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## Private and communal lands? The ramifications of tenure ambiguity and regional integration for tenure formalization and its consequences in northern Bolivia

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**Abstract:** Major integration initiatives such as large-scale infrastructure projects are moving forward in Latin America, creating the conditions theorized by the ‘evolutionary theory of land rights’ (ETLR) for the shift from communal to private individual tenure. This however assumes a clear distinction between communal and private individual tenure that avoids ambiguities such as those arising from contrasts between de jure tenure rights and de facto practices. We take up these issues by focusing on northern Bolivia, an ambiguous case because groups of families with individual land claims recently received communal titles as ‘independent communities’. This has occurred in areas near a major market

integration initiative, the Inter-Oceanic Highway, which has recently been paved. We draw on a survey of households in putatively communal lands in northern Bolivia to evaluate the claims of the ETLR concerning regional integration and formalization of private claims and its consequences. We find evidence of practices consistent with private individual tenure, but they are not related to market integration. Further, indications of formalization of private individual rights do not lead to the outcomes anticipated by the ETLR. These findings call for additional comparative work on integration and tenure.

**Keywords:** Bolivia, common pool resources, forestry, institutions, land management, protected areas

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## 1. Introduction

While institutions are key factors behind the management of natural resources (Ostrom et al. 1999; Dietz et al. 2003), there remains debate as to the institutions best suited for sustainable management of particular resources under specific conditions. A predominant view highlights the advantages of private property, stemming from arguments of the ‘property rights’ school (Demsetz 1967), later extended to the ‘evolutionary theory of land rights’ or ETLR (Feder et al. 1988) and recently renovated in terms of tenure formalization (de Soto 2000). Another prominent view underscores the benefits of communal tenure arrangements for management of common pool resources (CPRs) (Berkes 1989; Ostrom 1990). Critical appraisals of ETLR and CPRs have highlighted the importance of attending to the many requirements for the proposed benefits of either path to obtain (Agrawal 2001; Sjaastad and Cousins 2008). Such evaluations have emphasized that private and communal rights constitute ideal types in theory.

By contrast, in concrete cases, there is potential for combinations of the two, resulting in tenure ambiguities (Platteau 1996; Sjaastad and Cousins 2008). In Latin America, many innovative tenure models have been implemented as policy in the past 20 years, including variations on parks, concessions, indigenous lands, communal lands, and sustainable use areas (Richards 1997; Zoomers and van

der Haar 2000; IUCN 2003). Many such models do not neatly correspond to ideal types of private individual or communal lands. Such land tenure models incorporate elements of both private individual and communal tenure relations, and thus raise questions about whether and how well propositions of dominant theoretical frameworks apply with regard to tenure and resource management.

Further, the effectiveness of tenure regimes for regulating resource use becomes particularly challenging to assess under conditions of rapid change. One key driver of change concerns major integration initiatives such as infrastructure projects (Bulmer-Thomas 2001; Bourguignon and Pleskovic 2008). A key question is thus how new tenure models relate to resource management practices in the context of modifications in external conditions such as infrastructure and market integration. The ETLR framework makes specific arguments about integration as it affects tenure and resource management, but assumes a shift toward formalization of private individual tenure, which leaves open questions and doubts with regard to cases involving tenure ambiguities.

This paper takes up these issues using the case of northern Bolivia, a highly dynamic region with innovations in land tenure models that involve tenure ambiguities as well as recent infrastructure projects seeking regional integration. 'Independent communities' constitute a new tenure model in northern Bolivia as they resulted from economic shifts and political pressures to formally recognize land rights in a manner distinct from those previously sanctioned (Stoian and Henkemans 2000; Assies 2002). Independent communities were demarcated by the Government of Bolivia as communal tenure areas. However, such 'communities' encompass lands previously held in private individual claims and which exhibit signs of informal parcelization. Northern Bolivia thus serves as a useful case for the study of tenure ambiguity between the ideal types of private and communal tenure models. Northern Bolivia is also located close to a major infrastructure project, the Inter-Oceanic Highway (IOH). Insofar as the IOH is simulating market expansion and other processes that are part and parcel of regional integration, northern Bolivia permits a doubly interesting assessment of tenure ambiguities: whereas ETLR theorizes that integration induces formalization of private individual tenure rights, independent communities in northern Bolivia already have formal but communal rights, which begs the question of whether there will be a shift toward formalization of private individual rights. Our overarching research question is therefore whether tenure ambiguity in northern Bolivia persists in the presence of regional integration, or whether there are signs of the formalization of private individual tenure rights and its consequences, including for sustainable resource use.

The remainder of this paper proceeds as follows. We first review theoretical statements on tenure and resource management, noting the arguments of the ETLR and CPR literatures. We focus on the shared emphasis in both on tenure formalization as a means of consolidating the effectiveness of tenure models for sustainable resource management. The paper then provides an historical review of northern Bolivia, particularly the western portion of the Department of

Pando, which was the first part of Bolivia to undergo land titling that recognized independent communities. We discuss the ambiguities of *de jure* communal land demarcation in light of historical private claims, as well as recent integration initiatives via new infrastructure. We then raise questions about whether, given tenure ambiguities, regional integration may lead to formalization of private individual claims along the lines proposed by the ETLR. We then outline our methods and data, which feature a household survey. Data collection revealed different perceptions among residents of independent communities concerning whether they had communal or private individual tenure, despite having had their lands demarcated and titled as communal lands. Because integration is hypothesized by the ETLR to drive tenure evolution toward formalization of private rights, we use the ETLR framework to organize our analysis. But because integration in northern Bolivia is occurring in a context with tenure ambiguities, we take a critical perspective on the assumptions behind the expectations of the ETLR concerning formalization of private individual tenure. Within our overarching research question, we address three specific questions surrounding formalization of private individual tenure. First, we focus on household determinants of private individual tenure formalization, featuring the role of distance to new infrastructure as a spatial correlate for regional integration. Second, we examine the consequences formalization, highlighting the role of integration and formalization for access to credit, participation in markets, and land conflicts. And third, we evaluate the ramifications for the sustainability of resource management, again highlighting the roles of integration and formalization and its consequences. Findings from both descriptive statistics and statistical models reveal some points in agreement as well as points running contrary to the ETLR. We conclude by discussing the implications of our findings for regional integration, tenure ambiguity, and debates over land tenure and resource management.

## 2. Background

### 2.1. The evolutionary theory of land rights (ETLR)

The ETLR is associated with the ‘property rights school’ which emphasizes the advantages of private property rights for resource management (Demsetz 1967; Alchian and Demsetz 1973). Private property rights were held to be a solution to the problem of open access, which resulted in overexploitation of resources and the ‘tragedy of the commons’ (Hardin 1968). As resources become scarcer and thus more valuable, it becomes more worthwhile to gain formal property rights. Such rights come in bundles and refer to rights of access (and thus rights to exclude others), rights of use, and rights of transfer. Whereas rights of access/exclusion ensure control over a resource and thereby avoid overexploitation and thus permit sustainability, rights of use motivate investments to make the resource more productive, and rights of transfer afford e.g. sales to realize gains. Private property rights were thus asserted to be vital to sustainable development.

The property rights argument drove theoretical elaboration on land titling and related policy proposals falling under the banner of tenure security (Feder et al. 1988). Tenure security is a crucial precondition for reaping the benefits of property rights. Whether by formal land titling or other means, tenure security provides the basis for investing in resource productivity. Equally crucial is that in many countries, titles are necessary to substantiate property rights to land as collateral for obtaining credit from banks in order to make investments in productivity.

