IDB WORKING PAPER SERIES Nº IDB-WP-01411

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Inter-American Development Bank
Climate Change and Sustainable Development Sector

December 2022

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Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Benefits of titling indigenous communities in the Peruvian Amazon: a stated preference approach / Allen Blackman, Sahan Dissanayake, Adan Martinez Cruz, Leonardo Corral, Maja Schling.

p. cm. — (IDB Working Paper Series ; 1411)

Includes bibliographic references.

1. Indigenous peoples-Peru-Econometric models. 2. Right of property-Peru-Econometric models. 3. Land titles-Peru-Econometric models. I. Blackman, Allen. II. Dissanayake, Sahan T. M. III. Martínez Cruz, Adan L. IV. Corral, Leonardo. V. Schling, Maja. VI. Inter-American Development Bank. Climate Change and Sustainable Development Sector. VII. Inter-American Development Bank. Office of Strategic Planning and Development Effectiveness. VIII. Series

IDB-WP-1411

http://www.iadb.org

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THE BENEFITS OF TITLING INDIGENOUS COMMUNITIES IN THE PERUVIAN AMAZON: A STATED PREFERENCE APPROACH

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THE BENEFITS OF TITLING INDIGENOUS COMMUNITIES IN THE PERUVIAN AMAZON: A STATED PREFERENCE APPROACH

Abstract. We conduct a discrete choice experiment with leaders of a random sample of 164 Peruvian indigenous communities (ICs)—to our knowledge, the first use of rigorous stated preference methods to analyze land titling. We find that: (i) on average, IC leaders are willing to pay US$35,000–45,000 for a title, roughly twice the per community administrative cost of titling; (ii) WTP is positively correlated with the value of IC land and the risk of land grabbing; and (iii) leaders prefer titling processes that involve indigenous representatives and titles that encompass land with cultural value.

Keywords: discrete choice experiment, indigenous community, land rights, mixed multinomial logit

JEL codes: O13, Q15, C93

1. INTRODUCTION

Although indigenous communities (ICs) effectively manage more than 38 million square kilometers in 87 countries—an area representing more than one-quarter of the world's land surface—they have formal rights to only a fraction of that land (Garnett et al. 2018; RRI 2015). Over the past four decades, advocates have built an international movement aimed at strengthening IC land rights (UN 2021; Alden Wily 2018). With hundreds of millions of dollars of support from multilateral development banks, bilateral cooperation agencies, and nongovernmental organizations, dozens of countries, mostly in the Global South, have funded campaigns to provide formal legal land titles to ICs (DGM 2020; RRI 2018). A growing body of evidence suggests that at least in some situations, such titling can have a range of private benefits, including boosting agricultural investment and improving livelihoods (Higgins et al. 2018; Besley 1995; Tseng et al. 2020).[1]

But important gaps remain in our understanding of the private benefits that titles generate. First, we have little information on the features of land titles and the titling process about which IC leaders are most concerned. The amount of land titled? Whether titled land encompasses areas with high cultural value? The pecuniary cost of the titling process? The duration of this process? Answers to this question could help stakeholders design and manage titling campaigns so as to enhance the net benefits to ICs. Second, we know little about how the private benefits of land titling vary across subgroups of ICs—that is, about the characteristics of ICs that obtain higher and lower benefits.

[1] Some evidence also indicates that titling ICs can prevent forest loss and degradation, a benefit with both public and private aspects (Blackman et al. 2017; Vélez et al. 2020).

And third, we lack reliable estimates of the dollar value of the private benefits of IC titles, assessments that policymakers need to determine whether and by how much the benefits of titling campaigns exceed the costs. Monetary values of these benefits are difficult to measure, for several reasons (Farr et al. 2016). Neither land titles themselves nor many of the benefits they confer—including cultural services and bequest values—are traded in markets. As a result, market prices cannot be used as measures of the value of titles. In addition, the various benefits of titles are often interdependent and potentially overlapping. For example, titles to forested land can generate both intangible cultural benefits and tangible benefits like food, medicines, and building materials. Parsing and aggregating the benefits of land titles is therefore challenging. And finally, many of these benefits accrue to the community as a whole as opposed to its individual members. Hence, surveys of individual community members may provide an incomplete accounting.

Discrete choice experiments (DCEs) offer a novel and to our knowledge, as yet untested means of helping to close these knowledge gaps and address these challenges. DCEs are survey experiments in which respondents are asked to repeatedly select a preferred option from among structured sets of options (Adamowicz et al. 1998; Bennet and Blamey 2001; Hensher 2007). All options have a common set of attributes, at least one of which entails some form of payment, but each option features different levels of the attributes. For example, in a DCE designed to assess IC preferences for land titles, the attributes might include the extent of land titled and the cash payment the IC is required to make to obtain the title. Each option would feature different levels of these attributes. Respondents' marginal willingness to pay (MWTP) for each attribute and for various combinations of them could be derived econometrically from respondents' choices. Such a DCE would shed light on ICs' preferences for land title attributes, provide insights into how the

private benefits of land titling vary across subgroups, and generate estimates of the monetary value of IC land titles.

We conducted such a DCE with leaders of a random sample of 164 of the approximately 800 ICs in the Peruvian Amazon that have yet to receive official land titles. We reach three main conclusions. First, IC leaders tend to prefer titling processes that include indigenous representatives and titles that encompass the areas they perceive as having high cultural value, but not those that award them more land than they expected to be titled ex ante. Not surprisingly, they also tend to prefer titling processes that are shorter and require lower out-of-pocket payments. Second, individual IC leaders' MWTPs for a titling contract are positively correlated with the value of IC land and negatively correlated with the risk of land grabbing. And finally, on average, IC leaders' MWTP for a titling contract ranges from US$35,203 to US$44,749 (US$15 to US$20 per hectare), depending on the contract's specific attributes. To put these estimates in context, back-of-the-envelope calculations indicate that they equal 10 to 13 percent of median IC net agricultural revenue and exceed per community administrative costs of titling by a factor of 2. These findings suggest that the private benefits of initiatives aimed at titling ICs could be enhanced by including indigenous representatives in titling teams and awarding titles to geographic areas with high cultural significance. They confirm the conventional wisdom among advocates that the net private benefits of strengthening IC land rights are both positive and significant. And finally, they provide guidance for targeting titling to ICs for which benefits will be highest.

Our study makes three main contributions to the literature. Most important, to our knowledge, it is the first use of a DCE to analyze IC titling and, more generally, the first to use a rigorous stated preference approach (i.e., DCE or contingent valuation) to analyze any type of land titling. Hence, it represents a proof-of-concept for this approach. The study most closely related to

ours is Qin, Carlsson, and Xu (2010), which uses a DCE to assess individual Chinese farmers' preferences for concession contracts that confer rights to harvest timber from forests. However, unlike our study, Qin, Carlsson, and Xu (2010) do not examine land titling per se, and they focus on individual land holders, not communities.

Second, our paper adds to the thin literature on the private benefits of providing land title to communities in the Global South. A recent systematic literature review identified 117 quantitative studies of the benefits of land tenure security (Tseng et al. 2020). Of these, eight examine the private (versus environmental) benefits of land titling. All find evidence of some type of private benefit. Xu et al. (2018), Gao, Sun, and Huang (2017), and Ito, Bao, and Ni (2016) examine the effect of post-2000 changes in China's rural land policies that strengthened land tenure security on collective land. Xu et al. (2018) and Gao, Sun, and Huang (2017) find that these changes boosted the use of organic fertilizer, an indicator of long-term agricultural investment, and Ito, Bao, and Ni (2016) find that they encouraged land rental, which they say enhances the efficiency of land use. Mendola and Simtowe (2015), Mueller et al. (2014), and Gayatri, Del Carpio, and Hoffman (2009) all analyze the Community Based Rural Land Development Project, a resettlement initiative in southern Malawi that formalized property rights for groups of households. All three studies conclude it increased productive efficiency. Finally, Pender, Suyanto, and Kato (2008) find that an Indonesian program, Hutan Kamasyarakatan, that gives groups of farmers secure tenure on state-owned land contributed to the planting of timber and multipurpose trees.

