the control group. If true, however, this would be inconsistent with the heterogeneous treatment effects reported in the main paper. A second possibility is that citizens in the treatment group who participate in these institutions could have discussed the program and coordinated more among themselves, increasing the probability of formalization. We address this possibility by regressing a pre-randomization baseline measure of respondents' interest in an upcoming government land titling program on our measures of participation in social institutions. This analysis uses the full sample, as interest in the program was elicited prior to the eligibility restrictions discussed in Section H. The estimates show that citizens who participate more in horizontal social institutions expressed greater interest in the program before treatment assignment. This suggests that the higher likelihood of formalization among citizens in the treatment group who take part in these institutions is unlikely to be driven by information-sharing or coordination.

**Table E.1:** Correlation between participation in social institutions and interest in participating in the land titling program

| | Interest in Land Titling Program | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ROSCA | 0.041*** | | | | |
| | (0.012) | | | | |
| Mutual Aid | | 0.014 | | | |
| | | (0.015) | | | |
| Church Contributions | | | 0.028** | | |
| | | | (0.011) | | |
| Weddings/Funerals | | | | 0.024** | |
| | | | | (0.012) | |
| Social Institutions (Index) | | | | | 0.087*** |
| | | | | | (0.022) |
| Observations | 3781 | 3781 | 3781 | 3781 | 3781 |
| $R^2$ | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Control Mean | 2.68 | 0.99 | 0.99 | 0.99 | 0.99 |

*Notes:* OLS estimates. Coefficients show the correlation between dichotomous measures of participation in and contributions to horizontal social institutions and a pre-treatment measure of interest in participating in the land titling program. All specifications are estimated using OLS and interactively control for income, gender, and education. This estimation uses the full sample since the outcome variable was measured before defining the sample of respondents eligible for the titling program. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## E.2 Social preferences

Social preferences could be predictive of both institutional participation and the demand for formalization. We explore the role of three social preferences—envy, altruism, and reciprocity—measured at baseline. Table E.2 reports negative but generally noisy effects of individuals' social preferences on the demand for land titles.

**Table E.2:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by social preferences

| | Initiation of Titling Process | | | Receipt of Land Title | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Treatment | 0.207*** | 0.194*** | 0.213*** | 0.003 | -0.004 | 0.002 |
| | (0.064) | (0.062) | (0.063) | (0.031) | (0.031) | (0.032) |
| × Envy | -0.041 | | | -0.009 | | |
| | (0.031) | | | (0.024) | | |
| × Altruism | | -0.042 | | | -0.014 | |
| | | (0.030) | | | (0.022) | |
| × Reciprocity | | | -0.052* | | | -0.009 |
| | | | (0.030) | | | (0.024) |
| Observations | 483 | 483 | 483 | 483 | 483 | 483 |
| $R^2$ | 0.36 | 0.36 | 0.36 | 0.15 | 0.15 | 0.15 |
| Control Mean | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

*Notes:* OLS estimates from Equation 2. Columns display the heterogeneous effects of assignment to the land titling program on initiation (columns 1-3) and completion (columns 4-6) of the titling process. Coefficients are the interaction term between assignment to the program and measures of respondents' social preferences: envy, altruism, and reciprocity. All specifications are estimated using OLS and interactively control for income, gender, and education. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

## E.3 Trust in formal and informal institutions

Trust in formal and informal institutions might also influence formalization decisions. In weak states, distrust of these institutions may be a major reason why people rationally choose to remain informal. Alternatively, high trust could obviate the need for formalization. However, trust generally has no effect on formalization (Table E.3). While trust in NGOs and foreign research organizations does not predict a greater likelihood of starting the titling process, the latter is associated with a higher probability of receiving a land title. Citizens with above-median trust in foreign

research organizations at baseline were significantly more likely to obtain a land title. A possible interpretation is that these citizens did not lose faith in the program—despite the long delays—due to their trust in the implementation team.

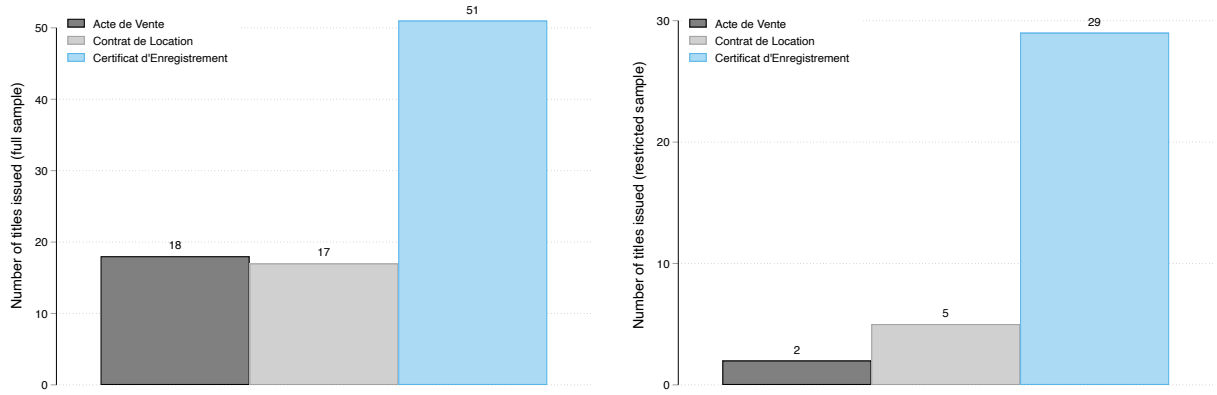
**Table E.3:** Heterogeneous effects of treatment assignment on initiation of the titling process and receipt of land titles, by citizens' trust in formal and informal institutions

