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| August 24, 2010 |
| Professor Oliver CoomesEditor-in-chief, World DevelopmentDepartment of GeographyMcGill University, 805 Sherbrooke Street West, Montreal, QC H3A 2K6 Canada |  |
| Dear Dr. Coomes: |  |

I am writing in response to your invitation to revise and resubmit the manuscript "Comparing Forest Decentralization and Local Institutional Change in Bolivia, Kenya, Mexico and Uganda" for World Development, manuscript #: otc/2009/000686.

While the first round of revisions had three reviewers, the second round had only one. The points made by this reviewer were important and insightful, but did not require substantial reworking of the manuscript. We have tried to address this reviewer’s concerns by expanding the discussion section in the text and clarifying some of the existing discussion. We feel that the major problem in this round of reviews appears to stem from a misunderstanding of the explanatory power of our theoretical framework for our empirical analysis. We have tried to clarify, both in the text and in our comments to the reviewer, that while the framework does explain most of the tested hypotheses, it fails to explain others. We feel it is important to openly and honestly report the strengths and limitations of the framework; the finding that some hypotheses cannot be explained is just as, if not more, interesting than the results that were anticipated in the analysis (see our response the reviewer’s comments).

I am including our response to the reviewer, the revised manuscript, tables, figures, etc. merged into this single integrated word file as per the email request sent by Karen Molgaard, managing editor of World Development, on August 10, 2011. Please let me know if I need to provide you with any additional information to help in the review process. Thank you for taking the time to consider our manuscript for publication.

Sincerely,

Eric A. Coleman

**RESPONSE TO REVIEWER**

We are grateful for the opportunity to respond to the reviewer in this second revision. We have taken advantage of this opportunity to clarify some points in our paper, and improve our discussion section as requested by the reviewer. What follows is a point-by point response to the reviewer’s comments:

1. The insistence of the authors that they are advancing a theory of decentralization which is very much stated on the grounds that they are adopting quantitative research methods in opposition to previous flawed and not corroborated qualitative analysis. Yet, the statistical analysis proves that not all of the assumptions provided in the analytical framework are statistically significant, which leads to the author(s) to conclude that “… the mixed nature of these findings indicate that the theories that we test are useful guides, but are insufficient to explain the full range of decentralization outcomes”.

We largely agree with this statement. As we state in the introduction to our paper, we use existing and widely cited theoretical frameworks to develop a specific theory, and then test this theory quantitatively. Previous studies, we argue, are limited in that they address a small number of cases, and our quantitative dataset provides us with the opportunity for a broader test. Our analysis is partially supportive, indicating that existing theories are useful, but incomplete. We believe that science advances through the testing of existing theories, and then the revision of those theories in response to their success or failure. In this case, our analysis, which partially supports the theory, indicates that aspects of the theory are strong, but additional variables need to be accounted for. We have added a section in the discussion section in which we propose possible additional variables, but our primary purpose here is to test existing theory.

1. While only in one case (Mexico) the author(s) is able to test their hypothesis, they found contrasting opposite outcomes in Uganda, and almost no impact of decentralization in Bolivia and Kenya. Thus, the authors attempt to build assumption about why is that this happen, and argue that in Mexico this is due to a “long history of decentralized forestry governance”, while in Uganda this is due to “macro-level instability”, and no clear explanation is provided for Bolivia and Kenya, in spite of the fact that case studies undertaken by other scholars found significant impacts in practice. Thus, I think that the author(s) has to revisit their analytical framework, the criteria for cases selection, or go back to look at the available literature that could explain why is that it could be likely that these outcomes would be expected.

As mentioned in the previous comment, we have added a section in which we have proposed additions to our theoretical framework which might be examined in future work; these additions are consistent with suggestions in other recent literature. However, we are concerned that the reviewer is overstating the incongruence of our theoretical framework with our empirical findings. It is not fair to say that decentralization has “contrasting opposite outcomes in Uganda” and “no impact…in Bolivia and Kenya.” We have tried to clarify in the discussion section that the paper examines four different outcomes for each of the four countries for a total of 16 hypothesis tests. Of these 16 tests we found contrary evidence for only two tests: forest investments fell in Kenya and local rule-making increased in Uganda. Our hypotheses were always confirmed in Mexico and partially confirmed in the other countries. While we found that decentralization did not have a significant impact on forest conditions or wealth inequality in Kenya or Bolivia, this was within our range of expectations (see our discussion section). We have attempted to explain some of the unmeasured variables we believe may have driven the unanticipated results (i.e. for forest investments in Kenya and local rule-making in Uganda).

In the discussion section we discuss each outcome for each country. The rulemaking results, in general, were not strong (although they only run counter to expectations in the Uganda case). The empirical results from the sustainability/socioeconomic outcomes (the additional 8 hypotheses), however, did conform to our earlier hypotheses.

We would also like to point out that these findings are in fact consistent with published case studies that we are aware of from these countries. We do not know of any published case studies of forest decentralization in Kenya, and the published case studies from Bolivia are consistent with our finding that impacts on forest conditions and wealth inequality writ large were not significantly impacted by decentralization. However, since the reviewer does not mention which case studies “found significant impacts in practice,” nor what those significant impacts were, we cannot fully respond to this part of the comment.

1. I ratify my previous comment #1 which is that the author(s) fails to provide an analytical framework able to link decentralization with other conditions that explain outcomes in forest condition and wealth inequality. At least, the authors should provide a much more robust discussion section analyzing what are the gaps in the analytical framework which are leading to unclear outcomes in the analysis.

We have taken this advice seriously, and have attempted to address this in our discussion section by explaining what the gaps are in our analytic framework.

1. Thus, I think that the author(s) has two ways to go which are suggested below, which yet require an editorial decision:
	* The first is to provide a more robust discussion section identifying the main gaps and shortcomings of the analytical frameworks or methods, explaining why is that Mexico is “special case”, and why is that according to the author(s) analysis decentralization has not had any proved impact in Bolivia and Kenya in contradiction with what other scholars have indicated for these same countries.
	* The second is to refrain to publish this paper and based on the outcomes achieved under the current analysis, question some of the initial assumptions underpinning the analytical framework, and attempt to look for more robust explanatory variables which could be able to explain in a more meaningful way the outcomes in both forest condition and wealth inequality.

As mentioned above, we have expanded on our discussion section. We have also taken pains to correct the impression which this reviewer mistakenly gained that there were a large number of unexpected outcomes. In fact, our theory was largely supported, and we have now added a clearer discussion of which variables need to be added. We strongly object to the second suggestion (i.e. that the paper not be published in this form, and that instead we revise our theoretical framework entirely) for two reasons. First of all, as explained above, large parts of our theoretical framework were supported, a fact that the reviewer seems to have missed (probably because we were not clear enough in the discussion section). Second, we believe that reporting negative or partially negative findings, such as those we present in this paper, are crucial to the progress of science. The finding that variables that have been heavily emphasized in decentralization literature (accountability and empowerment) cannot fully predict observed outcomes is important in and of itself, because it points to gaps in theoretical development.

Comparing Forest Decentralization and Local Institutional Change in Bolivia, Kenya, Mexico and Uganda

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Comparing Forest Decentralization and Local Institutional Change in Bolivia, Kenya, Mexico and Uganda

# Summary. In this paper we assess the institutional and environmental impacts of forest decentralization in Bolivia, Kenya, Mexico, and Uganda. We develop theories of institutional impacts based upon the specific content of decentralization reforms. We classify each country’s reforms in terms of the creation/change in local user group empowerment and accountability mechanisms. Using data from the International Forestry Resources and Institutions Program, we estimate the effects of forest decentralization on local forest investments, rulemaking, wealth inequality, and forest conditions in the four countries. Some results support our theory, but the theory is insufficient to explain the full range of outcomes.

*Key words* – Bolivia, Kenya, Mexico, Uganda, Decentralization, Forestry

# 1. INTRODUCTION

Forest decentralization programs have rapidly spread in developing countries in the last twenty years (Agrawal, Chhatre, & Hardin, 2008; Andersson, Gibson, & Lehoucq, 2004). There is now a large literature that examines case studies of decentralization and develops theoretical frameworks to explain the causes and consequences of decentralization (Ribot, Agrawal, & Larson, 2006, Boone, 2003; O'Neill, 2003; Falleti, 2005). In this paper we use these frameworks to develop a theory of how changes in accountability and user empowerment that result from decentralization policies impact user group behavior and forest conditions. We then test this theory using a unique over-time data set on forest resources and institutions in Bolivia, Kenya, Mexico and Uganda, which allows us to test theories across a broader range of cases than has been possible in previous work. We find, consistent with previous theories, that in countries where reforms increase both upward and downward accountability as well as empower forest users, there are more likely to be positive results both in terms of intermediate outputs such as user group collective action and in terms of outcomes such as improved forest conditions and decreased income inequality. These effects, however, are weak and inconsistent. The theory explains the data most strongly in Mexico, the country with the most well-established and democratic decentralization in the study area, but the results from Bolivia and Kenya are mixed. Surprisingly, Uganda, the country with the least stable forest governance system, saw the greatest increase in one important measure of local collective action – the making of rules about forest governance. The mixed nature of these findings indicate that the theories we test are useful guides, but are insufficient to explain the full range of decentralization outcomes.

Research on forest decentralization, like much of the broader literature on decentralization, is plagued by analytical problems. First, decentralization is not a single, well-defined policy but rather a general term that is applied to a diversity of policies that may include some combination of (a) moving bureaucrats from central locations to sites closer to resources; (b) increasing the decision-making discretion of local level bureaucrats; and (c) increasing the decision-making authority of local users (Cohen & Peterson, 1996). Second, while there are a large number of theoretical arguments relating to the benefits and costs of decentralized political orders, under closer scrutiny these fail to generate consistent explanations of observed outcomes (Andersson et al., 2008; Treisman, 2007). Third, decentralization policies interact with numerous other pressures to change governance institutions, forest user behavior, and resulting forest conditions and livelihood outcomes (Andersson et al., 2008). The connection between national policy changes and changes in local level behavior are mediated by complex processes that inhibit policy implementation in even the best of circumstances (Pressman & Wildavksy, 1978; Sabatier, 1986). Forest management, an activity frequently undertaken in remote and politically marginal areas of poor countries, is not a promising candidate for implementation success.

