Institutional Innovation and Adaptive Management: Learning from Bolivia's Decentralization Experiment

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Abstract

The purpose of this paper is to present and illustrate the usefulness of the Institutional Analysis and Development (IAD) framework for identifying the institutional conditions that are conducive for adaptive management. Drawing from the literature on adaptive management, the authors use the framework to formulate a series of testable hypotheses about what institutional factors seem to influence the likelihood for successful governance outcomes in a decentralized context. We test the hypotheses using recent empirical data from 50 municipal governments in Bolivia. The results of these tests suggest that local governance actors are seldom successful on their own, and that the more information that is exchanged between actors at *different governance levels*, i.e. national, regional, municipal, and community, the higher the likelihood that forest users will rank municipal forest services as satisfactory. In municipalities where governance actors have created a governance system with a high level of information exchange, there is also significantly less uncontrolled resource degradation. These findings reaffirm one of the fundamental principles of adaptive management: that the capacity of individuals to *learn* about the effects of past and current activities is instrumental to becoming effective natural resource stewards.

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1. Introduction

The governing of common natural resources is increasingly affected by multiple stakeholders using different types of ecosystem services. The complexity of natural resource management has been increased since stakeholders from multiple levels of scale become part of the debate on resource management. There has also been an increasing insight in the non-linear complex dynamics of ecosystems at different levels of scale (Gunderson and Holling, 2002). Top-down management of natural resources focused on optimal control and a uniform approach aimed at engineering of the natural environment is generally not the proper management strategy for the longer term (Ostrom and Janssen, 2002). There is a need to harness complexity of the social-ecological systems.

If we lack knowledge and control to engineer natural resources, we need to find new ways to manage common natural resources. Institutional innovation with regard to environmental management is required, and therefore we have to experiment with new types of institutional arrangements. Lee (1993: 9) argued: "policies are experiments; *learn from them*" [author's emphasis], and this is precisely the topic of our paper. We will discuss how one may benefit from policy experiments to learn how we might better fit institutions and ecological dynamics. This is known as adaptive management (Holling, 1978; Walters, 1986).

In most applications of adaptive management the focus is on learning the dynamics of ecosystems. The experiments are new ways of resource management to understand the relation between human activities and ecological dynamics. In this paper we focus on experiments on institutional arrangements related to natural resource management. Even if we know the essential dynamics of the ecosystem, we still lack sufficient insight as to how we could create incentives such that societies manage their common resources in a sustainable way.

We are especially interested in institutional arrangements that foster resilience and adaptive capacity of the system. Resilience is the ability of a system to cope with disturbances without changing the configuration of the system in a fundamental way. Adaptive capacity is the ability of actors in a system to create novel solutions for their challenges. Although both concepts overlap, one important difference is that actors with adaptive capacity can on purpose reduce the resilience of a system to get out of a gridlock situation into a more desired configuration of the system. The challenge for governance is to provide the conditions that actors built up adaptive capacity to maintain the resilience of desired configurations of the system.

From analyzing case studies and different types of natural systems, a number of system characteristics emerge as being crucial conditions for actors to govern their common resources in a sustainable way. From an institutional perspective, Ostrom (1990) identifies a number of factors important for sustainable use of common resources such as the similarity of the appropriators, the active role of local appropriators, and the use of gradual sanctions.

Although the system conditions creating adaptive capacity might be clear from a theoretical perspective, clear approaches as to how to carry this out in different contexts is lacking. In this paper we discuss a possible approach that may provide the right conditions: decentralization. The expectation is that decentralization, which in a way split a system up into modules, provides the conditions that local governance can adapt to the

local circumstances. By loose interactions between the decentralized regions, the regions may learn from experience and experiments of others and implement that in their own way in their own region.

A large number of countries have decentralized some aspects of how they manage their natural resources, with mixed results (Andersson, 2002; FAO, 1999; Burki et al. 1999; Silva et al. 2002). However, systematic monitoring of the consequences of decentralization, both at the national and subnational levels, has become one of the lacunas in the decentralization process. In line with adaptive management such decentralization policies might be seen as experiments, and hypotheses formulated at the beginning of the institutional reform need to be carefully monitored and tested empirically as the policy results emerge. Decentralization might be especially suitable for adaptive management since its implementation is essentially a series of parallel experiments in a wide variety of different regions and institutional configurations. As such, a decentralized context is an excellent field laboratory well suited for learning about natural resource policy. To fully benefit from this learning so that actors can move towards a better fit between their institutional arrangements and ecosystem dynamics, the learning needs to take place across at least two dimensions: (i) vertically, between higher and lower levels of governmental authorities; and (ii) horizontally, between actors that function at the same level of authority (i.e., municipal governments, citizens, NGOs, etc.).