| | Initiation of Titling Process | | | | | Receipt of Land Title | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Treatment | 0.199*** | 0.169** | 0.277*** | 0.129* | 0.174** | -0.012 | -0.036 | 0.010 | -0.028 | -0.059* |
| | (0.072) | (0.073) | (0.087) | (0.074) | (0.069) | (0.038) | (0.039) | (0.056) | (0.040) | (0.034) |
| × Trust Prov. Gov. | 0.006 | | | | | 0.019 | | | | |
| | (0.061) | | | | | (0.044) | | | | |
| × Trust Nat. Gov. | | 0.057 | | | | | 0.060 | | | |
| | | (0.061) | | | | | (0.044) | | | |
| × Trust Chiefs | | | -0.091 | | | | | -0.012 | | |
| | | | (0.070) | | | | | (0.054) | | |
| × Trust NGOs | | | | 0.116* | | | | | 0.043 | |
| | | | | (0.066) | | | | | (0.042) | |
| × Trust FROs | | | | | 0.058 | | | | | 0.115*** |
| | | | | | (0.061) | | | | | (0.040) |
| Observations | 483 | 483 | 483 | 483 | 483 | 483 | 483 | 483 | 483 | 483 |
| $R^2$ | 0.35 | 0.35 | 0.35 | 0.36 | 0.36 | 0.15 | 0.15 | 0.15 | 0.16 | 0.17 |
| Control Mean | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |

*Notes:* OLS estimates from Equation 2. Coefficients display the results of an interaction term between assignment to the titling program and measures of respondents' trust in the provincial and national governments (columns 1-2), chiefs (column 3), NGOs (column 4), and foreign research organizations (column 5). All specifications are estimated using OLS and interactively control for income, gender, and education. Sample size is lower in some columns because of missing values in some of the outcome variables. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

# F Types of Titles Delivered

**Figure F.1:** Number of land titles by type




*Notes*: This figure shows the distribution of titles delivered by the program. Left panel: full sample. Right panel: final titling sample. This is discussed in Section 6.

# G Randomization Details

The randomization procedure was implemented in two different ways. First, for respondents sampled for the first time at baseline, we collected survey data and, after surveying was completed in

a polygon, randomly assigned treatment within that polygon, ensuring that an equal proportion of respondents within each polygon were assigned to treatment and control. Survey teams then revisited households selected for treatment to invite them to participate in the titling program. During those visits, respondents were given flyers with information about each formal document offered through the program.

Second, due to government demands to increase the speed at which we registered participants, we adopted an alternative approach: embedding the randomization procedure directly into the baseline survey. Treatment assignment occurred at the start of the survey, and only the relevant sections of the titling offer appeared to those assigned to treatment. The only difference between this randomization process and the initial method is that, because of the real-time nature of assignment, it was not possible to randomize within polygons. However, the probability of being assigned to treatment remained 0.5.

Importantly, we first screened out individuals who were either ineligible or uninterested in learning more about the land titling program. Initially, the basic eligibility requirement was that a citizen possess any kind of document showing proof of land ownership, including expired land titles from the Mobutu period. The sample size resulting from the original criteria was 2,966, with 1,416 respondents in the treatment group. However, as the program progressed, the land titling office revised its definition of household eligibility. Under these stricter criteria, the total number of eligible respondents dropped to 483, of whom 268 had originally been assigned to treatment. In total, 2,347 respondents were excluded from the study due to the revised criteria. See Section H for a more detailed description of these changes.

## H Changes in Eligibility Criteria and Attrition Analysis

At the beginning of the program, eligibility was determined using the following questions from the baseline survey: (i) "Do you have any titles concerning the ownership of the compound? If so, which ones?" (ii) "I am going to mention a list of documents. Please tell me if you or a family member have any of the following documents for this compound." (iii) "Would you be interested in receiving a visit from this program?"

Some changes to the eligibility criteria had to be made once the program was underway. Initially, in June 2017, the Provincial Government declared that individuals with at least one of the following titles were eligible for any of the three offered titles: (i) *Certificat d'Enregistrement*, (ii) *Contrat de Location*, (iii) *Acte de Vente* (notarized or not), (iv) *Fiche Parcellaire*, (v) *Livret de Logeur*, (vi) *Autorisation d'Occupation*, (vii) *Certificat d'Occupation / Contrat de Concession*.

As the program progressed, we encountered several political and legal hurdles:

1. Some respondents were deemed ineligible for the CE because their plot lacked sufficient built area.

2. Some respondents seeking a CE were declared ineligible if a CE already existed for the same plot. For example, if the previous owner held a CE, the new owner would have to pay a fee equal to 3 percent of the property value to update the name on the original document.

3. Official documents (the *procès verbal*) needed to be signed by an official surveyor from the

cadastral office. The surveyor insisted on revisiting households, expressing distrust in the agents' initial visits.

4. The land titling office decided to enforce stricter eligibility criteria: (i) Respondents were required to have the original versions of all prior land titles for their plot; (ii) Respondents had to possess an additional official document other than the *Acte de Vente*; (iii) A narrower set of documents was recognized as valid for eligibility: (a) *Certificat d'Enregistrement*, (b) *Contrat de Location*, (c) *Fiche Parcellaire*, (d) *Livret de Logeur*, (e) *Autorisation d'Occupation*.