 Not surprisingly, evaluations of forest decentralization have reported disappointing results. The most influential theoretical work in this area is Agrawal and Ribot’s (1999) framework, which emphasizes the importance of actors, powers, and accountability on the influence of decentralization reforms on governance institutions.[[1]](#endnote-1) Work in this tradition has led to the pessimistic conclusion that decentralization reforms have reinforced the power of the central state (see also Boone, 2003; Ribot & Larson, 2005; Ribot, Agrwal, & Larson, 2006; Larson & Ribot, 2007). This literature has emphasized evaluations of the political consequences of decentralization, examining whether local actors have in fact gained political power, but has largely neglected the impact of decentralization policies on forest conditions and local level collective action around forest management (Andersson & Gibson, 2007). Most of this literature draws on relatively small numbers of cases, limiting the generalizability of the findings.

This paper seeks to address this gap by explicitly analyzing changes among forest users on the ground, placed within the larger political context of national decentralization policies. Rather than assuming uniform effects, we follow the approach suggested by Agrawal & Ribot (1999) and Larson (2003) by examining how particular decentralization policies affect local actor incentives, drawing on the extensive literature on decentralization in the four countries we study. We move a step further, however by examining how these altered incentives affect both local forest user collective action (in terms of investment decisions and rulemaking) as well as the broader objectives of forest decentralization reforms (in terms of wealth inequality and forest conditions as seen by local user groups). Using the relatively large number of cases available in our dataset allows us to test the generality of theories developed by previous authors using smaller samples.

 The paper is organized as follows. In the next section we review the history of forest decentralization reforms in each of the four countries. These case histories provide the basis for our theoretical predictions of the impact of decentralization on our outcome variables. In Section 3 we draw on existing theory to derive predictions of the effects of decentralization in each of the countries. In Section 4 we describe the data we use for our analysis as well as summary statistics for each of the four countries. In Section 5 we report our empirical results. In Section 6 we discuss these findings and in Section 7 we conclude.

# 2. NATIONAL CASE HISTORIES

As a starting-off point for our analysis we examine how decentralization reforms in Bolivia, Kenya, Mexico, and Uganda have affected actor incentives. These countries were selected because all four have undergone forest decentralization reforms in the last decade, and baseline, pre-reform data were available in the International Forestry Resources and Institutions (IFRI) database. Furthermore, they represent diversity in terms of region and age and type of reforms.

 (a) Bolivia

 Two recent dissertations have focused on the forest decentralization in Bolivia (Andersson 2002; Andersson & Pacheco 2004; Pacheco 2007). The Bolivian reform is considered by many to be a success story (UNDP, 1998; FAO, 1999; Ferroukhi, 2003, but see Pellegrini, 2009). Market-oriented and municipal government reforms took place from 1985 through 1995, expanding both the participatory nature and political power of municipalities, including the forestry sector. Then, in 1996, an agrarian reform and a forestry law were passed. These were the first laws in Bolivian history to recognize forestry as a legitimate land use for all property owners, and to recognize the harvesting rights of indigenous communities. These policies specify that the Bolivian government owns all forest resources, with private ownership restricted to plantations and permits granted for commercial harvesting activities (Andersson & Pacheco, 2004).

 Prior to 1996, de jure control of the forest sector rested exclusively with the central government. The new set of forestry institutions attempted to introduce checks and balances between numerous actors. The most powerful of these actors was the newly created forestry superintendence, a politically independent central regulatory agency. Some power also rests with the Ministry of Sustainable Development and Planning, and municipal governments are given control over monitoring, administration and technical advice. Municipal governments have no authority to tax the forestry sector, but they are supposed to receive 25 percent of the money from central government forestry taxes, including a one USD tax per hectare on logging concession holders. In the vast majority of municipalities, this amount of money is insufficient for the purposes it is supposed to support (Andersson, 2003).

 Municipal governments hold other powers to engage in land use planning through participatory processes that may play an important role in planning in the forestry sector (Andersson, 2004). In addition, the governance institutions of indigenous communities and other local forest associations have been empowered to play a much more active role in forestry planning, including commercial timber harvesting (Pacheco, 2007).

(b) Kenya

 Relative to the other three countries in this study, the history of Kenya’s forest decentralization has not been well studied. A broad decentralization began in 1983 with the establishment of the “District Focus for Rural Development” system, which delegated responsibility for numerous rural development projects to the local districts. However, policymaking, planning, and funding decisions largely remained centralized within government ministries. Local districts (and their associated county councils) had limited accountability to local people, and decision-making in the forest sector rested exclusively with the forest agency (Omondi & Omosa, 2002; Ongugo & Njuguna, 2004; Poole & Leakey, 1996).

 The New Forest Act of 2005 replaced the Forest Department with the Kenya Forest Service (KFS), a semi-autonomous body managed by a board made up of representatives from various central government ministries. Under the Act, the KFS is expected to devolve powers to the private sector and to forest conservation committees and community forest associations (CFAs). Community participation, achieved primarily through CFAs, and integrated management of forests are central principles motivating the new policy (Ongugo, et al., 2008). Because the 2005 law went into effect in early 2007, the formation of CFAs and other responses to the law’s requirements are still evolving.

(c) Mexico

The process of decentralization in Mexico differs from the processes in Kenya, Bolivia, and Uganda due to Mexico’s history of communal land tenure. Agrarian reforms in the Mexican Constitution of 1917 set in motion the creation of *ejidos* and *comunidades.*  Ejidoswere newly created communities with collective rights to land, governed by local councils in collaboration with the central government, while comunidades were indigenous communities who had prior rights. In both cases, the national government claimed ownership of the land, with the community receiving long-term rights to use the land.[[2]](#endnote-2) The result of these reforms is that roughly 80 percent of Mexico’s forest is governed under some form of common property (Klooster, 2003). Thus, Mexico’s forest decentralization built on existing modes of center-local collaboration (de Janvry, et al., 2001).

 Beginning in 1986, there were a series of changes in forest policy in Mexico, with a new forest law in 1986, new forest and agrarian laws in 1992, and additional changes in forest laws in 1997 and 2003. Prior to 1986, the central government managed forest land within ejidos and comunidades, granting concessions to private logging. Since the communities could not control or realize profits from forest land within their boundaries there were strong incentives for community residents to clear forests for agricultural use. The 1986 law ended private concessions, required more detailed environmental studies for logging permits, and authorized communities to hire their own forest engineers to develop management plans—all services that had been monopolized by the government (Bray et al., 2006).

 The 1992 agrarian reform was a fundamental legal restructuring of the ejido. Ejidos were given the choice to privatize all or part of their common agricultural holdings, and were given much greater management rights (e.g., rights to rent land or offer concessions). References to state ownership were removed, and ejidos became de facto full owners of the property. The dividing up of forest parcels was prohibited – if an ejido voted to dissolve, its forest would become property of the state. Finally, the ejidos were allowed to set up sub-communal enterprises as well as joint enterprises with outside ventures (Gordillo, de Janvry, & Sadoulet, 1998).

 Both the 1986 and the 1992 forest laws were written with limited consultation; however, the 1997 law resulted from public dialogue (Bray et al., 2006). The 1997 law attempted to fix problems in the 1992 law, wherein focus on plantations failed due both to global market conditions and to the inherent problems of establishing large scale commercial plantations on scattered communally managed forest lands. It included the first formal program to support community forestry since the 1980s.

 The 2003 law, like the 1986 and 1992 laws, were the result of bureaucratic initiative, not popular demand. The chief effect of the 2003 law was to greatly expand institutional support and funding for community forestry initiatives (Bray et al., 2006). While decentralization in Mexico has been a much more gradual process than in the other countries discussed here, we have chosen to focus on the most recent reform in our analysis, in part because of the availability of data.

(d) Uganda

 Uganda’s history of forest decentralization has been characterized by frequent policy reversals, and according to two recently completed dissertations on forestry in Uganda (Namubiru 2008; Jagger 2009), the resulting policy instability is a major driver of actor behavior. After independence in 1962, a two-tiered system of forest reserves was set up. Local forest reserves—typically small, non-commercial areas—were managed by district government authorities for the benefit of local people. Central forest reserves were managed by the forest department for regional benefits, and were larger and more commercially oriented. In 1967, with the adoption of a new, republican constitution, local forest reserves were abolished and authority over all local forests was centralized (Namubiru, 2008; Turyahabwe & Banana, 2008).

 President Yoweri Museveni took control at the end of the civil war in 1986 and later introduced decentralization programs in an attempt to consolidate his power (Boone, 2007). In 1993, forest management was decentralized to District governments under the Local Government Statute. Local governments were able to retain fees from logging, but also incurred significant new expenses for permitting and administration. This led them to increase logging to generate revenue. The Forest Department complained that local governments were overexploiting their forests, and recentralized the forests in 1995.

 A new process of forest sector reform was set in motion in 1999, resulting in a new forest policy in 2001, a national forest plan in 2002, and the National Forestry and Tree Planting Act in 2003 (Turyahabwe & Banana, 2008). The 2001 policy explicitly recognized the rights and interests of communities and individuals and was seen as an improvement over previous policies. Under this policy, in 2003, the Forest Department was reorganized into a semi-autonomous National Forest Authority (NFA), with control over central forest reserves, which constitute approximately 15 percent of the forests. While some areas were set aside for conservation, the NFA is also engaged in planting fast-growing exotics and commercial harvesting to achieve fiscal independence. The NFA is supposed to share 40 percent of its revenue with the local governments, in exchange for help with monitoring, but little trickles down to the parish level.[[3]](#endnote-3)

 The 2001 policy also created the District Forest Authority to manage the remaining forested lands. In practice, not all districts have an officer, and those that do frequently do not employ sufficient staff or resources to help the officer achieve stated goals. The 2003 forestry law emphasizes setting up community forest management groups and providing incentives for forest management on private lands, but a lack of funding has slowed this process. Nevertheless, decentralization and improved participation have been the articulated goals of forest policy for the last two decades (Namubiru 2008, Jagger 2009).