Third, ours is among a handful of studies that use DCEs to analyze ICs. As noted above, these studies do not examine preference for land tenure security. Rather, most analyze preferences of individual respondents for different conservation outcomes and/or estimate the value of

environmental and cultural goods used by ICs (Hoyos, Mariel, and Fernández-Macho 2009; Zander and Garnett, 2011; Rolfe and Windle 2003; Venn and Quiggin 2007; Oleson et al. 2015).

The remainder of the paper is structured as follows. The next section provides background on IC titling in Peru. The third section discusses our DCE and econometric models. The fourth section describes out data. The fifth section presents our results. And the last section sums up and concludes.

2. BACKGROUND

In Peru, indigenous communities (*comunidades nativas*) are defined as collections of families linked by indigenous language or culture and by common use of a single territory (IBC 2013; COFOPRI 2008). To date, the Peruvian government has awarded formal land titles to 1,943 ICs (Chirif 2021). Since the first IC title was awarded in 1974, the pace of titling has varied markedly: 44 percent of IC titles were awarded during the Fujimori administration (1991–2000) and 32 percent in the eight years between the start of the Humala administration (2012–2016) and the end of the Sagasti administration (2020–2021). The Peruvian government counts 800 ICs that still lack formal title (Chirif 2021).

Peru's 1,943 titled ICs comprise more than 16 million hectares and host a population of about 421,000 (Chirif 2021; Calderón 2021). Hence, the average IC covers 8,261 ha and supports a population of 210 people. The large majority of titled ICs are in rural areas of Peru's Amazon region. Infrastructure is limited and socioeconomic levels are relatively low. Only 23 percent of households in Amazonian ICs have access to electricity, only 15 percent have piped potable water, and only two percent have telephone service (Thiede and Gray 2020).

Titling of Peruvian ICs was made possible by the passage of two foundational laws (Dandler 1998).[2] The 1974 Law of the Agricultural Development of Native Communities of the Rainforest and Rainforest Border (D.L. 20653) established the legal basis for granting ICs rights to land. It recognized a broad range of criteria that could be used to delimit IC territory, including use of land for hunting, gathering, and fishing. The 1978 Law of Native Communities (D.L. 22175) set out detailed procedures for granting ICs legal title organized into two broad stages: recognizing the IC as a legal entity and awarding it title. Each stage involves numerous legal, bureaucratic, and technical steps, and each is complex, costly, and lengthy. For example, the titling stage involves (i) a desk phase that entails compiling technical and legal documents, forming a working group of representatives of the responsible entities and agencies, and formally notifying local stakeholders of the process; (ii) a fieldwork phase that entails face-to-face meetings with the IC and local stakeholders, demarcating the IC's territory and installing stone markers, and classifying parcels of land within the territory as suitable for agriculture, forestry, and forest protection; and (iii) a processing phase that involves preparing maps and field reports, obtaining approval of these documents by a general assembly of the IC, and issuance of formal reports by the Regional Agrarian Agency (DRA) of the Agriculture Ministry and other agencies. The cost and complexity of these interactions with state authorities put them out of reach for most ICs acting on their own. As a result, external organizations have provided technical and financial assistance.[3]

For the past three decades, the Peruvian government's main rural land titling initiative has been the Land Titling and Registration Program (*Programa de Titulación y Registro de Tierras*,

[2] This second and third paragraphs of this section are taken from Blackman et al. (2017), who in turn draw on Dandler (1998) and COFOPRI (2008).

[3] These organizations include nongovernmental organizations such as Asociación Interétnica de Desarrollo de la Selva Peruana (AIDESEP) and Instituto de Bien Común (IBC), government agencies such as Proyecto Especial de Titulación de Tierras (PETT) and later the Organismo de Formalización de la Propiedad Informal (COFOPRI), and multilateral and bilateral international cooperation agencies such as the InterAmerican Development Bank (IADB) and the US Agency for International Development.

PTRT), which has had three phases, all focused primarily but not exclusively on private properties (IADB 2015). From 1993 to 2001, PRTR1 titled about 900,000 properties on Peru's Pacific coast. From 2001 to 2007, PTRT2 titled more than 1 million properties in the Sierra (Andean highlands) region. Launched in 2015 (but mothballed in 2022 because of implementation challenges), PTRT3 was intended to title more than 230,000 properties in the Sierra and Amazon regions of eastern Peru, including 331 ICs. Of these 331 ICs, 250 were in Loreto department and 81 in six other departments: Amazonas, Cusco, Huanuco, Junin, San Martin, and Ucayuali.

3. METHODS

This section describes our DCE's experimental design, its implementation, and the specification of our econometric model.

3.1. Experimental Design

Stated preference nonmarket valuation methods are survey-based methods used by social scientists to explore preferences for goods and services, typically those that are not traded in markets and for which market prices are not available to serve as measures of value. Based on Lancaster's pioneering work on consumer theory (Lancaster 1966) along with random utility theory (McFadden 1974; Manski 1977), the DCE is a stated preference method that generates estimates for both values of a nonmarket good or services and consumers' preferences for attributes of the good or service (Adamowicz et al. 1998; Bennet and Blamey 2001; Hensher 2007).

For our DCE, an initial set of attributes and levels was selected on the basis of consultations during 2018 with stakeholders working on IC land rights in the Peruvian Amazon, including academic researchers and representatives of Peruvian governmental and nongovernmental

organizations. The authors piloted preliminary version of the DCE in four ICs in San Martín and Loreto departments in May 2019. The pilot data along with enumerators' feedback informed subsequent revisions.

The final version of the DCE features five attributes, each with two to seven levels (Table 1). The first attribute, *pecuniary cost*, is the out-of-pocket payment the IC must make each year for five years to receive a title. ICs typically pay some portion of the titling cost, the remainder being absorbed by government agencies. The seven levels of this attribute range from zero to 3000 soles (US$900).[4]

[Insert Table 1 here]

The second attribute, *quantity land*, is the amount of IC land titled, typically the outcome of a negotiation among the government titling agency, the IC, other local stakeholders with land claims and nongovernmental organizations. The three levels of this attribute are the reference level, the reference level plus 20 percent, and the reference level plus 40 percent. The reference level is the number of hectares the respondents indicated they believed would be titled in answer to a survey question that preceded the DCE (enumerators reminded respondents of their answers to this question while explaining this DCE attribute).

The third attribute, *traditional uses*, is whether the IC's titled land encompasses burial grounds and other places with religious or customary significance. In our sample of 164 ICs, just over half of respondents reported that these lands were "close to" the ICs, and the remainder either

[4] Here and throughout the analysis, we use an exchange rate of US$0.30 per Peruvian sol, the average for 2019.

said they were “far from” the community or “somewhere between near and far.” The levels of this attribute are simply yes and no.

The fourth attribute, *duration*, is the number of years between the start and end of the titling process. Historically, in Loreto and San Martin, the two departments where our data were collected, the average lags between the formal recognition of an IC and the award of title were 1.9 years and 5.5 years, respectively (IBC 2013).

The final attribute, *indigenous representative*, is whether the titling team includes a representative of the local regional federation of ICs. Historically, some titling teams have included such personnel and others have not. The levels of this attribute are yes and no.

Using those five attributes and associated levels, we generated choice cards with an orthogonal fractional factorial D-efficient experimental design (Kuhfeld 2010). The design resulted in 36 unique choice cards, each with three options, A, B and C. Options A and B were framed as hypothetical titling contracts between the government and the IC, each featuring combinations of levels of the five attributes. Option C represented the status quo (no payment, zero hectares titled, etc.). The 36 choice cards were randomly divided into groups of six blocks. To facilitate learning, we included a seventh “practice” choice card as the first choice question of each block, responses to which were not used in the analysis. Each survey respondent was randomly assigned to a block of seven choice cards. Figure 1 is the English translation of an example choice card.