Work on tenure security and titling in developing regions motivated articulations of the ETLR in the context of regional integration and economic development (Feder and Feeny 1991; Deininger and Feder 2001). Figure 1 outlines a series of relationships among change processes entrained by regional integration, resulting in the evolution of land tenure. Exogenous factors such as new infrastructure can stimulate regional population growth, the emergence of markets, and the introduction of new technologies, which tend to raise land values. Where property rights are not precisely defined, rising land values motivate formalization of property rights for tenure security, as via demarcation of clear property boundaries, clarification of access and use rights, and titling of land. At the same time, formal sources of credit emerge and grow in the form of banks, and formalization of property rights becomes more important for securing credit. Formalization, tenure security and credit motivate greater investments in long-term resource productivity, contributing not only to increased yields but also sustainable land use and thus regional development. Synergistically, the state finds it increasingly worthwhile to make public investments in the recognition and enforcement of property rights, which reduce agrarian conflicts. Further, land markets emerge, property values appreciate, and land sales become more viable.

This synergistic dynamic is the 'evolution' to which the ETLR refers: during the course of regional development, property rights change by shifting from traditional rights shared by communities toward formalized private individual rights (Platteau 1996; Deininger and Feder 2001). When land becomes scarcer and more valuable, communal and informal rights become increasingly costly to uphold because conflicts over land and other resources become more likely. There have been similar arguments to formalize property rights in urban areas to encourage investments and liquidity for economic growth and poverty alleviation (de Soto 2000). The property rights school, ETLR and formalization arguments have supportive empirical research in several countries (Feder et al. 1988; Alston et al. 1999; Otsuka et al. 2001; Deininger and Jin 2006).

## **2.2. Critiques of the ETLR**

Criticisms of the property rights school have also appeared (Platteau 1996; Balland and Platteau 1998; Firmin-Sellers and Sellers 1999; Heltberg 2002; Whitehead and Tsikata 2003; Nyambu Musembi 2007; Sjaastad and Cousins 2008). While no one has suggested that external drivers such as infrastructure development and the ensuing change mechanisms involved in regional integration do not

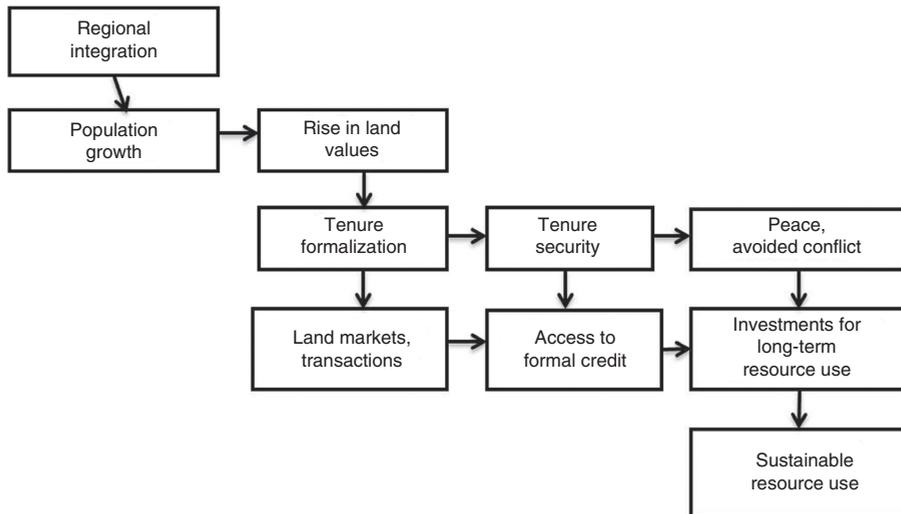


Figure 1: Relationships theorized in the evolutionary theory of land rights. Based on Feder and Feeny (1991).

yield rising land prices, there has been dispute about the subsequent processes: whether formalization proceeds via titling, whether titling begets tenure security, whether credit is necessarily available, whether titling or credit beget long-term investments in resource use, and whether resource use among titled properties is necessarily more sustainable. With regard to the question of formalization, even during integration, titling may not proceed for political reasons (Platteau 1996). Pre-existing tenure arrangements may have strong governmental or popular support.

Even if formalization proceeds via titling, titling by itself may not be sufficient to ensure tenure security (Alston et al. 1999; Firmin-Sellers and Sellers 1999; Gray and Kevane 2001; Nyambu Musembi 2007; Sjaastad and Cousins 2008). Social inequalities may raise the political transaction costs of titling, making enforcement of property rights difficult or impossible for the state. In some cases, titling itself may generate rather than resolve agrarian conflicts, as when there is real or perceived elite capture of land in titling programs.

A key criticism of the ETLR concerns its assumptions about the availability of credit (Platteau 1996; Firmin-Sellers and Sellers 1999; Heltberg 2002). The ETLR recognizes that if informal credit is available, the benefits of titling for productivity may be lessened (Feder et al. 1988; Feder and Feeny 1991; Deininger and Feder 2001). But there remain open questions as to whether banking institutions emerge in tandem with regional integration, whether they will offer credit lines to small producers, and whether credit will be available on advantageous terms for producers. Even if credit is widely available, there are also doubts about how producers will use credit to invest in land productivity (Platteau 1996; Heltberg

2002). In particular, the ETLR assumes that technologies and extension assistance are available to improve resource management and raise productivity. Both are necessary for credit with interest to be worthwhile, but in many contexts one or both do not obtain.

There is also dispute concerning the ramifications of formalization for land markets (e.g. Whitehead and Tsikata 2003; Chimhowu and Woodhouse 2006). The ETLR presumes that formalization reflects increasing value attached to land, which itself is part and parcel of the emergence of land markets. While formalization may respond to markets, it may also proceed via state-directed titling programs that may respond to political pressures. To the extent that formalization fails to ensure tenure security, the marketability of titled land may be limited. Conversely, in emerging land markets, it is common to find informal or illegal sales of untitled land.

Finally, there are questions concerning the content of the term 'sustainable' in resource use following land investments. While sustainability is often invoked with regard to ecological sustainability, the ETLR's emphasis on economic efficiency leads to a focus on investments in resource productivity, which may imply shorter time horizons and relatively homogeneous agro-ecosystems. While many land investments are likely to reduce soil erosion and other forms of environmental degradation, this is not necessarily the same as ensuring intact ecosystems.

### **2.3. Common pool resources (CPRs)**

In response to accounts that privileged private property as the alternative to open access tragedies, Ostrom (1990), Berkes (1989) and others emphasized communal regulation of shared access to resources. The 'common pool resources' (CPR) literature has consequently expanded, offering theoretical statements about the conditions under which communal resource management is advantageous over private rights. Notable among the applicable cases are resources to which exclusion of outsiders by an individual is difficult. Per Ostrom's (1990) 'design principles,' limited excludability makes monitoring costs high for an individual, but less so for a group. Also important are situations where usage of a resource involves subtractability, i.e. use by one party reduces availability to others. CPRs thus involve arrangements where parties agree to limit their resource use on the expectation that their benefits will be greater and their costs of usage less over time than would be the case under other tenure arrangements. Viewed in terms of the characteristics of the resources in question, CPRs become more advantageous to the extent that resources are harder to monitor or are mobile. Whereas agricultural lands permit relatively easy monitoring and thus lend themselves to parcelization for individual property rights, forests, fisheries and watersheds are often more manageable under CPRs.

