Ask a local:
Improving public pricing in urban Tanzania*

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November 11, 2021

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Abstract

The rapid growth of cities in Africa is raising demand for urban services that many local governments struggle to provide. Information on willingness-to-pay is key for public pricing and allocation of services, but not easily collected. This paper studies land title deeds in Dar es Salaam, Tanzania, asking whether local leaders know and will reveal plot owners' willingness-to-pay. First, we conduct a field experiment where local leaders predict willingness-to-pay for individual owners in their neighbourhood under randomly assigned settings. Second, we elicit owners' actual individual willingness-to-pay using the Becker-DeGroot-Marschak method. We find that the demand for titles in our study area is 25% above cost, despite very low uptake. This suggests that well-targeted fees could make titles more accessible while also covering costs. Further, leaders' predictions can approximate the aggregate demand curve and distinguish variation across owners. Using leader predictions, the government could raise revenue by 30% or increase uptake six-fold while holding revenue fixed compared to the status quo. However, policy-relevant settings affect the information that leaders reveal. Accuracy deteriorates in a setting where predictions are used to allocate subsidies but adding cash incentives mitigates this. We conclude that local leaders can provide valuable information to the state if they are compensated and more closely integrated with the formal land system.

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1 Introduction

Information on willingness-to-pay can provide a key input for pricing policy, guiding the magnitude and targeting of subsidies (Berry et al. 2020). However, the central government typically lacks the capacity to extract willingness-to-pay effectively. This is especially the case in developing countries where market transactions are frequently off the record. At the same time, community leaders are an untapped potential source of local information, and therefore have the potential to raise state capacity if they are integrated in its processes (Balan et al. 2020). Local leaders often operate through informal or semi-formal practices and are a common feature of communities across Africa.[1] Since the colonial era, informal and customary property institutions in many areas of Africa have had a strong reliance on local leaders (Boone 2014). While growing importance of the state can be seen as eclipsing their role, these leaders can be complementary to state capacity when they are formally integrated (Henn 2020).

We focus on one important state policy, that is, the provision of formal title deeds. Much land in urban Africa is allocated low values of built capital, remains unplanned, and is settled under informal property rights (UN Habitat 2016, Lall et al. 2017). And yet, the development of these cities depends on the formalisation of property rights (Henderson et al. 2020, Djankov et al. 2020). Formalisation creates transparency in prices enabling functional urban land markets, and improved property records facilitating taxation (Collier et al. 2017). More generally, property rights can reduce expropriation risk, lower the cost of property protection, and remove barriers to credit (Besley & Ghatak 2010).[2] However, establishing property rights is costly for cash-strapped governments in sub-Saharan Africa.[3] To recover

[1] There is, nevertheless, significant heterogeneity in the way that leaders interact with the state. Depending on context, community leaders may or may not be part of the state apparatus, be democratically elected, or exercise important political, administrative and regulatory functions (Manara & Pani 2020*c*). Therefore leaders' objective functions may vary by context. To be transparent, in Section 2.2 we detail the role and responsibilities of our leaders and recognise that this may differ for leaders in different settings.

[2] There is empirical evidence that property rights have a positive impact on investment in rural Africa (Besley 1995, Goldstein & Udry 2008). For urban land, evidence is concentrated in South America finding impacts on household investment, education and labour supply (Field 2007, Galiani & Schargrodsky 2010).

[3] Formalization requires surveying and town planning to meet the standards of formal law. There are

program costs once neighbourhoods are surveyed and entered into a town plan, plot-specific fees are charged for title deeds. The charging of these fees reduces the uptake of title deeds, which represents a bottleneck in the process of formalisation in many African cities (Omar 2017, Sheuya & Burra 2016, Moses & Chiwambo 2018, Bezu & Holden 2014).[4]

If local leaders know and truthfully reveal information on plot owners' willingness-to-pay for title deeds, the state can use this information to better target fees, e.g. by charging less to owners with lower willingness-to-pay. Better targeted fees could raise uptake and make formalisation inclusive for the urban poor and financially viable for the government. However, extracting this information can be difficult depending on the incentives of the leaders. For example, leaders may wish to favour co-ethnics as they have been found to do in the slum rental markets of Nairobi (Marx et al. 2019). However, evidence from Indonesia suggests that, while leaders do favour their relatives in targeted government transfer programs, the extent to which they do so is minimal in terms of welfare cost (Alatas et al. 2019). Two obvious questions arise which are the focus of our paper: Are leaders informed about the willingness-to-pay for title deeds? And if so, will they share this information accurately when they are able to influence the prices faced by plot owners in their neighbourhoods?

To answer these questions we conduct an RCT with local leaders and elicit willingness-to-pay for title deeds from plot owners in Dar es Salaam, Tanzania. We randomly assign leaders to predict the willingness-to-pay of individual plot owners under three different environments. The first environment is the *control* group where leaders are told that their predictions will only be used for research. The second environment is the *stakes* group where leaders are told that, by predicting lower willingness-to-pay, they raise the chance that plot owners receive subsidies. The third environment is the *incentives* group where leaders are told that they can influence subsidies in the same way as the stakes group, but also that they can

scale economies to surveying, and so governments and development agencies alike make efforts to coordinate land demarcation (surveying) en masse.

[4]This bottleneck is observed in Dar es Salaam where formal titles account for only 20-25% of residential surveyed plots.

receive a cash payment for accurate predictions.[5] We then elicit the property owners' actual willingness-to-pay for title deeds using the Becker-deGroot-Marschak (BDM) method which incentivises owners to truthfully reveal their preferences.[6] Finally we can compare, both in the aggregate and at an individual level, how leaders' predictions of willingness-to-pay relate to the elicited values from owners, and how this relationship between predictions and truth depend on the experimental environment assigned to leaders.

This paper is related to the literature studying the use of agents to target subsidies. This literature has studied various targets: poverty, individuals with high returns to loans, and corruption (Olken 2009, Niehaus et al. 2013, Basurto et al. 2018). Agents may have different preferences from the social planner and strategically give misleading information. In a related paper, Rigol et al. (2021) test whether cash incentives can encourage entrepreneurs to report which of their peers have the highest marginal returns to a loan. Our paper is, to the best of our knowledge, the first to study whether agents (local leaders in our case) can be used to extract information on willingness-to-pay.

This paper is also related to the literature on eliciting willingness-to-pay for non-market based goods. In a related paper, Ali et al. (2016) estimate the demand for title deeds in a neighbourhood of Dar es Salaam using a take-it-or-leave-it randomisation of title fees. Their method estimates mean compliance conditional on fee size, and so cannot be used to determine individual willingness-to-pay. In another related paper, Berry et al. (2020) elicit the willingness-to-pay for water filters using the Becker-deGroot-Marschak (BDM) method. This method does allow the researcher to estimate individual willingness-to-pay, however the policy maker cannot use it to set fees in practice.[7] Our paper provides a method (by eliciting third party information) that both identifies individual willingness-to-pay, and can

[5]The payment is based on an ex-post payment rule, implementable in a policy setting.

[6]The BDM method was originally developed by Becker et al. (1964) and is still used at the frontier of applied work (Berry et al. 2020). Despite concerns that the BDM mechanism may deteriorate participant comprehension or trust, recent work in Uganda has shown that comprehension is very high in a similar real world setting Burchardi et al. (2021).

[7]The BDM cannot be used in practice by the policy maker because it relies on the credible incentive that the customer will be able to buy the good at a random price.

be practically implemented.

In another related study, Balan et al. (2020) show that tax collection by local elites can raise more revenue than collection by state agents. Their evidence suggests that the primary mechanism is informational advantages of chiefs; enabling chiefs to better target tax visits based on households' underlying payment propensities. They test this with a treatment arm where state collectors meet with local chiefs and indicate, address by address, willingness and ability to pay taxes. Our paper sheds light on this mechanism of local leaders as state capacity by directly measuring the ability of local leaders to predict willingness-to-pay (for title deeds in our case), and by studying the conditions under which this information can be accurately extracted.

Finally, this paper is related to the literature on demand for title deeds in Tanzania specifically. Despite low uptake, this literature suggests that there is a demand for land titles in this city. In fact, qualitative research suggests that formalisation policies rally considerable social support (Manara & Pani 2020*b*). However, it is argued that the price of registration constitutes a considerable barrier (Kusiluka & Chiwambo 2018, Magina et al. 2020, Omar 2017)[8]. Our paper contributes to this literature by quantitatively estimating demand for full statutory property rights independent of the prevailing price.

Our paper makes three contributions. First we challenge the view that the low uptake of title deeds is due to plot owners not recognising, or not needing, the benefits from tenure formalisation (Briggs 2011). We provide evidence of significant demand for title deeds, albeit at lower prices than the government is currently charging. According to our BDM estimates, roughly 40% of untitled plot owners are willing to pay fees equal to the monthly income of a typical household. Further, we calculate that there are private gains to title deed provision about 25% above the cost of surveying and planning, even under very conservative assumptions. This suggests that better targeted fees could raise uptake and make formalisation more inclusive while still financially viable for the government.

[8]Beyond the literature, key policy makers at all levels of government also suggested this to the authors.

Our second contribution is to show that local leaders' predictions can be used to improve the pricing policy for title deeds. In particular, using leader predictions of willingness-to-pay, the state could calibrate parameters in the current fee function to (a) raise revenue by 30% compared to the status quo, or (b) increase uptake by six times holding revenue mostly fixed compared to the status quo. The leaders' predictions can be used to accurately approximate the aggregate demand curve, and to distinguish variation in willingness-to-pay across owners in their neighbourhood. This is true even when conditioning on the fee size, or property value. Therefore, community leaders have meaningful local knowledge of the demand for land titles.

Our third contribution is to show that leaders act strategically when the information they provide influences the allocation of subsidies in their neighborhood. Compared to a control group where there are no stakes at play, we find that leaders overstate willingness-to-pay in a setting where subsidies will be given if they assign lower willingness-to-pay, i.e. leaders make titles more expensive when given the opportunity. We discuss this initially counter-intuitive result in depth, and through follow up interviews comment on several possible explanations. We conclude that a likely explanation is that leaders may try to block uptake of title deeds since they represent competition for a main source of their compensation: earning tips for validating customary ownership. Further, we find that the overstatement is entirely driven by predictions of individuals believed in the top two thirds of neighbourhood income. That is, despite overstating willingness-to-pay on average, leaders are not burdening those that they perceive as poor. Finally, we show that there is no evidence of these distortions for a group of leaders randomly assigned to an environment where they are also offered a simple cash payment for ex-post accuracy. These results suggests that leaders can provide valuable information to the state if they are formally compensated.

The paper is outlined as follows. Section 2 describes the title deeds, neighbourhoods, and leaders being studied. The data collection and experiment are described in section 3, and sample descriptives on leaders, plot owners, and their willingness-to-pay are provided in 4.

Results in section 5 show leaders' ability to predict demand on the aggregate and across owners. Section 6 provides a conceptual motivation outlining how willingness-to-pay can be welfare improving and when it is useful in practice. We discuss results and short follow up studies in Section 7, and in section 8 we conclude.

2 Setting

2.1 What are the neighbourhoods and title deeds being studied?

Our study was conducted in Kilungule A and B; two mtaas in Ubungo Municipality of Dar es Salaam.[9] This area can be described as suburban middle class with average monthly household incomes around 200,000 TSH.[10] The neighbourhood unit that we study is called *shina* in Swahili and typically contains 250 plots. For simplicity we refer to our study area as Kilungule and it is shown in Figure **??**. Here, the Tanzanian Ministry of Lands, Housing and Human Settlements Development (MLHHSD) designed and implemented a pilot project of land tenure formalisation starting in 2016. We focus on fifteen neighbourhoods that participated in this pilot program. At the time of our study, surveying was complete and invoices already issued to plot owners in these neighbourhoods. The government has fronted the fixed costs of surveying and planning, and now plot owners can simply pay their invoice to complete the process of acquiring a title. After the first three years uptake was less than 13%. We focus our study on owners of plots who had yet to pay their invoice by the start of the intervention, which was over three years since the commencement of the formalisation project.