[Insert Figure 1 here]

3.2. Implementation

The DCE was incorporated into the baseline (pre-intervention) survey for PTRT3, the Peruvian government project initiated in 2015 that aimed to title 331 ICs in eastern Peru, mostly in Loreto department (Section 2). The survey, including the DCE, was designed by the authors of the present article and administered by the Peruvian Cadastral Institute (Instituto Peruano de Cadastro, IPDC), a consulting firm specializing in land titling and survey administration. The DCE was administered in person and on site in ICs by IPDC enumerators who were trained and supervised by the authors. Respondents were either current and former IC leaders. IC leaders are typically elected by IC general assemblies. The leaders and former leaders that participated in our DCE were those who were available on the day that that our enumerators visited their IC.

To economize on the costs of traveling to remote ICs, IPDC restricted the baseline survey to 169 ICs in four of the seven departments targeted for IC titling: Amazonas, Cusco, Loreto, and San Martin. These 169 communities were randomly selected from a list compiled by the Peruvian Ministry of Agrarian Development and Irrigation (Ministerio de Desarrollo Agrario y Regio, MIDAGRI) of 651 untitled ICs in these four departments.

Of the 169 ICs in the baseline survey sample, 165 (98 percent) were located in two departments: Loreto and San Martin. To control for unobserved confounding factors correlated with geography, we restrict our regression sample to the sample ICs in these two departments. One of these sample ICs declined to participate in the DCE. Hence, our regression sample comprises 164 ICs: 137 in Loreto and 27 in San Martin.

3.3. Econometric specification

Our econometric analysis has two stages. In the first stage, we assess respondents' MWTP

for titling contract attributes and combinations of these attributes. In the second stage, we explore the determinants of their MWTPs.

3.3.1. First stage: Respondents' preferences and marginal willingness to pay

To analyze our experimental data, we use a mixed multinomial logit (MMNL) model, which, unlike other polychotomous choice models, does not require assumptions of homogeneous preferences or the independence of irrelevant alternatives (Hensher and Greene 2003; Carlsson and Martinsson 2003; Campbell 2007).[5] The conceptual framework for this model is well known, so we provide only a brief sketch here.

Assuming a linear random utility model, the utility gained by person q from option i in choice situation t is given by

$$U_{qit} = \alpha_{qi} + \beta_q X_{qit} + \varepsilon_{qit} \qquad (1)$$

where X is a vector of the option's observable attributes, α and β are individual-specific parameters reflecting the individual's preferences, and ε is an stochastic error term. Hence, utility comprises a nonrandom observable component (the first two terms on the right-hand side) and a stochastic unobservable component (the last term). The parameter α_{qi}, often referred to as the alternative specific constant (ASC), can be interpreted as individual q's intrinsic preference for option i irrespective of the specific levels of the attributes.

[5] The mixed multinomial logit model is also known as the mixed logit, hybrid logit, random parameter logit, and random coefficient logit model.

The probability that person q chooses option i in choice situation t is the probability that utility from i is greater than that from all other options. That is,

$$P_{qit} = Pr\left(U_{qit} - U_{qjt} \geq 0\right) \quad \text{for } i \neq j, j = (1, 2 \ldots n) \tag{2}$$

where P_{qit} is the probability of choosing i and n is the number of options. If we substitute Equation (1) into Equation (2) and assume that error terms are independent and have a Weibull distribution, we have a MMNL model.

$$P_{qit} = exp\left(\alpha_{qi} + \beta_q X_{qit}\right) / \sum_j exp\left(\alpha_{qj} + \beta_q X_{qjt}\right) \tag{3}$$

The coefficients for the MMNL model cannot be estimated directly and must be derived through simulation (Holmes, Adamowicz, and Carlsson 2017; Train 2009). To that end, we used the *mixlogit* command in Stata (Hole 2007).

Although coefficient estimates from the MMNL model do not have an intuitive interpretation, the ratio of the estimated coefficient for the payment attribute to the coefficient for any other attribute reflects the marginal rate of substitution between the payment attribute and the other attribute and therefore can be interpreted as the average MWTP for the other attribute. That is,[6]

[6] We note that whereas most stated preference studies elicit an individual respondent's own WTP, ours elicits the WTP of a respondent, namely an indigenous community leader, for an entire community. Given the well-known challenges of aggregating individual preferences, we believe that relying to IC leaders to estimate (via their responses to our DCE) their community's WTP is likely to be the least problematic strategy to for estimating IC WTP. Typically, important IC decisions such as participation in a titling initiative are the outcome of an iterative process involving IC leaders and an IC general assembly. However, it would not be feasible to rely on such a process to obtain responses to a DCE. We believe that relying on the responses of IC leaders, whose job is to

$$MWTP_i = \frac{-\beta_i}{\beta_{payment}}. \quad (4)$$

3.3.2. Second stage: Determinants of individual respondents' willingness to pay

Our analysis of individual respondents' MWTP entails two steps. First, following Revelt and Train (2000), Hensher and Greene (2003), and Hole (2007), we use MMNL model results to generate individual respondent-level parameter estimates. Specifically, we derive these parameters as the conditional means of the coefficient distributions for all respondents who made identical choices when faced with the same choice set. We use these individual respondent-level parameters to calculate individual respondent-level MWTP using Equation (4). Next, following Campbell (2007), we use ordinary least squares (OLS) to identify correlations between MWTP and respondent characteristics. [7]

Here, too, the analytical framework is well known, so we provide only a brief sketch. The expected value of β_q conditional on a given response pattern *p* and a set of options *a* is given by

$$E(\beta|p_q, a_q) = \frac{\int \beta \prod_{t=1}^{T} \prod_{i=1}^{I} \left[\frac{exp(a_{qi}+\beta_q X_{qit\,q})}{\sum_{j\in J} exp(a_{qj}+\beta_q X_{qjt})}\right]^{Pqit} f(\beta|\Omega)d\beta}{\int \prod_{t=1}^{T} \prod_{i=1}^{I} \left[\frac{exp(a_{qi}+\beta_q X_{qit\,q})}{\sum_{j\in J} exp(a_{qj}+\beta_q X_{qjt})}\right]^{Pqit} f(\beta|\Omega)d\beta} \quad (5)$$

represent their communities in negotiations about land titles and make decisions about community financial management, is a reasonable alternative.

[7] Campbell's (2007) pioneering analysis focuses on rural landscape improvements in Ireland. Subsequent applications of this approach have analyzed preferences for recreational use of forests in Lorraine, France (Abildtrup et al. 2013); biodiversity enhancement in New Zealand's planted forests (Yao et al. 2014); forest management and protection program in Poland (Czajkowski et al. 2017); power outages in Mekelle, Ethiopia (Zemo, Kassahunb, and Olsen 2019); demand for crop insurance in India (Ghosh et al. 2021); and coastal and marine conservation in Nha Trang Bay, Vietnam (Börger et al. 2021).

We approximate the value of $E(\beta|p_q, a_q)$ via simulation using Stata's *mixlbeta* command (Hole 2007), assuming preferences for attributes are random and lognormally distributed. We identify the determinants of individual MWTP by using OLS to estimate

$$w_q = \delta_q + \gamma_q Z_q + \upsilon_q \quad (6)$$

where w is individual MWTP, Z is a vector of respondent characteristics, υ is a stochastic error term, δ is a parameter, and γ is a vector or parameters.

4. DATA

Table 2 defines and provides descriptive statistics for the covariates used in the analysis of respondents' WTP. Our rationale for selecting these covariates is explained below. Here, we focus on the characteristics of our survey sample, respondents' general views about land titling, and their responses to DCE follow-up questions.

[Insert Table 2 here]

4.1. Respondent and community characteristics

The average survey respondent was 46 years old. Seventy-two percent of respondents had more than six years of formal education.

Of the ICs in our sample, 84 percent were in Loreto and 16 percent were in San Martin. Only 36 percent were within a half-hour travel time to the nearest main road. The average level of

economic development was low: only two percent of sample communities had households with indoor sewage, and only four percent had households with piped potable water.

On average, 64 percent of community land was considered not steeply sloped, and just over one-fifth was used for agriculture. The average community had 43 household parcels, each comprising 143 hectares. The mean net revenue per hectare used for agriculture was S/ 4,207 (US$1,262).

Just over three-quarters of the sample communities obtained their land via "ancestral possession" versus purchasing it or other means. Two-thirds of the communities had formal rules governing land use, and 62 percent had rules penalizing unauthorized logging. Thirteen percent reported that some of their land was claimed by noncommunity members, and just over one-quarter stated that such claims had led to conflict in the past five years.