A key focus of the empirical CPR literature concerns whether CPR rules change due to infrastructure development and the ensuing processes involved in regional integration. Contrary to the expectations of the ETLR, several cases suggest that

during regional integration, CPRs may not change, or may change but not toward private rights. Several studies of customary rights based on tribal membership and kin networks in Africa indicate that even with e.g. growing population, emerging land markets, and rising land prices, customary authority persists (e.g. Platteau 1996; Whitehead and Tsikata 2003; Chimhowu and Woodhouse 2006). In Latin America, when market integration of indigenous peoples involves commercialization of indigenous crafts, participation in markets has had the effect of reinforcing traditional resource management involving shared access and gift reciprocity regulated by tribal leaders (Richards 1997).

Perhaps the highest-profile cases of CPRs in Latin America are Mexico's *ejidos*, originally established as communal land areas that included provisions prohibiting land sales (Richards 1997; Barnes 2009). Land transfers in *ejidos* occur via family inheritance or auctions among community members. However, *ejidos* face significant external changes. Mexico's 1992 Agrarian Law legalized *ejido* land sales by community members to non-members. Further, the 1994 North American Free Trade Agreement (NAFTA) encouraged trade in commodities. NAFTA in turn facilitated market penetration into the Mexican countryside, already underway due to urban population growth. However, contrary to expectations of the ETLR and many observers, privatization of *ejido* lands has not (as yet) occurred (Barnes 2009; Barsamintov et al. 2010).

What arises from a critical appraisal of ETLR along with the CPR literature is that 1) the process of development as via regional integration often occurs alongside modifications in land tenure arrangements, but 2) the details of specific contexts also matter, such that changes in tenure regimes vary from place to place depending on the history of tenure and possible ambiguities, political as well as economic factors, and the characteristics of the natural resources of interest. A key implication of these two observations is that there is a need to evaluate land tenure change in other contexts where regional integration is occurring, notably cases where tenure arrangements exhibit ambiguities involving contrasts in *de jure* designations and *de facto* practices.

### 3. The case of independent communities in northern Bolivia

Amidst the numerous experimental models of land tenure underway in Latin America, the case of independent communities in northern Bolivia is of interest for present purposes. Northern Bolivia encompasses the Department of Pando and portions of Beni and La Paz, and falls within the larger ambit of the Amazonian lowlands of Bolivia (Stoian and Henkemans 2000). Figure 2 shows the study area in western Pando.

Historically, northern Bolivia was integrated into commodity circuits due to the presence of rubber and other forest products (Ormachea and Fernandez 1989; Stoian 2000; Henkemans 2001). However, this region was basically ignored by agrarian law in Bolivia, due to its remote location and its emphasis on forest products rather than agricultural production. The traditional productive unit

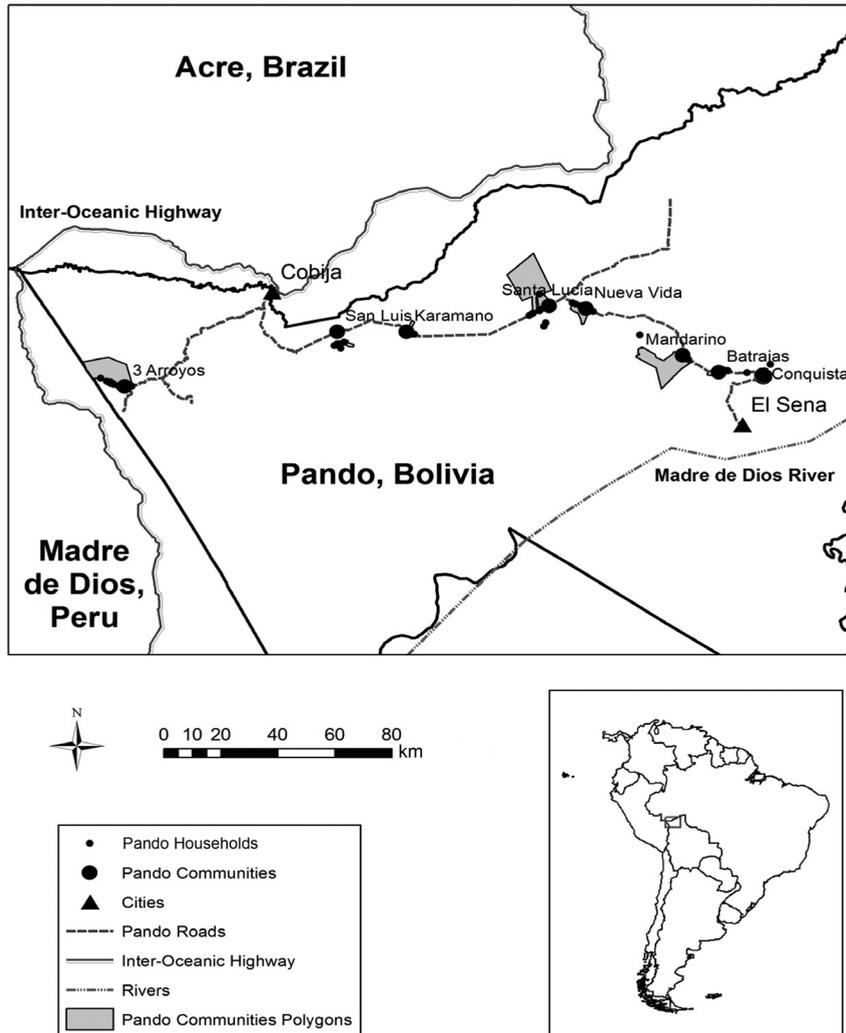


Figure 2: Study area with independent communities and households visited along the Cobija-Sena road in Pando, northern Bolivia.

in northern Bolivia was the *barraca*, typically a large private land concession with on-site labor. *Barraca* owners, or *barraqueros*, played the role of patron by provisioning their laborers in return for favorable terms of trade for rubber. *Barracas* persisted until rubber prices went into terminal decline in the 1980s (Stoian and Henkemans 2000). By the early 1990s, emigration from the *barracas* was underway. Significantly, this proceeded at the same time as construction of roads across northern Bolivia, providing overland transport routes and opening new lands for settlement (Stoian and Henkemans 2000).

The new settlements were often created by kin and groups originating from the same *barraca*, and resulted in the constitution of independent communities, that is, communities independent of the *barraqueros* (Stoian and Henkemans 2000). Meanwhile, governmental reforms advanced in Bolivia such as the Popular Participation Law of 1994, the new Agrarian Law of 1996 and the new Forestry Law of 1996 (de Jong 2004). Consequently, demand from indigenous groups and independent communities intensified for recognition of their land claims (Assies 2002). Debate ensued as to how Bolivian law could account for *barracas*, timber concessions, independent communities, indigenous territories (TCOs) and other lands with very different resource management practices (Assies 2002). In the end, the Government of Bolivia prioritized recognition of independent communities and TCOs, and began the process of demarcation and formal recognition in 2001 in Pando.<sup>1</sup>

While independent communities formed via groups of individual land claims by families, Bolivia's National Institute of Agrarian Reform (INRA) titled independent communities as single communal tenure units. Families of independent communities self-identified based on their affiliations and contiguous land claims, and jointly petitioned INRA for a collective title. Demarcation was a highly political process due to the reliance of independent communities on forest products. With rubber having gone bust, by the 2000s castaña ('Brazil nuts') had become much more economically important (Stoian 2005a; Duchelle 2009; Pacheco et al. 2009; Cronkleton and Pacheco 2010). After much political debate, the Government of Bolivia determined that each family reliant on forest resources required 500 hectares (ha) to support itself; hence each independent community was demarcated as having at least 500 ha per family (Assies 2002; Cronkleton et al. 2009).

