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The effectiveness of market-based conservation in the tropics: Forest certification in Ecuador and Bolivia

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ABSTRACT

During the last decade, forest certification has gained momentum as a market-based conservation strategy in tropical forest countries. Certification has been promoted to enhance forest management in countries where governance capacities are insufficient to adequately manage natural resources and enforce pertinent regulations, given that certification relies largely on non-governmental organisations and private businesses. However, at present there are few tropical countries with large areas of certified forests. In this study, we conducted semi-structured stakeholder interviews in Ecuador and Bolivia to identify key framework conditions that influence the costs and benefits for companies to switch from conventional to certified forestry operations. Bolivia has a much greater relative area under certified forest management than Ecuador and also significantly more certified producers. The difference in the success of certification between both countries is particularly notable because Bolivia is a poorer country with more widespread corruption, and is landlocked with less access to export routes. Despite these factors, several characteristics of the Bolivian forest industry contribute to lower additional costs of certified forest management compared to Ecuador. Bolivia has stronger government enforcement of forestry regulations a fact that increases the cost of illegal logging, management units are larger, and vertical integration in the process chain from timber extraction to markets is higher. Moreover, forestry laws in Bolivia are highly compatible with certification requirements, and the government provides significant tax benefits to certified producers. Results from this study suggest that certification *can* be successful in countries where governments have limited governance capacity. However, the economic incentives for certification do not only arise from favourable market conditions. Certification is likely to be more successful where governments enforce forestry laws, provide financial incentives for certified forestry, and provide land tenure security, and where large-scale and vertically integrated forestry operations are commercially feasible. For this reason, at present, there are few developing countries where forest certification is likely to achieve widespread success.

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1. Introduction

The conversion and degradation of tropical forests contributes to both the decline of biodiversity and global warming (Bawa and Seidler, 1998; Houghton, 2005; FAO, 2006). Along with agriculture, cattle ranching, and road construction (Burgess, 1993), unsustainable logging is one of the major causes of tropical deforestation and degradation (Sierra, 2001; Geist and Lambin, 2002). In the past, traditional conservation interventions such as international forest conservation agreements, national forest policy reform, and the

creation of additional protected areas have not been able to significantly reduce unsustainable logging (Gulbrandsen, 2004; Damania and Hatch, 2005). This is partly because many tropical countries lack the resources and governance capacity to effectively enforce forestry and land-use regulations and to provide secure land tenure (Kramer et al., 1997; Smith et al., 2003). As a result, in the last two decades, market-based instruments involving non-state actors, such as forest certification, have been promoted as economically attractive alternatives that are less dependent on public resources and governance capacity and therefore potentially more effective in tropical developing countries (Gullison, 2003; Gulbrandsen, 2004). In this study, we examined the respective roles of market factors and national political and institutional conditions on the success of Forest Stewardship Council (FSC) certification in two tropical countries, Bolivia and Ecuador.

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Rather than assessing actual on-the-ground impacts of certification, we measured “success” through proxies such as certified forest management area and shares of certified timber exports. It has been shown elsewhere (Gullison, 2003; WWF, 2005) that FSC certification does not merely recognize existing good practices in exemplary operations but actually leads to improvements in management practices and measurable biodiversity benefits. We focused on FSC certification rather than competing schemes because FSC standards has received most support by international civil society organisations and are most widely applied in the tropics (Joint NGO Statement, 2001; Atyi and Simula, 2002). It was also the only certification scheme present in the two case study countries when this study was conducted. For FSC certification, third-party organisations (NGOs or private companies) audit forest management practices according to rigorous standards. These standards include protecting old growth forests, threatened species, and important habitat types, restricting harvest volumes, complying with national or international regulations, and ensuring compliance with safety guidelines; and creating employment for local people (Cauley et al., 2002; Gullison, 2003; WWF, 2005). Chain-of-Custody (CoC) certification and an associated label then trace the certified products from forests to end customers through the production chain. Consumers can reward good management practices through preferential purchase or by paying a premium for certified products (Washburn and Miller, 2003).