4.2. Community leaders' views on land titling

The survey of IC leaders that included our DCE also featured several general questions about land titling. Asked to identify the single most important reason to title IC land, 43 percent of respondents selected "tenure security" and 40 percent selected "to prevent others from invading the IC" (Table A1). Eighty-six percent of respondents thought the titling process takes too long and 72 percent thought it is too costly. Finally, 99 percent agreed that tenure security is important for their ICs economic development.

4.3. Follow-up questions about DCE and attributes

After the DCE was administered, follow-up Likert-scale questions asked both enumerators and respondents to indicate whether respondents understood the DCE and were confident in their

answers. For 92 percent of the 164 DCEs administered, enumerators reported that they were either "very confident" or "confident" that the respondents understood the DCE and had thought through their answers (Table A2). As for the respondents themselves, 88 percent reported that they were either "very confident" or "confident" of the choices they made. Follow-up Likert-scale questions about the importance of individual attributes suggest that respondents viewed all five attributes as important, particularly *traditional uses*: at least 88 percent of respondents reported that each attribute was either "very important" or "important" and 96 percent reported that *traditional uses* was.

5. RESULTS

5.1. First Stage: Respondents' preferences and average marginal willingness to pay

Estimated coefficients for *traditional uses* and *indigenous representative* are statistically significant at the one percent-level, indicating that both attributes are positively associated with the probability of choosing a titling option (Table 3). Coefficients for *pecuniary cost* and *duration* are negative and statistically significant at the five or 10 percent levels, suggesting that these attributes are negatively associated with the probability of choosing a titling option. Only the coefficient on *quantity of land* is not statistically significant. ASC is positive and statistically significant at the one percent level. These results suggest that IC leaders value titling overall, irrespective of the specific levels of the attribute, that they tend to prefer titles that encompass the areas they perceive as having high cultural value, but not those that award them more land than they expected to be titled ex ante. And not surprisingly, they also tend to prefer titling processes that are shorter, involve indigenous representatives, and require lower out-of-pocket payments.

[Insert Table 3 here]

Our estimates of standard deviations are statistically significant for ASC and for *indigenous representative* (Table 3). The implication is that respondents varied considerably in their preferences for a land title irrespective of its attributes, and in their preferences for including an indigenous representative in the titling team.

We use estimated parameters from the first-stage models to calculate the average MWTP for all respondents in our regression sample (Table 4). Standard errors are calculated using the delta method. Note that because our pecuniary cost attribute is an annual payment over five years, our MWTPs are annual payments over five years. On average, respondents are willing to pay S/ 28,207 (US$8,462) per year for five years for a communal land title, irrespective of its specific attributes. On average, they are willing to pay an additional S/ 3,217 (US$965) for a titling team that includes an indigenous representative, and an additional S/ 1,760 (US$528) for a title that includes land used for traditional purposes.

[Insert Table 4 here]

Next we calculate our respondents' average MWTP for titling options with selected attributes (Table 5). Option 1 is meant to be the least preferred, Option 3 the most preferred, and Option 2 is intermediate. Recall that the pecuniary cost attribute is an annual payment over a five-year payment period. We report both average annual MWTP and the average total MWTP, which is calculated as the present value of five annual payments, assuming a 10 percent discount rate. Average total MWTP for Option 1 is S/ 117,342 (US$35,203), for Option 2 is S/ 147,548

(US$44,265), and for Option 3 is S/ 149,314 (US$44,794). For the average IC in our sample, which comprises 2283 ha, average MWTPs are S/ 51 (US$15), S/ 65 (US$19), and S/ 65 (US$20) per hectare.

[Insert Table 5 here]

How do these estimates compare with measures of IC financial resources? The PTRT3 baseline survey for IC members (versus leaders) included questions on annual revenue and expenses per household plot. From these data we are able to calculate median annual net agricultural income per community: S/ 1.18 million (US$0.35 million). Hence, average total WTP for Option 1 (least preferred) equals 10 percent of median annual net agricultural income, and that for Option 3 (most preferred) is 13 percent of the average.

How do these estimates compare with measures of the administrative cost of providing title to Peruvian ICs? As noted above, our DCE was incorporated into a PTRT3 baseline survey that aimed to title 331 ICs in the Peruvian Amazon. The estimated per unit cost of titling these 331 ICs was 2019 US$ 21,079 (IADB 2014). Hence, estimated average total MWTP for Option 1 (US$35,203)—which can be interpreted as the private benefit of a title—exceeds the administrative cost of providing title by a factor of 1.7, and the average total MWTP for Option 3 (US$44,794) exceeds it by a factor of 2.1. Note that if our estimate of benefits included both private and public benefits, such as the effect of titling on reducing forest loss and degradation (Blackman et al. 2017), these ratios would be even higher.

5.2. Second stage: Determinants of individual respondents' willingness to pay

Here we explore the determinants of individual respondents' MWTP for a land title. We first retrieve respondent-specific MWTP from the MMNL estimates reported in Table 3. Figure A1 displays histograms for the distributions these MWTPs, both for a communal land title irrespective of its specific attributes, and for each of our four specific attributes other than pecuniary cost. Figure A2 displays a histogram for the distribution of WTP for titling option 2.

Next, we estimate OLS regressions to explore correlations between MWTP for titling Option 2, as described above (quantity land = reference level + 20%; traditional uses = yes; duration = 1 year; indigenous rep = yes), and the characteristics of our respondents and the ICs they represent (Table 6). To control for outlier effects, we trim the regression sample by dropping 5 percent of observations at the extremes of the distribution of MWTP, leaving a sample of 148 observations.

5.2.1. Conceptual framework

A simple heuristic conceptual framework guides our selection of covariates and our hypotheses regarding their correlations with MWTP. We hypothesize that

$$MWTP = f(C, L, R, V)$$

where C is the capacity of the IC to successfully negotiate the titling process; L is the liquidity required to finance the cost of that process; R is the risk of land grabbing absent a title*;* and V is the IC leader's perceived value of the IC land. We posit that MWTP is an increasing function of each of these metavariables.

The covariates in our regression analysis proxy for these metavariables. The last column in Table 2 indicates the correspondence between each covariate and the five metavariables. Some covariates may proxy for more than a single metavariable. For example, *near* may proxy for both *V* (since land closer to population centers is typically more valuable) and *R* (since competition for land close to population centers is likely to be more intense). For the sake of simplicity, the last column of Table 2 lists the metavariable for which the link to the covariate is, in our view, likely to be strongest.

We hypothesize that our two respondent characteristics, *age* and *education*, proxy for and are positively correlated with *C*, the capacity of the IC to successfully negotiate the titling process. We posit that our two community infrastructure variables, *indoor sewage* and *drinking water*, proxy for and are positively correlated with *L*, the liquidity required to finance the cost of the titling process.

We conjecture that four covariates proxy for *R*, the risk of land grabbing absent title: *land use rules, logging rules, competing claims,* and *land rights conflict*. We hypothesize that all four covariates are positively correlated with *R;* the first two because those ICs facing a significant risk of land grabbing tend to promulgate land use and logging rules, and the last two because historical land-use conflict is correlated with future conflict.

Finally, we hypothesize that six community land characteristic variables (*near, flat, percentage agriculture, crop net revenue per hectare, parcels,* and *land per family*) as well as one community institutional characteristic (*ancestral ownership*) proxy for *V*, the perceived value of the IC land. We conjecture that *near, flat,* and *percentage agriculture* are positively correlated with *V* because land that is close to population centers, is flatter, and tends to be used for agriculture is likely to be more valuable for that purpose; that *parcels* and *land per family* are negatively

correlated with *V* because in communities with more parcels and with larger parcels, land is presumably less scarce and therefore less valuable; that *crop net revenue per hectare* is positively correlated with *V* because it is a measure of the average current return on agricultural land uses; and that *ancestral ownership* is positively correlated with *V* because a longstanding historical link to community land increases its perceived value.