The resulting tenure polygons thus bear some characteristics of CPRs as well as private individual lands. On the one hand, independent communities were de jure titled as communal land areas, with one document per independent community (Cronkleton et al. 2009; Fraticelli and Merlet 2010). As in *ejidos*, land sales were prohibited in independent communities. Demarcation as communal lands was in part based on the nature of the resource base, involving dispersed forest products. This permits communal management insofar as it involves collective monitoring for exclusion of outsiders. At the same time, the independent 'communities' were also official designations overlaid on individual and mutually exclusive claims by different families to adjacent lands and forest resources. Hence the communal designation refers more to the boundaries of the community tenure polygon than to shared management inside that polygon.<sup>2</sup>

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<sup>1</sup> Importantly, "independent communities" differ from "original community lands" (TCOs); whereas TCOs involve indigenous peoples, independent communities encompass "campesinos," i.e. non-indigenous rural peoples. In this paper, we focus on independent communities and not TCOs.

<sup>2</sup> Further, while the assignment of 500 ha per family reflects the dispersed nature of forest products, it also draws on an agrarian model of land tenure rather than tree tenure. Hence some families ended up with more castaña trees on their 500 ha than others. There is thus also some tenure ambiguity in independent communities concerning land-based designations for managing tree resources.

More specifically, family parcels for both agricultural plots (*chacos*) and castaña forests (*castañales*) are informally recognized within independent communities. This is hardly new in CPRs, which often involve individualized resource management alongside collective monitoring to exclude outsiders (Richards 1997). However, parcelization of independent communities has occurred in the context of rising prices for castaña, a key commodity. This has resulted in conflicts among community members over castaña theft (Duchelle 2009) and efforts to more clearly demarcate individual castañales (Cronkleton et al. 2010).<sup>3</sup>

Key to the castaña harvest is the traditional informal credit system, the *habilito* (e.g. Stoian 2000; Pacheco et al. 2009). Originally instituted under the *barraca* regime, the *habilito* has persisted in independent communities. *Barraqueros*, castaña buyers, castaña processing firms, and others front households with *castañales* money to support harvesting activities in return for the right to buy the harvest at a set price. *Habilito* relations thus constitute ties between independent communities, *barracas* and urban areas, and often inform rural-urban livelihood strategies beyond the castaña harvest (Stoian 2005b). The existence of the *habilito* system is key in the context of an evaluation of the ETLR, which assumes that titles are important as collateral for purposes of securing formal credit. The availability of informal credit violates this assumption, and implies that the expectations of the ETLR may not obtain for northern Bolivia. Whether this is the case is an empirical question.

Meanwhile, in the neighboring states of Acre (in Brazil) and Madre de Dios (in Peru), construction crews were paving the Inter-Oceanic Highway (IOH), which runs along the borders of Pando (see Figure 2). The IOH is among the first trans-boundary infrastructure projects under the auspices of IIRSA, the Initiative for the Integration of Regional Infrastructure in South America (CEPEI 2002; IIRSA 2008). The IOH was explicitly conceived as an ‘axis of integration’ among countries in South America to link the southwestern Amazon to both Atlantic ports in Brazil as well as Pacific ports in Peru. The logic of integration is thus to permit regional development in the southwestern Amazon via incorporation into global commodity circuits via export of agricultural and forest products. In this context, migration to Pando and especially Cobija has been rapid in recent years (Rojas et al. 2005; Llanque Zonta 2006; Pacheco et al. 2009).

Highway paving is thus stimulating regional integration as via population growth, which according to the ETLR should foster formalization of private property claims. There is anecdotal evidence that parcelization in independent communities in Pando has led to an association of family land claims with land ‘improvements,’ in turn associated with potential profits from land sales, despite being officially prohibited (Fratlicelli and Merlet 2010). Because members of independent communities are not required to pay taxes (as would private

<sup>3</sup> By contrast, Mexican *ejidos* have responded to their shifting political economic circumstances by engaging in communal timber management (Barnes 2009).

landholders), there exists the incentive for market-based land transactions involving rentals if not outright sales.

These observations raise questions of whether households in *de jure* communal land tenure units nonetheless pursue steps to formalize private individual land claims. Per ETLR, formalization should proceed under conditions of new infrastructure and regional integration. Alternatively, tenure ambiguity may be ideal for independent communities insofar as communal tenure provides legal protection via exclusion of outsiders as well as decision latitude among individual families managing their agricultural plots and forest areas. Further, the existence of informal credit via the *habilito* may undermine the importance of formal credit for production decisions as contemplated by the ETLR. Hence regional integration and *de facto* parcelization may coexist with communal titling and informal credit, and yield unexpected findings with regard to the ETLR. We therefore pursue an analysis of whether the expectations of the ETLR apply to the case of independent communities in Pando, as concerns the extent of formalization of parcels, market-based transactions (including access to formal credit), ramifications for conflicts over *castaños*, and the sustainability of resource management.

#### 4. Methods and data

We report findings from a collaborative research effort in Pando, Bolivia involving faculty and students from the University of Florida and the Amazonian University of Pando. In 2007, we visited 37 independent communities (excluding TCOs) in western Pando for interviews with community leaders (Biedenweg et al. 2009; Perz et al. 2012). In 2008, we revisited 8 of those communities for household interviews (n=164).<sup>4</sup>

We selected the communities for household interviews based on knowledge from the previous wave that the communities spanned the diversity seen in the first wave, especially in terms of location (see Figure 2). We sampled geographically from communities along the road from the departmental capital of Cobija (where the IOH touches Pando) to El Sena (in the interior of Pando, close to the Madre de Dios River). The sample therefore provides a distance gradient from Cobija and the IOH as well as the Madre de Dios River for spatially evaluating the effects of market integration. Within communities, we worked from lists of member families to permit random sampling.

The household questionnaire included items on location, migration history, family composition, household assets and capital, farming inputs, tenure (both agricultural and *castaña* lands as well as land rentals), and livelihood activities (annual and perennial crops, livestock, forest extractivism, off-farm income

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<sup>4</sup> Our original intention was to visit two additional communities in Pando, but political violence in September 2008 rendered this unviable.

sources). Given the de facto parcelization of independent communities in Pando, we pursue a household-level analysis.<sup>5</sup>

We draw on the ETLR to organize our analysis. In particular, the ETLR relates 1) regional integration as via new infrastructure to tenure formalization; 2) tenure formalization to tenure security, and via tenure security to market-based transactions (including access to credit) and land conflicts, and 3) formalization to resource management. Our analysis features these relationships and therefore involves three research questions that we address in a series of steps, shown in Figure 3. Our first research question concerns distance to infrastructure and population growth as determinants of formalization (Figure 3, Part 1); the second question takes up the effects of integration, population and formalization on market-based transactions and conflicts (Figure 3, Part 2); and the third question concerns effects of integration, population, formalization, markets and conflict on resource management (Figure 3, Part 3).