We then used pre-treatment characteristics measured at baseline to restrict our sample to match the government's revised eligibility criteria, allowing us to estimate the effect of the program on those ultimately able to benefit. This procedure was applied to both treatment and control groups to assess true eligibility under the new rules.

The original sample, based on the initial eligibility criteria, consisted of 2,910 respondents, with 1,396 assigned to treatment. Among those eligible for a title, only 489 expressed interest in receiving a visit from cadastral and titling agents. Under the stricter criteria, the number of eligible respondents dropped to 483, of whom 254 had originally been assigned to treatment. In total, 2,427 respondents were excluded from the study due to the revised criteria.

We address attrition in the following ways. First, we test for balance in the initially eligible sample and do not find systematic differences across households assigned to the treatment and control groups (Table H.1). One out of 17 covariates is imbalanced at the 1% level (education), and two are imbalanced at the 10% level.

**Table H.1:** Descriptive Statistics and Randomization Balance (initially eligible sample)

| | Control | | | Treatment | | | |
|---|---|---|---|---|---|---|---|
| | Observations | Mean | SD | Observations | Mean | SD | Difference in Means |
| Age | 1505 | 51.06 | 16.73 | 1393 | 51.16 | 16.07 | 0.103 |
| Female | 1514 | 0.27 | 0.44 | 1396 | 0.25 | 0.43 | -0.023 |
| Years of Education | 1514 | 9.90 | 3.68 | 1396 | 10.39 | 3.69 | 0.493*** |
| Household Size | 1505 | 5.62 | 3.79 | 1393 | 5.64 | 3.75 | 0.021 |
| Years Residing in Kananga | 1362 | 42.16 | 19.19 | 1294 | 42.01 | 18.45 | -0.159 |
| On Electrical Grid | 1514 | 0.00 | 0.06 | 1396 | 0.01 | 0.10 | 0.005* |
| House Near Ravine | 1511 | 0.37 | 0.64 | 1396 | 0.35 | 0.62 | -0.026 |
| Predicted Property Value (USD) | 1380 | 1449.28 | 2732.76 | 1267 | 1759.16 | 3205.36 | 309.872*** |
| Monthly Income (USD) | 1493 | 97.68 | 1006.57 | 1379 | 88.48 | 171.67 | -9.197 |
| Recent Expenditure (USD) | 1503 | 2.51 | 9.03 | 1392 | 2.66 | 5.34 | 0.151 |
| Business Owner | 1514 | 0.18 | 0.39 | 1396 | 0.18 | 0.38 | -0.001 |
| Trust in Provincial Government | 1433 | 2.52 | 1.24 | 1336 | 2.48 | 1.25 | -0.040 |
| Political Party Member | 1514 | 0.28 | 0.45 | 1396 | 0.29 | 0.45 | 0.007 |
| Frequency of Land Disputes | 1514 | 0.73 | 2.93 | 1396 | 0.61 | 1.57 | -0.124 |
| Helps with Community Security | 1514 | 1.54 | 6.91 | 1396 | 1.26 | 4.81 | -0.285 |
| Ever Paid Property Tax | 1502 | 0.34 | 0.47 | 1389 | 0.36 | 0.48 | 0.018 |
| Affected by Militia Violence | 1500 | 0.38 | 0.49 | 1387 | 0.36 | 0.48 | -0.017 |

*Notes*: This table shows averages at baseline for the treatment and control groups for the initially eligible sample. The last column is the coefficient of a bivariate regression of treatment assignment each variable measured at baseline. Militia Violence refers to a fighting that broke out in 2017 between the national government and *Kamuina Nsapu* militias, leaving thousands dead and hundreds of thousands displaced.

Second, we compare attrition rates across treatment and control groups and find that households in the treatment group are slightly less likely to attrite ($\beta$ = -0.041, SE = 0.016). We test for differential attrition by owner and household characteristics and do not find evidence that attriters appear to differ across treatment groups (Table H.2). This table restricts the analysis to attriters in each group and runs separate regressions for each baseline characteristic to assess differences. Three covariates are significant at the 10% level, and none are significant at the 5% level.

**Table H.2:** Attrition by individual characteristics

| | Observations | Control Mean | Treatment |
|---|---|---|---|
| Age | 1149 | 50.96 | -0.522 |
| Female | 1154 | 0.27 | -0.006 |
| Years of Education | 1154 | 9.75 | 0.286* |
| Household Size | 1149 | 5.50 | -0.138 |
| Years Residing in Kananga | 1047 | 42.08 | -1.029 |
| On Electrical Grid | 1154 | 0.00 | 0.001 |
| House Near Ravine | 1154 | 0.41 | -0.009 |
| Predicted Property Value (USD) | 1135 | 1224.36 | 203.084* |
| Monthly Income (USD) | 1140 | 96.79 | -21.030 |
| Recent Expenditure (USD) | 1148 | 2.14 | 0.280 |
| Business Owner | 1154 | 0.16 | 0.009 |
| Trust in Provincial Government | 1097 | 2.51 | -0.016 |
| Political Party Member | 1154 | 0.28 | 0.003 |
| Frequency of Land Disputes | 1154 | 0.70 | -0.072 |
| Helps with Community Security | 1154 | 1.48 | -0.201 |
| Ever Paid Property Tax | 1143 | 0.33 | 0.007 |
| Affected by Militia Violence | 1142 | 0.39 | -0.035* |