The title that we study is a legal document of ownership, Certificate of Right of Occupancy (CRO), that is supplied by the MLHHSD and provides the highest protection by law in the

[9] A mtaa can typically contain a few thousand plots, and it is the Swahili word for street. The mtaa is the smallest administrative unit and the lowest level of local government in Tanzania.

[10] This is just under 100USD per month. The exchange rate at the time of our study was 2,300TSH per USD (average for 2019).

country. A CRO formally recognizes a 66 year lease of a plot of land from the government. Legally a CRO provides private benefits in three ways; protection from government-led expropriation, use as collateral with mainstream banks, and legal transferability of land.[11] Title deeds also come with an added tax burden. In particular, owners with a CRO must pay land rent to the MLHHSD (Franzen & McCluskey 2017). However, the land rent is relatively small and often not collected.[12] Further, all properties, not only those with a CRO, are subject to the property tax which is levied by the local government (Franzen & McCluskey 2017).

The main cost to the provision of title deeds is surveying and town planning. A plot of land must be surveyed and approved by the municipal town planning office to be eligible for a CRO. There are scale economies to surveying.[13] For this reason the MLHHSD pilot program first surveys plots for entire neighbourhoods and then tries to recoup the fixed cost by charging fees for the uptake of title deeds.

The costs of this program include survey, planning, and administration. However, fees are not only charged for these costs, but also include premiums.[14] Trying to capture rents above program costs, especially in light of low uptake, raises concerns over the effectiveness of the government's strategy to supply affordable CROs. It may be that the government is dynamically optimising revenue collection by setting high fees and waiting for plot owners

[11]More specifically, owners of a CRO who are expropriated by the government are entitled to higher compensation, and since surveying is a pre-requisite, documentation of exact plot boundaries mitigates potential conflict with neighbours (Wolff et al. 2018). For use as collateral, small loans can actually be accessed without a CRO by using the informal sale agreement. However, these typically have a maximum ceiling of 20 million TSh. In contrast, for loans pledged against CRO, the loan amount is only limited by the collateral value and the bank's single borrower limit (Manara & Pani 2020*a*). For land sales, the CRO provides the buyer a guarantee of the seller's rightful ownership. While land is often sold informally these types of sales are susceptible to scamming with land being sold to multiple people. Wolff et al. (2018) describe a case in Kigamboni, Dar es Salaam, where a single plot was sold to over 30 individuals.

[12]For a plot of typical size in our sample, the annual land rent is around 1.5USD.

[13]The survey of a standalone plot may cost around 6 million TSh while the average cost drops to 17% of this when 10 plots are surveyed at once, 5.8% for 100 plots, and for large scale projects with more than 1,000 plots the average cost is about 0.2 million TSh. From author's discussions with two of Tanzania's leading survey companies.

[14]The invoices include two such premiums. The first, is simply called 'Premium' and is a mark-up to raise government revenue. The second, called 'Revolving Fund', is a mark-up used to subsidise future surveying projects. Some fees are fixed (Application, CRO, and Deed Plan), while all others vary with plot size and land value. Figure **??** shows an example of an invoice from the Kimara program with a breakdown of charges.

to uptake when they receive positive income shocks. However, under independent income shocks, it would take about 50 years before reaching 90% uptake at the current rate.[15] We conclude that the current fees are set too high overall.

2.2 Local leaders and their objective function

The local leaders that we study are called *mjumbe*, or *wajumbe* (plural) in Swahili. They represent formal political parties at the shina level, however they are unofficial and unpaid positions and so bear a quasi-formal status (Manara 2020). We include all wajumbe that have been active for at least one mandate since the announcement of the formalisation project. This means that, for the same neighbourhood, we include wajumbe from both the ruling CCM party and the opposition Chadema party. Almost all wajumbe are also residents of the neighbourhood, and in many cases are recognised as community elders.

How are the leaders selected and removed? Every four years, the party elected to the mtaa level selects wajumbe for each shina as follows:[16] First, the party reviews wajumbe candidates for each shina and selects candidates to run for elections. Normally, the candidates are active members of the party. Second, an election is run at the shina level to select among the candidates. In this election voters must be registered with the party and be residents of the shina. Finally, after being elected, each mjumbe appoints several assistants who must be approved by the party committee. We include assistants in our analysis since they typically collaborate with them on tasks, and even act on their behalf when the latter are absent.

While the role of local leaders is mostly political on paper, in practice it also encompasses social and administrative tasks beyond an official mandate. For example, wajumbe organise and encourage residents' attendance of public meetings.[17] Furthermore, they are involved in

[15] Assuming that income shocks are independent over time, and each period of three years 13% of plot owners receive a positive income shock large enough that they choose to purchase their title, i.e. $0.9 = (1-0.13)^{(50/3)}$. In practice, shocks are likely positively correlated across time meaning that it will take even longer for uptake to reach 90% in this simple calculation.

[16] The National Election Committee regulates and supervises the election of the mtaa chairmen. In this case, the party reviews several candidates and selects one contestant to run for the mtaa election, whereby all residents have voting power.

[17] Including, but not limited to, the political party meetings.

solving family disputes, issuing identification letters (e.g. to banks, schools and government), monitoring service provision (e.g. waste collection) and facilitating government projects (e.g. distribution of IDs). Finally, the mtaa chairman and executive officer often engage wajumbe as witnesses in cases of land dispute and, more generally, to validate informal ownership when this is required by third parties, e.g. prospective buyers, municipal or bank officers (Manara & Pani 2020*c*). Serving as a witness is one of the few opportunities that a mjumbe can be paid for her services.[18] In fact, wajumbe are the ultimate source of knowledge on local land matters. For this reason, we argue that wajumbe may have information that can improve the allocation of title deeds. However, for this same reason, the transition from informal to formal property rights may jeopardize the role of wajumbe.

Given the characteristics, selection process, and role of the leaders what can we conclude about their objective function? Certainly wajumbe are not passive agents when it comes to the allocation of title deeds. Incentives could motivate behaviour in a variety of ways: First, since they are members of community and neighbours to plot owners, they may have social and personal ties within their community and therefore favour these individuals over the objectives of the central government. Second, favouritism towards the local community could manifest in different ways. Wajumbe could favour personally connected individuals (e.g. relatives), or they may choose to act more equitably since they are responsible for and invested in the community and so wish to preserve social cohesion. Third, they are selected by the party in power at the mtaa level which could align or oppose the mandate of the central government. Therefore, wajumbe may choose to act against or in support of the government's agenda to raise the uptake of title deeds. Finally, since the responsibilities of wajumbe largely depend on the existence of an informal land tenure system, they may be incentivised to maintain the status quo by interfering with land formalisation.

[18] As noted above the party does not pay wajumbe for their work. However, they often earn informal tips from individuals who require their services.

3 Data Collection and Experiment Procedure

We conduct two surveys; one with 90 local leaders under three experimental settings and the other with 146 plot owners including BDM price elicitation for the title deed to their plot. The full time line of the study is outlined below and depicted in Figure **??**. In brief, first we collected data for the sampling process. Then we conducted the leader survey and experiment. Finally, we held information sessions with plot owners, and after a few weeks we invited them for their price elicitation sessions. These passages are fully described in this section. Lastly, we conducted two rounds of follow-up data collection in January and October 2020 to gather administrative records on the history of each invoices file and to interview a sample of leaders who had taken part in our experiment. We present and analyse this data in Sections 7.3 and 7.4 of this paper.

3.1 Sample Selection

We first sample owners who had yet to pay their invoice by the start of the intervention. We collected CRO invoice records of all 1,482 invoiced plots in our study area and matched 1,401 of these to geo-located plot boundaries. Of these, only 13% had purchased their title deed, even though 97% had been invoiced over six months earlier and 28% had been invoiced over two years earlier. From this population we randomly sampled 15 invoiced plots from each neighbourhood in our study area, for a total of 225 plots. We stratified our sampling so that low, medium, and high value plots were represented in each neighbourhood. We then conducted a rapid survey of the selected plot owners in order to gather their contact information, occupancy (i.e. owner-occupier or absentee landlord), and their social connection to each leader (i.e. whether they knew or ever interacted with their leaders).

Following the invoice collection, we conducted a census of the 96 leaders in our study area which allowed us to match them to neighbourhoods, classify their party affiliation (CCM or Chadema) and hierarchical position (main leader or leader assistant), and geo-locate their

residence. Leaders were then randomised to one of three treatment groups explained below.[19]

All randomisation (sampling plot owners and leader treatment assignment) was done mechanically during a series of public meetings where the process could be observed. For the assignment to treatment, leaders were simply assigned to a 'red', 'green', or 'blue' team so that they were unaware of their actual treatment. Despite the potential for mechanical error, this was an important procedure to garner trust with the community. It also provided a practical experience with randomisation so that those who also participated in the BDM at the end of the study were already familiar with the lottery process.

3.2 Leader Survey and Experiment

We conducted surveys with the leaders one month in advance of the first plot owner price elicitation session. All 96 leaders in our study area were invited to participate and 90 (93.8 percent) attended and completed the survey. The questionnaire consisted of demographics, a CRO knowledge test, social network mapping, and predictions of plot owner characteristics. The network and prediction questions all related to the owners of the 15 selected plots in each leader's respective neighbourhood. For reference the leaders were given both official names and nicknames of each owner as well as a photo of the particular plot that was selected.

The survey concluded with price elicitation tasks. Leaders were asked to rank each of the 15 plot owners in their neighbourhood in terms of their willingness-to-pay for the title deed. After ranking, leaders had also to predict, for each plot owner, their exact willingness-to-pay.[20] Each leader conducted the task under one of three treatment groups.

Leaders assigned to the *control* group were told that the research was conducted for academic purposes only. They were encouraged to be as truthful and accurate as possible to enable high quality research. Finally, they were ensured that their answers would not be used to change any procedure over the course of the study.

[19] We stratified the leader randomisation based on political affiliation and physical and social proximity to sampled invoiced plots.

[20] The exact scripts used can be found in Appendix **??**.

Leaders in the *stakes* group were informed that their responses to the price elicitation tasks would be used to change procedures in the remaining study; in particular, to help decide which plot owners would have higher chances to win large discounts through the lottery. If leaders suggested a plot owner had a low willingness-to-pay, we would adjust the distribution of discounts available in the lottery to this plot owner so as to make it more likely that they win a high discount.[21]

Finally, leaders in the *incentives* group received the same instructions as the stakes group, but they had the opportunity to earn cash for their accuracy. We adopted an ex-post payment rule that would be implementable in a policy setting.[22] Leaders were given simple payment examples to work through. Each leader was reminded that being as truthful and accurate as possible was the best way to earn the cash. At the end, the leader with the most points was paid 30,000TSh and the four runner-ups were paid 20,000TSh each.

3.3 Owner Information Sessions

We invited all 225 sampled plot owners to attend an information session to introduce them to our project, two to three weeks before their actual research session. The focus of the information session was on familiarising the respondents with the BDM procedure. They were told that, during the research session, they would be asked "What is the maximum price that you would and could pay in the next 10 days for your invoice towards your title deed?". We then explained the concept of willingness-to-pay both in theory and with examples. They were told that on research day they would have an opportunity to commit to pay their invoice if it was offered at a price they could afford, and so it was important that they thought carefully over the following weeks about their willingness-to-pay for the

[21] We adjusted the distribution of available discounts based on an average of leader predictions for the same plot owner, therefore mitigating concerns over the ethical aspects of this treatment.

[22] Before the price elicitation tasks, leaders were explained that, at the end of the study, we would pick one price level and observe which plot owners stated willingness-to-pay above that price. For each plot owner with stated willingness-to-pay above the threshold price, leaders would get a number of points corresponding to the assigned ranking position of that plot owner. This is implementable in a real world setting, since the policy maker will observe which of the plot owners do in fact uptake titles. If titles were purchased by owners for whom the leader ranked high, then the leader was accurate.

title deed. We then explained the specifics of the BDM method and that their best strategy was to determine for themselves their true willingness-to-pay and then reveal exactly that price to the surveyor. We used theory and examples to show why this was the best strategy for them. We finished the session by practising with volunteers for either a soda or an aerial photo of their plot. Throughout the session we asked for feedback from respondents until it was clear they understood.