We begin by focusing on determinants of formalization (Figure 3, Part 1). Analyses of formalization in the context of ETLR focus on land titling and presume private individual rights. Given that 1) titling of independent communities in Pando proceeded at the community level, and 2) titling was largely finished by the time of fieldwork, we focus on other indicators of formalization at the household level. In our questionnaire items on community lands, we asked households questions about informal parcel demarcation and fencing. Both represent investments in land that constitute preliminary steps toward formalizing claims that are private and exclusive. This recognizes that formalization is a process that may conclude with titling, but under circumstances of tenure ambiguity, the shift toward private individual rights may at first take preliminary steps like putting in fences between parcels. In addition, we consider future plans for *castaños* as an indicator of formalization. Because independent communities are titled communally to recognize the social bonds among member families, land sales are prohibited, so plans for sales were likely underreported. We therefore asked about plans to pass *castaños* on for inheritance as an indicator of resistance to formalization of family land claims, with the implication that plans not to pass land via inheritance imply other plans including sales.

Our analysis involves multivariate statistical models of formalization and its consequences. We focus on factors highlighted by the ETLR as affecting formalization, notably regional integration and population growth. For regional integration, we focus on new infrastructure as a key catalyst of integration processes. We adopt a spatial measure of integration via distance to Cobija and the IOH, since previous work on the study site has emphasized that resource use is

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<sup>5</sup> We asked households about both “private” and “communal” land, and found that households in the same community would answer differently, with some claiming their *castaños* were private (invoking de facto tenure arrangements) while others noted that their *castaños* were communal land (invoking the de jure tenure designation). Such responses confirmed ambiguity in perceptions about tenure in independent communities.

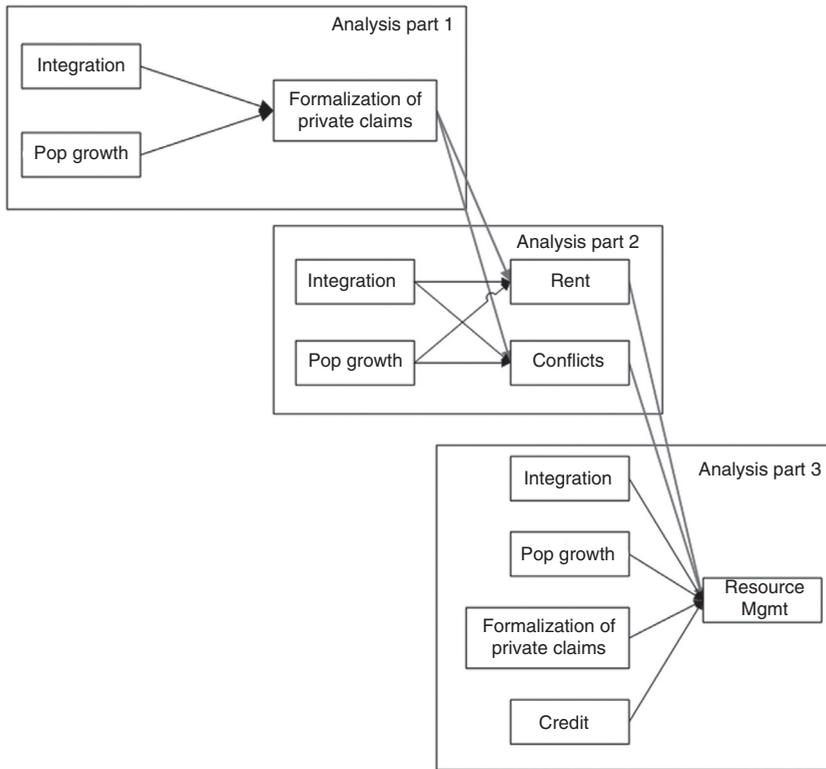


Figure 3: Key relationships modeled in the three-part analysis.

more commercial closer to the capital and the highway (Stoian and Henkemans 2000). For population growth, we observe community net migration in the 5 years prior to the community survey.<sup>6</sup> If the ETLR is correct, these variables should correspond to formalization via fencing and demarcation but not plans for inheritance.

While we focus on the integration and population variables, we also control for the effects of other factors likely to influence formalization. For those, we draw on Bebbington's (1999) capitals and capabilities framework, which highlights the importance of land, labor and various capitals (cultural, human, social) as assets which influence decision latitudes in rural livelihoods. For land

<sup>6</sup> We also considered an alternative measure of integration, in terms of the lesser of the distances to either end of the Cobija-Sena road, since Cobija is a key market gateway to Brazil (via the IOH) whereas Sena is a traditional market center on the Madre de Dios river. In virtually all models, the results were the same when using the alternative measure, with one exception (see note 10 below). Examination of the data in terms of e.g. formalization, credit and resource management indicates stronger differences among households closer to Cobija and the IOH.

we consider hectares claimed; for labor we account for household composition (labor availability via the number of adults, dependency via the number of children and elderly); for cultural capital we include region of birth (northern Bolivia or elsewhere, to reflect distinct regional identities) and time in the community (less than 10 years or 10+ years, to reflect migration prior to land titling during the rubber bust in the 1980s and 1990s or migration during or after land titling); for human capital we account for place of birth (rural or urban) and respondent education (years of school completed); and for social capital we consider absent family members (who reside in towns) and organizational memberships. We anticipate that households with greater assets will invest more in formalization in order to put said assets to work.

In the second part of the analysis, we focus on the consequences of formalization in the ETLR framework, highlighting market transactions and land conflicts (Figure 3, Part 2). Per the ETLR, formalization begets tenure security; while that is difficult to observe directly, the ETLR asserts that tenure security should result in more market engagement as via land transactions and credit, as well as fewer land conflicts (Figure 1). We therefore focus on three outcomes of formalization in independent communities: 1) land rentals from others, 2) formal bank credit obtained in the past 5 years, and 3) conflicts over community land (Figure 3, Part 2). Here tenure ambiguity permits a critical evaluation of ETLR, for while the communities visited are *de jure* titled, *de facto* parcelization raises questions about security as manifest in market transactions and land conflicts. We use land rentals since sales are prohibited, but rentals still constitute a form of market-based transaction. We consider formal credit because it is central to the ETLR account with regard to land investments. We evaluate land conflicts as tenure security should on the ETLR account result in fewer conflicts, though tenure ambiguity makes this assumption questionable, especially given high castaña prices (Duchelle 2009). We feature the effects of integration via infrastructure, population growth and the formalization variables, net of the effects of the control variables, on each of these formalization outcomes. Because the formalization variables were sometimes correlated, we ran separate models to see which formalization variables exerted the strongest effects on market transactions and conflicts.

In the third and final step of the analysis, we evaluate the ramifications of integration, population growth, formalization, market-based transactions and conflict for resource management (Figure 3, Part 3). This addresses the ETLR's treatment of the sustainability question. We consider three indicators of natural resource management with regard to sustainability in the Amazonian context: castaña nut harvesting, cattle pasture, and tree crops. Each requires distinct investments and bears very different environmental ramifications. Castaña is an important non-timber forest product (NTFP) in Pando (Stoian 2005a; Biedenweg et al. 2009; Duchelle 2009; Pacheco et al. 2009; Cronkleton and Pacheco 2010). Castaña harvesting requires fewer capital investments but permits retention of standing forest. By contrast, cattle pasture requires investments for clearing of

forest and pasture maintenance against weeds and soil degradation. Ranching has frequently been vilified for causing forest destruction and land degradation in the Amazon, though practices are changing (Walker et al. 2009). Tree crops constitute long-term investments and provide forest cover that secures soil against erosion. Given these contrasts, one would expect that integration, population, and formalization would better predict pasture and tree crops than castaña harvesting.