While there are many theoretical advantages associated with decentralized natural resource governance, there are also a number of potential pitfalls with a decentralized system. A prominent problem is that some stakeholders benefit from not disseminating information and thus blocking the learning by others. Valuable information may be perceived as a threat to some actors who will try to conceal information and will not pass the desk of some officers or politicians. It is sometimes not in their interest to provide society with the full information of the consequences of institutional reforms. Another potential problem is that governmental bureaucrats lack incentives to experiment, especially when they are held responsible for failures. Therefore, new incentive structures are needed that reward careful experiments. Finally, a crucial element of benefiting from a decentralization experiment is the social learning between different regions.

In this paper we will use the Institutional Analysis and Development (IAD) framework to analyze an actual policy experiment: the decentralization reform in Bolivia's forestry sector, which was initiated in the mid-1990s. On the basis of our institutional analysis, we discuss some of the potential advantages as well as risks associated with decentralized natural resource management in general. We use the IAD framework to formulate a series of hypotheses and identify critical variables to be used in empirical testing. We test the hypotheses and find that effective decentralized governance of natural resources is associated with the local conditions for horizontal information exchange and learning by local governance actors. We end with a discussion of the importance of both horizontal and vertical learning from the decentralization experiments, especially at the national level (through creative use of monitoring and evaluation programs) and at the international level (through comparative analysis).

2. Decentralization: What is it, What is it Good for, and What is it not Good for?

Decentralization is understood as the "the assignment of fiscal political and administrative responsibilities to lower levels of government" (Litvack et al. 1998). In this study, decentralization refers to government functions only and, therefore, does not include privatization. Because of the particular emphasis that the Bolivian reformers assign to the role of municipal governments, the main focus of this study is on the municipal mandate in the forestry sector.

The literature on both decentralization and natural resource management speak of many potential advantages of a decentralized regime for the governance of natural resources. Among the most frequently cited advantages are more accountable government (Coen and Peterson, 1999; Ribot, 1999; Johnson et al. 1998); incorporation of local knowledge into government problem solving (Ostrom et al. 1993; Hayek, 1948); more civil participation in governance activities (de Tocqueville, [1835] 1945); more responsive government administration (Light et al. 2002; Johnson, 2000); better match of public services to local needs (Light et al. 2002) facilitating self governance (O'Riordan, 2001; Oakerson, 1999; Gibson and Lehhoucq, forthcoming); and faster and better learning about ecosystem characteristics (Ostrom and Janssen, 2002).

Less common in the decentralization literature concerning natural resource management are the potential pitfalls that decentralization represents. Yet, in countries where the central government has failed in delivering efficient and effective public goods and services to its citizens, one can expect that some of the same reasons that led to central government failure may also threaten the successful performance of local governments. The problems of producing collective goods and services, whether they take place on aggregate, national levels or disaggregated subnational levels, are faced with several difficult social dilemmas. A social dilemma is a situation in which a group of actors try to act in their common interest to produce a collective good, but their pursuit of self-interest detracts from their commitments to the common goal and, thus, the cooperative effort is threatened. Whether a national or subnational governance system, both need to find ways to motivate officials and other governance actors to function in the public's interest and constrain their temptations to use their position of power and privilege to further their personal self-interest. Unless the governance system is able to devise the institutions that can counteract such unproductive disincentives, successful governance is not likely to occur, neither at the national nor the subnational level.

From a theoretical perspective, then, we have reasons to be wary of the claimed advantages of decentralization. The risk of counterproductive outcomes seems particularly high when we have a highly segregated political tradition in which a small political elite has been able to protect its privileged status in society (Kaimowitz et al. 1999; Ribot, 2002). The relative power of such groups is likely to increase through decentralization, as it would give them more unrestrained freedom to pursue their interest. This in turn could lead to less equity, more conflicts, and deteriorating collective goods for others than the privileged class. For forest-dependent rural communities, decentralization may bring important opportunities to get more public services to help them solve common problems, but the delivery of this promise depends on the performance of the local institutions in place. The institutional analysis in this paper aims

to identify the factors that explain whether these institutions are likely to develop in any given situation.

On balance, there seems to be both potential advantages and potential disadvantages associated with the decentralization of governance responsibilities in natural resource management. A decentralization process that yields successful outcomes is far from an automatic process. Decentralization reform should be seen as an experiment from which we should seek to learn about what particular factors are conducive for successful decentralized governance of natural resources in different contexts. This paper looks specifically at the importance for local governance actors to engage in local-level learning about natural resource management. This has been a theme developed in the literature of adaptive management, but relatively little empirical research has addressed this issue. The Bolivian decentralization experiment in its forestry sector provides an exceptionally well-suited natural experiment for this purpose.

Why Bolivia?