Owners were given at least two weeks between the information session and the price elicitation session. During this period they were encouraged to consult others (family, joint plot owners, friends, etc.) on their willingness-to-pay and plan out a strategy for gathering the funds they may need if they won a discount. This time was also used to sort out individual issues with each invoice. Some of these issues were simple for us and the Ubungo Municipal Office to accommodate, such as the misspelling of names, partial payments already made, and the addition of spouses to invoices. On few exceptional circumstances, we allowed 'decision makers' to participate on behalf of the true owner on the invoice.[23] For other issues we had to drop invoices from our sample. This was the case where, by the time of starting the study, invoices had already been fully paid or the plots sold (19 cases), where at least one owner had deceased (4 cases), when the owner lived out of country and could not be reached (13 cases) or had conflicts (5 cases) over the rightful ownership. After discarding these issues there were 184 remaining invoiced plots.

3.4 Owner Survey and Price Elicitation

We invited the 184 eligible plot owners to participate in a survey and price elicitation lottery, and 146 of these attended. We also invited a leader to each session in order to establish trust with the respondents. The survey collected information on demographics, a CRO knowledge test, sentiments towards tenure security, and perceived costs and benefits of a CRO. Following

[23]This was done in two exceptional cases, one where the plot owner had been living in Canada for over thirty years and his brother was the de-facto owner of the plot, and a second where the plot owner was disabled and her son took on responsibility for the plot. In both cases the decision maker was responsible for paying the invoice, and in neither case did we change the name of the plot owner on the invoice.

the survey each respondent participated in the BDM price elicitation. This began with a practice round where the respondents were randomly assigned the opportunity to purchase either a soda or an aerial photo of their plot (see Figure **??** for an example) through the BDM mechanism. Following the practice, they were offered the opportunity to acquire the title deed for their plot at a discounted invoice price, again through the BDM mechanism. If the respondent won the discount, they were scheduled to make their payment within ten days.[24]

The BDM procedure that we implement closely follows that of Berry et al. (2020) with slight adjustments to our context. Respondents stated their willingness-to-pay (bid) and participated in a lottery extracting a new invoice price (draw). According to standard BDM procedure, if the draw was lower or equal to their bid, they would be offered the title deed at the new discounted price; if the draw was higher, they would not be offered a new price. Each BDM session began with a description of the procedure followed by a practice for either a soda or an aerial photo of their plot before proceeding with their invoice. Scripts can be found in Appendix **??**. Practice rounds enabled respondents to understand that their bid should represent the maximum price they could and would like to pay; their bid could not be changed after the lottery; and, upon winning, they must make the according payment within ten days. Once the bid for the invoice was finalized, a price was drawn which determined whether the respondent would pay for the invoice at the drawn price.[25]

There were 39 respondents who drew prices lower than their bid and so won a discounted invoice value. For each, we confirmed that they could pay and that they had a plan to

[24]Because the title deed cost was high for many households we did not ask for immediate payment. First, asking respondents to bring the full amount of cash necessary to cover their bid value would be a significant wasted effort in the case that they did not win. The second reason was to allow enough time to gather funds from family, friends, or micro-lending groups. In fact, 15% of respondents admitted asking the financial support of family and friends to make higher bids.

[25]Practically, the respondents drew 1 of 75 plastic balls from an opaque jug. Each ball corresponded to a price between 0 and their full invoice value which was recorded on a reference sheet. The exact distribution depended on the size of their plot (thus, indirectly, also the invoice value). In order to maintain goodwill the distribution of prices was shown upon request just before the price was drawn and none of the respondents asked to change their bid after seeing the distribution. A full description of the distributions can be found in Appendix **??**.

collect the necessary funds, and had them sign off on their bid value and draw outcome. All participants received a 10,000TSh cash allowance for their participation, and winners were required to use this as a down-payment in order to discourage overstating their willingness-to-pay. Still, five (12.8 percent) of the winners did not complete the purchase.[26]

4 Data and Sample Descriptives

4.1 Summary Statistics and Balance

In Table 1 we present mean characteristics for the whole sample of both the plot owners (column 1) and leaders (column 2). Compared to leaders, plot owners tend to be younger and more highly educated but score worse on a short quiz about CROs and have lower household monthly incomes. While the majority of owners are male there is a significant share of female ownership (73% of plots have sole ownership, and 36% of these are owned by women). This is in line with previous findings that the cultural environment in Dar es Salaam is not particularly opposed to co-titling or female ownership (Ali et al. 2016). Leaders are also slightly more likely to be men, but 40% of them are women. Considering potential heirs, 92% of plots are owned by individuals with at least one child.

The average CRO invoice value is 526,000 TSh, or roughly two and a half times the median monthly income in our sample. Most plots are occupied by their owners, still 28% are owned by absentee landlords. A full 86% of plots were acquired by purchase, as opposed to inheritance or squatting, though only 24% of all plots have a informal certificate of sale (*hati ya mauzo* or *sale agreement*). Half of the plots are owned by individuals with at least one other plot in Tanzania.

Leaders themselves tend to own their homes; 94% own the plot they live on, while the remainder all live on a plot owned by a member of their household. Leaders typically have

[26]Three of these cited unforeseen health issues with a family member that became a priority for the funds that were allocated to the title deed. One was unable to borrow the money that she had expected to. The last one went away on business and was unwilling to arrange a representative to make her payment.

a long history of residence in Kilungule; while only 7% have settled in the past six years, a full 38% have been living there for over 19 years. Out of the fifteen owners sampled for each neighbourhood, leaders know on average 12 of these, though only 4.3 have ever come to the leader for official assistance. Leaders have few social connections among the plot owners in the study; on average 0.22 owners are family, 1.4 are friends, 1.8 meet together regularly for religious purposes, and 1.3 are considered highly esteemed by the community.

Also presented in Table 1 are differences in leaders' characteristics between *stakes* and *control* groups (column 4) and differences between *incentives* and *control* groups (column 5). There are only a few marginally significant differences, though standard errors are large. The *stakes* group has fewer women and more leaders with household income below 100,000TSh compared to the *control* group. The *incentives* group has more leaders with their home plot surveyed than the *control* group.

4.2 Demand for CROs

Figure 1 describes the demand for CROs elicited through the BDM. For the BDM demand curve we show, for each price, the share of plot owners whose bid was greater than or equal to that price. This is done by running successive logit regressions at each price point and correcting for heteroskedasticity in the calculation of the confidence intervals.

While the full sample of plot owners were not willing to purchase a title deed at their invoiced price there is still a significant amount of demand for CROs. Over 40 percent of plot owners would be willing to pay 200,000 TSh which is more than the monthly household income of half of our respondents. However, demand is still much below invoice fees that are currently being charged. The median invoice in our sample is 500,000 TSh, at such a price less than 10 percent of plot owners would be willing to pay. Even if all plots were charged 170,000 TSh, the minimum invoice value observed in our sample, roughly half of plot owners would not purchase a title deed.

In Figure 1b we compare the elasticity of demand calculated from smoothed version of the

demand curve above. There is a wide range (200-600,000 TSh) where demand is relatively elastic, beyond which we have trouble estimating due to the sparsity of observations in the tail of the distribution.

4.3 Leader Predictions and Placebos

Because we are interested in knowing whether leader's have accurate knowledge of the willingness-to-pay for CROs in their neighbourhoods, we first check if they have knowledge on a more conventional set of plot characteristics. In Table 2 we run regressions based on the model:

$$y_{ij} = \beta \hat{y}_{ij} + x_j' \gamma + \epsilon_{ij} \tag{1}$$

where y_{ij} is a characteristic of plot i related to leader j, $\hat{y}_{ij}$ is leader j's prediction of plot i's characteristic and x_j is a vector of leader controls for randomization strata, neighbourhood, and surveyor id.

Panel A shows that leaders predictions of plot and plot owner characteristics are positively associated with their true characteristics. For columns 1-3 we use the within-neighbourhood rank of the plot owner characteristic as dependent variable. In column 1, leaders are able to distinguish between owners with higher or lower income. Our estimate of 0.2 implies that, an individual predicted to be five positions higher in the ranking is on average 1 position higher in the rank of plot owners' income. This estimate for income rank is very similar as those found by Rigol et al. (2021) for Indian entrepreneurs' predictions of their peer's income rank.[27] In column 2 we show leader's predictions of CRO invoice value rank are positively associated with the true CRO invoice value rank of plots in our sample, and for column 3 this is also true across the full sample of plots.[28] Therefore column 3 signals that our plot

[27]Rigol et al. (2021) find an estimate of 0.18 for income, 0.2 for profits, and 0.22 for assets.

[28]The full sample of plots includes those plot owners that were not part of our plot owner survey.

owner survey sample is not selected towards plots that are easier to predict. In columns 4 and 5 we can see that leaders also have some ability to predict whether plot owners have paid their property tax or if they have an informal certificate of sale.

Panel B does placebo tests by comparing the relationship of leader predictions and actual characteristics across treatment groups. It is a placebo because all of these predictions were given by leaders before they were assigned their treatment. The stakes group does have a slightly higher differential between predicted and observed for each characteristic, but there are no significant differential coefficients of either the stakes or the incentives treatments. This suggests that leaders in different treatment groups have similar predictive capacity.

5 Results

5.1 Leader Predictions of Aggregate Willingness-to-Pay

Demand for CROs elicited through the BDM mechanism is compared with that elicited through local leaders in Figure 2. For the BDM demand curve we plot, for each price, the share of plot owners whose bid was above that price. We follow a similar procedure for the leader predicted demand curve, but use the leader prediction of the plot owner's willingness-to-pay instead of the owner's bid. Since there are multiple leaders for any given owner, and so multiple predictions of their willingness-to-pay, we cluster standard errors at the plot owner level. The same 146 plots are used to construct both the BDM and leader predicted demand curves.

In Figure 2a, we only use leaders in the *control* group and compare the demand curve based on their responses with the BDM results. Whether demand is elicited from the BDM mechanism or predicted by leaders, the curves are strikingly similar. At least on an aggregate level, leaders seem to have knowledge of the distribution of willingness-to-pay in their neighbourhoods.

When leaders are told that their responses will be used to determine the likelihood that a

plot owner receives a discount (i.e. those in the *stakes* group) they distort their responses. Figure 2b uses only leaders under the *stakes* treatment and compares the demand curve based on their responses with that based on the BDM. For most prices where demand is positive there is a large gap between the demand curve elicited from this group of leaders compared to the BDM. This suggests that, despite their predictive ability, eliciting aggregate demand from leaders may be difficult in a setting where their responses are used to set prices for CROs in the community. This result is interesting because it enables us to further explore the objective function and motivations of the leaders. In particular, we argue that overstatement of willingness-to-pay in the stakes group suggests that leaders may be trying to prevent the uptake of title deeds because they see the formal system as a competing one, or they may be trying to decrease the chances of high discounts for some in order to facilitate others, e.g. the poorest, as discussed in Section . In Section 7.3, we elaborate on this argument and rule out alternative explanations, like whether the result is driven by misinterpretation of the task or experimenter demand effects.

Offering a monetary incentive to leaders for their predictive accuracy (i.e. the *incentives* group) can mitigate the distortions created in the *stakes* environment. Figure 2c uses only leaders under the *incentives* treatment and compares the demand curve based on their responses with that based on the BDM. Whether demand is elicited from the BDM mechanism or predicted by leaders with incentives, the curves are statistically indistinguishable. This is not only due to wide confidence intervals. The largest gap between the point estimates of leader and BDM elicited demand curves is a 0.08 point difference, and for the majority of price points the gap is less than a 0.03 point difference. The cash incentive has shrunk the gap that occurs when leaders are told that their responses will used to determine discounts.