## 5. Findings

Table 1 presents descriptive findings for the indicators of formalization and its consequences. In terms of formalization, nearly 30% of households in our sample had demarcated their land, 25% had fencing, and only 56% had plans to pass their land on to family via inheritance. These findings suggest preliminary steps toward formalization of private individual claims in the independent communities visited. That said, in terms of market transactions, less than 10% of households rented land from others or received credit. Hence there are fewer indications of market transactions than formalization. The prevalence of land conflicts falls somewhere in between, as roughly 20% of households reported conflicts.

For natural resource management, Table 1 reports descriptive findings for castaña, pasture and tree crops. Castaña is important in Pando and households averaged nearly 7000 kg in the last harvest. Pasture areas were modest; the same is true for tree crops. For all three variables, standard deviations are large relative to means, indicating considerable variation among households.<sup>7</sup>

Table 1 also presents descriptive statistics for determinants of formalization and its consequences. Here we feature key determinants in ETLR, namely distance from the IOH as a spatial proxy for the catalyst of regional integration and migration for population growth. The households we visited were in communities at varying distances along the road from Cobija (and the IOH) to Sena, as confirmed by the large standard deviation. We measure community population growth via net migration of families, calculated as the number of families who joined a community in the past 5 years minus the number who left in the same time period, divided by the number of resident families at the time of interviews and multiplied by 100. This yields a percentage that indicates net change, where positive values indicate population growth. Table 1 confirms that independent communities have been gaining population since they were established.

The remainder of Table 1 considers the control variables for land, labor and capital assets held by households. By land we refer to the community land area claimed by each family. Whereas independent communities were established and titled with 500+ ha per family, Table 1 shows somewhat less land per family, likely a result of net in-migration and either land division or limited access to land

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<sup>7</sup> The large standard deviations indicate that each measure of resource management had a non-normal distribution, so for purposes of modeling we use natural log (ln) transformations as they have normal distributions.

*Table 1: Descriptive statistics for determinants and consequences of tenure formalization in independent communities, Pando, Bolivia, 2008.*

Indicator	Mean	Standard deviation
Formalization		
Land demarcation (0=No, 1=Yes)	0.29 <sup>1</sup>	0.45
Fencing (0=No, 1=Yes)	0.25	0.44
Plans for inheritance (0=No, 1=Yes)	0.56	0.50
Market transactions		
Land rentals from others (0=No, 1=Yes)	0.09	0.29
Credit in past 5 years (0=No, 1=Yes)	0.07	0.26
Conflict		
Conflicts over community land (0=No, 1=Yes)	0.19	0.39
Natural resource management		
Kg castaña nut harvest, 2007	6924.84	23,571.19
Ln Kg castaña nut harvest, 2007	6.95	3.11
Ha under cattle pasture	11.50	44.87
Ln Ha under cattle pasture	0.87	1.44
Ha under tree crops	1.05	2.61
Ln Ha under tree crops	0.44	0.62
ETLR variables		
Km to Cobija and IOH	166.24	57.00
Community Pctg. net migration ((In-Out)/Families*100)	+3.55	10.29
Capitals and capabilities		
Land		
Ha community land	323.18	373.91
Ln Ha community land	4.08	2.75
Labor/dependency		
Adults in household	2.32	1.19
Children in household	2.18	1.95
Elderly in household	0.19	0.44
Cultural capital		
Region of birth (0=Other, 1=North)	0.93	0.26
Time in community (0≤10 years, 1=10+ years)	0.49	0.50
Human capital		
Place of birth (0=Rural, 1=Urban)	0.34	0.47
Years of school completed	5.99	4.16
Social capital		
Absent family members	0.91	1.52
Organizational memberships	0.78	0.74

<sup>1</sup> Reported values are weighted based on sampling weights from community sizes and sampling ratios. Weighted values are more representative of the households in the study region as samples of the populations in the communities visited.

by newcomers (cf. Henkemans 2001).<sup>8</sup> In terms of labor, households on average had two adults, two children and occasionally an elderly member. With regard to cultural capital, most households originated in northern Bolivia, and roughly half had been in their independent community for 10+ years; hence the other half had joined since independent communities had been established in the 1990s.

<sup>8</sup> Because raw values for land were skewed, we use a log-transformed variable for land in our models.

Regarding human capital, roughly one-third of respondents were born in urban areas and education levels varied among households. Finally, households also had measurable social capital; most had an absent family member living elsewhere, and most were members of one or another type of organization.

The first part of our analysis evaluates the effects of integration and population growth on formalization, net of the effects of the control variables. Table 2 presents results from logistic regression models, which are appropriate when the dependent variables are binomial (two-category). Table 2 shows the odds ratios for each explanatory variable; ratios over 1 indicate a positive effect wherein increases in the value of the explanatory variable yield a higher probability of observing formalization. Table 2 provides weak support for expectations of the ETLR. While distance to Cobija was inversely related to demarcation, integration had no significant effect on fencing or plans to pass land for inheritance, and net migration had no significant effect on any of the formalization indicators. Instead, land area claimed had a strong positive effect. When we removed the land variable, time in community became the most important variable, such that families in the community for 10+ years were more likely to have demarcated and/or fenced their land. As it happens, land and residence duration are related; original community members got their 500+ ha of land, whereas newcomers squat on much smaller parcels. These findings indicate that formalization has less to do with integration via infrastructure or population growth than with being present at the time of establishment of the community.

Table 3 proceeds to the second step of the analysis, where we evaluate the effects of integration, population growth and formalization on market transactions and land conflicts. We first present a ‘base model’ that only considers the effects of integration and population growth (along with the control variables); we then present a series of models with one or another indicator of formalization. Because we are focusing on how integration, population growth and formalization affect market-based transactions and land conflicts, to save space we do not present the findings for the control variables, though we comment on strong findings not shown.<sup>9</sup>

The first suite of models evaluates land rentals. The models are significant but integration and population growth are not. The most important variable is land area claimed, which has a strong negative effect, indicative of land scarcity: households with less land are forced to rent from others. When we add the formalization variables, little changes until the last model, where plans for inheritance greatly reduce the probability of being involved in land rentals. While the other findings concerning land rentals do not confirm expectations of the ETLR, the relationship of plans for land and land rentals does; households not planning to pass land for inheritance (and thus potentially contemplating sales) are participating in market-based transactions via rentals.

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<sup>9</sup> The full tables with results for all control variables are available upon request from the authors.

Table 2: Determinants of formalization in independent communities, Pando, Bolivia, 2008.