5.2.2. Results

In Table 6, which presents our results, Models 1–4 each include the subsets of covariates that proxy for each metavariable (*C,L,R,V*) and Model 5 includes all covariates together. Only the proxies for *V*, the perceived value of the IC land, and *R*, the risk of land grabbing, explain variation in MWTP. Specifically, for Model 5, two proxies for *V* (*parcels* and *land per family*) are negatively correlated with MWTP, and one proxy for V (*ancestral ownership*) and one proxy for R (*land use rules*) are positively correlated with MWTP. The hypothesized reasons for these correlations are discussed above. Estimated coefficients indicate that on average, each additional parcel in a community reduces MWTP by S/ 40 (US$12), each additional hectare of land per family reduces MWTP by S/ 41 (US$12), ancestral ownership increases MWTP by S/ 12,332 ($3,700), and land-use rules increase MWTP by S/ 9,149 (US $2,745). Finally, on average, MWTP is S/ 15,353 ($4,606) lower in San Martin department than in Loreto, a spatial fixed effect that may control for a variety of unobserved factors.

[Insert Table 6 here]

6. DISCUSSION

To analyze the private benefits of awarding formal legal title to ICs, we conducted a DCE with leaders of a random sample of 164 untitled ICs in the Peruvian Amazon. To our knowledge, it represents the first attempt to use rigorous stated preference methods (DCE or contingent valuation) to examine land titling.

Our findings shed light on IC leaders' preferences regarding land titling, the magnitude of the private benefits that titling generates, and how net benefits vary across IC types. As for preferences, IC leaders place a high value on receiving a title irrespective of its attributes. That said, among the five titling contract attributes we examined, IC leaders were most concerned about whether the IC titling team includes an indigenous representative. They were at least as concerned about the location of the land titled as the quantity of it. And not surprisingly, they prefer titling processes that are shorter and less expensive. A caveat is that our DCE tested whether IC leaders valued obtaining more land than they expected to, not less. As for the magnitude of private benefits, our results suggest that they are significant—10 to 13 percent of median IC net agricultural revenue and two times the administrative costs of providing titles. Finally, we find that the net benefits of titling depend on IC characteristics. They are most strongly correlated with proxies for the perceived value of land: an indicator of ancestral ownership, the number of parcels of land in the IC, and the amount of land per household.

What are the implications of our results for policy? They suggest that titling campaigns could boost the private benefits of IC titling by including indigenous representatives in titling teams and ensuring that these teams pay close attention to whether titles encompass lands with high cultural significance. Furthermore, our results confirm the received wisdom that the net benefits of formal legal land rights are both positive and significant. Although net benefits of interventions aimed at titling ICs would need to be compared with net benefits from other

interventions to determine how to allocate resources across intervention types, our study provides preliminary evidence that further investment in IC titling is justified. Finally, our findings suggest that private net benefits of investments in titling can be maximized by targeting scarce titling resources to ICs where land is prized most highly.

In sum, we believe our study represents a proof-of-concept for the use of DCEs to analyze the private benefits of IC titling. It indicates that DCEs can help stakeholders decide whether to invest in titling campaigns, how to design them, and where to target them. A relatively low-cost strategy for fielding such DCEs is to incorporate them into baseline surveys aimed at informing and evaluating titling campaigns like the PTRT3 program in the Peruvian Amazon.

Acknowledgments: This research was funded by the Inter-American Development Bank via the Rural Land Titling & Registration Project in Peru, Phase 3 (PE-L1026), Economic Sector Work RG-E154, and the KIC Visiting Scholars Fund. For helpful comments and assistance with data and field work, we thank Alejandro Bartalles, Joe Cook, Henrry Delgado, Alvaro Garcia, Mark Jeuland, Michael Kent, José Martín Márquez, Juan de Dios Matos, Cesar Montiel, Brian Robinson, Kelly Ruiz, Rodolfo Tello, Giulia Zane, and the Instituto Peruano de Cadastro. We are grateful to Sally Atwater for editorial help. The information and opinions presented herein are entirely those of the authors, and no endorsement by the Inter-American Development Bank, its Board of Executive Directors, or the countries they represent is expressed or implied.

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TABLES

Table 1. Choice experiment attributes and levels

Attribute	Description	Levels
pecuniary cost	Out-of-pocket payment IC must make each year for five years to receive title	• S/ 0 • S/ 500 • S/ 1000 • S/ 1500 • S/ 2000 • S/ 2500 • S/ 3000
quantity land	Hectares of IC land titled. Reference level is amount respondent indicated s/he believes will be titled (in responding to pre-experiment survey question)	• reference level • ref. level + 20% • ref. level + 40%
traditional uses	Does the title encompass burial grounds and other places with religious and customary significance?	• yes • no
duration	Years between start and end of titling process	• 1 year • 2 years
indigenous representative	Does titling team include representative of local regional federation of ICs?	• yes • no

Table 2. Variables and descriptive statistics (n = 164)

Variable	Description	Mean	S.D.	Proxy for
Respondent characteristics				
age	Age (yrs.)	45.96	12.75	C
education	More than 6 years of formal education (0/1)	0.72	0.45	C
Community infrastructure				
indoor sewage	Households with indoor sewage (%)	2.38	14.77	L
drinking water	Households with piped potable water (%)	3.85	18.66	L
Community land characteristics				
near	< 30 minutes from main road and distance known (0/1)	0.36	0.48	V
flat	Land not steeply sloped (0/1)	0.64	0.48	V
percentage agriculture	Agricultural land (%)	20.54	18.96	V
crop net revenue per hectare	Net revenue per ha crop land (/S)	4207.40	7004.17	V
parcels	Household parcels (no.)	43.34	73.50	V
land per family	Land per family (has)	143.26	470.19	V
Community institutional characteristics				
ancestral ownership	Community land obtained via “ancestral possession” (0/1)	0.76	0.43	V
land use rules	Community rules govern land use (0/1)	0.67	0.47	R
logging rules	Community penalizes unauthorized logging (0/1)	0.62	0.49	R
competing claims	Some community land claimed by outsiders (0/1)	0.13	0.34	R
land rights conflict	Outsider land claims led to conflict in last 5 years (0/1)	0.26	0.44	R
Department				
san martin	In San Martin department (0/1)	0.16	0.37	n/a

C = capacity to successfully negotiate titling process; L = liquidity needed for process; R = risk of land grabbing absent title; V = value of land

Table 3. Parameter estimates from mixed multinomial logit model (s.e.)

Variable	**Coefficient (s.e.)**
Mean estimates	
ASC	5.345***
	(1.261)
pecuniary cost	-0.000189**
	(0.0000910)
quantity of land	0.0774
	(0.0893)
traditional uses	0.333***
	(0.119)
duration	-0.220*
	(0.118)
indigenous representative	0.610***
	(0.131)
Standard deviation	
ASC	3.473***
	(0.938)
pecuniary cost	0.000307
	(0.000265)
quantity of land	-0.120
	(0.0748)
traditional uses	-0.00198
	(0.395)
duration	0.250
	(0.465)
indigenous representative	0.623**
	(0.270)
No. respondents	164
No. choices	1476
LL	-395.4
Chi-squared	42.69

ASL = alternative specific constant
***, **, * = significant at 1, 5, 10% level

Table 4. Average annual marginal willingness to pay (MWTP) for generic option and specific attributes (s.e.) [/S]

Option	**MWTP**
alternative specific constant (ASC)	28207.4**
	(13860.0)
quantity of land	408.6
	(504.7)
traditional uses	1759.6*
	(961.7)
duration	-1158.7
	(721.8)
indigenous representative	3216.7**
	(1532.7)
No. respondents	164
No. choices	1476

***, **, * = significant at 1, 5, 10% level

Table 5. Average annual and total willingness to pay (WTP) for titles with specific attributes (s.e.)[a] [/ S**]**

Option no.	***quantity of land***	***traditional uses***	***duration***	***indigenous rep.***	**Annual WTP**	**Total WTP**[b]
1	ref. level	no	2 years	no	30,955	117,342
2	ref. level + 20%	yes	1 year	yes	38,923	147,548
3	ref. level + 40%	yes	1 year	yes	39,389	149,315

[a]Excluding 5% top and bottom outliers
[b]Present value of five equal annual payments, assuming a 10 percent discount rate