5.2 Leader's ability to distinguish willingness-to-pay across owners

While leaders may be able to predict the aggregate distribution of demand fairly well, it remains to be seen if they can also distinguish between individuals with high and low willingness-to-pay. In this section we describe the ability of leaders to distinguish individuals with high and low willingness-to-pay by running regressions based on the model:

$$w_{ij} = \beta \hat{w}_{ij} + x_j' \gamma + \epsilon_{ij} \tag{2}$$

where w_{ij} is willingness-to-pay of plot i related to leader j, $\hat{w}_{ij}$ is leader j's prediction of plot i's willingness-to-pay and x_j is a vector of leader controls for randomization strata, neighbourhood, and surveyor id.

In Table 3 Panel A we show the coefficient on leader's predictions of different measures of owner's willingness-to-pay is always positively associated with the true measure of owners willingness-to-pay. Column 1 considers the within neighbourhood rank; an individual predicted to be one position higher in the ranking is on average 0.2 positions higher in the rank of plot owners' bids. Column 2 uses the actual level of willingness-to-pay; an individual predicted to bid 10,000TSh above another will on average bid 2,200TSh more. Column 3 takes the log of willingness-to-pay; a one percent increase in predicted willingess-to-pay translates to a 0.42 percent increase in actual willingness-to-pay on average. Column 4 takes the percentile rank of all owners in the sample (rather than within neighbourhood). Here moving from an individual at the median to one at the 60th percentile of predictions results in a 3.1 percentile increase in the true willingness-to-pay on average. Finally, columns 5 and 6 use the probability of being the top or bottom rank in the neighbourhood; an individual is 15 percentage points more likely to be the highest willingness-to-pay in the neighbourhood if predicted to be so, and 24 percentage points more likely to be the lowest willingness-to-pay if predicted so. On this last point, it is clear that leaders are particularly capable of identifying

individuals with the lowest willingness-to-pay. It is of interest here to note that one of the largest land surveying companies in Tanzania runs a 'free lunch' program, consulting local leaders before charging fees to determine plot owners in the neighbourhood who are most in need of a discount. In one of their larger projects, they surveyed over 5,000 plots and used leader information to waive fees for about 2% of the plot owners. Our evidence suggests that leaders are quite capable of identifying the correct plot owners for this 'free lunch' program.

Leaders have knowledge of individual willingness-to-pay, and yet, they may distort their responses if it can help certain plot owners win discounts or if they are paid incentives for accuracy. In Panel B we analyse the impact of the *stakes* and *incentives* environments. To do so we adjust model 2 to account for the differential coefficient for leaders in different treatment environments:

$$w_{ij} = \beta \hat{w}_{ij} + \beta^S \hat{w}_{ij} \mathbb{1}(j \in stakes) + \beta^I \hat{w}_{ij} \mathbb{1}(j \in incentives) + \alpha_S + \alpha_I + x_j' \gamma + \epsilon_{ij} \qquad (3)$$

where $\mathbb{1}(j \in stakes)$ is an indicator if leader j was assigned to the stakes environment, $\mathbb{1}(j \in incentives)$ is an indicator if leader j was assigned to the incentives environment, and α_S and α_I are dummies for each treatment group. Returning to Table 3 Panel B, none of the differential coefficients of either environment is significantly different from zero at the five percent level. Therefore, we find that the correlations between the leaders predictions and various measures of owner willingness-to-pay do not vary significantly by treatment group. That is, the slope does not change across treatment groups even if the average level changes. We elaborate on this finding by exploring more deeply how the leaders predictions shift across treatments focusing on results from the stakes group.

First, we look more closely at differences between leader predictions and actual willingness-to-pay and how these depends on the treatment. In Figure 3 we visualise the distribution of differences between leader predictions of willingness-to-pay, and actual willingness-to-pay for each leader-owner pair. Specifically we calculate the difference between leader j and

plot owner i as $d_{ij} = \hat{w}_{ij} - w_{ij}$, so that positive differences represent an overestimate of the willingness-to-pay by the leader. Figure 3a plots the distribution of differences by treatment group. As we know the distribution for the stakes group is shifted to the right. Specifically, the stakes group overestimates willingness-to-pay by 102,000TSh on average. However, from this figure we can also see that the distribution of differences for the stakes group is more dispersed. To see this more clearly we demean each observation by the respective treatment group mean, and plot the distribution in Figure 3b. Here we can see that there is less mass at zero in the stakes group, suggesting that these leaders are also worse at discriminating across individuals. To highlight this further, we plot absolute values of the demeaned differences in Figure 3c to show that predictions in the stakes group are slightly further away from true willingness-to-pay on average - even after accounting for their mean shift. While the differences are not visually striking they are quantitatively important. In fact, a regression of absolute demeaned differences on treatment group shows that, after accounting for a level shift, the control group was off from true willingness-to-pay by an average 147,000TSh, the incentives group is statistically indistinguishable from this at 150,000TSh, while the stakes group is significantly larger at 179,000TSh (p-value=0.016).[29] Despite this, higher dispersion in the stakes group is not large enough to be detected in our analysis of differential correlations presented in Table 3.

Second, we break down the mean shift in the stakes group by types of plot owner to understand whether leaders are overestimating particular individuals. On average, predictions in the stakes group were 103,000TSh higher than the actual willingness-to-pay. Again we take our measures of the difference between leader predictions and willingness-to-pay (d_{ij}). Based on the observations in the stakes group only, we run regressions of the form:

$$d_{ij} = \beta^t t_i + x_j' \gamma + \epsilon_{ij} \tag{4}$$

[29]The regression controlled for leader strata, neighbourhood, and surveyor fixed effects and clustered standard errors at the leader level.

where t_i is a dummy equal to one if owner i is of type t. We focus on two sets of types and results are in Table 5. First, we look at characteristics guided by our follow up interviews with leaders from the stakes group (see Section 7.3).[30] Results in panel A show that, leaders do not tend to favour those they think will benefit most, those with the highest invoice, those with income below 50,000TSh, those older than 60, those who they think are interested in bequeathing their plot to their children, nor those they believe are interested in taking loans using their plot as collateral. Conversely, we find that leaders relatively under predict those owners who they believe to be the poorest (bottom third in the sample of 15 from their neighbourhood) by about 98,000TSh. Evaluating at the means of our control variables, the difference between predictions and actual willingness-to-pay is 136,000TSh for owners believed in the top two thirds of income, and statistically indistinguishable from zero at only 38,000TSh for owners believed in the bottom third. Therefore all of the over prediction in the stakes group concern those plot owners who are not believed to be poor. Turning to panel B, we now look at how differences between predictions and actual willingness-to-pay vary by the relationship between the leader and the plot owner. Results show that leaders do not tend to favour those with whom they are familiar, those who have used their services in the past, those who are a family member or friend, nor those who they regard as highly esteemed in the community. We do find that leaders tend to significantly over predict those with whom they regularly meet at religious gatherings by about 187,000TSh. Evaluating at the means of our control variables, the difference between predictions and actual willingness-to-pay is 271,000TSh for owners that meet regularly at religious gatherings with the leader, and 85,000TSh for those who do not. Both estimates are significantly larger than zero at the 1% level.

To summarize, we do not find evidence that correlations between predictions and actual willingness-to-pay vary by treatment group. However, we do find evidence that differences

[30]In these interviews our respondents emphasized that they believed most leaders who were in stakes would have tried to increase the chances of high discounts for at least some plot owners (examples given were elders, the poor, those with pending loans, and those with dependent children).

between predictions and actual willingness-to-pay are more dispersed in the stakes group (even after accounting for the large mean shift in the stakes group), and that most of the mean shift can be explained by leaders over predicting the willingness-to-pay of owners who they do not believe to be poor. An interpretation of this is that leaders over predict on average, but when doing so they avoid harming the poorest. Furthermore, we see that leaders over predict those whom they regularly meet with at religious gatherings. An interpretation of this that meeting at religious gatherings may provide a better signal for the wealth level of the owner - therefore the leader can be more confident in identifying the poor and overcharging the wealthy.

5.3 Property Characteristics to distinguish willingness-to-pay across owners

The government currently charges for CROs with a formula based on ward level land values, plot area and land use. In this section we examine the ability of this formula to target high and low willingness-to-pay individuals. In addition, we create a measure of property values based on photos of the plot, and local knowledge of the area.[31] We consider this measure of property value as another potential indicator to price discriminate on. Below we show how variation in property and invoice value relate to willingness-to-pay of plot owners.

In Table 4 we run regressions of the general form:

$$w_{ij} = \alpha z_{ij} + \beta \hat{w}_{ij} + x_j' \gamma + \epsilon_{ij} \tag{5}$$

where z_{ij} is either invoiced fee or property valuation of plot i related to leader j. When willingness-to-pay is transformed, we also transform the observable characteristic accordingly, e.g. in Panel A column 1 where the outcome is the rank of willingness-to-pay, we use

[31] This follows the procedure that is used for property valuation by local governments and the Ministry of Lands. The valuations are based on the subjective determination of three students from Ardhi University, a local university which specialises in surveying, planning, and valuation.

the rank of invoice value as the explanatory variable.

In panel A we use invoice value unconditional of the leaders prediction of willingness-to-pay. Across columns 1-5 invoice values are positively associated with individual willingness-to-pay. Column 6 shows that the bottom rank willingness-to-pay is particularly difficult to predict with the invoice value. Otherwise the invoice value correlates strongly with willingness-to-pay, with coefficients that are typically closer to 1 than the leader predictions in Table 3 Panel A. Finally we note that, while variation in invoice value closely follows that of willingness-to-pay, the average invoice value is more than 2.7 times that of the average willingness-to-pay (Table 1 Column 1).

In Panel B we include the leader's prediction in addition to the invoice value. In columns 1-4 we show that, conditional on the invoice value, the leaders are still able to explain variation in the willingness-to-pay. This suggests that invoice formula and leader predictions could be applied complementary to one another. Finally, conditional on invoice value, leaders are not able to capture any variation when it comes to the the top rank of willingness-to-pay. Instead, when considering the bottom rank, leaders are effective while the invoice value is not.

Moving to Panel C we use property valuation unconditional of the leaders prediction of willingness-to-pay. In columns 1-4 the property valuation is positively associated with willingness-to-pay and the correlations are of similar magnitude than the leader predictions in Table 3 Panel A. However, in columns 5 and 6 the subjective valuation of the property has no ability to predict the top or bottom ranked willingness-to-pay. In Panel D columns 1-4 we show that subjective property value and leader prediction are both able to describe variation in willingness-to-pay conditional on one another. In columns 5 and 6 only the leader prediction is able to describe the variation in the top and bottom rank willingness-to-pay.

Overall, we can conclude that leaders predictions are still able to predict variation in willingness-to-pay, even after controlling for invoice and property values. Thus, their predictions could be used complementary to the formula that the government currently applies for

a better price-discrimination strategy, particularly in order to make CROs more affordable to the plot owners with the lowest willingness-to-pay. As seen, this level of information could not be obtained by considering the property value alone.

6 Conceptual motivation for extracting willingness-to-pay

In this paper we propose that, by collaborating with leaders who have local knowledge, the central government can more effectively target fees to both neighbourhoods and individual plots. In Section 6.1, we highlight the potential welfare gains with a simple theoretical example of first degree price discrimination. In practice, there are obvious issues to using price discrimination which we outline in Section 6.2. We conclude in Section 6.3 by summarizing how information on willingness-to-pay can be used in practice to improve the allocation of title deeds and lead to welfare gains.

6.1 First-degree price discrimination can be welfare improving

Here we provide a simple theoretical example that shows how first degree price discrimination can be welfare improving in a setting in which the government is allocating services to citizens. There are two cases in which first degree price discrimination can theoretically lead to gains which are laid out below.