Determinants	Demarcation (Logit)	Fencing (Logit)	Inheritance (Logit)
Chi-square (df=11)	53.32**	37.79**	68.78**
Drivers of tenure evolution:			
Km from Cobija	0.990*	0.998	0.994
Community Pctg. net migration	0.989	0.997	0.974
Control variables:			
Ln land area claimed	1.769**	1.321**	1.916**
Adults in household	0.897	0.809	1.252
Children in household	0.941	1.045	1.246+
Elderly in household	1.097	0.746	1.271
Region of birth (0=Other, 1=North)	1.439	6.587	2.457
Time in community (0≤10 years, 1=10+ years)	2.511+	2.411+	1.414
Respondent years of school completed	1.023*	0.972+	1.007
Place of birth (0=Rural, 1=Urban)	0.949+	1.034*	0.515
Absent family members	1.296+	1.078	1.176
Organizational memberships	1.171	2.492**	1.241

\*p<0.15, \*p<0.05, \*\*p<0.01.

The second column in Table 3 presents models for access to formal credit. The findings here are uniformly weak, regardless of the model. The ETLR

Table 3: Effects of formalization on market-based transactions and conflicts, households in independent communities, Pando, Bolivia, 2008.

Determinants	Land rentals from others (Logit)	Credit last 5 years (Logit)	Conflicts over community land (Logit)
Drivers of tenure evolution:			
Chi-square, base model (df=11)	28.21**	11.67	26.89**
Km from Cobija	0.996	1.011	1.002
Community net migration Pctg.	1.030	0.883	0.974
Indicators of formalization:			
Chi-square, demarcation model (df=12)	28.20**	13.64	26.80*
Km from Cobija	0.995	1.010	1.003
Community net migration Pctg.	1.030	0.882	0.973
Demarcation	0.464	0.704	1.203
Chi-square, fencing model (df=12)	27.22*	12.26	27.15*
Km from Cobija	0.996	1.013	1.002
Community net migration Pctg.	1.028	0.864	0.974
Fencing	0.492	2.448	0.930
Chi-square, inheritance model (df=12)	31.23**	19.22+	34.22**
Km from Cobija	0.996	1.012	1.003
Community net migration Pctg.	1.025	0.879	0.977
Plans for inheritance	0.112*	4.625	4.424+

\*p<0.15, \*p<0.05, \*\*p<0.01.

variables are insignificant, including the formalization indicators. It is unclear what determines who gets credit among households in individual communities. The likely explanation concerns the availability of informal credit via the *habilito*. Previous ETLR work has noted that the availability of informal credit reduces the importance of formal credit (Feder et al. 1988; Feder and Feeny 1991; Deininger and Feder 2001). This in turn removes one key incentive for formalization itself: if informal credit is available and is not dependent on formal titling, then formalization of private individual claims is not important for formal credit. Hence, if informal credit is available, even in the presence of regional integration via new infrastructure and population growth, there may not be strong incentives for formalization. Consequently, the *habilito* not only explains the weak findings for formalization and credit, but also the weak relationships observed between integration and formalization. In northern Bolivia, the availability of informal credit via *habilito* involving *barraqueros*, castaña processing firms, and other sources may account for weak relationships among integration, population, private formalization, and formal credit. While independent communities formed as part of the process of the decline of *barracas*, the findings for credit indicate that there remain interwoven social and economic relations involving informal credit.

The last column in Table 3 presents models for conflicts. The models here are significant but as with land rentals, integration and population growth are not important.<sup>10</sup> Land area claimed is often the key explanatory variable; families with larger land claims are more likely to report conflicts. Plans for inheritance exert a weak and positive effect on conflicts, which indirectly accords with the ETLR insofar as households not planning for market-based transactions may face less tenure security and thus more conflicts. As there is pressure on families via castaña thefts by other families (Duchelle 2009), communal tenure security may have little to do with household tenure security. Given the strong effect of land area, conflicts stem more from the characteristics of valuable natural resources for which monitoring costs are high, as in castaña forests.

Table 4 pursues the third and final step in our analysis by considering the effects of integration, population growth, formalization, market transactions, and conflicts on natural resource management. The first column presents models of the castaña harvest. The models are significant, largely due to significant effects of having a *castañal* and originating in northern Bolivia. In addition, a weak effect of integration appears, such that households farther from Cobija and the IOH harvested somewhat more castaña. Put another way, households closer to the town of Sena on the Madre de Dios River, with transport to Riberalta, a larger castaña processing town, had larger castaña harvests. This finding indirectly corroborates

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<sup>10</sup> In note 6 above, we indicated that we considered an alternative specification of integration via lesser of the distances to Cobija and Sena. Results with this alternative were the same in all models except for conflict. Here, the alternative measure is weakly significant ( $p < 0.15$ ), indicating that conflicts over castaña occur in communities more distant from both Cobija and Sena. This supports the ETLR.

Table 4: Formalization and resource management, households in independent communities, Pando, Bolivia, 2008.

Determinants	Ln castaña nut harvest (Tobit)	Ln Ha under cattle pasture (WLS)	Ln Ha under tree crops (WLS)
Drivers of tenure evolution:			
Base model (df=12)	34.83**1	9.79**2	6.51**2
Km from Cobija	0.007+	-0.006**	-0.001
Community net migration Pctg.	0.034	-0.008	0.017
Formalization:			
Demarcation model (df=13)	37.40**	9.13**	5.96**
Km from Cobija	0.009+	-0.007**	-0.001
Community net migration Pctg.	0.037	-0.009	0.017
Demarcation	1.090+	-0.509+	0.085
Fencing model (df=13)	37.75**	9.25**	6.06**
Km from Cobija	0.008+	-0.006**	-0.001
Community net migration Pctg.	0.032	-0.008	0.017
Fencing	1.150+	-0.251	-0.060
Inheritance model (df=13)	34.92**	9.12**	6.86**
Km from Cobija	0.008+	-0.006**	-0.001
Community net migration Pctg.	0.035	-0.008	0.017
Plans for inheritance	0.223	0.061	0.195
Land transactions:			
Land rental model (df=13)	39.18**	5.37**	6.21**
Km from Cobija	0.007+	-0.009**	-0.001
Community net migration Pctg.	0.039	-0.008	0.018
Land rental from others	-2.304*	-0.658*	-0.456**
Credit model (df=13)	47.45**	9.18**	6.21**
Km from Cobija	0.008+	-0.006**	-0.001
Community net migration Pctg.	0.018	-0.007	0.017
Credit	-4.012**	0.231	0.215
Conflicts:			
Land conflict model (df=13)	36.55**	8.96**	6.04**
Km from Cobija	0.008+	-0.006**	-0.001
Community net migration Pctg.	0.037	-0.009	0.017
Land conflict	0.928	-0.286	0.034

Notes.

1. Inferential statistics for Tobit models are Chi-square tests.

2. Inferential statistics for WLS models are F-tests.

\*p<0.15, \*p<0.05, \*\*p<0.01.

the ETLR, insofar as forest harvesting is less important closer to the IOH. Other findings are more mixed: demarcation and fencing also have weak positive effects on the castaña harvest, perhaps a result of conflicts, though conflict itself had no significant effect. However, a related interpretation is that insofar as castaña becomes valuable, households make investments in demarcating or fencing their *castaños*, even if they haven't themselves had conflicts. The land rental and credit models indirectly confirm this interpretation: households without land rentals or credit had much larger castaña harvests.

The middle column in Table 4 presents models for cattle pasture. The models are strong, notably due to a positive effect of having more land and being born in a rural area. Further, the integration effect is indeed strong: households farther from Cobija and the IOH had significantly less pasture area (Marsik et al. 2011). However, results for formalization, credit and conflict were insignificant. Households renting land had less pasture; this likely reflects land scarcity, such that households with less land are those renting from others. The findings for pasture thus corroborate the ETLR in terms of integration but not formalization, market transactions, or conflicts.