If successful, certification can provide economic incentives for better forest management by securing a greater market share for certified producers and improving their corporate image (Meidinger et al., 2003; Washburn and Miller, 2003). Moreover, securing long-term economic value of forested land reduces the risk of its conversion to other uses, such as agriculture or cattle grazing, which would cause a much greater loss in biodiversity than sustainable logging (Gullison, 2003).

The original goal of certification was to protect tropical forests. However, today certified logging operations exist mostly in boreal and temperate environments; at present only 17% of FSC-certified forests are located in the tropics (Cashore et al., 2006b). Given the significantly higher need for conservation in tropical forests, it is crucial to understand the factors limiting the adoption of certified forest management in developing countries. Identifying these factors may help to predict the likely success of certification in different countries and to evaluate the realistic potential of forest certification to serve as a global forest conservation strategy. Conservation efforts could then be directed towards either creating favourable framework conditions for certified forestry or, alternatively, promoting certification in countries where these conditions already exist.

Although several studies have examined the socio-economic factors influencing the success of forest certification, such research has been conducted mainly in industrialised countries (e.g., Cashore et al., 2004) where there may be less variability in law enforcement and governance capacity. Moreover, the existing literature on tropical certification focuses largely on either a conceptual analysis of the barriers to certification or on technical issues of certification at a project level (Atyi and Simula, 2002; Gullison, 2003; Richards, 2004). The success of forest certification and other types of certification depends not only on local project level factors but also on a range of macro-economic and political conditions such as access to eco-sensitive markets, conducive governance conditions, and industry structure (McDaniel and Gowdy, 1998). There are remarkably few empirical studies that systematically assess how these macro-economic and political factors might promote or hinder the implementation of forest certification in developing countries. Similar to the approach taken by Cashore et al. (2004) with respect to industrialised countries, in this study

we examine how political and economic framework variables influence the uptake of forest certification in two developing countries. Specifically, we assess factors influencing the economic benefits and (opportunity) costs of certification at the operational level.

The decision for producers and land-owners to switch from conventional logging practices to certified forest management ultimately depends on their evaluation of the relative costs and benefits of certification (Thornber et al., 1999; Gullison, 2003). The potential economic *benefits* of forest certification depend primarily on access to eco-sensitive markets that differentiate and favour certified forest products (CFPs). Although the demand for CFPs has been increasing in Japan, relevant eco-sensitive markets currently exist mainly in Western Europe and, to a lesser extent, North America (UNECE, 2006). The share of a country's timber exports to these two regions could therefore be an important influencing variable for the attractiveness of certification to producers. In addition, national government policies, such as the granting of tax exemptions or other preferential treatment to certified timber producers, could also enhance the potential economic gains from certification. Contrary to earlier hopes, buyers are generally unwilling to pay higher prices for certified wood products (UNECE, 2006).

Several factors relating to domestic policies may in turn influence the costs of adopting FSC forestry standards. Apart from the direct costs of auditing and certification fees, introducing certifiable management practices can entail considerable indirect costs. Logging operations in tropical countries often are poorly planned and do not follow legal requirements due to weak enforcement of forestry laws (Putz et al., 2000). This can lead to unsustainable over-harvesting of resources. Consequently, the “standard gap” (Richards, 2004) and comparative costs between certified and conventional forestry can be high. Moreover, there are greater start-up costs for certified forest management due to greater planning and documentation needs. Therefore, the costs of switching to certified forestry from conventionally practiced logging would be lower if laws were reliably enforced and if legal and certification requirements were compatible. In addition, formal land tenure security and effective protection from squatters or illegal third-party logging would enable forest managers to adopt longer-term planning horizons.