Consider a policy maker who chooses whether to invest in public infrastructure for a neighbourhood, and what fee to charge for the provision of that public good. To implement the project the policy maker must pay a fixed cost of c. The neighbourhood is a continuum of plots with measure one, and plots are denoted by their willingness-to-pay $w > 0$. The fee charged is denoted by $p > 0$, and the share of plots that uptake for a given price is $q(p) \in [0, 1]$ with $q'(p) \leq 0$. Define the fee that maximises revenue as p^*. We assume that the policy maker maximizes social welfare, but is constrained to self-finance the project. So

the policy maker chooses the lowest fee $\bar{p}$ such that total revenue is equal to cost $q(\bar{p})\bar{p} = c$, and if no such fee exists (i.e. maximised revenue is below $p^* < c$) the policy maker chooses not to invest. We breakdown the potential welfare gains to first degree price discrimination in both these scenarios below.

First, consider the case $q(p^*)p^* \geq c$ so that the policy maker chooses to invest. In this case, first degree price discrimination can be used to recover the Harberger triangle deadweight loss, which is $\int_0^{\bar{p}} w dw$. With perfect information of w there are many potential prices that the policy maker could set to recover this deadweight loss. The simplest example of this would be to waive fees for individuals with low willingness-to-pay, i.e. set $\bar{p} = \frac{c}{q(\bar{p})}$ if $w \geq \bar{p}$ and zero otherwise. Thus, in this case price discrimination can lead to gains through the recovery of the Harberger triangle deadweight loss.

Second, consider the case $q(p^*)p^* < c$ so that the policy maker chooses to not to invest. In this setting the deadweight loss is $\int w dw - c$ and it can be recovered through first degree price discrimination by making the entire project viable. Again, with perfect information of w there are many potential prices that the policy maker could set to recover this deadweight loss. The simplest example is to charge plots their willingness-to-pay and return a lump sum back to all plots, i.e. $\bar{p} = w$. The potential gains in this setting can be significantly larger than recovery of the Harberger triangle deadweight loss (Kremer & Snyder 2018).[32] For example, in the knife-edge case where $p^* = c - \epsilon$ the gains will be the Harberger triangle deadweight loss plus the consumer surplus from all plots with $w > p^*$. Therefore, in this case price discrimination can lead to gains through the recovery of deadweight loss which can be even larger than the Harberger triangle.

6.2 Practical issues with first degree price discrimination

There are theoretical gains to first degree price discrimination, however it is important to highlight that it is not commonly used in practice. Here we discuss the practical issues of

[32]This reasoning is similar in spirit to Romer (1994) who shows the potential for large gains from trade when 'new' goods are introduced in the market by raising enough revenue to cover a fixed cost of entry.

implementing first degree price discrimination.

First, the government may not engage in first degree price discrimination because it lacks the capacity to do so. This is the key issue that this paper focuses on, and we argue that it can be mitigated by gathering information on willingness-to-pay from local leaders. First degree price discrimination can be next to impossible for centralised policy makers with little to no information on the plot owners themselves. The centralised policy maker is likely to observe a very noisy signal of w and cannot, for example, separate those individuals that should be subsidized from those willing to pay full price.

Second, it may be simply illegal or at least politically infeasible for the government to first degree price discriminate. We do not know of any law explicitly prohibiting the use of first degree price discrimination in the charging of fees for property titles in Tanzania.[33] However, it is reasonable that the government may be reluctant to a first degree price discrimination scheme anticipating public backlash.

Third, it may be difficult for the government to credibly stick to the prices set in a first degree price discrimination scheme. For instance, a plot owner may hold out for a lower price if they see that they are being charged a higher price than a seemingly identical plot. The key being that, without an obvious justification for the higher price, then a plot owner may refuse to pay until they receive a similar price.

Finally, price discrimination may not be used in practice because it is simpler for the government to cover project costs and give away the titles for free, or at marginal cost. Aside from obviously not being true for title deeds in Tanzania (in fact the charging of fees for title deeds is enshrined in Tanzanian law (United Republic of Tanzania 1999)), there are two reasons why this may not be advisable. First, is that the government may not be able to secure the necessary funds to do so, or the efficiency of raising public funds may be so low as to make it unviable. This may be especially true if channels of raising

[33]For instance, the 1999 Land Act provides no definition about the methods by which fees must be determined, and simply states that "The Minister ... shall prescribe the rates of fees for all matters in respect of which, by this Act, prescribed fees are required to be paid by any person and shall keep such fees under continuous review." (United Republic of Tanzania 1999).

revenue are limited or wasteful as is the case in many developing countries (Pomeranz & Vila-Belda 2019). Secondly, a growing body of research underscores that building capacity for revenue collection is important for state development (Besley & Persson 2014). From this perspective, a system that charges fees effectively may improve state capacity and bolster intrinsic motivation to pay for public infrastructure.

6.3 How can eliciting willingness-to-pay from leaders be useful in practice?

While it might seem radical and impractical for the government to use leader information to price discriminate when allocating property titles, we note that a basic version of leader-elicited price discrimination is already employed in the private market for survey services. Private companies offer a 'free lunch' to individual plot owners that can not afford to pay the survey fees. To do this, they hold discussions with local leaders who help them identify the plot owners with the lowest willingness-to-pay. As long as these individuals do not own plots above 800m^2, they are offered the service for free.[34] This is a real world example of trying to recover the Harberger triangle deadweight loss outlined in Section 6.1.

We accept that the issues with first degree price discrimination laid out in Section 6.2 are substantial. Therefore, below we argue that third degree price discrimination may be a more viable option, and can still benefit from improved information on willingness-to-pay.

First, third degree price discrimination can also lead to welfare gains in the setting laid out in Section 6.1. It is likely that less deadweight loss can be recovered through third degree price discrimination. However, the same intuition applies that price discrimination can lead to gains through both recovery of some of the Harberger triangle deadweight loss, and also, in the case that the project does not get built with a flat fee, price discrimination can make a project viable and therefore the potential deadweight loss that can be recovered is even higher.

[34]From author conversations with one of the largest surveying and planning companies in Tanzania.

Second, the legal, political and credibility issues raised in the previous section are not as relevant for third degree price discrimination. For the issue of legality and political feasibility, there is already precedent in Tanzania that fees for title deeds are charged differentially based on land use, location, and individual plot size. Further, in our sample of plot owners, 86% of respondents believe that it is fair to charge different invoices to different plots. The credibility of charging plots different prices is less of an issue for third degree price discrimination where prices can be set on explicit characteristics, as long as the rates charged are communicated transparently.

Third, the issue of low government capacity remains an issue for third degree price discrimination. Again, this is the key dimension along which this paper argues that gathering information on willingness-to-pay from local leaders can improve capacity. Just like the issue of the central planner observing a noisy signal of w, even the demand function $q(\cdot)$ for a particular group of properties may be observed by a noisy signal. For example, if the government wishes to target fees differentially based on whether the use is commercial or residential, they would need to use noisy signals of the demand function for each of these uses. Therefore, low capacity is an issue for both first and third degree price discrimination, and our rationale for the potential gains to eliciting information on willingness-to-pay from local leaders.

Therefore eliciting willingness-to-pay from local leaders could improve the allocation of titles and lead to welfare gains. This could be done either by engaging in a scheme like the 'free lunch' program employed by private sector surveying companies, or by improving the quality of the information used in the existing third degree price discrimination conducted by the government.

7 Discussion

7.1 Can willingness-to-pay cover project costs?

In this section we do back-of-the-envelope calculations to determine whether the willingness-to-pay is high enough to cover the cost of the project. Currently, 13% of invoices have been paid and their average fee was 616,000TSh. Therefore, the government raised about 80,000TSh on average. In our sample of the remainder of plots the average willingness-to-pay was 194,000TSh. Taking this figure as representative for the entire 87% of unpaid invoices, the maximum revenue that could be extracted from the remainder, averaged across the entire sample, is 0.87*194,000=168,780TSh. Together the average potential revenue is about 249,000TSh.[35] Considering that the average cost of surveying a plot is about 200,000TSh for large projects (quote from two private survey companies), and comparing this to the average willingness-to-pay, we realize that the costs of the project are covered and there is an average gain of 50,000TSh per plot.

That means that the gains outweigh the costs, even only counting the perceived private gains to the title document. Furthermore, we note that the willingness-to-pay for the title deed, which we elicited in our study, does not capture the overall private gains to formalisation. In fact plot owners already perceive large benefits to the surveying and allocation of beacons regardless of the acquisition of the title document.[36] Thus the overall private gains are larger than those captured by the willingness-to-pay for the title alone. In addition, there are likely further gains to surveying and titling that are not internalised by the current plot owners, which will manifest in the long-run (Michaels et al. 2020). Together this suggests that the gains to formalisation can far outweigh the costs of surveying and planning.

[35]Note that this is a conservative estimate since the willingness-to-pay of the 13% of plot owners who have already paid, must have had a willingness-to-pay above their invoiced fee. Here we assume that their willingness-to-pay was equal to the fee.

[36]For instance, a major perceived benefit was that the beacons mitigated encroachment of neighbours either into one's own plot or into public land. Based on 43 in-depth interviews with a sub-sample of plot owners.

7.2 Can leader information be used to improve public pricing?

The government currently charges fees to plots based on three characteristics: plot size, plot use, and average land value in the mtaa. In our study area there is no variation in the average land value and the vast majority of plots are residential. Therefore the invoice fees in our study area are based on a function of plot size. In particular the fees can be written as a linear function with three parameters.

$$p_i = \alpha + \beta \text{ size}_i + \delta[1(> 300sqm)_i + 1(> 800sqm)_i + 1(> 2500sqm)_i] \tag{6}$$

where p_i is the fee for property i. The parameter α determines the base price level, β determines the linear relationship between fee and plot size, and δ is a discrete jump at three plot size thresholds[37]. In our study area, the baseline parameters are $(\alpha, \beta, \delta) = (290, 0.42, 60)$ in thousands of TSh. At these parameter values, current uptake is 13% and revenue is 80,000 TSh per plot. Private gains are zero, making the same assumption from above that all properties that have chosen to uptake have a willingness-to-pay exactly equal their fee.

To evaluate the practical usefulness of leader information, we present counterfactual uptake, revenue, and private gains for parameter values calibrated to leader predictions. To do so, let us denote the vector of demand for given parameters as $q(\alpha, \beta, \delta)$ and the vector of leader predicted demand for given parameters as $\widehat{q}(\alpha, \beta, \delta)$. Where these are defined as:

$$q(\alpha, \beta, \delta) = \begin{cases} 1 \text{ if } w \geq p(\alpha, \beta, \delta) \text{ ,} \\ 0 \text{ otherwise} \end{cases} \tag{7}$$

$$\widehat{q}(\alpha, \beta, \delta) = \begin{cases} 1 \text{ if } \widehat{w} \geq p(\alpha, \beta, \delta) \text{ ,} \\ 0 \text{ otherwise} \end{cases} \tag{8}$$

[37] Plots above 300 square meters are charged an extra δ, those above 800 square meters an extra 2δ, and those above 2,500 square meters an extra 3δ.

where w is the vector of actual willingness-to-pay, and $\widehat{w}$ is the vector of leader predicted willingness-to-pay. The data on w is based on the BDM elicited willingness, and as mentioned above, on the paid fee in the case of early payers (13% of the population). The data on $\widehat{w}$ is based on leader predictions, specifically, we pool predictions from the control and incentives groups and take the median value for each individual property owner. So we have exactly one measure for each owner.[38]

We consider two scenarios with different government objective functions: first, with the objective to maximise revenue, and second, maximising uptake while holding current revenue fixed. Or more specifically:

$$(\alpha^*, \beta^*, \delta^*) = \underset{\alpha,\beta,\delta}{\operatorname{argmax}}\, p(\alpha, \beta, \delta) \cdot \widehat{q}(\alpha, \beta, \delta) \tag{9}$$

$$(\alpha^{**}, \beta^{**}, \delta^{**}) = \underset{\alpha,\beta,\delta}{\operatorname{argmax}} \sum \widehat{q}(\alpha, \beta, \delta)_i, \text{ s.t. } p \cdot \widehat{q} > 80 \tag{10}$$

In Table 6 we give results of these exercises. Panel A describes the current parameters, revenue, uptake, and private gains are given. Panel B describes the results for the scenario when government aims to maximise revenue. Here, we consider three different choices for settings fees: Uniform pricing (i.e. constraining $\beta = 0$, and $\delta = 0$), third degree price discrimination (i.e. allowing all three parameters to be chosen freely), and first degree price discrimination (charging each property owner a personalized price). There are a few takeaways. First, leader information can improve revenue from the status quo. Allowing all three parameters to be calibrated to leader predictions results in average revenue of 104,000 TSh - up 30% from current revenue. Second, even though the objective is to maximise revenue, the lowering of fees also raises uptake significantly and consequently there is also an increase in private gains. Third, while third degree price discrimination performs better than uniform pricing (revenue is 104k compared to 97k), first degree price discrimination does

[38]The leader predictions also suffer the issue that there are no predictions from the sample of 13% who uptook early. We fill in these leaders predictions, by taking a random draw for each property. We assume that the log leader prediction error for these early payers is normally distributed with the sample mean and variance of the leader prediction errors in our sample.

worst of all. This is because leaders prediction errors at the individual level are too noisy. Fourth, the last column shows the ideal potential uptake if the government had perfect information on willingness to pay. We can see that both uniform and third degree price discrimination based on leaders' predictions capture most of the total. Fifth, and finally, we can see that despite improvements in revenue, we still cannot extract enough to cover the average cost of 200,000 TSh.