Several factors make Bolivia a most appropriate country for the study of decentralization reforms. First, while many other countries in Latin America have introduced decentralization reforms in the natural resource management sectors, no other country has carried this process as far as Bolivia (FAO, 1999). The country's 1994 Popular Participation Law devolved a broad range of responsibilities, functions, and political decisions over education, health, urban infrastructure, and natural resource management. The central government also transferred approximately 20 percent of the national government budget to carry out the municipal government decisions. The 1996 Forestry Law gave municipal governments direct control over 25 percent of centrally collected royalties from commercial logging concessions within each municipal territory. In return, the decentralized regime asks municipal governments to perform a series of public service functions in the forestry sector.

Second, Bolivia's rich natural resource base is undergoing rapid changes. This means that one can expect to find large variances in the patterns of land-use change in the different municipal territories. The fast pace of land-cover change is especially evident in the country's tropical lowlands.

Third, Bolivia has gained an international reputation as a decentralization success story (UNDP, 1998). Since this study is particularly interested in understanding learning processes, and why some municipal governments do better than others, it is important that at least some success stories at the municipal level can be identified.

Finally, there is a growing number of national and international scholars who study the results of the decentralization reforms in Bolivia, and an important body of empirical literature is beginning to emerge (see, for example, Pacheco, 2000, 2001, 2002; Andersson, 2001, 2002; Kaimovitz et al. 1998; Kaimovitz et al., 1999; Kaimovitz et al., 2000; Urioste and Pacheco, 2001; Contreras and Vargas, 2001; Hernáiz and Pacheco, 2001; Rowland, 2001; Fauget, 2000; O'Neil, 1999; Thévoz, 1999; Pacheco and Kaimovitz, 1998).

3. The Bolivian Decentralization Reforms

Through the decentralization reforms in the mid 1990s, municipal governments became a *tour de force* in Bolivian politics. Most of the current municipal governments did not even exist before 1994, and the ones that did played mostly a symbolic role in the local political arena. In pre-reform Bolivia, municipal governments were essentially small, voluntary urban organizations without any significant political power, financial resources, or a clearly defined jurisdiction. Many of them had very few formal obligations to the central government and the citizens. That all changed with the reforms in 1994, when the central government began to transfer political decision-making competence and financial resources to municipal governments.

Starting in 1994, President Sanchez de Lozada's government introduced a series of decentralization reforms that would radically change the country's political structure. The Law of Popular Participation (1994), the Law of Decentralized Administration (1995), and the Law of Municipalities (1999) define the extent and content of the municipal government's mandate. In the decentralized regime, 314 municipal governments have been given the formal political competence and financial instruments to carry out a mix of centrally and locally defined priorities and political programs.

In 1994, just after the Law of Popular Participation was passed, many municipal government's annual operating budget increased by as much as a thousand percent, and more than a few went from a zero budget to tens of thousands of dollars in available resources, practically overnight. For instance, the 41 rural municipalities in the Department of Cochabamba increased their annual budgets by an average of 1,310 percent from 1993 to 1994, and by 259 percent from 1994 to 1998 (Government of Bolivia, 2000). In addition to the intragovernmental financial transfers, each municipality may levy taxes on motor vehicles, all urban property, and large rural properties (50 ha and larger), although the contribution of the municipality-levied taxes has been minimal for most rural administrations. However, municipal governments may not levy their own taxes on operations in the forestry sector, and they are not allowed to ask for user fees when providing public services in the sector.[1] The 1996 Forestry Law lays out the broad mandate of the municipal governments in the forestry sector. These are discussed in more detail in the section that follows.

4. Decentralization of Forestry Sector Governance

According to Bolivia's decentralized forestry regime, the main duties of municipal governments are related to the monitoring and enforcement of formal rules prescribed by the Forestry Law. Municipal governments are responsible for identifying and demarcating public forested lands in the municipal territory, which should be used exclusively for local communities. The Forestry Law also asks municipal governments to provide technical assistance to local forest users to develop forest management plans and to help local users acquire formal forest property rights (Government of Bolivia, 1996). As long as municipalities comply with the overall formal mandate, they are free to adopt their own strategies for how to meet the exigencies of forest users in their jurisdictions, as

[1] Note, however, that some municipalities have been known to break this rule and have chosen to both tax and fine users as they see fit.

long as these strategies do not conflict with the formal forestry regime. The formal municipal mandate, which defines what specific services municipal governments are to provide in the forestry sector, is summarized in Table 1.

Table 1. Formal Municipal Government Mandates in the Forestry Sector

Mandate	Task	Decision-Making Bodies
Judicial	Demarcation of municipal reserves to be assigned as community concessions for local user groups in up to 25% of the territory's forested land.	Ministry of Sustainable Development approves or rejects the application and, if approved, asks municipal government to assist the user group in developing a management plan.
	Inspect and control all forestry activities within the territorial jurisdiction.	Municipal government.
	Report violations of the forestry law and any other governmental regulations.	SF decides how to react to the reported violation and what sanction to impose, if any.
Technical	Technical advice to local user groups and indigenous territories for management plans.	Municipal government decides what input to give but SF approves or rejects management plans.
	Set up a municipal database with forest resources in the municipal government.	Municipal government.
Socioeconomic	Training for user groups	Municipal government.
	Facilitate and promote commercial undertakings and private sector participation in forestry.	Municipal government.