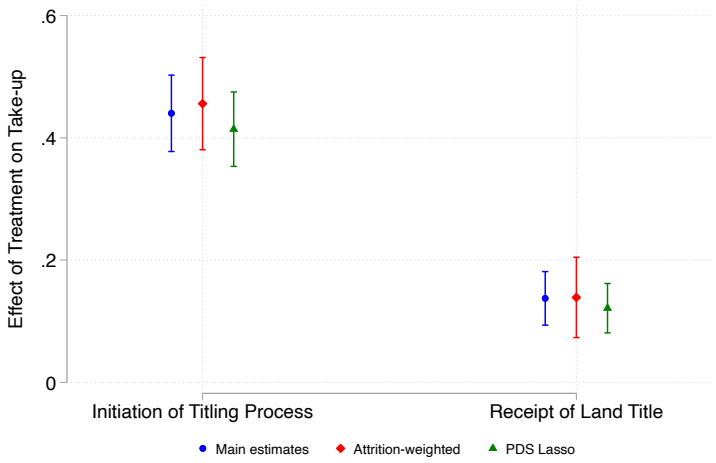
*Notes*: This table shows differential attrition by individual and household characteristics. It restricts analysis to attriters in each group and runs individual regressions for each baseline characteristic to see if they differ.

Finally, we re-estimate the main treatment effects shown in Figure 2, adjusting for attrition in two ways. First, we reweight observations by the inverse probability of remaining in the final eligible sample, as predicted by the characteristics in Table 2 and Table H.1. This procedure increases the weight on households more likely to attrite. Second, we use a double LASSO algorithm (Belloni, Chernozhukov and Hansen, 2014) to select controls that predict both treatment assignment and our outcomes of interest. Including these controls when estimating the main effects provides an alternative way to address potential imbalances arising from attrition.[27] In Figure H.1, we compare these adjusted estimates to our main results and find that the treatment effects remain virtually indistinguishable from those in Figure 1.[28]

[27]The double LASSO algorithm selects education squared, age interacted with education, and education interacted with household size as controls for the initiation-of-titling-process outcome, and female owner interacted with ravine and household size interacted with having electricity for the receipt-of-land-title outcome.

[28]More conservative methods of adjusting for attrition, such as imputing extreme values for attriters, are less applicable in our setting given the very low likelihood of obtaining a title absent the treatment intervention. In the control group, only three households reported an intent to formalize, and only one household received a land title.

**Figure H.1:** Attrition analysis




*Notes*: This figure re-estimates ITT estimates from Equation 1 (blue), adjusting for attrition using inverse-probability weighted (red) and a double LASSO algorithm (green). See the text in SI Section H for details. Lines are 95 percent confidence intervals. $N = 483$.

# I Variable Descriptions and Index Construction

**Chief Evaluation:** This variable equals 1 if respondents think their chief has an above-median evaluation of the performance of their chief. The exact question from endline is: "Overall, how would you rate the performance of the chief?"

**Chief Important:** This variable equals 1 if respondents have an above-median evaluation of the importance of their chief. The exact question from endline is: "To what degree do you think the work done by chief is important for the development of your *quartier* and Kananga in general?"

**Responsive Chief:** This variable equals 1 if respondents think their chief has an above-median level of responsiveness. The exact survey question from baseline is: "To what degree does the avenue chief respond to the needs of your avenue's inhabitants?"

**Trust Neighborhood Chief:** This variable equals 1 if respondents have an above-median level of trust in the neighborhood chief. The exact question from endline is: "I am going to name a number of people or organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [Neighborhood chief]"

**Trust Avenue Chief:** This variable equals 1 if respondents think their chief has an above-median level of trust in the avenue chief. The exact question from endline is: "I am going to name a number of people or organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [Avenue chief]"

**Salongo Participation:** An indicator that equals 1 if respondents report an above-median level of participation in *salongo*: (1) respondents' participation in *salongo* (at endline 2). The exact survey question is: "Did someone from your household participate in *salongo* in the past 30 days?".

**ROSCA:** This variable equals 1 if respondents participates in a ROSCA. The exact survey question from baseline is: "Do any of the members of your household participate in a ROSCA?"

**Participation in Mutual Aid:** This variable equals 1 if respondents participates in a mutual aid society. The exact survey question from baseline is: "Is anyone from your house a member of your mutualité?"

**Contributions to Church:** This variable equals 1 if respondents give money to the church above the sample median. The exact survey question from baseline/endline is: "In the past thirty days how much money have you given to your church?"

**Contributions to Weddings/Funerals:** This variable equals 1 if respondents give an above-median sum of money to weddings and funerals. The exact survey question from baseline/endline is: "In the past six months how much did your household give to others for weddings and funerals?"

**Participation in Social Institutions:** A standardized index comprising the following variables: (1) participation in ROSCAs, (2) participation in mutual aid societies, (3) contributions to church, (4) contributions to weddings/funerals.

**View on Chiefs:** A standardized index comprising the following variables: (1) chief evaluation, (2) chief responsive, (3) chief important, (4) trust in neighborhood chief, and (5) trust in avenue chief.

**Crowd-out Informal Institutions:** A standardized index comprising the following indicators: (1) whether the respondent belongs to a rotating savings and credit association (ROSCA), whether the respondent belongs to a mutual aid society, (3) whether the respondent donated money to her church in the last 30 days, (4) whether the respondent donated money for weddings or funerals in the past six months, and (5) whether the respondent or someone in her household contributed to *salongo* in the last 30 days.