Panel C describes, the results for the scenario when the government aims to maximise uptake while holding expected revenue fixed. This objective function is more in line with what we would expect from a social planner, i.e. we know that there are social benefits to titling so by raising uptake the government is creating an environment with more formal property rights and with more potential for well functioning land markets. Here we consider uniform pricing and third degree price discrimination. The results show that uptake could be significantly improved while holding revenue close to what is raised currently. In particular, uniform pricing can raise uptake from it's current 13% to 80% - a sixfold increase. Notably, revenue is slightly lower in this case since the constraint in the maximisation problem is also based on leader's predictions. Still, revenue in this scenario is only 5% less than it is currently.

7.3 Why do leaders in stakes overstate willingness-to-pay?

In January 2020, we conducted follow-up interviews with a sub-sample (72 percent) of leaders in the stakes group.[39] The purpose of the interviews was to better understand why these leaders had over-predicted the aggregate willingness-to-pay in their areas (Figure 2b). As explained in the script (Appendix **??**), leaders in the stakes group were given the opportunity to raise the chance of a discount for plot owners in their neighbourhood. To do so they needed to tell the enumerators that willingness-to-pay was low for these plot owners. Perhaps counter-intuitively we find that these leaders did the opposite: they overstated

[39]We conducted enough interviews until saturation was reached.

willingness-to-pay on average compared to both the control and incentives groups. As an initial investigation into the motivations of this result we conducted follow-up interviews to assess whether the script was understood incorrectly, and what other reasons may have caused the upward bias. The interviews were structured by; first, presenting the same script from the leader's experimental session, second a simple test of their understanding of the script, and finally a short questionnaire.[40]

First, we find evidence of experimenter demand effects. However it is not clear whether this drove the stakes group to overstate willingness-to-pay. As evidence of demand effects, 39% of respondents suggested that most of their fellow leaders would worry about depicting a certain image of their area and themselves. As they suggested, it is possible that this caused leaders to overstate the local willingness-to-pay in order to demonstrate to the researchers that their neighbourhood is not too poor, or that they do not intend to take advantage of the study. What is less clear is why this experimenter bias would be so much stronger for the stakes group compared to the control group. The first explanation - that leaders wanted to convey that their neighbourhood was not poor - should reasonably affect the control group in the same way as the stakes group. The second explanation - that leaders did not want to appear to be taking advantage of the researchers - could indeed be stronger for the stakes group since the control group was not given power over how discounts were determined. However, this second explanation requires that the experimenter bias is so strong that, not only do leaders not take advantage of the researchers, but that they actively harm the chances that their neighbourhood receives discounts in order to appear favourably to the researchers. Therefore, while there is evidence of experimenter demand effects it is unlikely this alone caused the stakes group to overstate willingness-to-pay compared to the control group.

Second, our evidence suggests that this result was unlikely to have been driven by a sim-

[40]For the test, leaders were asked multiple choice questions, such as: 'If a leader wants to increase the chances of high discount for a plot owner which he knows has willingness-to-pay 200,000 TSh, what willingness-to-pay should he predict? (Options: 100,000 TSh; 200,000 TSh; 300,000 TSh)', and 'If the leader wants to increase the plot owner's chances of high discount, where should he place her plot in the ranking? (Options: At the bottom; In the middle; At the top)'.

ple misunderstanding of the script. It is important to note that, leaders would have had to systematically interpret the script in the opposite way as intended in order for a misunderstanding to explain the overstatement of willingness-to-pay in the stakes group. Based on our survey results, we find that all but one leader demonstrated a strong understanding of the script by correctly answering the test questions. Furthermore, 65% of respondents confirmed that most of their fellow leaders would interpret the script correctly.[41] However, after being informed of the counter-intuitive results, 78% indicated difficult comprehension as a plausible explanation, and a few leaders admitted they were initially confused by the task. Thus, although the evidence suggests a systematic ability to interpret the script correctly, it is nonetheless possible that some leaders misinterpreted the task on the day of their experimental session.[42] To conclude, our results point at another potential misunderstanding, which might explain why leaders overstated exclusively in the upper two thirds of the perceived income rank. Leaders may have thought that, by decreasing the chances of the wealthier, this would raise the chances of high discounts for the poor whilst also maintaining a certain image of their neighbourhood. Thus, they aimed to help the poor by overstating willingness-to-pay of all but those they perceive as poor, rather than understanding just for the poor. This hypothesis is compatible with the experimenter demand effects explanation presented above.

Finally, with little evidence that the overstatement of willingness-to-pay by leaders in the stakes group was driven by misunderstanding or experimenter demand effects, we return to the leaders' objective function laid out in Section 2.2 as a potential explanation. We hypothesized that leaders' incentives in the allocation of title deeds could be driven by various factors. First, they may wish to favour their neighbours and community members (either as a whole or on an individual level). In this case, we would expect leaders to state

[41] We asked respondents if most of their fellow leaders would understand the script correctly with the intuition that is easier to admit that the majority, instead of oneself, found the questionnaire hard to comprehend.

[42] This might be the result of both script lack of clarity and the experimental environment. Tension and fatigue on the day of experimental sessions may have increased the propensity to misunderstand a complex script.

a low willingness-to-pay for their community in general so that they receive larger subsidies. However, we find the opposite. Second, leaders could be motivated by their accountability to their party and how its interests align with the central state. In this case, we would expect leaders in the CCM party to respond accurately since it is in their interest to raise the uptake of title deeds. However, we find no evidence that the overstatement varies by party affiliation the willingness-to-pay. Furthermore, leaders may be motivated by fear that their role in the informal land tenure system could be eclipsed by formalisation. Due to concern that formalisation will marginalise their position and diminish their opportunities to earn tips, leaders may wish to decrease the chances of discounts and prevent the uptake of title deeds in their community. This is a plausible explanation for why leaders in the stakes group would have overstated willingness-to-pay across the board.

Importantly we note that these incentives could be better aligned if leaders were incorporated into the formal system and paid for their work. On a macro scale, it has be shown that leaders and the state tend to be complements in countries where leaders are formally integrated into national institutions, and substitutes otherwise (Henn 2020). In our setting we find corroborating evidence on a very micro scale. In particular, during our follow up interviews with the stakes leaders most leaders claimed that they would like to help contribute to raising the rate of formalisation in their neighbourhood, but the majority also deem their current level of engagement with the program insufficient.[43] In their opinion, the government would get twofold advantages from a closer collaboration with leaders. On the one hand, they can provide information on the local demand for titles, as demonstrated in this paper. On the other, "leaders are essential to emphasise the project and motivate people to pay for the title deed" (Leader 12). Indeed, in this context plot owners tend to follow the advice of their leaders, because they "trust the wajumbe" (Leader 8) and "have little information, despite urging the title deed" (Leader 20).

[43]Many respondents provided motivations for the low engagement of leaders, for example explaining that the ruling party in the mtaa would exclude the opposition leaders from the formalisation project.

7.4 The supply side of title uptake

Following our study, we explored the supply side of land titles more closely. Here we give a brief description of the title deed process and describe some of the hurdles faced. In January and October 2020, several months following the price elicitation sessions, we collected data for all untitled plots that were sampled for our study. In a new centralised digital system, the land officers at Ubungo Municipality check off steps of the title acquisition process allowing us to follow the history of each title. The results are summarised in Table 7. We break the plots down into three groups; 'discounted' refers to plots that won a discount in the BDM procedure and therefore were paid during the study, 'full price' refers to plots that did not win a discount in the BDM procedure but may have nevertheless been paid since the time of the study, and the 'attriters' column refers to the group of plots whose owners were invited to attend the study but declined or did not show up but may have nevertheless been paid since the time of the study. Two stages of the acquisition process are recorded; once titles are 'allocated' this means that the title has been approved and is available for collection, and once titles are 'collected' this means that the owner has physically collected the title from the municipality - the final stage in the uptake of title deeds.

Our findings show that title collection, even for those plots that were entirely paid for as part of our study, has been very low. By October 2020, a full sixteen months after the discounted titles had been paid for at the municipality, the rate of title collection was 44% for those plots that won a discounted price, 2% for those that did not win, and 7% for the attriters. As we would expect, those plots which were paid for as part of our study are more likely to have had their title collected. However, even for this group, less than half of the titles were collected.

Further, this low collection rate cannot be explained by low demand. While there is evidence that plot owners may be slow to pick up their titles (across all groups, 20 plots had been allocated titles but only 6 collected at the eight month mark), after sixteen months all but one of the allocated titles had been collected. This shows that once titles have been

prepared by the municipality, the plot owners are willing to incur the final monetary and opportunity cost of travel in order to pick up their title. Therefore the limiting factor in collection seems to be the allocation step.

The allocation step being a limiting factor points to bottlenecks on the supply side. For example, among the 39 discounted plots, many titles had stalled because the municipality needed to amend mistakes in the cadastral drawings and database, including simple typos or major issues of overlapping plot boundaries. Unfortunately, sixteen months after completing the payment, 49% of the discounted plots are stalled at this stage. This evidence highlights that the survey process can produce significant bottlenecks if poorly organised and rushed, as many of our respondents complained.

To conclude, we find that there are significant supply constraints in the title acquisition process. Even after titles have been paid for the collection rate is very low. This is not due to a lack of demand or interest from the plot owner, as all plot owners collect their titles once they have been allocated by the municipality. Long delays to title collection are a result of mistakenly drawn cadastral surveys and incorrect government records.

8 Conclusion

African governments adopt land tenure reforms to contrast the socio-economic issues connected with unplanned and rapid urbanisation, essentially pushing for a transition from informal land tenure to formal law, from the local authority to the central government. Despite there being low uptake of property titles in much of urban Africa, we find that demand for formal property rights is substantial in two neighbourhoods of Dar es Salaam where a pilot project of formalisation only registered 13% uptake. Indeed, roughly 40% of plot owners are willing to pay fees equal to the monthly income of a typical household (200,000 TSh). This is much higher demand than is found in previous work in Dar es Salaam (Ali et al.

2016).[44] Drawing on this result, we challenge the view that plot owners do not recognise, or need, the benefits of formalisation.

However, demand remains considerably lower than current fees, with the average invoice value being more than two and a half times the average willingness-to-pay. Our conservative back-of-the-envelope calculation suggests that, if the government were able to better target fees based on willingness-to-pay, it would be possible to both cover the costs of surveying and planning and leave an average gain of at least 50,000 TSh per plot, as illustrated above.

This study has proposed that, in order to better target fees, community leaders can provide useful information on the local demand for titles. These leaders are typically involved in the land matters of unplanned settlements and so have an intimate knowledge of local demand for land. To summarise, this argument is supported by three sets of evidence. First, local leaders have accurate information about the aggregate demand curve in their neighbourhoods and they can distinguish variation in willingness-to-pay across plot owners. Second, whilst leaders predictions of aggregate demand deteriorate under an environment where their responses are used to allocate subsidies, an incentive scheme of cash payments for ex-post accuracy can correct for this misreporting. Third, there is predictive capacity of leaders even after conditioning on the current fee and property values.