Source: Authors' elaboration based on the 1996 Forestry Law and the 1994 Popular Participation Law.

The 1996 Forestry Law indicates that municipalities that receive forestry royalties must, within 6 months of the receipt of these funds, create, staff, and equip a Municipal Forestry Unit (Government of Bolivia, 1996). However, out of the 109 municipal governments that receive some forestry royalties, only about half provide some level of services and less than ten percent completely satisfy the requirements of the formal mandate (Pacheco, 2001, citing Superintendencia Forestal, 2000). The observation begs the question whether municipal government officials in Bolivia are at all willing to shoulder their responsibility to get involved in the governance of forest resources? And even if they are willing, are they able to manage the forestry sector issues in the best interest of the collectivity of forest users within their territory? These are two issues of central importance for the success of the decentralized regime and will be analyzed with the help of the IAD framework.

5. Institutional Analysis of Decentralized Governance

The governance of natural resources involves many actors with complex relationships between them. The behavior of these actors is affected by a multitude of factors and conditions. Any effort of trying to identify some of the most essential determinants of successful governance of natural resources needs to be structured in a way so that testable hypotheses can be formulated. The Institutional Analysis and Development (IAD) framework, developed by colleagues at Indiana University, provides guidance and structure to such efforts. Below, we use the questions suggested by the IAD framework to frame our empirical inquiry concerning uncovering the drivers of decentralized forest governance outcomes in Bolivia.[2]

5.1 What is the action arena?

The very first step in an institutional analysis is to establish the boundaries of the analysis: identify the action arena. To identify the factors that influence the variation in local government success in a country's forestry sector, the action arena should be defined as the forestry sector, or even the forestry sector in a particular part of the country or level of governance, depending on how specific the researcher wants the analysis to be.

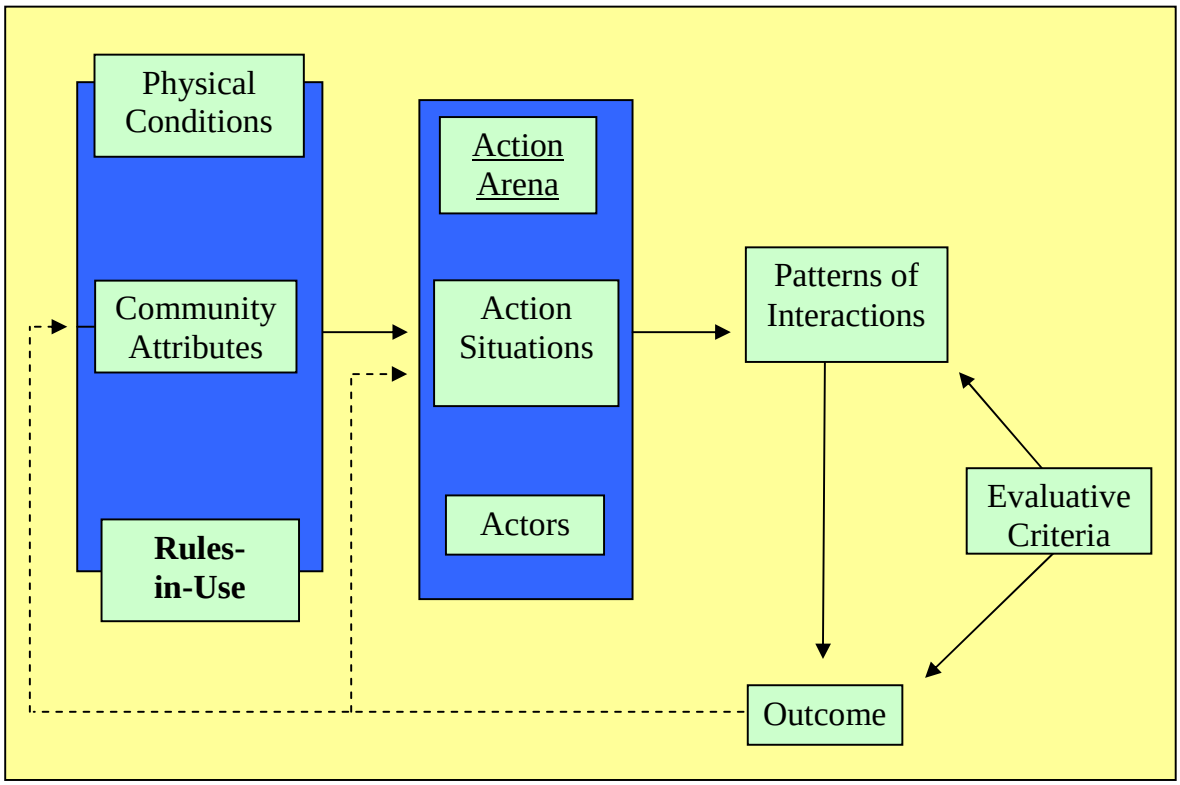
5.2 Who are the actors?