The size of forest management areas also influences the costs of introducing forest certification. Larger forest management areas generally do not have higher auditing or certification fees, which leads to smaller per-unit direct certification costs. Larger management areas also can achieve economies of scale leading to lower indirect costs of certification. For example, monitoring threatened species or establishing access roads to reduce harvesting impacts is relatively less costly in larger operations. Finally, greater vertical integration of the forest industry along the production chain, from land-owner and loggers to processing companies and exporters, reduces the transaction costs of establishing a certified CoC that traces timber from forests to end customers (Atyi and Simula, 2002).

In addition to the costs and benefits of becoming certified, producers can only adopt forest certification if they are aware of its existence, principles, and potential benefits, and if they know about and can access eco-sensitive markets.

In this study, we conducted semi-structured interviews with key stakeholders in the timber industry, NGOs, communities and private forest landowners, government agencies, and external experts, and carried out on-site visits to forestry operations to examine the success of forest certification in Ecuador and Bolivia and to assess how international markets and national policy conditions interact to influence the incentives for forest managers to adopt certified forestry practices. We selected Ecuador and Bolivia for the case

studies because both are low-income developing countries in the same geographical region.

The two countries also provide interesting comparisons regarding the importance of domestic policies and governance capacity. Bolivia has a much greater area of certified forest than Ecuador, even though Bolivia has higher corruption indices, lower per capita income, lower price stability, and other less favourable socio-economic framework conditions. Moreover, Bolivia is a land-locked nation, which increases export costs and thereby provides a less favourable framework for forest certification oriented towards international markets (Smith et al., 2003; TI, 2004; UNDP, 2004). Through this analysis, we hope to evaluate the realistic potential of certified sustainable forestry and identify key barriers that could limit its value as a widespread strategy to improve tropical forest management and protect biodiversity in developing countries (see Putz et al., 2001).

2. Methods

Between January and April 2005, we conducted 78 semi-structured interviews with key stakeholders from government, the timber industry (both certified and non-certified), NGOs, forest communities, and private landholders, as well as with national and international researchers and experts. During this period we were based in Quito, Ecuador and Santa Cruz, Bolivia. These cities are the respective centres of the timber industry in each country and have headquarters for many environmental NGOs, government forestry agencies, and relevant business associations. We interviewed certified ($n = 2$ and 4 , sample size for Ecuador and Bolivia, throughout) and non-certified timber companies ($n = 5$ and 4), communal landowners (in certification process $n = 6$ and 1 ; non-certified = 3 and 4), business associations ($n = 2$ and 2), environmental NGOs ($n = 9$ and 9), official development assistance agencies ($n = 2$ and 1), forestry government agencies ($n = 5$ and 2), national FSC initiatives ($n = 1$ and 1) in Ecuador and Bolivia (total $n = 36$ and 28), and external experts (total $n = 14$). Our sample included 100% and 68% of the total certified area in each country. Stakeholder interviews lasted between 15 min and 4 h (with a mean of slightly below 1 h) and were conducted in Spanish, English, or German. Two-thirds of the interviews were tape-recorded, and all were transcribed and anonymised. During interviews we evaluated a set of indicators pertaining to market or political factors (see first two columns of Table 1), and this information was complemented by an extensive literature review. In both countries, we also visited two forest operations that had achieved or were seeking certification and attended several stakeholder meetings, including a regional FSC workshop, in order to gain a better understanding of the practical influence of certification on forestry governance in the countries and of strategic considerations of different actors.

3. Results

The following information was obtained from interviews or supporting documents.

3.1. Success of forest certification

In Ecuador, only 21,300 ha (0.2% of forests) were FSC-certified under two certificates at the time of this study, and there were also no further CoC certificates among processing companies. The larger of the two certified entities does not produce timber for international markets and consists mainly of plantations (rather than natural forests) that were established as part of a carbon sequestration project of a Dutch organisation. The second certificate in Ecuador is for a small (1,300 ha) plantation located within a patchwork of plots on lands belonging to an agro-industrial firm.