# 3. HYPOTHESES

 Many conceptual models, definitions, and typologies of decentralization have been proposed in order to identify the types of cases where decentralization policies could be expected to fail or succeed (Samoff, 1990; Treisman, 2007; Dubois & Fattore, 2009). Because decentralization efforts are not uniform, any theory meant to link outcomes to decentralization must account for the actual content of decentralization policies. We propose examining the content of decentralization policies in terms of two critical concepts which have been emphasized by previous frameworks, including those presented by Samoff (1990), Agrawal & Ribot (1999) and Larson (2003): accountability and empowerment. Gormley & Balla (2008) define accountability in terms of the control over the agencies tasked with implementing policy. Ribot, Agrwal, & Larson (2006) distinguish between upward and downward accountability in the context of decentralization. Upward accountability refers to control by principals at higher levels of government, while downward accountability refers to control by local principals.[[4]](#endnote-4) Decentralization reforms may create upward accountability, downward accountability, both upward and downward accountability, or neither.

Empowerment has not been consistently defined in the decentralization literature (Samoff, 1990). This paper, however, defines empowerment as the ability of local actors to carry out the directives from decentralization policies. Empowerment is concerned with “whether or not decision making authority has actually been transferred (Samoff, 1990, p.517).” Agrawal & Ribot (1999, p. 476) differentiate between four types of powers: the power to create rules, the power to make decisions, the power to implement and ensure compliance to the new or altered rules, and the power to adjudicate disputes. Decentralization policies often do not empower local agents to autonomously meet decentralization objectives. Instead, decentralization often burdens local actors with additional responsibilities while either 1) withholding adequate funding to carry out these directives or 2) failing to provide an institutional environment whereby local actors can generate such funding or create rules and make decisions themselves (see Andersson, Gibson & Lehoucq, 2006 and the citations therein). Two key determinants of empowerment in terms of forest decentralization are capital transfers and the establishment of property rights (Agarwal & Ostrom, 2005).

While authors from different traditions have recognized the importance of both accountability and empowerment in explaining the content of decentralization policies, there has been little theoretical work that carefully combines the concepts of empowerment and accountability to generate theoretical predictions about decentralization outputs and outcomes. After presenting a framework to combine these concepts we also empirically (and quantitatively) investigate specific cases where varying degrees of empowerment and accountability are present in decentralization policies and assess the reforms in terms of both proximate outputs and intermediate outcomes.

 Our empirical tests in the following section are motivated by the conceptual framework presented in Figure 1, which combines the concepts of empowerment and accountability in decentralization. We acknowledge that there may be many more relevant dimensions of decentralization one might examine; however, these two dimensions provide novel and interesting theoretical predictions that can be empirically tested with the data in this paper.[[5]](#endnote-5) As a starting off point, we expect that decentralization policies which have strong upward and downward accountability and which empower local users are the most likely to cause local collective action—a proximate outcome of interest here. Given this local collective action, decentralization policies with strong accountability and local empowerment are also the most likely to achieve their stated policy goals (most decentralization policies, including the policies implemented in the study countries, have the dual goals of both making resource use sustainable and improving rural livelihoods, see Andersson, Gibson, & Lehoucq, 2004).

 In this framework local collective action is envisioned as a policy output, or intermediate objective to attain the ultimately desired policy outcome. Local collective action is necessary to insure monitoring and sanctioning of forest rules, which has been found to be associated with improved forest conditions (Gibson, Williams, & Ostrom 2005; Hayes 2006; Chhatre & Agrawal 2008, Coleman 2009), and it is also necessary to translate investments made by higher level authorities into changes in forest condition at the local level. Local collective action is most dependent upon empowerment and strong downward accountability. Empowerment from decentralization entails the establishment of property rights (Agrawal and Ostrom, 2003) and either material capital transfers or the authority of local groups to generate capital necessary to administer the program. Downward accountability, on the other hand, gives some assurance to forest users that benefits from successful collective action will be realized by the community. Thus, the conditions for successful collective action involve strong downward accountability and empowerment.

To achieve the ultimate policy goals of sustainable forest management and improved socio-economic conditions two requirements must be met: first, there must be sufficient downward accountability and empowerment to ensure local collective action; second, there must be upward accountability to ensure that the collective action satisfies the policy mandated goals of decentralization. Without upward accountability mechanisms, local collective action may lead to localized benefits which are out of harmony with the broader policy goals (e.g. short term economic benefits from timber extraction which improves local livelihoods, but at the expense of the broader goals of sustainability). Thus, in order for successful local collective action downward accountability and empowerment are needed; however, the additional presence of upward accountability is needed in order to achieve the broader goals of decentralization.

In order to evaluate the preceding theoretical arguments, we compare the effects of decentralization policies on four separate outcome criteria before and after decentralization in each of the four countries. We evaluate two indicators that reflect collective action on the part of local forest users: the frequency of forest investments and the willingness of forest users to make rules, indicating that users are sufficiently satisfied with the reforms so that they trust they will realize a return at some date in the future. To evaluate whether the policies meet the broader goals of sustainability and improved socioeconomic conditions, we also evaluate perceived wealth inequality and the perceived forest conditions.

The unit of analysis in this paper is a forest user group, defined as a set of individuals with the same rights and responsibilities to forest resources. User groups are connected to particular forests within each country and might be formal organizations such as formally constituted forest associations or informal sets of individuals who use the forest to harvest forest products. Thus each of our evaluation criteria are in reference to particular forest users groups in each country. In Table 1 we summarize our hypotheses as described in the remainder of this section.

[TABLE 1 ABOUT HERE]

(a) *Local Collective Action*

The first outcome criterion we examine to evaluate local collective action is investment in forest resources by planting seeds, trees, or bushes. The second criterion is whether the forest user group makes rules about forest use. Both actions are examples of local collective action that one would expect user groups to undertake if the proximate goals of decentralization are successful. From the previous discussion recall that the propensity to engage in these activities is determined by the decentralization policy’s ability to empower local user groups and create downward accountability. From Table 1, note the summary that downward accountability only persists from one decentralization reform, in Mexico. Here, the ejidos and comunidades have well established and nationally recognized local institutions. While these institutions do not perfectly establish strong downward accountability, they engender much more downward accountability relative to the other countries in the study. In Bolivia, Kenya, and Uganda there are no similar mechanisms to ensure downward accountability.

The two important determinants of empowerment in this study are the establishment of property rights and the availability of capital. These factors are expected to increase local collective action in the form of forest investments and rulemaking. When forest users have capital resources to invest, they are more likely to invest them, and when property rights are established then future benefit streams from future investments are more likely to be realized (Schlager & Ostrom, 1992). Decentralization policies that contribute to local economic growth or provide subsidies for forest investments may increase capital availability for forest investments. Policies that increase local decision-making authority may enhance tenure security, but frequent changes in policies are likely to increase uncertainty and create a sense of tenurial insecurity.

Table 1 reports the level of empowerment from the decentralization policies in each country.

The decentralization process in Uganda had some moderate empowerment by establishing minimal property rights for forest user groups. While the property rights were not firmly established because of the policy instability of the decentralization process, some “minimal recognition of rights” (Ostrom, 1990) persisted throughout the process. (Forest policy was decentralized then recentralized a number of different times in the decade prior to final decentralization.) That is, because the policy process was so unstable, even though property rights were not firmly established for local users they were also not denied. In this state of flux, the de facto condition was that many forest user groups assumed property rights. While there was some, albeit quite limited empowerment through property rights, there was no cash assistance available for forest user groups because the central forest authority, and its access to central funding, was all but eliminated.

 In Bolivia, Kenya, and Mexico, on the other hand, there was some local empowerment from decentralization. In each case, decentralization enhanced tenure security and/or capital availability. One might expect that investments in Mexico would not change because the decentralization reforms were relatively modest compared to the other countries; however, the reforms stipulated increased funding from the forestry department to communities which, we will show, were used for forestry-related investments. (Thus, it is probably likely that forest investments would increase, although the effects on rulemaking are less clear because many groups already engaged in rulemaking.) In Bolivia and Kenya, while there was little money from the central forestry departments, the reforms created property rights for local users that were previously nonexistent. We hypothesize that this incentivizes locals to invest in these resources as their tenure security was enhanced.

 Because downward accountability and high empowerment decentralization was only present in the Mexican decentralization reform, that is the only country where we expect high local collective action. In Bolivia and Kenya the decentralization reforms had a similar content on the accountability and empowerment dimensions: some moderate empowerment by establishing property rights which did not exist before, little capital transfer for local forest user groups, and minimal downward accountability. Thus, we expect only moderate collective action in these countries as a result of decentralization. In Uganda, there was very minimal empowerment of local forest users, because property rights while minimally recognized, were not properly defined and there was no capital availability. In addition to low empowerment Uganda had little downward accountability and thus we hypothesize that Uganda would have only moderate-low collective action as a result of decentralization.