Once the general arena is defined, the main actors are identified. In this case, the governance outcome in Bolivia's forestry sector depends on the behavior of several different crucial actors, including private landholders, rural community groups, forest user groups, NGOs, externally funded project representatives, municipal governments, central government agents, private forestry firms, among others.

In what action situations do actors participate? The different groups of actors interact to produce the collective goods and services that make up forest governance. Central government representatives may, for example, decide to devolve responsibilities to municipal governments as they are believed to be able to perform these responsibilities more efficiently. The action situation refers to the specific type of interaction these actors engage in to arrive at such a decision. Another example of an action situation is the possible conflict situations that may arise between different forest user groups with unclear boundaries, or forest property rights. The behavior of each of the actors in these action situations can be explained in terms of a set of contextual factors, which the IAD framework breaks up into three main categories: (1) physical conditions, (2) community attributes, and (3) rules-in-use.

[2] For a more in-depth presentation of the IAD framework, see Kiser and Ostrom, 1982; Ostrom et al. 1994; Ostrom, 1998, 1999; Ostrom et al, 2002.

Figure 1. The Institutional Analysis and Development (IAD) framework



Source: Ostrom, Gardner, and Walker (1994: 37).

5.3 Physical Context: What is the Nature of the Good?

Perhaps the most important issue in institutional analysis is to define the nature of the good that is involved in the action situation. At a most fundamental level, the general characteristics of the country's forest resources frequently resemble a loosely regulated common-pool resource (CPR) (high subtractability, low excludability) and such a characterization defines the physical conditions of the action arena's context. Prior theoretical knowledge of CPRs suggests that human institutions are needed in order to prevent a "tragedy of the commons-outcome" – a situation in which individual forest users are unable to refrain from the temptation to pursue their narrowly defined, short-term, self-interest, which in the end results in the destruction of the resource. Collective action institutions are needed to stymie this short-term self-interest. The governance of forest resources, therefore, aims at providing the institutions necessary to ensure the constraining of the individual, short- term incentive to overharvest. The traditional way of providing these institutions has been for central government to introduce command and control rules, or privatization of the forests. However, both of these traditional policy remedies have proven to be unsuccessful, especially in developing countries, in regulating access and enforcing exclusion rights to forests (Gibson et al. 2000). Yet, the provision of the required human institutions, or set of agreed-upon rules, to solve the CPR dilemma is far from a straightforward process.

The establishment of human institutions is subject to its own set of social dilemmas. Participants in this process also face an incentive not to contribute to the sometimes costly set of activities required to agree on the new rules, modes of enforcement, sanctions, etc. Ostrom (1990) notes that in self-organized efforts to solve CPR dilemmas, actors face a three-tiered social dilemma. First, actors interested in solving the social dilemma need to be motivated to contribute to the solution of the dilemma: they need to cooperate with a suggested solution or the dilemma will not get solved. Secondly, if motivated, the actors need to acquire the necessary information and agree on a rule modification. Finally, even if the actors have gotten this far they need to be able to enforce the modified rule effectively, or the effort will not have worked to modify the group's behavior (Ostrom, 1990).

5.4 Community Attributes: How do actors associate in forestry?

The physical conditions of the context sets the stage for the community attributes. Under the community attributes heading we examine how actors within and between clusters of actors relate to each other. We consider the historical background, culture, religion, values, beliefs, socioeconomic needs, and other social characteristics of the groups defined as the main actors. If groups of actors engage they share a history of repeated interactions with mutually beneficial outcomes, chances are that trust has developed in their relationship, which in all likelihood will facilitate the solution of the social dilemma.

5.5 What are the Rules-in-use?

The rules-in-use refer to the norms and rules that are actually respected by the actors participating in an action situation. These are the most important independent variables in an institutional analysis, because these rules ultimately determine the behavior of actors, and thus generate the incentives that each actor faces in an action situation. The focus on the rules-in-use requires the institutional analyst to rely on first-hand field observations, rather than secondary data about formal rules. It is what is actually acted upon that counts when documenting rules-in-use, not just what is written (the rules-in-form).

The most important question that the analyst should ask is whether the observed rules-in-use are likely to be sufficient to solve the three-tiered social dilemma that is associated with successful forest governance. Whatever the answer to that question is, the multiple interactions in the different action situations in the action arena create patterns of interaction which, over time, result in predictable outcomes. By studying these patterns of interactions, one can identify the institutional incentives of the different actors in a given action situation. Because of the explicit design of the framework, these incentives can be traced back to specific contextual factors that seem to generate the observed incentives. The outcome may be evaluated with different criteria of interest, such as rural sustainability, equity, efficiency, and/or effectiveness. The process is reiterative, as whatever outcome results, it will affect the contextual variables as well as the action arena in future interactions between actors.