Table 6. Determinants of marginal willingness to pay (mwtp): ordinary least squares regression results (s.d.)[a]

Variable	Model 1 capacity (C)	2 liquidity (L)	3 risk (R)	4 value (V)	5 all
Resp. characteristics					
age	39.13				117.8
	(156.0)				(165.8)
education	2083.4				-1172.5
	(5348.1)				(4746.5)
Community infrast.					
indoor sewage		-4.565			-22.45
		(132.0)			(80.22)
drinking water		-90.24			-66.77
		(94.38)			(86.74)
Community chars.					
near				-1895.3	-1233.6
				(4945.5)	(5022.5)
flat				-702.1	-1177.2
				(4701.4)	(4851.1)
percentage ag.				148.2	142.4
				(121.8)	(138.7)
crop net rev. / ha				0.173	0.127
				(0.361)	(0.395)
parcels				-38.55*	-40.04**
				(20.09)	(20.01)
land per family				-37.98***	-40.82***
				(10.42)	(11.16)
land / family sq				0.00847***	0.00906***
				(0.00204)	(0.00221)
Comm. instit. chars.					
ances. ownership				14677.9**	12331.9**
				(5071.9)	(5161.7)
land use rules			10559.3**		9149.4*
			(4345.8)		(4884.0)
logging rules			4512.2		3727.6
			(3779.9)		(3686.5)
competing claims			-15.06		-1959.7
			(10221.6)		(11352.1)
land rights conf.			4519.0		6420.0
			(8206.5)		(8644.5)
Dept. fixed effect					
san martin	-8450.2**	-6327.0	-10224.5**	-15387.6**	-15353.3*
	(4013.6)	(4203.0)	(4179.9)	(6443.3)	(7982.2)
Constant					
constant	37446.7***	40755.0***	29887.1***	33350.8***	21693.9*
	(9812.4)	(2353.8)	(4663.5)	(6576.7)	(12360.1)
Nobs.	148	148	148	148	148
R2	0.0164	0.0188	0.0698	0.132	0.178

[a]Dependant variable is estimated WTP for titling option 2: quantity land = reference level + 20%; traditional uses = yes; duration = 1 year; indigenous rep = yes.

FIGURE

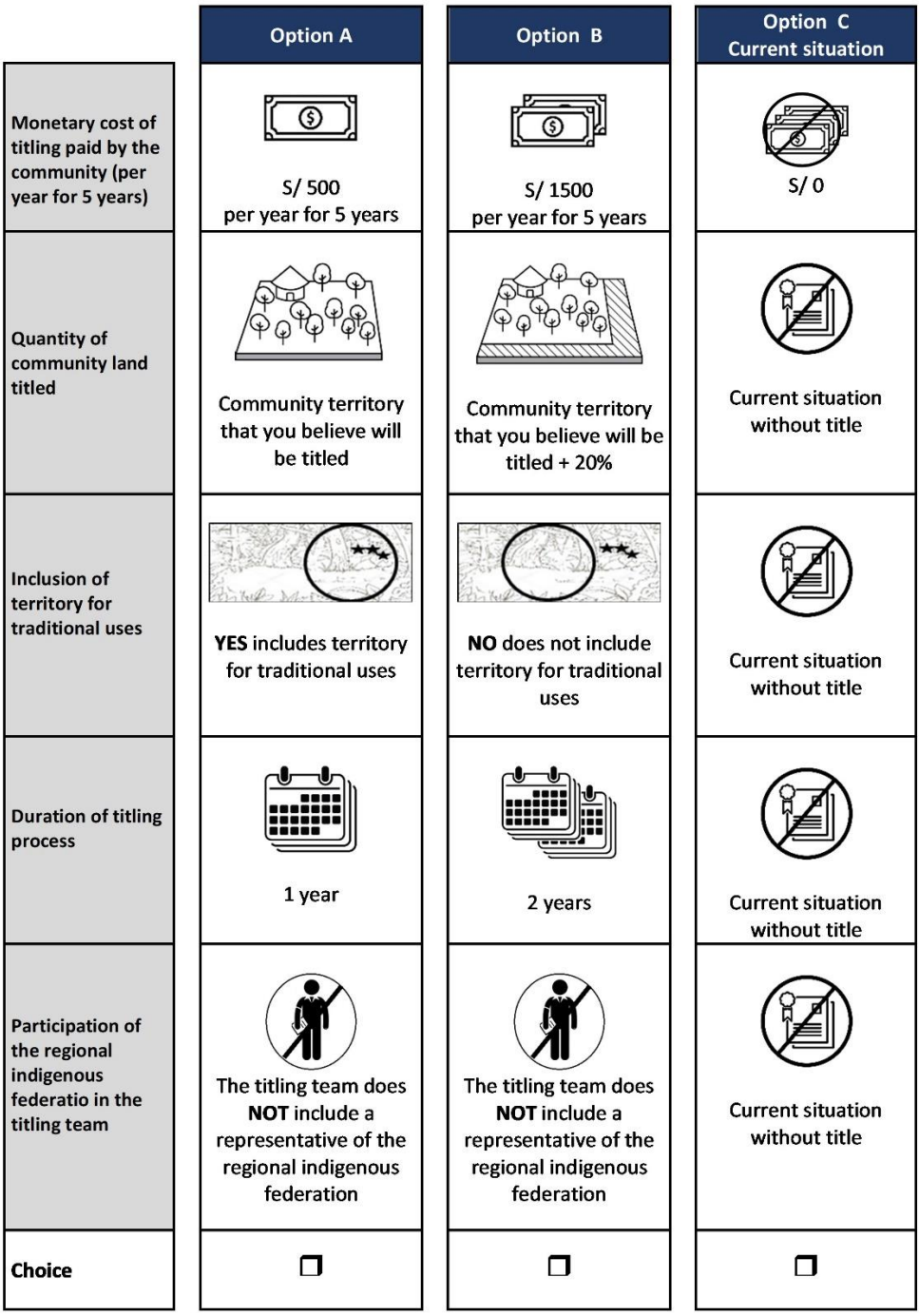


Figure 1. English translation of example choice card

APPENDIX

Note: As explained in the main text, the discrete choice experiment (DCE) was embedded in the baseline (pre-intervention) survey for PTRT3, the Peruvian government project initiated in 2015 that aimed to title 331 indigenous communities along with thousands of private properties in eastern Peru. Here, we include English translations of the enumerator script that directly preceded the administration of the DCE and of follow-up survey questions directly pertaining to the DCE. We do not include baseline survey questions unrelated to the DCE.

1. Discrete choice experiment enumerator script

Note: the script is in italics and notes to enumerator are in regular font.

1.1. Introduction

You just answered some questions about your community and your community land tenure. Now, we will ask you about your preferences regarding a variety of different imaginary arrangements that could be made to grant a title to your community.

Your community may be selected to receive formal legal land title in the coming year. The purpose of this part of the survey is to help us better understand your views about amount and location of land that would be titled, and the process that would be used to award title.

To help us understand your views, we will show you different options for the award of title, and we will ask you to choose the one that you prefer. Each option will have different attributes. These attributes have to do with

- *the amount of land titled;*
- *whether the land titled includes land for customary uses;*

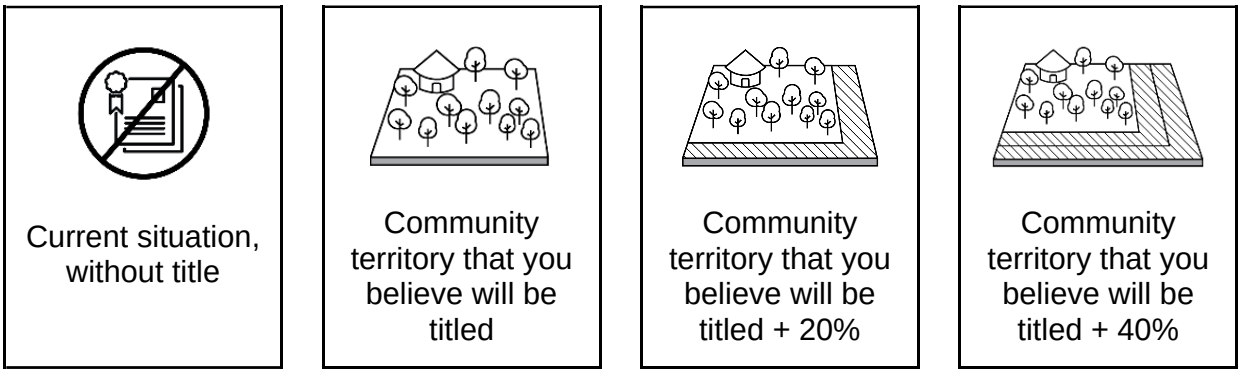
- *how long it takes to receive title;*
- *whether the titling team includes a representative of the regional indigenous federation;*
- *the cost of the titling process to the community.*

Do you have any questions?