**Property Value:** Predicted property value of each property in the sample (in Congolese Francs).

**Income:** Respondents' income in Congolese Francs. The exact baseline survey question is "What was the household's total earnings this past month?"

**Education:** Respondents' years of education. The exact baseline survey question is "What is the highest level of school you have reached?"

**Migrant:** An indicator of whether the respondent was born in Kananga or is a migrant. The exact baseline survey question is "Have you always lived in Kananga?"

**Gender:** This variable equals 1 if the respondent declared their gender to be Female.

**Chief Name:** This variable equals 1 if respondents know the full name of their chief or part of their name. The exact survey question from baseline is: "What is the name of your chief?"

**Chief Number:** This variable equals 1 if respondents have the phone number of their chief. The exact survey question from baseline is: "Do you have the phone number of the chief?"

**Established Chief:** This variable equals 1 if the chief had been appointed more than ten years ago at the time of the survey.

**Political Party Member:** This variable equals 1 if the answers to the question "Have you ever

been a member of a political party?" are "Yes-I am currently a member" or "Yes-I used to be a member, but am not."

**Ruling Party Member:** This variable equals 1 if the chief reports being affiliated with the ruling party (PPRD).

**Salongo Frequency:** This variable equals 1 if the chief organizes *salongo* above the median frequency. The exact survey question from the chief survey is: "How many times per month do you typically organize *salongo*?"

**Government Performance:** This variable equals 1 if respondents have an above-median opinion of the provincial government's performance. The exact question from endline is: "How would you rate the performance of the provincial government in Kananga?"

**Government Corruption:** This variable equals 1 if respondents think the provincial government would steal an above-median amount of tax revenues. The exact question from endline is: "Now I would like to ask you what you think the provincial government will do with the money it receives thanks to taxes. Imagine that the provincial government of Kasai Central receives $1000. How much of this money will be used on the well being of the population? [Diversion of funds and waste]"

**Government Responsiveness:** This variable equals 1 if respondents have an above-median opinion of the provincial government's responsiveness. The exact question from endline is: "To what degree does the provincial government respond to the needs of your avenue's inhabitants?"

**Erased Tax Code:** This variable equals 1 if respondents erased a tax code written with chalk for the purpose of a tax collection campaign described in Weigel (2020).

**Political Participation:** An index comprising the following binary indicators capturing whether in the last year the respondent: (1) attended a political party meeting, (2) attended a community meeting, (3) joined or participated in the meetings of a civic association, such as a club, a union or a NGO, (4) voted in the 2018 national election, (5) met with a politician, and (6) met with a bureaucrat.

**Contact Formal vs. Informal Authorities:** This variable captures the difference between the following two indexes. Contact Formal Authorities: An index comprising the following items: (1) whether the respondent would be willing to get help from the government in case of a land dispute, (2) frequency with which the respondent reaches out to the a city offer (*bourgmestre*), (3) frequency with which the respondent reached out to the police or court in case of a land dispute, and (3) frequency with which the respondent reached out to a deputy in case of a land dispute. Contact Informal Authorities: An index comprising the following items: (1) frequency with which the respondent reaches out to a priest in case of a land dispute, (2) frequency with which the respondent reaches out to the thunderman in case of a land dispute, and (3) frequency with which the respondent reaches out to the avenue chief in case of a land dispute, and (4) frequency with which the respondent reaches out to a neighbor in case of a land dispute.

**Formalization Spillovers:** An index comprising the following binary indicators: whether the respondent obtained (1) a drivers' license, (2) a work permit, (3) a business permit, and (4) a birth certificate.

**Beliefs:** An index comprising the following indicators: (1) level of envy of a hypothetical neighbor

towards someone who holds a title, (2) level of envy by family members towards someone who hypothetically holds a title, (3) level of belief by a hypothetical titleholder that his neighbors or family will practice witchcraft against her, (4) belief that business success is due to supernatural as opposed to natural causes.

**Land disputes:** This variable equals 1 for above-median values of an index comprising two variables: (1) the frequency of disputes about household ownership and (2) whether the respondent wrote an inscription on the compound walls to secure it. The exact questions from endline are: "How many times has a member of your household had a dispute about the ownership of this compound?" and "Did you ever write on the walls of this compound to prevent your compound being sold?"

**Land disputes city:** This variable equals 1 for above-median values of the following variable: "How many How many people do you know in Kananga who have had disputes about the ownership of their compound?"

**Investment:** This variable equals 1 for above-median values of the (reverse coded) following variable measured on a four-point scale. The exact question from endline is: "Imagine your neighbors do not have any property title. Do you think they will fear the following things. [Invest in their compound]"

**Hunger:** This variable equals 1 if respondents report experiencing hunger due to liquidity constraints. The exact question from endline is: "In the past 30 days, has your household had to go to bed feeling hungry because you haven't had enough money on hand?"

**Subjective Well-Being:** This variable equals 1 if respondents feel an above-median level of subjective-well being. The exact question from endline is: "Imagine 5 steps, where on the bottom, the first step, stand the poorest people on the avenue, and on the highest step, the fifth stand the richest people on the avenue."

**Health Access:** This variable equals 1 if respondents report having access access to health services.

**Education Access:** This variable equals 1 if respondents report having access access to schools.

**Pension:** This variable equals 1 if respondents report having access access to a retirement fund or pension.

**Affected by Conflict:** This variable equals 1 if respondents give a positive answer to the question "Has anyone living on your street been hurt or killed because of the conflict in Kasa i."