(b) *Broader sustainability/socioeconomic outcomes*

Two of the ultimate goals of the decentralization policies under study here are to decrease wealth inequality and improve forest conditions. Decentralization of natural resources might conceivably either exacerbate or alleviate local wealth inequality. Many authors have argued that decentralization exacerbates wealth differences at the local level (Bardhan & Mookherjee, 2000; Harris, Stokke, & Törnquist, 2005; Platteau, 2004; Hayward, 2003). Inequality is anticipated to increase if local political leaders are able to capture control of forest resources, the resources are quite scarce, and there are readily available markets to sell forest products. On the other hand, decentralization has the potential to decrease inequality if resources are less scarce, there is upward or downward pressure to allow the poor to supplement their incomes with revenues generated from forest resources, and if forests are isolated from markets. As in the case of investment and rule-making, we expect that decentralization’s effect on wealth inequality will be mediated by the interaction between reforms and existing institutions, particularly those that facilitate accountability of forest management to poor resource users, as well as the type of income-generating activities available to resource users.

One of the most often cited justifications for decentralization is to improve forest conditions. Decentralization may contribute to improved forest conditions if it empowers local users to engage in more monitoring and sanctioning, and gives them the resources to do so. It may also lead to improved forest condition if decision-makers are downwardly accountable to forest users who demand that the forest be protected, or are upwardly accountable to conservation authorities. On the other hand, decentralization may lead to a decline in forest condition if it empowers users who value alternative uses of the forest (such as unsustainable timber harvests or conversion to agriculture), or if it makes decision-makers accountable to people – at lower or higher levels – who prefer such alternative users. Decentralization may also lead to a decline in forest condition if it reduces capital availability for local resource management. The interests of actors are likely to be mediated in turn by relative scarcity. In areas where forests are abundant, or scarce and highly degraded, few local actors may value them, but in conditions where forests are relatively scarce, but provide goods and services that are highly valued, there are likely to be more actors at all levels working for improvements.

 Reforms in Uganda did little to create upward accountability. The former forest service was all but abandoned, so there was little oversight of local political elites. There were readily available markets to sell forest resources and realize gains from capture. This gave local elites the opportunity to gain from decentralization at the expense of other users. Because the forests in Uganda are relatively scarce resources, under increasing pressure as population growth continues at a high rate, the poor had fewer opportunities to realize benefits from the forests that were not captured (Jagger, 2009). Because of these conditions, we expect, consistent with Jagger’s findings, that wealth inequality will increase following decentralization and forest conditions will worsen.

 In Bolivia, we do find some evidence of upward accountability. First, the Forestry Superintendence and Ministry of Sustainable Development and Planning provide checks against municipal corruption. Second, the forests are more isolated from markets. These two factors should make it more difficult for municipal-level elites to capture forest resources, exacerbate wealth inequality and degrade forest conditions. Finally, forest resources are relatively less scarce in Bolivia. Because the decentralization reforms allowed indigenous and other user groups rights to harvest from the forest, local officials and other elites should have more difficulty in capturing the resources, and since resources were abundant, these new harvesters should have the potential to supplement their pre-decentralization incomes with subsistence forest resources.

 In Mexico the federated governance of the forest system demands upward accountability and Mexico tends to have more upward accountability than the other countries. We have less confidence in our expectations of the Kenyan reforms. The law was passed in 2005, stipulating the creation of CFAs, but their role remains to be seen. It does seem that the central government maintains much control over the decentralization process, but nonetheless our data analysis here can be construed as an analysis of the effects of the reform, but the upward accountability here is less clear than the other cases.

 Thus, because the incentives for local collective action in Uganda are only moderately low and there is no upward accountability, we expect that Uganda will not successfully meet its broader sustainability/socioeconomic objectives. In Mexico, both the incentives for local collective action are high and the presence of upward accountability indicates that it is more likely to meet the decentralization objectives. In Bolvia and Kenya, there are some incentives for local collective action, but no upward accountability; thus, they fall somewhere between Mexico and Uganda in terms of our expectations of forest conditions and wealth inequality.

# 4. DESCRIPTION OF DATA

To investigate the effects of forest decentralization policies according to our expectations outlined in Table 1 we perform a variety of statistical analyses. Data are taken from the International Forestry Resources and Institutions (IFRI) research program. This program is unique in that forest sites for each country have been visited both before and after decentralization reforms. Forest sites are not randomly chosen, but neither are they selected because of key characteristics of the dependent variables. As such, care should be taken when generalizing these results; specifically, the findings only hold for similar forests in each country (Coleman, 2009).

 The IFRI dataset has been described in detail elsewhere (Wollenberg et al., 2007), and has served as the basis for many similar analyses (Gibson, Williams and Ostrom, 2005; Hayes 2006; Chhatre & Agrawal 2008; Coleman & Steed 2009; Coleman 2009). The unit of analysis for this paper is the user group. During each IFRI site visit, which may last from 2-4 weeks, an interdisciplinary team of social and natural scientists gather data both on the biological conditions of the forests as well as on forest communities and user groups using a mixture of standard forest mensuration techniques and rapid rural appraisal tools such as semi-structured interviews and participatory mapping exercises. The data analysis strategy is to assess how user group behaviors have changed in years after decentralization. Table 2 gives the distribution of the data gathered from the user groups across countries both before and after decentralization reforms were passed. There are 303 user group entries from the four countries. Note that the data in the analysis are not a panel; the same user group is not followed before and after decentralization in every case. Instead, a sample of forest user groups is collected before decentralization and another sample is collective after decentralization. In some instances, the same user groups appear in both samples, but in others, the samples are different. This data problem presents some analytical challenges that will be discussed later in this section.

[TABLE 2 ABOUT HERE]

(a) Variable descriptions

 We are interested in four outcomes from these user groups: rulemaking, differences in wealth, the perceived conditions of the forest, and investments in the forest. As discussed previously, decentralization affects each of these indicators. We measure each of these outcome variables as a binary variable. See Appendix A for the exact phrasing of each of the questions used to construct the variables.

 Forest investment activities include planting seeds, trees, and bushes. The frequency with which the user group engaged in each activity was assessed. Information about these activities was gathered at each site visit through semi-structured interviews with many key informants. Forest investments are coded to indicate if the user ever engages in forest investment activities (=1) or not (=0). Similarly, rulemaking takes the value of 1 if the user group engages in rulemaking and 0 if it does not.

 The measure for wealth inequality indicates if there are substantial perceived differences in wealth (=1) or not (=0), as assessed by the IFRI team conducting the research based on semi-structured interviews with key informants. We measure forest conditions with a user group ranking of their own forest conditions compared to the conditions from ecologically similar forests. Thus, forest conditions take the value of 1 if the group assesses the conditions as equivalent to or in better condition than other forests, and a value of 0 if they assess that the conditions are worse.[[6]](#endnote-6) While decentralization is a continuous process and is coarsely identified by our treatment of behavior using a before and after time measurement, the years of decentralization in this analysis are based on important dates of legislation that changed forest management responsibilities. For some countries this was much more gradual, as in Mexico. Still we find it useful to assess the effects of the reform from the given reform year from past conditions. For other countries there were distinct events which separate decentralized management from a centralized period, such as the National Forestry and Tree Planting Act in 2003 in Uganda. Note that our data only capture the change in user group activity for the indicated year of reform, for each country, as reported in Table 2. So, for example, we compare user group activities in Uganda before 2003 with their activities after 2003, while we compare user group activities in Bolivia before 1997 with activities after 1997.

 In the following sections we also make reference to a number of control variables that are expected to affect the outcomes separately from decentralization. The control variables include the following: forest size, in hectares; scarcity of forest resources, as measured by the number of user group members per hectare of forest; monitoring and sanctioning, a dichotomous variable indicating if the user group frequently engages in such activities (=1) or not (=0), and; the proportion of subsistence households in the user group, measured as the number of subsistence households as a fraction of the total households in the user group.

(b) Descriptive statistics

 Data are collected for every inventoried user group in the four countries during IFRI visits. Each outcome variable is binary; thus, the estimated means are simply the proportion of user groups that have one of the variables equal to one. In Figure 1, data are presented at times both before and after decentralization for each country and for each variable. In the table of Appendix A we show the statistical tests for a significant difference before and after decentralization. The final row of this table reports a z-test statistic from a comparison of equivalent proportions before and after decentralization for each variable.

[FIGURE 1 ABOUT HERE]

 The difference in proportions test shows some important trends in the outcome variables. There were significant increases in forest investments in Bolivia, Mexico, and Uganda and a significant decrease in forest investments in Kenya. There was a significant increase in rulemaking in Bolivia, Kenya and Uganda, but not in Mexico. Wealth inequality was significantly exacerbated only in Uganda. Finally, user groups’ perceptions of forest conditions did not significantly change in any country. Descriptive statistics for the control variables are found in Table 3.

[TABLE 3 ABOUT HERE]

# 5. MODEL ESTIMATION

 Our primary concern in this analysis is to assess the role of decentralization, holding the control variables constant. In the preceding discussion of descriptive statistics we found some significant changes in the key dependent variables in Table 1; however, there are possible alternative explanations for these changes. Therefore, we include a number of control variables that might provide alternative explanations for the summary statistics we observed in the previous section. Furthermore, some care needs to be taken to account for the non-panel nature of the data and this issue is also addressed in this section.

 The dependent variables are each binary and thus as a first analysis we employ probit models to estimate the effects of decentralization on each outcome variable (see Long, 1997). This method, however, is limited because it treats forest user groups as equivalent in all other respects before and after decentralization. To account for the fact that some forest user groups are the same in both samples, and yet some are different, we also employ propensity score matching—nearest neighbor and nearly exact matching. In the nearest neighbor matching, user groups under decentralization are matched with the five most similar user groups (in terms of the control variables) prior to decentralization. Differences in the outcomes are then tested by comparing the outcome variables in these similar user groups. In nearly exact matching, user groups are matched with user groups from the same forest prior to decentralization, if possible, and where there are no user groups prior to decentralization from that forest, they are matched to the five most similar user groups outside of the forest. Again, outcomes are compared and tested to assess if there has been a significant difference.[[7]](#endnote-7) Thus, the nearly exact matching method compares changes in a forest user group before and after decentralization if possible, but where this is not possible it selects forest user groups that are most similar to it (in terms of the control variables) where there is not a pre-decentralization user group for comparison.