Altogether, this evidence suggests that the local knowledge of leaders can be used to set prices of land titles in combination with the current price discriminating formula based on average land value, land use and plot area. As argued, this pricing strategy would help to make formalisation projects financially viable and crucially more inclusive of the urban poor. However, it is important that leaders are adequately incorporated into the formal system if they are expected to be cooperative. In fact, interviews with leaders suggest that they are keen to support the governments formalisation endeavours and facilitate vulnerable plot owners in achieving higher tenure security. Thus, we recommend that these key actors of informal institutions are not left behind in the transition to formal property. Finally, we

[44]However, results are not easily comparable, because Ali et al. (2016) study two neighbourhoods closer to the city-centre, where the land value is higher and plots are smaller.

underscore the need for more empirical research on the supply side of land titling, whereby bottlenecks can provide significant disincentives to the uptake of titles.

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Tables

Table 1: Owner and Leader Summary and Balance

Plots		Leaders			
	(1)		(2)	(3)	(4)
	Mean		Mean	Diff Stakes-Contr	Diff Incent-Contr
Sole ownership	0.73				
	(0.037)				
Sole ownership and female	0.26	Female	0.40	-0.24*	-0.15
	(0.036)		(0.052)	(0.124)	(0.130)
Under 40 years old	0.23	Under 40 years old	0.07	0.06	0.04
	(0.035)		(0.026)	(0.064)	(0.058)
Over 60 years old	0.20	Over 60 years old	0.33	0.09	0.11
	(0.033)		(0.050)	(0.120)	(0.123)
Educ. primary or less	0.48	Educ. primary or less	0.57	0.05	0.05
	(0.041)		(0.053)	(0.129)	(0.131)
Educ. above secondary	0.27	Educ. above secondary	0.12	-0.07	-0.06
	(0.037)		(0.035)	(0.087)	(0.090)
Monthly income < 100,000TSh	0.34	Monthly income < 100,000TSh	0.19	0.25**	0.00
	(0.039)		(0.041)	(0.104)	(0.080)
Monthly income > 300,000TSh	0.35	Monthly income > 300,000TSh	0.42	-0.08	0.05
	(0.040)		(0.052)	(0.127)	(0.132)
Avg. CRO quiz score	4.9	Avg. CRO quiz score	7.4	0.15	0.08
	(0.114)		(0.124)	(0.309)	(0.318)
No children	0.08	Opposition party	0.14	0.03	0.00
	(0.022)		(0.037)	(0.092)	(0.091)
Over 4 children	0.32	Assistant leader	0.39	-0.05	0.01
	(0.039)		(0.052)	(0.126)	(0.130)
Absentee Owner	0.28	Owns their home plot	0.94	0.00	0.03
	(0.037)		(0.024)	(0.064)	(0.058)
Acquired in last 6 years	0.11	Settled in last 6 years	0.07	-0.03	0.04
	(0.026)		(0.026)	(0.056)	(0.074)
Acquired over 19 years	0.34	Settled over 19 years	0.38	-0.01	-0.06
	(0.039)		(0.051)	(0.127)	(0.128)
Acquired by purchase	0.86	Home plot surveyed	0.91	0.07	0.17**
	(0.029)		(0.030)	(0.087)	(0.070)
Has sale certificate	0.25	Count of 15 owners known at all	12	0.54	1.1
	(0.036)		(0.321)	(0.807)	(0.773)
Owns another plot	0.50	Count of 15 owners use services at all	4.3	1.7	0.33
	(0.042)		(0.465)	(1.19)	(1.01)
Owns another surveyed plot	0.25	Count of 15 owners family members	0.22	0.09	-0.03
	(0.036)		(0.052)	(0.130)	(0.114)
Owns another titled plot	0.10	Count of 15 owners close friends	1.4	-0.41	-0.08
	(0.024)		(0.142)	(0.358)	(0.363)
Avg. invoice value (1000TSh)	526	Count of 15 owners religious affiliation	1.8	-0.48	0.07
	(17.9)		(0.267)	(0.646)	(0.757)
Avg. plot area (sqm)	464	Count of 15 owners highly esteemed	1.3	0.02	0.08
	(32.8)		(0.124)	(0.297)	(0.330)
Avg. BDM bid (1000TSh)	195				
	(14.5)				
N	146	N	90		

*$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$ for difference=0 t-test
Standard errors in parentheses

Table 2: Leader Predictions and Placebos

	(1) Income Rank	(2) Invoice Rank	(3) Invoice Rank Full	(4) Property Tax Paid	(5) Certificate of Sale
Panel A: Predictions					
Leader Prediction	0.20***	0.30***	0.34***	0.07**	0.08*
	(0.019)	(0.034)	(0.029)	(0.029)	(0.047)
N	876	876	1349	876	876
R^2	0.25	0.12	0.11	0.14	0.18
Panel B: Placebos					
Leader Prediction	0.19***	0.27***	0.32***	0.02	0.08*
	(0.035)	(0.058)	(0.046)	(0.050)	(0.047)
Stakes × Leader Prediction	0.05	0.06	0.08	0.06	0.02
	(0.047)	(0.085)	(0.068)	(0.064)	(0.059)
Incentives × Leader Prediction	-0.03	0.02	-0.02	0.09	-0.04
	(0.046)	(0.078)	(0.071)	(0.072)	(0.041)
N	876	876	1349	876	876
R^2	0.25	0.12	0.12	0.14	0.18

$^{*}p \leq 0.1, ^{**}p \leq 0.05, ^{***}p \leq 0.01$

Notes: Robust standard errors clustered at leader level in parentheses. Each observation is a leader-plot owner pair. Column 1 the dependent variable is the within neighbourhood rank of plot owner's income. The dependent variable in columns 2 and 3 is the within neighbourhood rank of invoice value. Column 2 restricts the sample to respondent owners, while column 3 includes all invoices. Column 4 the dependent variable is an indicator if the plot owner paid property tax in 2018. Column 5 the dependent variable is an indicator if the plot owner has a certificate of sale. The regressor is always the leader's prediction of the dependent variable. Fixed effects for leader strata, neighbourhood, and surveyor are included in all models.

Table 3: Leader's ability to distinguish variation in willingness-to-pay

	(1) WTP Rank	(2) WTP	(3) ln(WTP+1)	(4) WTP Percentile	(5) Top Rank	(6) Bottom Rank
Panel A: Predictions						
Leader Prediction	0.20***	0.22***	0.42***	0.31***	0.15***	0.24***
	(0.024)	(0.050)	(0.050)	(0.035)	(0.052)	(0.055)
N	876	876	876	876	876	876
R^2	0.18	0.13	0.11	0.12	0.03	0.12
Panel B: Distortions from real stakes						
Leader Prediction	0.172***	0.325***	0.365***	0.299***	0.125	0.250***
	(0.041)	(0.085)	(0.080)	(0.066)	(0.085)	(0.093)
Leader Prediction	0.050	-0.147	0.138	0.055	0.044	-0.117
× Stakes	(0.059)	(0.100)	(0.120)	(0.084)	(0.125)	(0.130)
Leader Prediction	0.032	-0.031	0.134	0.038	0.019	0.103
× Incentives	(0.054)	(0.100)	(0.121)	(0.077)	(0.125)	(0.135)
N	876	876	876	876	876	876
R^2	0.18	0.14	0.12	0.13	0.03	0.12

$^{*}p \leq 0.1, ^{**}p \leq 0.05, ^{***}p \leq 0.01$

Notes: Robust standard errors clustered at leader level in parentheses. Each observation is a leader-plot owner pair. Column 1 the dependent variable is the within neighbourhood rank of plot owner's BDM bid. The dependent variable in column 2 is the value of the plot owner's BDM bid in Tanzanian shillings, and column 3 is the log value. Column 4 is the percentile rank across the entire distribution, rather than neighbourhood only. Column 5 the dependent variable is an indicator if the BDM bid is the highest in the neighbourhood, and column 6 indicates if the bid was the lowest in the neighbourhood. The regressor is always the leader's prediction of the dependent variable. Fixed effects for leader strata, neighbourhood, and surveyor are included in all models.

Table 4: Using Observable Characteristics to distinguish variation in willingness-to-pay

	(1) WTP Rank	(2) WTP	(3) ln(WTP+1)	(4) WTP Percentile	(5) Top Rank	(6) Bottom Rank
Panel A: Invoice Formula						
Invoice	0.26***	0.49***	1.32***	0.42***	0.44***	0.04
	(0.016)	(0.052)	(0.088)	(0.031)	(0.059)	(0.050)
N	876	876	876	876	876	876
R^2	0.24	0.37	0.15	0.20	0.19	0.08
Panel B: Invoice Formula and Leader Prediction						
Invoice	0.230***	0.461***	1.169***	0.384***	0.431***	0.028
	(0.020)	(0.052)	(0.097)	(0.034)	(0.060)	(0.052)
Leader Prediction	0.151***	0.103***	0.315***	0.244***	0.062	0.241***
	(0.023)	(0.030)	(0.048)	(0.033)	(0.044)	(0.055)
N	876	876	876	876	876	876
R^2	0.29	0.38	0.17	0.23	0.20	0.12
Panel C: Valuation						
Property Value	0.12***	0.20***	0.27***	0.22***	0.02	0.03
(1,000TSh)	(0.007)	(0.071)	(0.061)	(0.022)	(0.047)	(0.066)
N	875	876	876	876	876	876
R^2	0.14	0.07	0.09	0.10	0.01	0.08
Panel D: Valuation and Leader Prediction						
Property Value	0.077***	0.072	0.210***	0.177***	-0.014	-0.012
(1,000TSh)	(0.012)	(0.084)	(0.058)	(0.025)	(0.054)	(0.064)
Leader Prediction	0.167***	0.220***	0.390***	0.279***	0.147***	0.244***
	(0.029)	(0.052)	(0.049)	(0.038)	(0.054)	(0.056)
N	875	876	876	876	876	876
R^2	0.20	0.13	0.12	0.14	0.03	0.12

$^{*}p \leq 0.1, ^{**}p \leq 0.05, ^{***}p \leq 0.01$

Notes: Robust standard errors clustered at leader level in parentheses. Each observation is a leader-plot owner pair. Column 1 the dependent variable is the within neighbourhood rank of plot owner's BDM bid. The dependent variable in column 2 is the value of the plot owner's BDM bid in Tanzanian shillings, and column 3 is the log value. Column 4 is the percentile rank across the entire distribution, rather than neighbourhood only. Column 5 the dependent variable is an indicator if the BDM bid is the highest in the neighbourhood, and column 6 indicates if the bid was the lowest in the neighbourhood. The regressor in Panels A and C are the invoice and property valuation equivalents of the dependent variable, respectively. While the regressor in Panels B and D are the leader's prediction of the dependent variable as well as the invoice and property valuation equivalents of the dependent variable, respectively. Fixed effects for leader strata, neighbourhood, and surveyor are included in all models.

Table 5: Which owners are overpredicted in the stakes group?