An indicator that equals 1 if a respondent's household is located within the boundaries of colonial Kananga (Luluabourg).

An indicator that equals 1 if a respondent's household is located in one of the four customary areas in Kananga.

**Trust Provincial Government:** This variable equals 1 if respondents have an above-median level of trust in the Provincial Government .The exact question from baseline is: "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [the provincial government]"

**Help from Government:** This variable equals 1 if respondents report above-median likelihood of

getting help from the government in case of a property dispute. The exact question from baseline is: "Imagine your neighbors do not have any property title. Do you think they will be fear the following things [Get help from the government in the case of a property dispute]."

**Trust Chief:** This variable equals 1 if respondents have an above-median level of trust in city chiefs .The exact question from baseline is: "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [the avenue chief]"

**Chief Taxes:** This variable equals 1 if the chief gives a positive answer to the question "Have you ever collected taxes in Kananga?"

**Envy:** This variable equals 1 if respondents have an above-median level of envy. The exact survey question from baseline is: "Imagine a man possesses an official land document/title. How much envious of his situation will his neighbors be?"

**Altruism:** This variable equals 1 if respondents have an above-median level of altruism. The exact question from baseline is: "Imagine a man named Kabeya receives 20,000 CF from an NGO. How much do you think Kabeya should share with others?"

**Reciprocity:** This variable equals 1 if respondents have an above-median level of reciprocity. The exact question from baseline is: "Imagine a man named Badibanga asks his neighbor Tshimbalanga for $20 to help pay for his child's school fees. Shortly thereafter Badibanga repays the debt. Later Tshimbalanga comes to Badibanga and asks to borrow $30 to buy a ticket to return to the family village. Badibanga has the money but he refuses. How acceptable is Badibanga's decision?"

**Trust National Government:** This variable equals 1 if respondents have an above-median level of trust in the Provincial Government .The exact question from baseline is: "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [the national government (in Kinshasa)]"

**Trust NGOs:** This variable equals 1 if respondents have an above-median level of trust in NGOs .The exact question from baseline is: "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [NGOs]"

**Trust FROs:** This variable equals 1 if respondents have an above-median level of trust in foreign research organizations .The exact question from baseline is: "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? [foreign research organizations]"