 We report the estimated Average Treatment Effect on the Treated (ATT) for both matching estimators. This gives an estimate of the effects of decentralization given that decentralization occurred for a given user group (Morgan & Harding, 2006). Of the three estimation methods (probit, matching, nearly exact matching), we prefer the ATT estimates from nearly exact matching because they best account for the nature of the data; thus, we expect them to give the most accurate estimated decentralization effects. Without nearly exact matching, user group specific differences are not accounted for in the estimation of the treatment effects; instead estimates of the treatment effects rely solely on differences in user group characteristics of the measured variables for identification.

When reporting results from the probit models we report the estimated marginal effects of decentralization. We initially used multilevel probit models to estimate forest specific effects, but these estimates were very similar to using standard errors clustered at the forest level. We do not view the probit models as sufficient to estimate the effects of decentralization because they do not adequately account for forest user group specific characteristics which are only recovered when using the information that some user groups are the same both before and after decentralization. Still, probit marginal effects (with cluster-robust standard errors) are reported along with both matching estimators as a reference.

 The probit models are estimated via maximum likelihood, while the matching estimators use the algorithm of Abadie et al. (2004) for use in Stata. In order to match post-decentralization user groups with pre-decentralization user groups, we evaluate the similarity of these groups based on the control variables. “Similarity” in this algorithm is defined by the Mahalanabis metric: a vector norm, $\left‖x\right‖=(x^{'}Vx)^{\frac{1}{2}}$, where $x$ is the vector of control variables and $V$ is a positive definite weighting matrix (the variance-covariance matrix of the control variables) used to correct for the different scales of the control variables. This vector norm is calculated for all user groups; vector norms for user groups in the post-decentralization era are then compared to all user groups in the pre-decentralization era, and the closest five are chosen to match with the post-decentralization group. Outcomes from the pre-decentralization matches are then weighted by 1/5 and compared to the outcome from the post-decentralization group.

(a) Forest investments

The frequency of forest investments is a binary indicator of the frequency of investment activities including planting seeds, trees, and bushes as described in the previous section. Estimates for each country from the probit model, nearest neighbor matching estimator, and nearly exact matching are reported in top panel of Table 4 under the heading Forest Investments. (The full estimates from the probit model are found in Appendix B.)

[TABLE 4 ABOUT HERE]

 For these sections on interpreting the effects of decentralization we concentrate and interpret the results from the nearly exact matching procedure, because we view it as the most relevant for this application. This analysis suggests that after decentralization the proportion of user groups making forest improvements in Bolivia was not significantly affected. In Uganda, decentralization years saw a slight increase in the proportion of forest improvements by 0.12 (p<0.05), and in Mexico the probability of forest investments during decentralization increased by 0.25 (p<0.10). In Kenya, decentralization years are associated with a much lower proportion of user groups making forest investments; the proportion fell by 0.26 (p<0.05).

(b) Rulemaking

The variable for rulemaking is a binary variable indicating if the user group makes rules (=1) or not (=0). Estimates for each country from the probit model, nearest neighbor matching estimator, and nearly exact matching are reported in the second panel of Table 4 under the heading Rulemaking. (The full estimates from the probit model are found in Appendix C.) It appears that years of decentralization are associated with an increase in rulemaking activities in all the countries, although the increase is not statistically significant in three of the four countries. Only in Uganda did the proportion of user groups making rules increase in decentralization years, by 0.25 (p<0.01), holding the other variables constant.

(c) Wealth Inequality

Wealth inequality is a dichotomous variable and we similarly model the outcome with a probit model. Note that a positive outcome here means there is a more unequal distribution of wealth in the user group. The third panel of Table 4, under the heading Wealth Inequality, reports the marginal effects of decentralization in the probit model as well as the nearest neighbor matching estimator and the nearly exact matching estimator.

 The nearly exact matching results report that in Bolivia and Mexico the years of decentralization are associated with a decrease in the proportion of user groups with an uneven wealth distribution. In Bolivia, this decrease is slight and statistically insignificant, while in Mexico, the years of decentralization are associated with a decreased proportion of over 0.3 (p<0.10). In the African countries we find that wealth inequalities are exacerbated by decentralization. While wealth distribution did not change very much in Kenya (and was not statistically significant), the proportion of user groups with an unequal wealth distribution in Uganda significantly increased by 0.26 (p<0.01).

(d) Forest conditions

Forest conditions are also binary, indicating a forest with conditions (as ranked by user groups) as being in worse than similar forests (=0) or the same or better than similar forests in the region (=1). As in the previous sections, probit marginal effects and the matching estimators are reported in the last panel of Table 4 under the heading Forest Conditions.

 There are mixed results as to the effects of decentralization on forest conditions—some countries appear to be impacted negatively while others are impacted positively. However, in three of the four countries the effects are substantively very small. Only in Mexico are decentralization years strongly associated with the condition of the forest, and there the results appear to be quite comforting. Mexican user groups are more likely to rank the forest as being in average or above average conditions; in years after decentralization the proportion of user groups with a good ranking of the forest rose by nearly 0.8 (p<0.01), after accounting for the other factors. The magnitude of this effect is very large.

 Surprisingly, in Uganda forest conditions appear only marginally negatively affected by decentralization. There is substantial literature, however, that shows that forest conditions declined rapidly in Uganda after decentralization (Banana et al., 2007; Coleman, Kershaw, & Fischer, forthcoming; Jagger, 2009; Namubiru, 2008). There may be two reasons for this. First, our variable here measures user groups’ perceptions of forest conditions and thus may not reflect ecological conditions. In other words, even if the forest is in poor condition, user groups may consider this to be preferable to the prior state of affairs when they could not use the forest, or may give more value to forest products available in ecologically degraded forests, such as fodder or non-timber forest products, than to forest products available in healthy forests, such as timber, harvesting of which requires levels of capital investment beyond the capability of most local users (Jagger, 2009). Second, our variable asks user groups to compare their forests to other forests in similar ecologies in the region. If all of the forests in the region are in poor shape then their forests might not be ranked as low as otherwise might be the case.

# 6. DISCUSSION

In this section we compare the results from the previous section with our theoretical expectations as outlined in Table 1. That table reports the hypothesized expectations derived from our theoretical framework. The empirical analysis in Section 5 reports the results from 16 hypothesis tests; the results of decentralization in each of the four countries for two measures of local collective action and two measures of the broader sustainability/ socioeconomic outcomes. In this section we briefly compare the observed empirical results to the 16 hypothesized relationships.

The first four hypotheses posited that local collective action would moderately increase in Bolivia and Kenya, have a moderate-low increase in Uganda, and increase in Mexico. Our empirical analysis found that decentralization was associated with increases in forest investments in Uganda and Mexico, and slight increases in Bolivia. We did not anticipate that forest investments would fall so dramatically in Kenya. Our sense is that the reforms are still quite new; Kenya was highly centralized before the reforms and local user groups may take some time adapting to the new institutional environment. The next four hypothesis tests use the rulemaking measure of local collective action. We expected that Ugandan forest users would be the least likely to engage in rulemaking; however, the only significant increase in rulemaking occurred in Uganda. Perhaps the macro-level instability in Uganda was so potent that user groups had strong incentives to make rules to compensate. In the remaining countries there were slight increases in rulemaking, although these were not statistically significant.

 We expected Uganda to be the country least likely to achieve the broader sustainability/ socioeconomic objectives and that Mexico would be the most likely, and for Kenya and Bolivia to fall somewhere between these extremes. Wealth inequality did increase in Uganda and did fall in Mexico. Forest conditions improved in Mexico and worsened in Uganda, although the effect in Uganda was substantively small and not significant. In Kenya and Bolivia decentralization did not appear to worsen or improve either forest conditions or exacerbate wealth inequality. Thus, the anticipated sustainability/ socioeconomic outcomes from decentralization appear to be largely confirmed by our analysis.

 Thus, the results provide some empirical evidence that conforms to the hypotheses derived from the theoretical framework. Empowerment and accountability have been heavily emphasized in the widely cited frameworks of Agrawal and Ribot (1999) and Larson (2003). Our findings provide qualified support to the importance of these variables. In most cases, predictions derived from our theory were confirmed. We find that measuring accountability and empowerment enable us to predict some of the impact of decentralization reforms on livelihood and forest condition, but some outcomes remain unexplained. This points to the potential importance of other variables in explaining outcomes. While the data in our paper do not allow us to fully evaluate alternative explanations, our knowledge of the cases lead us to believe, with Andersson & Gibson (2007, p. 99), that “variation in the local institutional context,” and “the fit between the reform and other public policies,” may be crucial intervening variables. As an example of how variation in local institutional contexts may drive outcomes, the deterioration in conditions in Uganda after decentralization coincided with rapid population growth and shifts in timber demand which had uneven effects in the country by region (Jagger 2009). Long-term policy instabilities, coupled with these shifts in markets and population, may be creating a local institutional environment in which local collective action is the only route available for local villagers. In Mexico, forest decentralization programs built on a nearly 100 year history of agrarian reform, and thus there may have been a special fit between forest decentralization programs and a broader agenda of decentralized rural governance there. At the same time, Mexico’s land reforms have had very different impacts in different parts of the country, and these different histories may drive modern day variations in local institutional context. We therefore propose that further theoretical development focus on how local institutional environments and program fit interact with accountability and empowerment to impact program outcomes.

# 7. CONCLUSION

In this paper we have argued that the expectations of policy analysts and researchers on the effects of natural resource decentralization need to account for the content of the decentralization reforms being implemented. We illustrated that the content of decentralization, in relation to its empowerment of local people and the accountability it engenders, may be used to generate theoretical predictions about decentralization outcomes. We then analyzed decentralization policies in four different countries to test these hypotheses.