The opportunity of actors to learn from experience of others depends on the social connectivity among the relevant actors. From organization learning, we know that information diffuses by three broad processes (Levitt and March, 1988): (1) diffusion from a single source like governmental agencies and professional organizations; (2)

individual interactions such as consultants and movement of actors; and (3) a normative process through experts and through trade and popular publications.

5.6 Mapping the Information Flows

The IAD framework-guided analysis explicitly relates the information available to different groups of actors and asks the researcher to characterize the flow of information between actors in the action arena. We try to answer two main questions in this part of the analysis: Who has access to what information? And, to what extent is the flow of information transparent to others? Here we consider three different dimensions of information flow:

1. **Downward flow** – e.g., a central government agent or national expert informs local government representatives or citizens about decisions or new knowledge. Without a constant downward flow of information, local people will not be able to learn about formal government rules that may (or may not) protect their rights to natural resource management, or available government programs that they can benefit from. Citizens also need a transparent downward flow of information to learn about government officials' performance in order to hold such officials accountable (Putnam, 1993; Ribot, 1999; Andersson, 2002). When there is a transparent *downward* flow of information, citizens are in a better position to engage in *upward* learning, that is, learning about what is going on at a higher level of the governance hierarchy.

2. **Upward flow** – e.g., government officials learn about local conditions, problems, and needs. With an effective upward flow of information, conceivably through recurrent meetings between government officials and local people, government officials at both local and national levels will be in a position to differentiate policy interventions according to important local variations (Korten, 1980; Pretty and Chambers, 1992; Oakerson, 1999; Ostrom, Bish and Ostrom, 1988). Government officials can improve the upward flow of information about local conditions by inviting stakeholders to participate in policy decision making (Ascher and Healy, 1990; Blair, 2000; Varughese, 1999; Klooster, 2000; Osmani, 2001). When there is a transparent *upward* flow of information, government actors are in a better position to engage in *downward* learning, that is, government officials can learn about the local realities.

3. **Horizontal flow** – e.g., a group of local farmers travel to a neighboring village to learn about how they were able to access technical assistance from a governmental agency. Farmer-to-farmer extension activities represent another example of horizontal learning. Within a local cluster, information barriers are often less constraining, making information sharing within each cluster relatively easy. This internal homogeneity in information makes the possibility to derive information from outside the cluster even more important, as such contacts might generate new ideas and new learning experiences (Chambers et al 1989). The links with the outside may be strong and formal in character, but sometimes weak, informal links can be just as important. Granovetter (1973) recognized the strength of such "weak links" after identifying their pivotal importance in a case

study on job search. Within the perspective of decentralization this means that municipalities should benefit from experience in other municipalities by exchanging information on successes and failures in forestry governance. Such exchange might be facilitated by information sources of the government or meetings of representatives of the municipalities.

The institutional analysis lead us to conclude that if successful municipal governance of forests is to emerge from the Bolivian experiment, the actors at the municipal level need to organize themselves as to share essential information about resource management activities and results. We formulate a hypothesis as to what factors determine whether municipal actors in Bolivia are likely to organize themselves in this manner. Then we test each of the hypotheses empirically using field data from 50 randomly selected municipalities in Bolivia.

Hypothesis 1: Learning and agreeing on rules

The stronger the municipal-level institutions for information sharing between local actors, the higher the perceived quality of municipal forestry services.

Hypothesis 2: Monitoring and enforcement of agreed-upon rules

The more developed the local institutions for monitoring and enforcement are, the better the conditions of the municipality's forests, ceteris paribus.

6. Empirical Methods

To test these hypotheses, we draw on extensive fieldwork in the Bolivian Lowlands, which was carried out in 2000-2001. Fieldwork consisted primarily of in-depth interviews with forestry sector actors in a representative sample of 50 municipalities in the Bolivian Lowlands (which holds two-thirds of the country's forest resources). Interviews were structured to record the different actors' perceptions about the relationship with each other and with other actors, such as central government agencies, forest user groups, NGOs, and private-sector actors operating within the forestry sector.

In each of the 50 municipalities, three different actors were interviewed: (1) the mayor who held office between 1996 and 19993, (2) the municipal forestry officer, and (3) the president of the municipal oversight committee, a group consisting of representatives from the rural communities of the municipal territory. The relationships between the institutional variables and the different outcome variables were then examined using mostly quantitative analytical methods, such as non-linear regression analysis and non-parametric statistics techniques.

[3] The survey used in the interview with the mayor is almost identical to the survey developed by Gibson and Lehoucq (forthcoming) for their research in Guatemala.

7. Results

Why are some decentralized modules more successful than others in the services they provide? This paper suggests that the local modules' adaptive capacity is a critical factor as the local actors must be able to learn what to do and how to do it effectively. The hypothesis is that the conditions for three different types of learning at the local level determine how effective the municipal governance system is. This hypothesis is tested by carrying out a logit regression analysis in which variables measuring the conditions for the following types of learning are included.