Dependent variable is always leader prediction - actual willingness to pay ($\hat{w}_{ij} - w_{ij}$)

Panel A: Characteristics of the owner

	(1) Believed will benefit most	(2) Believed highest invoice	(3) Income <50,000TSh	(4) Believed poorest	(5) Age>60	(6) Believed interested to bequeath	(7) Believed interested in loans
Coefficient on owner type	45.88	60.54	-9.257	-97.60**	-3.743	42.56	-7.974
	(39.74)	(43.13)	(53.87)	(37.57)	(56.89)	(52.62)	(60.09)
Observations	302	302	302	302	302	302	302
R^2	0.344	0.348	0.339	0.363	0.339	0.341	0.339

Panel B: Relationships between the leader and owner

	(1) Familiar	(2) Used services	(3) Family or friend	(4) Meet at religious gatherings	(5) Recognised as highly esteemed
Coefficient on owner type	21.11	15.03	0.0436	186.6**	13.93
	(32.94)	(44.79)	(68.82)	(78.66)	(47.51)
Observations	302	302	302	302	302
R^2	0.340	0.340	0.339	0.368	0.339

Notes: Robust standard errors clustered at leader level in parentheses. Each observation is a leader-plot owner pair. The dependent variable is always leader prediction - actual willingness-to-pay ($\hat{w}_{ij} - w_{ij}$). Fixed effects for leader strata, neighbourhood, and surveyor are included in all models. A different explanatory variable is used in each column. Panel A shows the coefficients on different types of owners; in col. 1 an indicator if the leader believes that the owner is in the top third in terms of benefits from a title deed, in col. 2 an indicator if the leader believes that the owner has an invoice value in the top third, in col. 3 and indicator if the owner earns less than 50,000TSh, in col. 4 an indicator if the leader believes that the owner is in the bottom third in terms of income, in col. 5 an indicator if the plot owner is over 60, in col. 6 an indicator if the leader believes that the owner wishes to bequeath their plot to their children, and in col. 7 an indicator if the leader believes that the owner wishes to take out loans using their plot as collateral. Panel B shows the coefficients on different types of relationships between the leader and owner in col. 1 an indicator if the leader is familiar with the owner, in col. 2 an indicator if the owner has ever used the services of the leader before, in col. 3 and indicator if the owner is a family member or friend of the leader, in col. 4 an indicator if the leader meets with the owner for religious gatherings, and in col. 5 an indicator if the leader sees the owners as highly esteem in the community.

Table 6: Policy Counterfactuals

	Parameter Values			Feasible Outcomes			Ideal With Perfect Info
Panel A: Current pricing							
Pricing	α	β	δ	Revenue	Uptake	Private Gains	
Current	290	.42	60	80	13%	0	.
Panel B: Maximising revenue							
Pricing	α	β	δ	Revenue	Uptake	Private Gains	Potential Revenue
Uniform	200	.	.	97	48%	103	103
Third deg.	150	0	50	104	53%	103	113
First deg.	.	.	.	77	37%	135	245
Panel C: Maximising uptake							
Pricing	α	β	δ	Revenue	Uptake	Private Gains	Potential Uptake
Uniform	95	.	.	76	80%	160	80%
Third deg.	50	0	50	75	86%	163	80%

Notes: This table reports results from the policy counterfactual exercises. The first three columns give the fee function parameters, the next three give revenue, uptake and privates gains for these parameters, and the last column gives the ideal government objective if using perfect information on willingness-to-pay. Panel A is based on the current pricing, Panel B is based on pricing if the government aimed to maximise revenue, and Panel C is based on pricing if the government aimed to maximise uptake conditional on raising current revenue.

Table 7: Title acquisition process

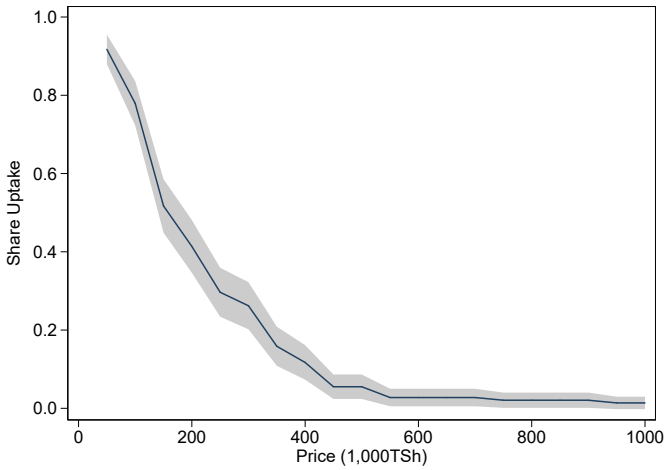
	Discounted	Full price	Attriters
Number of plots	39	107	73
Titles allocated after 8 months	14	2	4
Titles collected after 8 months	4	0	2
Titles allocated after 16 months	17	3	5
Titles collected after 16 months	17	2	5

Notes: This table reports the progress of title acquisition for three groups of plots; the 'Discounted' column refers to the group of plots that won a discount in the BDM procedure and therefore were paid for during the study, the 'Full price' column refers to the group of plots that did not win a discount in the BDM procedure may have nevertheless been paid for since the time of the study, and the 'Attriters' column refers to the group of plots who's owners were invited to attend the study but declined or did not show up. The first row reports the total number of plots in each group. The following rows report the status of these plots at two stages; the 'Titles allocated' rows count the plots that have been granted a title, and the 'Titles collected' rows count the plots where the title has been physically collected by the owner from the municipality. We record each of these stages at two points in time; once after 8 months (January 2020) an once after 16 months (October 2020).

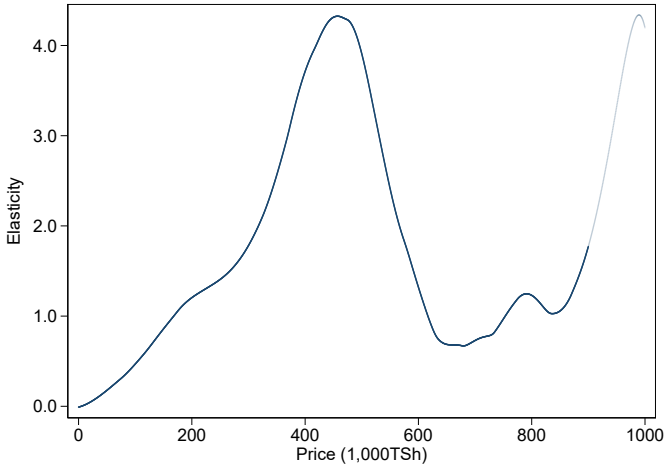
Figures

Figure 1: BDM Elicited CRO Demand and Elasticity

(a) Demand Curve



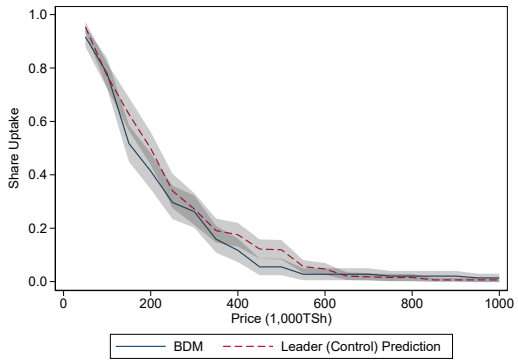
(b) Price Elasticity of Demand



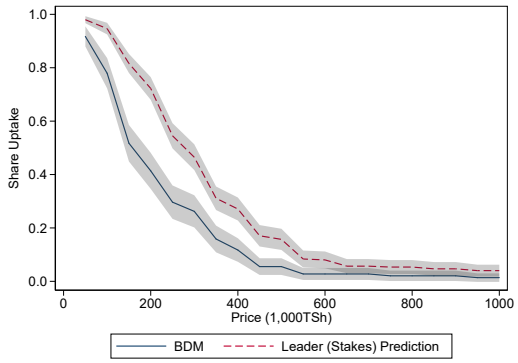
Notes: Figure 1a plots the BDM demand curve with 90% confidence bands. The demand curves indicate the share of respondents with a BDM bid greater than or equal to the indicated price. Confidence intervals are calculated using logit regressions (at prices TSh 50,000; 100,000; . . . ; 1,000,000) clustering standard errors at the plot level. The sample is 146 plots. Figure 1b shows demand elasticities using BDM predicted demand. The BDM elasticity is calculated by a local polynomial regression where, first demand is interpolated using a local polynomial regression with an Epanechnikov kernel, then the point elasticity is calculated and smoothed using a local polynomial regression. In Figure 1b to highlight the sparsity of data in the right tail of our data we lower the transparency over the range of the three largest observations used in the elasticity calculation.

Figure 2: Leader Elicited CRO Demand

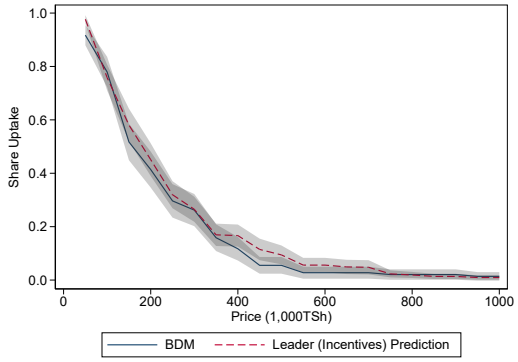
(a) Control Group Leader Elicitation



(b) Stakes Group Leader Elicitation



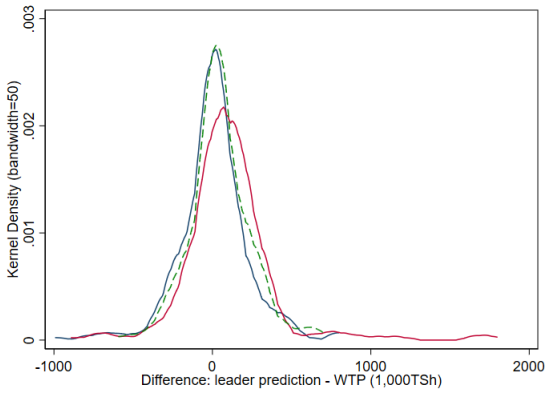
(c) Incentives Group Leader Elicitation



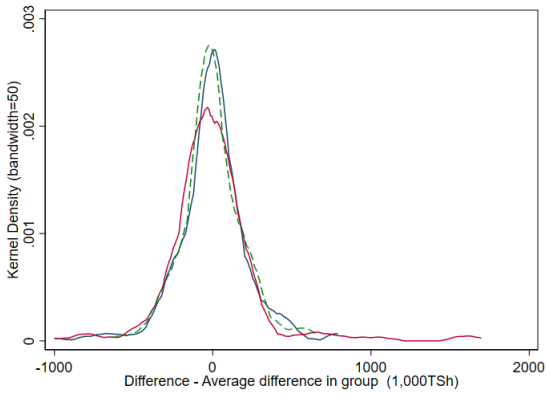
Notes: Figure 2 plots the BDM and Leader Predicted demand curves, with 90% confidence bands. The demand curves indicate the share of respondents with a BDM bid, or leader predicted WTP, greater than or equal to the indicated price. Confidence intervals are calculated using logit regressions (at prices TSh 50,000; 100,000; . . . ; 1,000,000) clustering standard errors at the plot level. The same sample of 146 plots are used for both, and predictions are frequency weighted by the number of leaders making predictions on that plot (i.e. each plot is equally weighted when calculating each leader predicted demand curve). Sub-figure 2a uses only leaders from the control group and compares the demand curve from their predictions with that of the BDM. Sub-figures 2b and 2c use leaders from the stakes and incentives groups respectively.

Figure 3: Distribution of differences between leader prediction and WTP

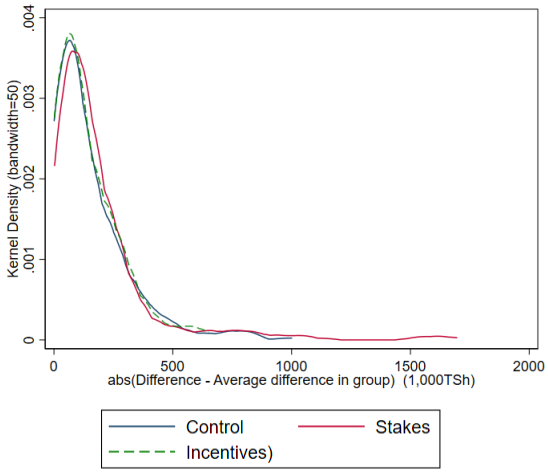
(a) Raw differences



(b) Demeaned differences



(c) Absolute value of demeaned differences



Notes: Figure 3 plots the difference between leader predictions of willingness-to-pay and owners actual willingness-to-pay for each pair of leader-owner by treatment group. Figure 3a plots the raw differences, Figure 3b plots the differences demeaned by the group average difference, and Figure 3c plots the absolute value of the demeaned differences.