We found support for our hypothesis that decentralization reforms that empower local actors through the establishment or strengthening of local property rights and the allowance for capital transfers to local users, and which establish downward accountability, are more likely to provide incentives for local users to engage in collective action. Upward accountability helps to ensure that this collective action leads to outcomes which are consistent (in terms of wealth inequality and forest conditions) with the broader program goals of decentralization. These findings were largely confirmed in our empirical analysis, although the fact that Uganda, which had weak empowerment and weak downward accountability nevertheless engaged in collective action, was anomalous. We conjectured that this may be due to the fact that the policy instability of decentralization created a large enough vacuum that local groups risked local collective action in order to establish property rights. The fact that our findings were confirmed most strongly in Mexico, the country with the longest history of decentralized forest governance, may indicate that decentralization reforms are mutually reinforcing over time. Decentralization may work best when significant powers have already been transferred to local levels, enhancing the capacity of local actors to take full advantage of new powers.

 A number of important lessons can be learned from this research. First, researchers and policymakers need to think carefully about the full range of possible outcomes from decentralization policies. Our research shows that mechanisms of upward and downward accountability, as well as user empowerment, are associated with better decentralization outcomes, but it also shows that the impact of those mechanisms varies based on other aspects of the national, regional, and local context. Researchers and policymakers should explicitly define what they mean by decentralization when discussing any potential impacts, and examine how reforms labeled as decentralization will alter accountability and empowerment within local contexts.

 Second, more attention needs to be paid to how local institutions and user behaviors change and adapt to broader policy reforms. Most analysis of forest decentralization has focused on the change in rule structure at the macro level (see Agrawal & Ribot, 1999). This paper also assumes institutions are changed at the macro level, but it takes the next step in assessing how local users respond to these macro level rules (given the rules’ content in terms of empowerment and accountability). Our investigation shows that users sometimes respond in unexpected ways to macro level conditions, as happened with the increase in local rulemaking in Uganda that resulted from instability in macro-level rules.

Third, while we acknowledge and support the development of theory in regards to decentralization impacts, this analysis adds to the limited existing empirical literature. There appears to be no shortage of theories regarding the expected outcomes from decentralization reforms. Unfortunately, however, the quantitative analysis of these theories often relies on macro-level data and completely ignores localized impacts (see Treisman, 2007 for a review). In some cases, our theories of the effects of decentralization were wrong or only weakly supported by our data; this indicates a need to revisit theoretical expectations and develop more complete theoretical models amenable to testing with localized data. While the framework of accountability and empowerment are supported here as important determinants of outcomes, our empirical results indicate that they are insufficient to explaining the full range of outcomes observed across a relatively large number of cases in four countries. Further theoretical developments can build on our findings by examining how accountability and empowerment interact with other dimensions in decentralization reforms, and how these interactions, in turn, influence local behavior and outcomes. These theories, of course, must then be rigorously tested empirically.

# 8. REFEERENCES

Abadie, A., Herr, J.L., Imbens, G.W., & Drukker, D.M. (2004). Implementing matching estimators for average treatment effects in Stata. *The Stata Journal* 4: 290-311.

Agrawal, A. and Ostrom, E. (2001). Collective Action, Property Rights, and Decentralization in Resource Use in India and Nepal. *Politics & Society* 29(4) :485-514.

Agrawal, A.A., & Ribot, J.C. (1999). Accountability in decentralization: A framework with south Asian and west African cases. *The Journal of Developing Areas* 33: 473-502.

Andersson, K.P. (2002). *Can decentralization save Bolivia's forests? An institutional analysis of municipal forest governance*. Ph.D. diss, Indiana University.

Andersson, K.P. (2003). What Motivates Municipal Governments? Uncovering the Institutional Incentives for Municipal Governance of Forest Resources in Bolivia. *Journal of Environment and Development*, 12(1), 5-27.

Andersson, K. P. (2004). Who Talks With Whom? The Role of Repeated Interactions in Decentralized Forest Governance. *World Development*, 32(2), 233-250.

Andersson, K.P., & Gibson, C.C. (2007). Decentralized governance and environmental change: Local institutional moderation of deforestation in Bolivia. *Journal of Policy Analysis and Management* 26: 99-123.

Andersson, K.P., Gibson, C.C., & Lehoucq, F. (2004). The politics of decentralized governance of natural resources. *PS: Political Science and Politics* 37: 241-248.

Andersson, K.P., Gibson, C.C., & Lehoucq, F. (2006). Municipal Politics and Forest Governance: Comparative Analysis of Decentralization in Bolivia and Guatemala. *World Development* 34(3): 576-595..

Andersson, K.P., Bauer, J., Jagger, P., Luckert, M., Meinzen-Dick, R., Mwangi, E., & Ostrom, E. (2008). *Unpacking decentralization*. Paper presented at the SANREM CRSP Annual Meeting, Los Baños, Philippines, May 26-28, 2008.

Andersson, K.P., & Pacheco, D. (2004). The historical origins of forestry policy in bolivia: lessons for community forestry. *Policy Matters* 13: 40-49.

Banana, A.Y., Vogt, N.D., Gombya-Ssembajjwe, W., & Bahati, J. (2007). Decentralized governance and ecological health: why local institutions fail to moderate deforestation in Mpigi district of Uganda. *Scientific Research and Essay* 2: 434-445.

Bardhan, P.K., & Mookherjee, D. (2000). Capture and governance at local and national levels. *American Economic Review* 90: 135-39.

Boone, C. (2003). Decentralization as Political Strategy in West Africa. *Comparative Political Studies* 36(4): 355-80.

Boone, C. (2007). Property and constitutional order: Land tenure reform and the future of the African state. *African Affairs* 106: 557-586.

Bossuyt, J., Hauck, V., & Keijzer, N. (2007). *Supporting decentralisation and local governance in third world countries*. Tools and Reference Series Reference Document 2, Brussels: European Commission.

Bray, D.B., Antinori, C., & Torres-Rojo, J.M. (2006). The Mexican model of community forest management: The role of agrarian policy, forest policy and entrepreneurial organization. *Forest Policy and Economics* 8: 470-484.

Chhatre, A., & Agrawal, A. (2008). Forest commons and local enforcement. Proceedings of the National Academy of Sciences, 105: 13286-13291.

Coleman, E.A. (2009). Institutional factors affecting biophysical outcomes in forest management. *Journal of Policy Analysis and Management* 28: 122-146.

Coleman, E.A., Kershaw, J., & Fischer, B. (Forthcoming). Using Stocking Guides to Take Stock of Forest Institutions. *Society and Natural Resources*.

Coleman, E.A., & Steed, B.C. (2009). Monitoring and sanctioning in the commons: An application to forestry. *Ecological Economics* 68: 2106-2113.

Cohen, J.M., & Peterson, S.B. (1996). *Methodological issues in the analysis of decentralization.* HIID Development Discussion Paper No. 555, Cambridge, MA, Harvard Institute for International Development.

de Janvry, A., Dutilly, C.E., Munoz-Pina, C., & Sadoulet, E. (2001). Liberal reforms and community responses in Mexico. In Masahiko Aoki and Yujiro Hayami, eds, *Communities and markets in economic development.* Oxford: Oxford University Press.

Dubois, H.F.W.& Fattore, G.. (2009). “Definitions and typologies in public administration research: The case of decentralization.” *International Journal of Public Administration* 32(8): 704-727.

Falleti, T. G. (2005). A Sequential Theory of Decentralization: Latin American Cases in Comparative Perspective. *American Political Science Review* 99(3): 327-46.

Ferroukhi, L. 2003. Municipal Forest Management in Latin America. Washington DC: Forest Trends and Center for International Forestry Research

Food and Agriculture Organization of the United Nations. (1999). State of the world’s forests 1999. Rome: Author

Gibson, C. C., Williams, J. T., & Ostrom, E. (2005). Local Enforcement and Better Forests. World Development, 33: 273-284.

Gordillo, G., de Janvry, A., & Sadoulet, E. (1998). Between Political Control and Efficiency Gains: The Evolution of Agrarian Property Rights in Mexico. *CEPAL Review* 66: 151-169.

Gormley, Jr., W.T., & Balla, S.J. 2008. *Bureaucracy and Democracy: Accountability and Performance.* Washington, DC: CQ Press.

Harris,J., Stokke, J.K., & Törnquist, O. eds. (2005). *Politicizing democracy: The new local politics of democratization*. New York: Palgrave Macmillan.

Hayes, T.M. (2006). Parks, people, and forest protection: An institutional assessment of the effectiveness of protected areas. *World Development* 34: 2064-2075.

Hayward, C.R. (2003). The difference states make: Democracy, identity, and the American city. *American Political Science Review* 97: 501-14.

Jagger, P. (2009) *Can forest sector devolution improve rural livelihoods? An analysis of forest income and institutions in western Uganda*. Ph.D. diss, Indiana University.

Klooster, D. (2003). Campesinos and Mexican forest policy during the twentieth century. *Latin American Research Review* 38: 94-126.

Larson, A. M. (2003). Decentralisation and forest management in Latin America: towards a working model. *Public Administration and Development* 23(3): 211-26.

Larson, A.M., & Ribot, J.C. (2007). The poverty of forestry policy: double standards on an uneven playing field. *Sustainability Science* 2: 189-204.

Long, J.S. (1997). *Regression models for categorical and limited dependent variables.* Thousand Oaks, CA: Sage Publications.

Morgan, S.L., & Harding, D.J. (2006). Matching estimators of causal effects: Prospects and pitfalls in theory and practice. *Sociological Methods & Research* 35: 35-60.

Namubiru, E.L. (2008). *Coping with top-down institutional changes in forestry*. Ph.D. diss, Indiana University.

Omondi, J., & Omosa, E. (2002). Capturing Opportunities for change in Kenya—Preparing stakeholders for the new Forest Act. *Forests, Trees, and People* 46: 29-32.

O'Neill, K. (2003). Decentralization as an Electoral Strategy. *Comparative Political Studies* 36(9): 1068-91.