1. **Downward learning**

   The conditions for government officials engaging in downward learning about local conditions are associated with the transparency of the upward flow of information. This index was created with variables that measure the frequency of field visits by municipal forestry staff, the amount of time that municipal officers spend in the field every month, the turnover rate of municipal staff, and the municipal forestry unit's access to transportation. This aspect of learning is essential for institutional innovation since the government agent may stimulate other groups to learn as he or she communicates what other local groups are doing and how they have organized themselves. This is an example of how downward learning may lead to upward learning.

2. **Upward learning**

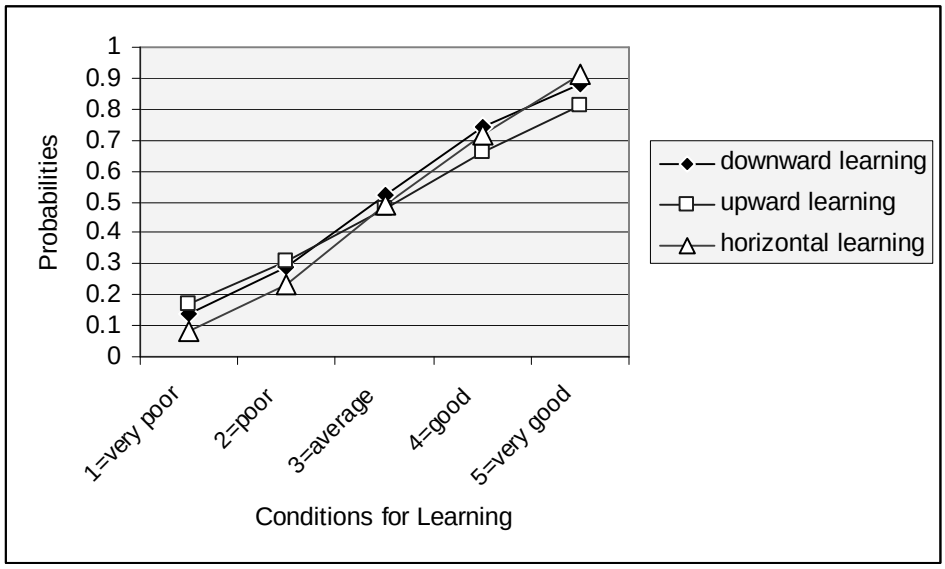
   The conditions for upward learning users learning about government programs, formal rules, and government officials' performance relate to the transparency of the downward flow of information. The upward learning index is composed of variables measuring the frequency of meetings between forest user groups and municipal and central government agency officials concerning forestry issues. The idea here is that the more frequent contacts there are between these actors the more information is exchanged. Such hierarchically vertical information exchange seems essential for making accountability mechanisms work locally (Ribot, 2002; Andersson, forthcoming).

3. **Horizontal learning**

   The conditions for horizontal learning correspond to the predisposition of local actors to learn about each other's activities. This index incorporates variable measures of the frequency of contacts between different municipal governments, and between the municipal forestry unit and other actors that undertake forestry related activities in the municipal territory, such as NGOs, international development projects, as well as central government agencies and municipal governments. Such horizontal learning among municipal-level actors seems essential for coordination and institutional innovation, especially when it comes to addressing management issues that overlap the boundaries of several municipalities.

These variables are five steps ordinal variables that are regressed on the user groups' perceived quality of services in each of the 33 municipalities that provided forestry-related services in 1999. Results in Figure 2 suggest that all three variables are significantly and positively affecting the probability of users perceiving governance success. Also, the modules that had constructed institutions to deal with these problems did relatively well in terms of user satisfaction.

Figure 2. Logit Regression Results on Learning



However, this result says little about the effects of the collective goods on the condition of the forests. Maybe, users wanted less forest and that is why they were satisfied with the municipality's performance. To rule out this possibility, a second empirical test was carried out in which the user satisfaction variable was replaced with a proxy measure for local forest conditions: an index of uncontrolled deforestation.4

Is it possible to discern the ecological footprint of local governance performance? Andersson (2002) set out to do so in a recent study from the Department of Santa Cruz in Bolivia. The author found that when measuring forest conditions in terms of absolute deforestation rates for each municipality (1993-2000), no significant relationship was found between the level of institutional development and deforestation. However, a significant relationship did emerge when crude deforestation rates were replaced by a measure of uncontrolled deforestation rates. This measure was calculated by subtracting the area of government authorized deforestation (in accordance with the official land use plan) from the total deforested area for the time period. The rejection of crude deforestation rates as a measure of forest condition is based on the notion that not all deforestation is necessarily unsustainable. Even though rural sustainability is not just about trees, and while it does include criteria for ecological protection, such criteria have to be put in relation to the social fairness and economic feasibility dimensions of rural sustainability.