1.2. Attribute cards

The attributes and the levels they can take are shown on these cards. Please look at the attributes and the levels carefully.

Attribute 1: Community land you think will be titled



- *This attribute has to do with the area of community land that you think will be included in the title*
- [Remind the respondent that, in response to a previous question (130), they said they think that X hectares of community land will be titled]
- *The levels of this attribute are*
    - *Community land that you think will be titled*
    - *Community land that you think will be titled + 20%*

- *Community land that you think will be titled + 40%*

Important notes for enumerator:

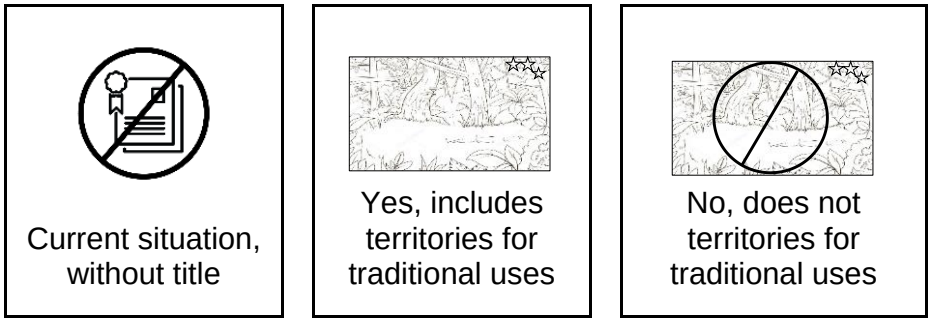
• "Community territory that you think will be titled" is the area indicated in question 130 of the main questionnaire ("What is the area of the community territory that you think *will be* titled? "). It is NOT the area reported in question 129 ("What is the area of the community territory that you think *should be* titled?").

• Neither you or the respondent needs to calculate the actual number of hectares of land for the middle and high levels. You need only describe them as "Community land that you think will be titled + 20%" and "Community land that you think will be titled + 40%"

Questions of understanding

- *(point to one level of the attribute) and ask: "If you choose this option, what will you receive?"*
- *What is the greatest amount of land you could get from the land titling?*

Attribute 2: Does the land titled include land used for customary uses?



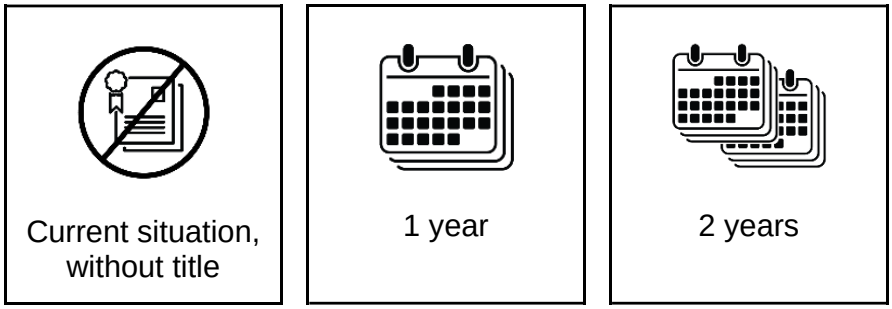
- *This attribute has to do with whether the land titled includes land that the community uses for customary purposes. Examples of such land include burial grounds, and other places with religious and customary significance.*

- *The levels of the attribute indicate that the community land titled does or does not include land used for customary purposes.*

Question of understanding

- *Which symbol indicates that the titled land includes land used for customary purposes?*

Attribute 3: How long does it take for title to be awarded?



- *This attribute has to do with how long it will take for title to be awarded.*
- *The levels of the attribute are*
    - *The titling process takes 1 year*
    - *The titling process takes 2 years*

Questions of understanding

- *What is the maximum and minimum amount of time the titling process can take?*

Attribute 4: Does the titling team include representatives of the regional indigenous federation?

Current situation, without title

The titling team does NOT include a representative of the regional indigenous federation

The titling team does include a representative of the regional indigenous federation

- *The government team that interacts with the community to award title can include representatives from the regional indigenous federation.*
- *The levels of this attribute are*
    - *The titling team does not include a representative of regional indigenous federation*
    - *The titling team includes a representative of regional indigenous federation*

Questions of understanding

- *Which image shows that that titling team does not include representative of regional indigenous federation?*

Attribute 5: What is the cost of the titling process to the community?

 S/. 0 current situation, without title	 S/. 500 per year for 5 years	 S/. 1000 per year for 5 years	 S/. 1500 per year for 5 years	 S/. 2000 per year for 5 years	 S/. 2500 per year for 5 years	 S/. 3000 per year for 5 years

- *This attribute has to do with the cost that the community must pay to receive a land title*
- *The cost must be paid each year for the first five years after title is awarded*
- *The levels of this attribute are*
    - *S/ 0*
    - *S/ 500*
    - *S/ 1000*
    - *S/ 1500*
    - *S/ 2000*
    - *S/ 2500*
    - *S/ 3000*
- *It is important to keep in mind that each of these levels is one-fifth of the total amount that must be paid. So for example, for the level S/ 3000, the total amount paid over five years it 5 × S/ 3000 = S/15000.*

Questions of understanding

- *What is the maximum and minimum amount titling process can cost the community per year?*

- *For how many years do you have to pay the amounts shown?*

Final check

Now check if the respondent has any questions about any of the attributes or any of the levels. Ask:

- *Do you have any questions about the attributes and the levels they take?*

1.3. Example choice card

We will now show you a series of cards. Each card has three options, one of which is current situation without the provision of title. I will first show you an example of a choice card. Each column represents a different option. You should compare each option (vertically) and then choose the one you like the most.

[See example choice card in main text]

Do you have any questions about this choice card and how to make choices?

If you have not questions, we will start with this part of the survey.

2. DCE Follow-up questions

[Questions for the enumerator]

1. Do you agree with the statement that "The respondent understood the attributes and the levels about land titling well"

    1. Strongly Agree
    2. Agree
    3. Not Sure
    4. Disagree
    5. Strongly Disagree

2. Do you agree with the statement that "The respondent understood the process for answering the choice questions well"

    1. Strongly Agree
    2. Agree
    3. Not Sure
    4. Disagree
    5. Strongly Disagree

3. On a scale of 1-5, how confident are you that the respondent understood the choice experiment and thought through his or her choices?