# J Program Materials

**Figure J.1:** Polygons (neighboroods) of Kananga.

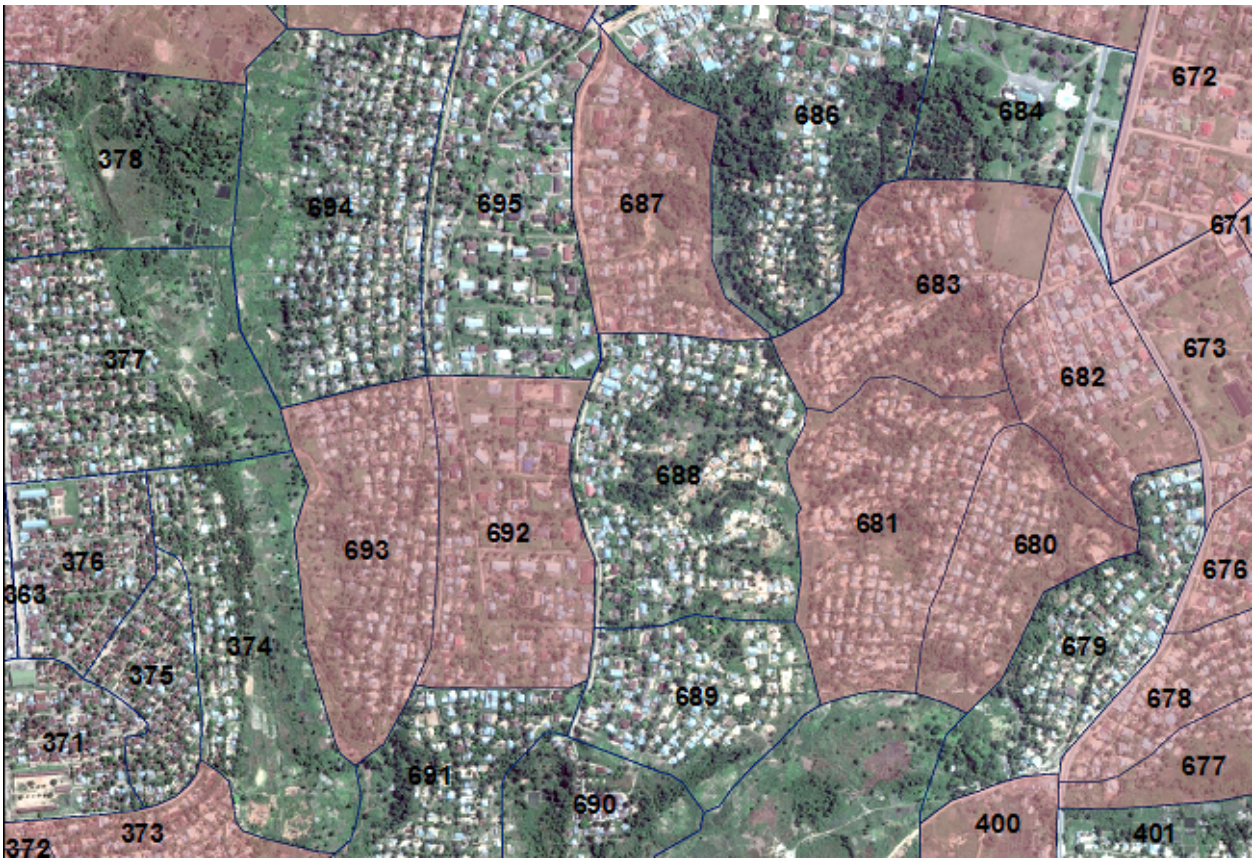
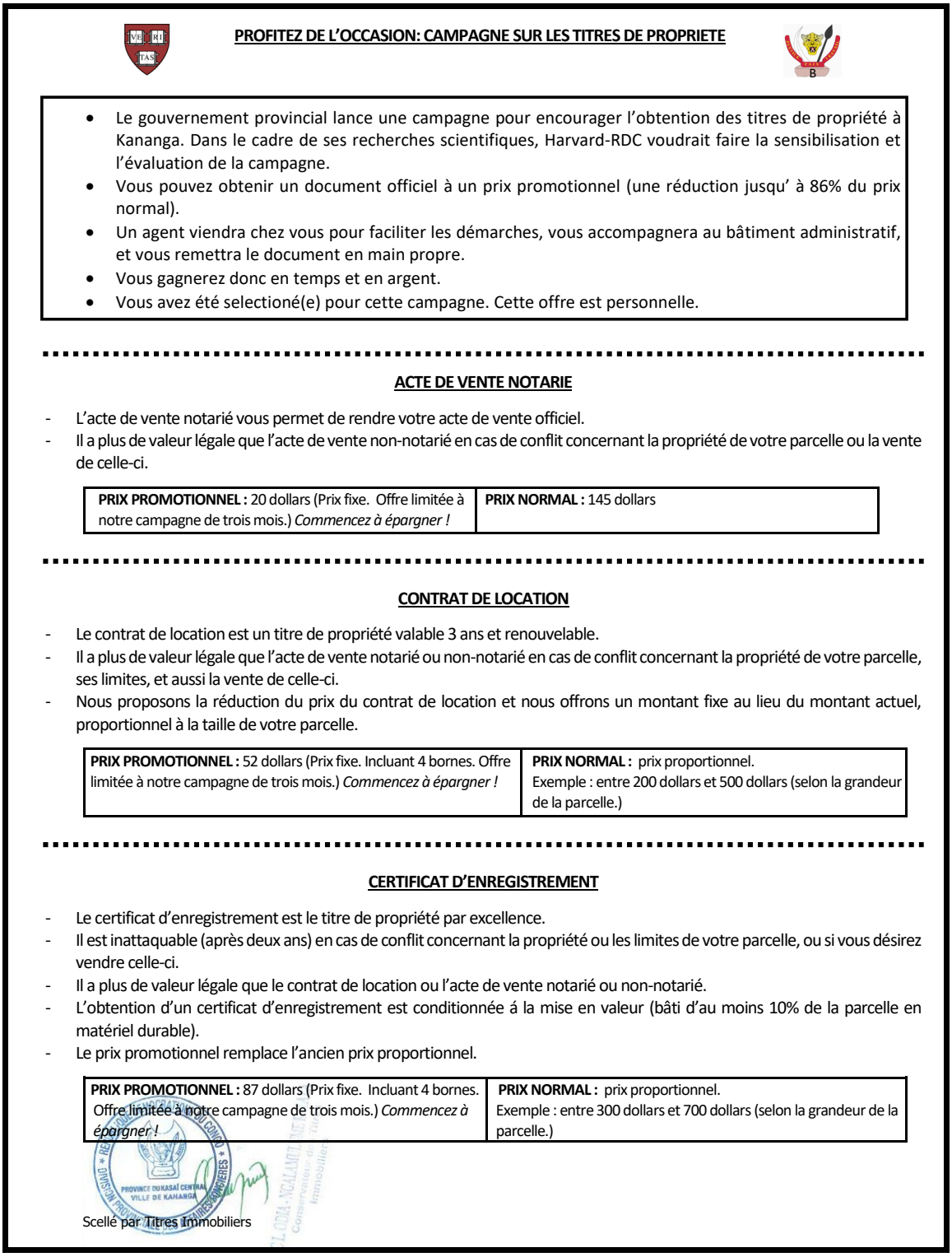


**Figure J.2:** Information flyer distributed to respondents randomly selected for the titling program. The flyer contains information on each type of land title subsidized by the program.



**PROFITEZ DE L'OCCASION: CAMPAGNE SUR LES TITRES DE PROPRIETE**

- Le gouvernement provincial lance une campagne pour encourager l'obtention des titres de propriété à Kananga. Dans le cadre de ses recherches scientifiques, Harvard-RDC voudrait faire la sensibilisation et l'évaluation de la campagne.
- Vous pouvez obtenir un document officiel à un prix promotionnel (une réduction jusqu' à 86% du prix normal).
- Un agent viendra chez vous pour faciliter les démarches, vous accompagnera au bâtiment administratif, et vous remettra le document en main propre.
- Vous gagnerez donc en temps et en argent.
- Vous avez été selectioné(e) pour cette campagne. Cette offre est personnelle.