Ongugo, P.O., Mogoi, J.N., Obonyo, E., & Oeba, V. (2008). *The effect of internal human conflicts on forest conservation and sustainable development in Kenya*. Paper presented in the IASC Conference, Cheltenham, England, July 11-19.

Ongugo, P.O., & Njuguna, J.W. (2004). *Effects of decentralization policies on forest management: experience from seven forests in Kenya*. Paper presented at the Tenth Conference of the International Association for the Study of Common Property, Oaxaca, Mexico, August 9-13.

Ostrom, E. *Governing the commons: The evolution of institutions for collective action.* Cambridge: Cambridge University Press.

Pacheco, D. (2007). *An institutional analysis of decentralization and indigenous timber management in common-property forests of Bolivia's lowlands*. Ph.D. diss, Indiana University.

Pellegrini, L. (2009). *Forest management in Bolivia, Honduras and Nicaragua: reform failures?* The Hague: Institute of Social Studies.

Platteau, J.-P. (2004). Monitoring elite capture in community-driven development. *Development and Change* 35: 223-46.

Poole, J.H., & Leakey, R.E. (1996). Kenya. In Ernst Lutz and Julian Caldecott, eds., *Decentralization and Biodiversity Conservation*. Washington, DC: World Bank Publications.

Pressman, J.L., & Wildavsky, A. (1978). *Implementation: How great expectations in Washington are dashed in Oakland; or, why it's amazing that federal programs work at all, this being a saga of the economic development administration as told by two sympathetic observers who seek to build morals on a foundation of ruined hopes*. Berkeley: University of California Press.

Ribot, J.C. *Building local democracy through natural resource interventions: An environmentalist's responsibility*. Washington, DC: World Resources Institute Policy Brief.

Ribot, J.C., Agrawal, A.A., & Larson, A.M. (2006). Recentralizing while decentralizing: How national governments reappropriate forest resources. *World Development* 34: 1864-1886;

Ribot, J.C., & Larson, A.M. eds. (2005). *Democratic decentralization through a natural resource lens*. New York: Routledge.

Sabatier, P.A. (1986). Top-down and bottom-up approaches to implementation research: a critical analysis and suggested synthesis. *Journal of Public Policy* 6: 21-48.

Samoff, J. (1990). Decentralization: The politics of interventionism. *Development and Change* 21(3): 513-530.

Schlager, E. & Ostrom, E. (1992). Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics* 68 (3): 249–262.

Treisman, D. (2007). *The architecture of government: Rethinking political decentralization.* New York: Cambridge University Press.

Turyahabwe, N., &Banana, A.Y. (2008). An overview of history and development of forest policy and legislation in Uganda. *International Forestry Review* 10: 641-656.

United Nations Development Program. (1998). Capacity 21 program 1998 annual report. New York: Author.

Wollenberg, E., Merino, L., Agrawal, A., &Ostrom, E. (2007). Fourteen years of monitoring community-managed forests: learning from IFRI’s experience. *International Forestry Review* 9(2): 670-684.

# TABLES

Table 1.Summary of hypothesized effects of decentralization by country

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Decentralization Content** |  | **Expected Outcomes** |
| ***Country*** | ***Accountability*** | ***Empowerment*** |  | ***Local Collective Action*** | ***Sustainability/ Socioeconomics*** |
| *Bolivia* | Upward | Moderate |  | Moderate | Moderate |
| *Kenya* | Upward | Moderate |  | Moderate | Moderate |
| *Mexico* | Upward/downward | High |  | High | High |
| *Uganda* | None | Moderate-Low |  | Moderate-Low | Low |

Table 2.Distributions of user groups by country before and after decentralization

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Country** | **Year of Decentralization** | **Pre Decentralization** | **Post Decentralization** | **Total** |
| *Bolivia* | 1997 | 42 | 11 | 53 |
| *Kenya* | 2005 | 57 | 14 | 71 |
| *Mexico* | 2003 | 21 | 19 | 40 |
| *Uganda* | 2003 | 102 | 42 | 144 |
| **Total** |  | **222** | **86** | **308** |

Table 3. Descriptive statistics for control variables

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Mean** | **Standard****Deviation** | **N** |
| Bolivia |
| ln(Scarcity)  |  -5.707  |  1.477  |  44 |
| Monitoring and Sanctioning |  0.358  |  0.484  |  53 |
| Subsistence Users  |  0.729  |  0.415  |  53 |
| ln(Forest Size)  |  8.458  |  1.323  |  44 |
| Kenya |
| ln(Scarcity)  |  -2.181  |  2.556  |  69 |
| Monitoring and Sanctioning |  0.338  |  0.476  |  71 |
| Subsistence Users |  0.842  |  0.306  |  71 |
| ln(Forest Size)  |  6.677  |  2.198  |  69 |
| Mexico |
| ln(Scarcity)  |  -0.660  |  2.404  |  40 |
| Monitoring and Sanctioning |  0.650  |  0.483  |  40 |
| Subsistence Users |  0.516  |  0.467  |  40 |
| ln(Forest Size)  |  5.177  |  2.180  |  40 |
| Uganda |
| ln(Scarcity)  |  -2.413  |  1.788  |  138 |
| Monitoring and Sanctioning |  0.118  |  0.324  |  144 |
| Subsistence Users |  0.880  |  0.285  |  144 |
| ln(Forest Size)  |  6.355  |  1.572  |  138 |

Table 4. Decentralization effects on outcome variables from various models

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bolivia** | **Kenya** | **Mexico** | **Uganda** |
| **Forest Investments** |  |  |  |  |
| Probit Marginal Effect  | 0.493\*\*\* |  Not | 0.047 | 0.147\*\* |
|   | (0.12) | Identified | (0.45) | (0.07) |
| Nearest Neighbor Matching (m=5) ATT  | 0.479\*\*\* | -0.431\*\*\* | 0.195 | 0.103\* |
|   | (0.16) | (0.14) | (0.15) | (0.06) |
| Nearly Exact Matching ATT  | 0.121 | -0.264\*\* | 0.249\* | 0.117\*\* |
|   | (0.11) | (0.13) | (0.13) | (0.06) |
| **Rulemaking** |  |  |  |  |
| Probit Marginal Effect  | 0.393\* | 0.096 | 0.095 | 0.029 |
|   | (0.22) | (0.25) | (0.24) | (0.14) |
| Nearest Neighbor Matching (m=5) ATT  | 0.284 | 0.211 | 0.162 | 0.219\*\*\* |
|   | (0.18) | (0.38) | (0.16) | (0.07) |
| Nearly Exact Matching ATT  | 0.293 | 0.172 | 0.210 | 0.254\*\*\* |
|   | (0.18) | (0.31) | (0.14) | (0.07) |
| **Wealth Inequality** |  |  |  |  |
| Probit Marginal Effect  | -0.098 | 0.058 | -0.311 | 0.139 |
|   | (0.18) | (0.10) | (0.37) | (0.11) |
| Nearest Neighbor Matching (m=5) ATT  | -0.004 | 0.038 | -0.119 | -0.044 |
|   | (0.21) | (0.16) | (0.20) | (0.10) |
| Nearly Exact Matching ATT  | -0.069 | 0.149 | -0.304\* | 0.264\*\*\* |
|   | (0.23) | (0.16) | (0.17) | (0.10) |
| **Forest Conditions** |  |  |  |  |
| Probit Marginal Effect  | 0.010 | -0.085 | 0.790\*\*\* | -0.003 |
|   | (0.09) | (0.11) | (0.08) | (0.14) |
| Nearest Neighbor Matching (m=5) ATT  | -0.034 | -0.053 | 1.017\*\*\* | 0.106 |
|   | (0.17) | (0.12) | (0.21) | (0.10) |
| Nearly Exact Matching ATT  | 0.051 | -0.018 | 0.791\*\*\* | -0.095 |
|   | (0.20) | (0.09) | (0.12) | (0.11) |
| Notes: Two tailed hypothesis tests: \*\*\*p<0.01, \*\*p<0.05, \*p<0.10 |

# FIGURES

Figure 1. Conceptual framework for decentralization policies.



Figure 2. Distribution of dependent variables before and after decentralization by country. Mean levels of user group behavior both before and after decentralization and 90% normal confidence intervals for those means.

# APPENDIX A. DESCRIPTIVE STATISTICS FOR DEPENDENT VARIABLES

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bolivia** | **Kenya** | **Mexico** | **Uganda** |
| Forest Investments |
| Pre Prop  |  0.49 |  0.37 |  0.57 |  0.06 |
| Pre N  |  39 |  57 |  21 |  101 |
| Post Prop  |  0.91 |  0.10 |  0.82 |  0.15 |
| Post N  |  11 |  10 |  17 |  41 |
| z-Stat  |  2.50\*\*\* |  -1.67\* |  1.66\* |  1.69\* |
| Rulemaking |
| Pre Prop  |  0.49 |  0.08 |  0.71 |  0.13 |
| Pre N  |  37 |  50 |  21 |  95 |
| Post Prop  |  0.80 |  0.40 |  0.72 |  0.32 |
| Post N  |  10 |  5 |  18 |  31 |
| z-Stat  |  1.77\* |  2.19\*\* |  0.05 |  2.50\*\*\* |
| Wealth Inequality |
| Pre Prop  |  0.33 |  0.33 |  0.40 |  0.42 |
| Pre N  |  39 |  49 |  20 |  99 |
| Post Prop  |  0.36 |  0.31 |  0.32 |  0.68 |
| Post N  |  11 |  13 |  19 |  40 |
| z-Stat  |  0.19 |  -0.13 |  -0.55 |  2.68\*\*\* |
| Forest Conditions |
| Pre Prop  |  0.72 |  0.21 |  0.53 |  0.55 |
| Pre N  |  25 |  53 |  19 |  95 |
| Post Prop  |  0.70 |  0.25 |  0.74 |  0.53 |
| Post N  |  10 |  12 |  19 |  38 |
| z-Stat  |  -0.12 |  0.32 |  1.35 |  -0.22 |

Notes: Pre Prop: Proportion of user groups prior to decentralization with a dependent variable coded as one. Pre N: Sample size of user groups prior to decentralization. Post Prop: Proportion of user groups after decentralization with a dependent variable coded as one. Post N: Sample size of user groups after decentralization. z-Stat: z statistic from an equivalence of proportions test. Two tailed hypothesis tests: \*\*\*p<0.01, \*\*p<0.05, \*p<0.10

APPENDIX B. IFRI QUESTION FOR ANALYZED VARIABLES

1. *Making Rules*

Are there some individuals in this user group responsible for making rules about the forest? (Yes/No)

1. *Wealth Difference*

Given the local definition of wealth, is there a great difference in wealth among households (as locally defined) in the user group? (Yes/No)

1. *Forest Conditions*

How do most individuals in the user group rank the condition of this forest? (1—Sparse, 2—Somewhat sparse, 3—About normal for this ecological zone, 4—Somewhat abundant, 5—Very abundant)

NOTE: This variable is recoded such that a ranking above 3 is equal to 1 and below three is equal to 0.