The final column in Table 4 presents findings from models of tree crops. The models are reasonably strong, due primarily to a positive effect of having more land and being born in a rural area, but no significant effects appear for integration, population growth, or formalization. Land rentals exert a significant negative effect on perennials. While this might seem to contradict the ETLR, because land rentals occur among households with less land, it is not surprising that they have less land under perennials.

## 6. Discussion

This paper examined relationships derived from the ETLR framework involving processes of private individual tenure formalization under conditions of tenure ambiguity and regional integration in northern Bolivia. There, lands along local roads with informal claims by families were given communal titles but remain informally parcelized internally. Hence lands with de jure communal titles were being managed de facto as individualized parcels. The paving of the IOH nearby raises questions in light of the ETLR of whether regional integration via new infrastructure will yield a shift from communal toward private individual tenure given the historical context of tenure ambiguity. We therefore examined three steps in the ETLR framework's account of tenure formalization: 1) the influence of regional integration via infrastructure on formalization, 2) the consequences of integration and formalization for participation in markets, and 3) the ramifications of integration, formalization, and market participation for natural resource use. With regard to step 1, there was little evidence of integration via infrastructure affecting indicators of a shift toward formalization of private individual tenure. Instead, land area claimed, duration of residence, social capital and other factors were more important. Concerning step 2, integration and formalization were not generally related to market participation or conflicts over land. Findings for formal credit were particularly weak, likely a reflection of the continuing prevalence of informal credit (*habilito*). The main exception concerned plans for inheritance (as opposed to plans for sale), which implied lower probabilities of land rentals and higher probabilities of land conflicts. Findings for step 3 showed stronger relationships of integration, formalization and market participation with natural resource management. Proximity to the IOH and especially access to formal credit were inversely related to reliance on castaña, but the opposite was

true of participation in cattle ranching. The findings confirm the importance of traditional transport circuits along rivers farther from the IOH and informal credit for castaña, and a spatial complementarity with ranching, which prevails closer to the frontier and the IOH.

Overall, analysis of the relationships surrounding tenure formalization indicate that the expectations of the ETLR were largely not met despite regional integration via the IOH. We suggest two main explanations for these findings: tenure ambiguity itself, and the availability of informal credit. Both circumstances fall outside the assumptions underlying the ETLR, and both are consistent with the findings. With regard to tenure ambiguity, we observe that the strongest findings for most models of formalization concern access to land as related to time in the community. That is, older land claims tied to *de facto* parcelization prior to communal titling best explain investments in formalization of parcels and the consequences thereof. While access to land can be interpreted in terms of population growth, it was families with access to *more* land and who were present earlier on that had greater indications of formality in their land parcels. This runs contrary to the ETLR, which argues that land *scarcity* prompts formalization. It thus appears that given historical *de facto* parcelization, communal titling has ironically enabled formalization of individual parcels. In the case of western Pando, communal titling officially recognizes household land claims – albeit collectively – and thus provides legitimacy to prior practices including parcelization by legally excluding outsiders. Hence it appears that given previous practices, communal titling encourages formalization of private parcels via internal demarcation, fencing, and plans to pass land on, since titling determines exclusivity at the communal level without prohibiting parcelization at the household level. Tenure ambiguity via communal titling of parcelized claims thus provides alternative path to tenure security to that outlined in the ETLR, even in the presence of regional integration initiatives via new infrastructure.

The other key consideration in interpreting the findings concerns the relative importance of formal and informal credit. The ETLR account assumes that informal credit is limited and thus landholders must formalize their land claims via land titles, which are usually necessary as collateral in order to obtain formal credit (Feder et al. 1988; Feder and Feeny 1991; Deininger and Feder 2001). By contrast, northern Bolivia has a long tradition of informal credit from various sources employing the *habilito* mechanism, which has historically been key for extractive activities, notably rubber and more recently for the castaña harvest (e.g. Stoian 2000; Pacheco et al. 2009). Credit plays a key role with regard to formalization and its consequences in ETLR, so the availability of informal credit modifies the incentives for formalization as well as the ramifications of formalization for market participation and natural resource management. While there has been debate over *habilito* with regard to production relations in northern Bolivia (cf. Stoian 2000; Assies 2002), it is evident from the findings here that informal credit mitigates the need to formalize private individual tenure. This conclusion is consonant with those in other cases used to critique the ETLR

(Platteau 1996; Firmin-Sellers and Sellers 1999; Heltberg 2002), with the addition that informal credit even in the presence of regional integration initiatives still mitigates formality in private individual tenure.

The findings provide an empirical basis for a reconsideration of the breadth of applicability of the ETLR as well as CPRs. On the one hand, in addition to available informal credit, tenure ambiguity undermines the likelihood of observing processes consonant with the ETLR, even in the presence of regional integration initiatives. But whereas the findings imply a critique of the ETLR in terms of its scope of applicability, neither do they imply a blanket endorsement of CPRs. For on the other hand, the findings also indicate that formal communal tenure is in many ways a *de jure* veneer for rather individualized *de facto* practices. While many CPRs have informal internal parcelization, several of our findings suggest more multifaceted individualization, and thus more abiding tenure ambiguity. For one thing, we noted contrasting responses from families in the same communities talking as to whether land they worked was private individual or community land. We also observed a degree of fencing, far from universal plans to pass land for inheritance (and thus possible sales, which are prohibited), and conflicts over communal land. Hence communal titling over individualized claims does not obviate individualized practices. Independent communities along roadsides in western Pando thus depart from the tenets of both ETLR and CPRs, but do not run entirely contrary to either.

All that said, one could also argue that the tenure ambiguity observed is temporary because the effects of regional integration via the IOH are still only incipient. This is an open question that deserves continued scrutiny. One future scenario is that continued migration to independent communities will eventually result in land subdivisions that will require not only formalization of individual land claims but also intensification of production systems. However, another scenario is that community leaders will recognize that given the continued importance of *castaña*, subdivisions cannot continue indefinitely without threatening household livelihoods dependent on dispersed forest resources. In that scenario, there may be continued investments in formalization of family *castañales* to manage internal conflicts, but communities will continue to monitor *castañales* collectively. One might nonetheless reply that after a point all this becomes too costly if population continues to grow, *castaña* prices remain high, and households in the same community continue to steal each other's *castaña*. But the implied alternative, formalizing private individual land claims in order to ensure tenure security for intensification via *castaña* plantations, would require very long-term investments. Of course, there is also the possibility of expanding forest clearing to replace *castaña* harvesting with agricultural land use.

The boundary conditions under which expectations of the ETLR and CPRs obtain are becoming better understood (Deininger and Feder 2001; Dietz et al. 2003). This in turn is instilling a greater appreciation of tenure diversity (Ostrom 2005). In that light, the evolution of tenure rights, especially in CPRs, deserves more attention with respect to the larger context of trans-boundary

integration initiatives in Latin America and elsewhere. Reviews of prior work on Africa (Platteau 1996) and Latin America (Richards 1997) as well as specific case studies such as *ejidos* (Barnes 2009) and the present analysis highlight diverse trajectories in tenure change with integration. Still needed is a systematic comparative analysis (cf. Agrawal 2001) of tenure evolution during integration.

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