**ACTE DE VENTE NOTARIE**

- L'acte de vente notarié vous permet de rendre votre acte de vente officiel.
- Il a plus de valeur légale que l'acte de vente non-notarié en cas de conflit concernant la propriété de votre parcelle ou la vente de celle-ci.

| | |
|---|---|
| **PRIX PROMOTIONNEL :** 20 dollars (Prix fixe. Offre limitée à notre campagne de trois mois.) *Commencez à épargner !* | **PRIX NORMAL :** 145 dollars |

**CONTRAT DE LOCATION**

- Le contrat de location est un titre de propriété valable 3 ans et renouvelable.
- Il a plus de valeur légale que l'acte de vente notarié ou non-notarié en cas de conflit concernant la propriété de votre parcelle, ses limites, et aussi la vente de celle-ci.
- Nous proposons la réduction du prix du contrat de location et nous offrons un montant fixe au lieu du montant actuel, proportionnel à la taille de votre parcelle.

| | |
|---|---|
| **PRIX PROMOTIONNEL :** 52 dollars (Prix fixe. Incluant 4 bornes. Offre limitée à notre campagne de trois mois.) *Commencez à épargner !* | **PRIX NORMAL :** prix proportionnel. Exemple : entre 200 dollars et 500 dollars (selon la grandeur de la parcelle.) |

**CERTIFICAT D'ENREGISTREMENT**

- Le certificat d'enregistrement est le titre de propriété par excellence.
- Il est inattaquable (après deux ans) en cas de conflit concernant la propriété ou les limites de votre parcelle, ou si vous désirez vendre celle-ci.
- Il a plus de valeur légale que le contrat de location ou l'acte de vente notarié ou non-notarié.
- L'obtention d'un certificat d'enregistrement est conditionnée á la mise en valeur (bâti d'au moins 10% de la parcelle en matériel durable).
- Le prix promotionnel remplace l'ancien prix proportionnel.

| | |
|---|---|
| **PRIX PROMOTIONNEL :** 87 dollars (Prix fixe. Incluant 4 bornes. Offre limitée à notre campagne de trois mois.) *Commencez à épargner !* | **PRIX NORMAL :** prix proportionnel. Exemple : entre 300 dollars et 700 dollars (selon la grandeur de la parcelle.) |

Scellé par Titres Immobiliers

## K Ethical Considerations

The design of this study involved careful consideration of potential risks to participants. In the following sections, we detail these risks, the steps taken to mitigate them, and the ethics review process we undertook.

**IRB Approval.** We obtained approval from our institution's IRB before commencing field research. Our submission included the experimental design, survey instruments, consent forms, and other relevant materials needed to assess potential risks and benefits to research participants. Although the D.R. Congo does not have a national ethics board, we sought local ethical approval from the University of Notre-Dame du Kasaï, the oldest and most highly regarded university in Kananga. We submitted the same set of materials and our IRB protocol to the university's academic dean, who provided a letter stating that "the project does not hurt the local culture nor its sensitivity" and will "help to understand the importance of private property and that of having in an easy way the title of it." We received a formal approval letter in 2017.

**Compensation.** Randomly sampled survey participants received compensation for their time. They were informed of the compensation during the consent process and received it at the end of the survey. Participants were compensated at a rate of approximately USD$2 per hour. The baseline survey lasted roughly one hour and respondents received USD$2. The endline survey lasted 90–120 minutes and respondents received USD$4. We have used similar compensation levels in Kananga since 2013, in line with practices by other international organizations conducting surveys in the city.

**Risks and Benefits.** The land titling campaign targeted 483 eligible households—a small cross-section of Kananga's population of approximately 1.6 million. The program did not eliminate the possibility of obtaining a title through the status quo procedure during or after the campaign. Focus group discussions indicated that land titles are highly valued, which is consistent with the high demand elicited by the program. While we do not detect short-run effects on perceived tenure security, formal titles do enhance tenure security in the event of land disputes. At the government level, the program increased revenue despite lower fees, as very few citizens obtain titles under the status quo. Revenue from land titles is shared between the national and provincial governments according to a formula unknown to the research team. We also conducted technical trainings with personnel from the Land Titling and Cadastral Offices who worked on the campaign. These trainings represent an investment in the technical capacity of the provincial government and may facilitate future expansion of titling programs. Importantly, these trainings were unrelated to the experimental variation studied in this research. Lastly, in 2017 the national government issued an official directive outlining guidelines to facilitate the titling process—capping fees and simplifying procedures—in a manner consistent with the intervention. The findings from this study may help inform the implementation of larger-scale land formalization programs.

## L Note on Pre-Registration

Below we note the parallels between the hypotheses in this paper and the hypotheses in the original pre-analysis plan (PAP), as well as departures from it.

**Empirical Implication 1**, on the heterogeneous effects of vertical and horizontal social institutions

on formalization corresponds to **H23** and **H24** in the PAP. However, those hypotheses contained the opposite prediction: that citizens more embedded in networks of informal insurance and those with closer connections to city chiefs would have lower demand for land titles. After learning more about the institutional environment during fieldwork, it became clear that the functioning of informal institutions was more nuanced, and that the opposite predictions could also be justified theoretically.

**Empirical Implication 2**, on the crowding-out of informal institutions corresponds to **H8** in the PAP. The PAP also contains hypotheses about crowding-out mechanisms of conflict resolution (**H7**) and traditional beliefs **(H12)**, spillovers onto other types of formalization (**H9**), and political participation (**H11**), which are tested in this paper.

The PAP also pre-specifies heterogeneous take-up by individual socioeconomic characteristics (**H18**).