    1. Very confident

2. Confident

3. Somewhat confident

4. Not confident

5. They clearly did not understand or think about their choices

[Questions for respondents]

4. How confident are you in the choices you made?

    1. Very confident

    2. Confident

    3. Somewhat confident

    4. I wasn't sure about some questions and guessed answers

    4. The truth is I just made choices in order to say something

5. In making your choices among contracts, how important was the attribute on the cost of the tiling process? (on a scale of 1-5, with 1 being very important and 5 being not important)

    1. Very important

    2. Important

    3. Moderately important

    4. Little importance

    5. Not important

6. In making your choices among contracts, how important was the amount of land titled attribute? (on a scale of 1-5, with 1 being very important and 5 being not important)

    1. Very important

    2. Important

3. Moderately important
4. Little importance
5. Not important

7. In making your choices among contracts, how important was the attribute on land for customary uses being included in the titled land? (on a scale of 1-5, with 1 being very important and 5 being not important)

    1. Very important
    2. Important
    3. Moderately important
    4. Little importance
    5. Not important

8. In making your choices among contracts, how important was the attribute on the length of time taken for the tiling process? (on a scale of 1-5, with 1 being very important and 5 being not important)

    1. Very important
    2. Important
    3. Moderately important
    4. Little importance
    5. Not important

9. In making your choices among contracts, how important was the attribute on the titling team including a member of the regional indigenous federation? (on a scale of 1-5, with 1 being very important and 5 being not important)

1. Very important
2. Important
3. Moderately important
4. Little importance
5. Not important

10. Where is/are the lands that you use for customary uses located?

APPENDIX TABLES

Table A1. Indigenous community leaders' views about land titling (n = 164)

Question	Percentage
What is the main reason it is important to title community land?	
• Tenure security	43
• To prevent others from invading	40
• Possibility of selling	2
• Possibility of renting out	0
• Possibility of inheriting	1
• To access credit	4
• To access social programs	4
• To develop forest management plans	2
• To develop community plans	2
• To invest	2
• It is not important	0
• Other	0
Does the titling process take too long?	
• Yes	86
• No, or do not know	14
Is the titling process too costly?	
• Yes	72
• No, or do not know	28
Is tenure security important for your community's economic development?	
• Yes	99
• No, or do not know	1

Table A2. Responses to follow-up five-point Likert scale questions (n = 164)

Question	Percentage responding 1 or 2
Enumerator	
• The respondent understood the attributes and the levels about land titling well (1=totally agree, 2=agree, etc.)	98
• The respondent understood the process for answering the choice questions well (1=totally agree, 2=agree, etc.)	98
• On a scale of 1–5, how confident are you that the respondent understood the choice experiment and thought through his or her choices? (1=very confident, 2=confident, etc.)	92
Respondent	
• How confident are you in the choices you made? (1=very confident, 2=confident, etc.)	88
• In making your choices among contracts, how important was …	
• … the amount of land titled attribute? (1=very important, 2=important, etc.)	91
• … land for customary uses being included in the titled land?	96
• … the length of time taken for the tiling process?	88
• … including a member of the regional indigenous federation?	93
• …the cost of the tiling process?	92

APPENDIX FIGURES

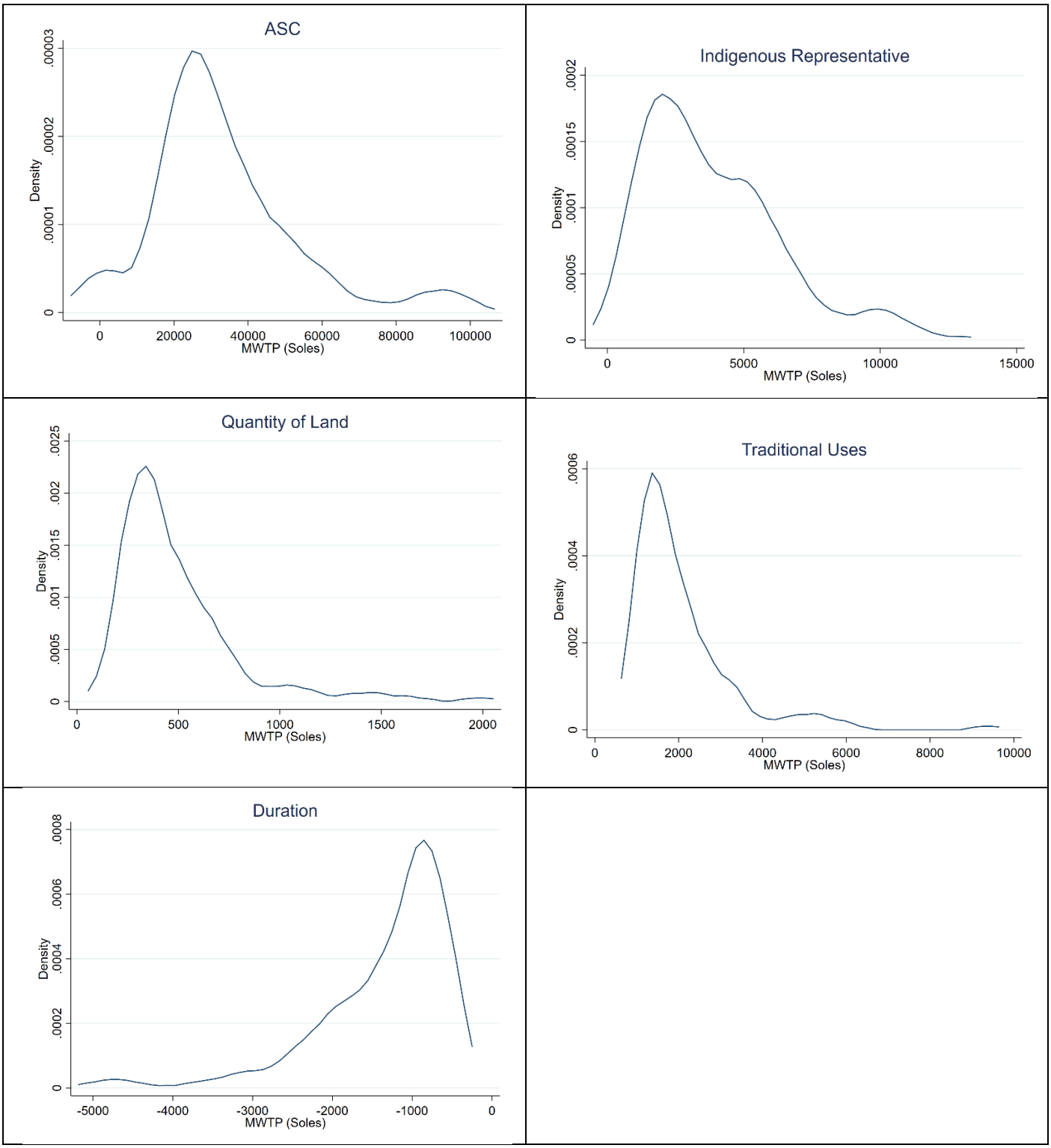


Figure A1. Individual marginal willingness to pay (MWTP) for title attributes; excludes 5 percent of outliers in each tail of distribution

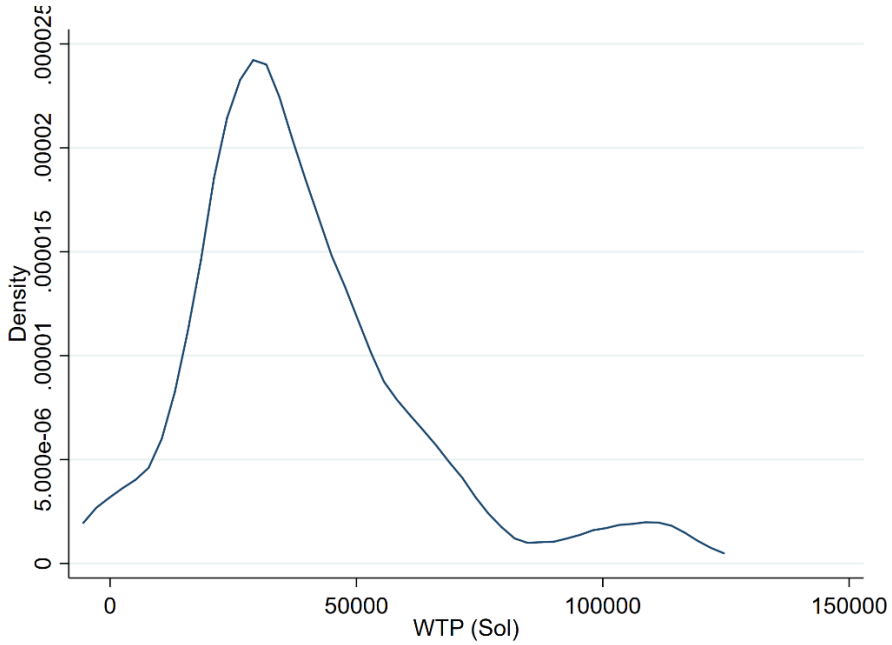


Figure A2. Individual willingness to pay (WTP) for titling option 2 (quantity land = reference level + 20%; traditional uses = yes; duration = 1 year; indigenous representative = yes); excludes 5 percent of outliers in each tail of distribution