[4] For a more thorough analysis of the influence of these aspects of learning on the probability of successful municipal governance of forest resources, see Andersson (2002).

The results of the regression analysis show that there is a significant and negative relationship between the institutional conditions for effective learning and uncontrolled deforestation rates. Municipalities with stronger institutions for dealing with the collective dilemmas associated with forest governance have, on average, a 12 percent lower uncontrolled deforestation rate than those municipalities with weak or missing institutions for learning.

8. Discussion of Results

The institutional analysis suggests that the success of decentralized governance rests on the institutional incentives for exploration and learning. The incentives may be seen as an underlying structure that influences the predisposition of actors to engage in learning. This is not to say that other factors, such as personality and monetary resources, would not also influence the likelihood of successful governance outcomes. In fact, among the 50 cases included in this analysis, there were at least three municipalities in which the local conditions for learning were far from optimal but where the municipal government had achieved considerable success. The success was at least in part attributable to the personal leadership of the mayor and other key actors. On the other hand, there were even more examples of municipalities in which the professional municipal staff and even the mayor were personally motivated to take action in the forestry sector, but where the local conditions were not supportive of taking such action, stifling the municipal actors' intentions to address forestry sector issues. The most common institutional hurdle to successful municipal governance of forest resources was the extremely high turnover rates of both mayors and municipal professional staff. During 2000, the latter had an average professional life expectancy of just 11.5 months (Andersson, 2002). Under such circumstances, not even the most committed and charismatic local leader will be likely to generate much successful results.

The conditions for three different aspects of learning explain why some municipalities are more successful than others. Note that this measure of success is derived from the perception of local community organizations and does not necessarily coincidence with the goals of the national government. With regard to enforcement, we can conclude that municipalities with stronger institutions dealing with collective action problems have less uncontrolled deforestation. The notion of uncontrolled deforestation is important since deforestation itself is not a good indicator of the effect of institutions. Thus the ecological footprint of institutional performance is only detectable if a context-sensitive measure of sustainability is employed.

The analysis illustrates the usefulness of considering a wide variety of cases, rather than just including successful cases, in the analysis. This gives a more robust character to findings and the underlying causal mechanisms. It is important to include both failures and successes in one analysis instead of only gathering impacts of successfully implemented decentralization programs. The factors that seem associated with successful municipal forest governance could constitute the basic building blocks of a national monitoring program, designed to learn about the causes and effects of the decentralized governance experiments.

9. Conclusions

What can we say about the implications of decentralization and the design of future decentralization experiments? The level of governance (the size of the provision and production units) should be defined by the boundaries of the particular problem that one wishes to address. When the scale of the environmental problem, like river catchment areas, goes beyond the boundaries of the municipal territory or whatever administrative unit, that local unit will have difficulties solving that problem unilaterally. The success of solving some problems of natural resource governance rests on the capacity of the system to co-provide and co-produce between different complementary levels of governance– local, regional, and national. For optimal results in a polycentric system, each level of governance produces what they provide and produce best. For instance, in many contexts such as property rights security and regulatory stability, control and coercive enforcement can often not be delivered effectively by local entities alone but require active backup by a credible threat and endorsement from the central powers of government. For accountability to work, checks and balances between different levels of government seem crucial. Incorporating local knowledge and aggregating local user preferences into policies and public services seem most appropriately and efficiently done at the local levels of governance.

We expect that the success of decentralization processes depends on the design of incentives to experiment and learn. Obviously, local successes depend on the abilities of the local actors, but the institutional arrangements provide the opportunities or barriers of entrepreneurs to bloom. Furthermore, policy changes are experiments and may benefit from it by more systematic monitoring and analysis. Institutions at national and international levels need to be developed that can stimulate learning between municipalities and between nations in order to improve our understanding of what are the conditions for successful decentralization processes.

Due to the transitions in socioeconomic development in contemporary Eastern Europe, institutional arrangements have changed significantly. As other chapters in this book illustrate (REF.), there has been a high amount of experimentation of new ways of governance. A new phase in the transition of institutional development will be the expected inclusion of various Eastern European countries within the European Union. This might provide important new opportunities for deriving knowledge and exchanging experience in developing institutions for environmental conservation. However, we also anticipate a potential threads; namely, the central control of the European Union might reduce the opportunity to experiment with new ways of governance. But as we have stressed in this paper, decentralization processes can be successful for environmental conservation if we take into account the notion that it is essential that experimentation is possible and that regions can learn from each other's experiments.

Finally, the IAD framework has proven to be a powerful analytical tool, especially when studying how local contextual variations influence natural resource governance outcomes. For the study of adaptive management, the IAD framework may be favorably used for a variety of tasks such as (1) diagnosing the local context in new sites and using this information to select the sites where the conditions are adequate for participatory action research; (2) identifying conditions conducive to good natural resource governance; and (3) structuring our efforts to monitor and learn about the impact of past and current policy interventions on rural sustainability.

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