(d) *Forest Investments*

Have individuals in this user group undertaken any of the following management or regeneration activities, and if so, how frequently?

Planted seedlings? (0—Never, 1—Done once a year, 2—Done every several years, 3—done about every five years, 4—Done about every ten years, 5—Rarely done)

Planted trees? (0—Never, 1—Done once a year, 2—Done every several years, 3—done about every five years, 4—Done about every ten years, 5—Rarely done)

Planted Bushes? (0—Never, 1—Done once a year, 2—Done every several years, 3—done about every five years, 4—Done about every ten years, 5—Rarely done)

NOTE: This variable is coded as 0 if Never is answered for each question and 1 if there is a positive amount answered for any question.

APPENDIX C. PROBIT MARGINAL EFFECTS FOR FOREST IMPROVEMENTS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bolivia** | **Kenya** | **Mexico** | **Uganda** |
| Decentralization (d)  | 0.493\*\*\* | Not | 0.047 | 0.147\*\* |
|   | (0.12) | Identified | (0.45) | (0.07) |
| ln(Households per HA)  | 0.287\*\*\* | -0.048 | 0.056 | -0.029 |
|   | (0.08) | (0.05) | (0.13) | (0.02) |
| Monitor & Sanction (d)  | -0.096 | -0.195\* | 0.231 | 0.013 |
|   | (0.33) | (0.11) | (0.16) | (0.11) |
| Proportion Subsistence Users  | 0.049 | -0.258 | -0.194 | -0.160\*\* |
|   | (0.25) | (0.21) | (0.22) | (0.08) |
| ln(Forest Size)  | 0.654\*\*\* | -0.038 | 0.165 | -0.001 |
|   | (0.17) | (0.05) | (0.12) | (0.02) |
| Log-Likelihood  | -9.59 | -35.44 | -16.88 | -34.50 |
| AIC  | 31.17 | 80.88 | 45.75 | 81.00 |
| BIC  | 41.60 | 91.09 | 55.58 | 98.48 |
| N  | 42 | 57 | 38 | 136 |
| (d) for discrete change of dummy variable from 0 to 1, Two tailed hypothesis tests: \* p<0.10\*\*, p<0.05\*\*\*, p<0.01 |

APPENDIX D. PROBIT MARGINAL EFFECTS FOR RULEMAKING

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bolivia** | **Kenya** | **Mexico** | **Uganda** |
| *Decentralization (d)*  | 0.393\* | 0.096 | 0.095 | 0.029 |
|  | (0.22) | (0.25) | (0.24) | (0.14) |
| *ln(Households per HA)*  | 0.393\*\*\* | 0.013 | 0.086\*\* | -0.001 |
|  | (0.14) | (0.02) | (0.04) | (0.01) |
| *Monitor & Sanction (d)*  | 0.248 | 0.253\* | 0.461\*\*\* | 0.375 |
|  | (0.22) | (0.15) | (0.16) | (0.90) |
| *Proportion Subsistence Users*  | 0.144 | -0.112 | -0.505\*\*\* | 0.181 |
|  | (0.27) | (0.09) | (0.18) | (0.84) |
| *ln(Forest Size)*  | 0.543\*\*\* | 0.005 | 0.018 | -0.001 |
|  | (0.19) | (0.02) | (0.06) | (0.01) |
| *Log-Likelihood*  | -13.14 | -14.00 | -14.64 | -31.35 |
| *AIC*  | 38.28 | 40.00 | 41.29 | 74.71 |
| *BIC*  | 48.42 | 51.94 | 51.27 | 91.43 |
| *N*  | 40 | 54 | 39 | 120 |
| (d) for discrete change of dummy variable from 0 to 1, Two tailed hypothesis tests: \* p<0.10\*\*, p<0.05\*\*\*, p<0.01 |

APPENDIX E. PROBIT MARGINAL EFFECTS FOR WEALTH INEQUALITY

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bolivia** | **Kenya** | **Mexico** | **Uganda** |
| Decentralization (d)  | -0.098 | 0.058 | -0.311 | 0.139 |
|   | (0.18) | (0.10) | (0.37) | (0.11) |
| ln(Households per HA)  | 0.095\* | 0.005 | 0.266\*\*\* | 0.066 |
|   | (0.05) | (0.05) | (0.09) | (0.04) |
| Monitor & Sanction (d)  | 0.113 | -0.053 | 0.240 | 0.314 |
|   | (0.21) | (0.09) | (0.17) | (0.20) |
| Proportion Subsistence Users  | -0.114 | -0.071 | 0.562\*\* | 0.073 |
|   | (0.26) | (0.17) | (0.24) | (0.17) |
| ln(Forest Size)  | 0.021 | 0.063\* | 0.320\*\*\* | 0.025 |
|   | (0.09) | (0.04) | (0.12) | (0.05) |
| Log-Likelihood  | -23.88 | -36.68 | -18.82 | -86.04 |
| AIC  | 59.76 | 85.37 | 49.63 | 184.09 |
| BIC  | 70.05 | 98.03 | 59.61 | 201.43 |
| N  | 41 | 61 | 39 | 133 |
| (d) for discrete change of dummy variable from 0 to 1, Two tailed hypothesis tests: \* p<0.10\*\*, p<0.05\*\*\*, p<0.01 |

APPENDIX F. PROBIT MARGINAL EFFECTS FOR FOREST CONDITIONS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Bolivia** | **Kenya** | **Mexico** | **Uganda** |
| *Decentralization (d)*  | 0.010 | -0.085 | 0.790\*\*\* | -0.003 |
|  | (0.09) | (0.11) | (0.08) | (0.14) |
| *ln(Households per HA)*  | -0.081 | -0.075\*\* | 0.154 | -0.040 |
|  | (0.09) | (0.03) | (0.14) | (0.05) |
| *Monitor & Sanction (d)*  | 0.005 | 0.182 | -0.693\*\*\* | 0.202 |
|  | (0.07) | (0.13) | (0.06) | (0.13) |
| *Proportion Subsistence Users*  | -0.770\*\* | -0.011 | -0.288\* | -0.128 |
|  | (0.30) | (0.14) | (0.17) | (0.13) |
| *ln(Forest Size)*  | 0.060 | -0.098\* | 0.092 | -0.006 |
|  | (0.07) | (0.05) | (0.13) | (0.05) |
| *Log-Likelihood*  | -13.46 | -27.37 | -15.65 | -84.06 |
| *AIC*  | 38.92 | 66.74 | 43.30 | 180.12 |
| *BIC*  | 47.71 | 79.69 | 53.13 | 197.18 |
| *N*  | 32 | 64 | 38 | 127 |
| (d) for discrete change of dummy variable from 0 to 1, Two tailed hypothesis tests: \* p<0.10\*\*, p<0.05\*\*\*, p<0.01 |

NOTES

1. See also Larson (2003). [↑](#endnote-ref-1)
2. For more information on the process of the creation of ejidos and their subsequent reform, see Bray, Antinori, & Torres-Rojo (2006). [↑](#endnote-ref-2)
3. The Ugandan Wildlife Authority (UWA) controls another 15% of forested areas as National Parks and Game Preserves. Its main source of revenue is from entrance fees, and it engages in limited revenue sharing with local communities. No commercial harvesting is permitted in UWA lands. [↑](#endnote-ref-3)
4. Some authors have argued that accountability refers to the ability of voters to remove their agents from office (Treisman, 2007). However, Ribot, Agrwal, & Larson (2006) caution that accountability is only loosely linked to electoral control. Some agents might be accountable to principals even without elections, while elections themselves may be abused so that they do not provide an accountability mechanism. [↑](#endnote-ref-4)
5. Dubois & Fattore (2009), for example, conduct a meta-analysis of decentralization research in public administration and define 5 different dimensions that have been used to classify decentralization in that literature. While empowerment and accountability are not explicitly among those criteria defined by Dubois and Fattore, those concepts appear to be more general concepts that subsume the 5 dimensions. Nontheless, future research might develop our theoretical framework in order to expand the relevant types of empowerment and accountability to generate more precise and accurate theoretical predictions. [↑](#endnote-ref-5)
6. Because outcomes are assessed at the user group level, more objective measures of forest conditions cannot be used; the outcomes must be related to a user group and not a forest. [↑](#endnote-ref-6)
7. For this estimation we used the software NNMatch. See, Abadie et al. (2004). There are a variety of matching estimators in the literature, but there is little guidance as to which matching procedure “works best.” For a discussion, see Morgan & Harding (2006). We favor the nearly exact matching in this application because it balances the need to compare user groups that are the most similar in geography to those that are similar on the control variable characteristics. [↑](#endnote-ref-7)