Although timber is only a side product of its overall production, FSC certification complements the company's strategy of demonstrating good social and environmental practices to its international customers. This company is one of the largest banana producers in Ecuador. It is certified as following "good agricultural practices" under a different scheme, and the certified wood is used to produce pallets for exporting the fruits. Given that this effectively represents the only certified wood exports from Ecuador, CFPs represent a minute share of total Ecuadorian timber exports and timber production.

There have been several attempts by NGOs and ODA agencies in Ecuador to implement certified forest management in community projects; however, these have mostly been unsuccessful. At the time of field research for this study, two projects with indigenous communities were in relatively advanced stages and planning to apply for certification in the near term. Another industrial operation, involving 8,000 ha of plantations, was undergoing its final evaluation at the time but has since failed to achieve actual certification. No additional timber companies showed any serious interest in pursuing FSC certification.

Forest certification has been more successful in Bolivia, where 16 FSC-certified operations existed at the time of this study, covering 1.9 million ha of natural forests (mean size of individual certificates = 120,000 ha, max = 365,000 ha). This is almost 4% of the country's forest cover and 22% of the area for which legal harvesting permits existed. Most timber produced in certified operations enters the export market. On a global scale, Bolivia accounts for 38% of all FSC-certified tropical natural forests. In 2004, certified timber accounted for 60% of Bolivia's total wood export value (up from 23% in 2001) (CFB, 2005). The certified area has been rapidly expanding; another concession of 306,000 ha was certified in late 2005, bringing the total area to 2.1 million ha (FSC, 2007). However, some observers expected lower growth rates in the future because most of the well-established large firms had already been certified, whereas many of the remaining forest management areas were managed by companies that were not expected to have the degree of organisational capacity necessary to achieve certification. In addition, there were 23 CoC certificates, of which 10 belong to companies that process wood but do not directly manage forested areas themselves (i.e. purely processing companies) (CFV, 2005; FSC, 2007).

Almost the entire certified forest area in Bolivia exists within privately held concessions in public forests, a land-use option that does not exist in Ecuador (mainly because there is very little public forest left outside of protected areas in Ecuador). At present, there is only one certified community operation in Bolivia, with an area of 26,000 ha in indigenous lands (FSC, 2007). This community received extensive external NGO and ODA support and obtained its certificate in 2004, having only held it for 1 year at the time of this study. One earlier certified community project lost its certificate in 2001 after failing to pass the 5-year reassessment audit (Raessens, 2004). Other community certification efforts ended after the supporting NGOs faced funding constraints. Several timber companies indicated that they had started to build partnerships with communities to work towards certification or intended to do so in the future; however, the feasibility and viability of certification outside of large private enterprises remains to be demonstrated in Bolivia.

3.2. Potential economic benefits of forest certification

3.2.1. Size of eco-sensitive markets

The main markets for wood harvested in Ecuador are domestic (Table 1, Online Supplement). Although no official data on overall timber production are available, clearly less than half of total production is exported. Only a handful of companies export significant volumes of wood products. Ecuador's export markets are

Table 1

Variables and indicators addressed during interviews in Ecuador and Bolivia to evaluate the success of forest certification and identify important framework conditions hypothesized to increase the relative economic benefits or lower the costs of certified forest production (Columns 1 and 2)

Variables	Indicators	Results for Ecuador		Results for Bolivia	
Success of certification	<ul style="list-style-type: none"> – Certified forest area (absolute number and share of total forest cover) – Number of Forest Management (FM) and Chain-of-Custody (CoC) certificates 	Low	<ul style="list-style-type: none"> – 21,300 ha (all plantation) – 2 FM/CoC certificates – 0 additional CoC certificates – 0.2% of total forest cover 	High	<ul style="list-style-type: none"> – 1.9 million ha (all natural) – 16 FM/CoC certificates – 10–23 additional CoC – 4% of total forest cover, 22% of FM area – 60% of timber exports
<i>A) Factors increasing the relative benefits of certified forestry</i>					
Size of eco-sensitive markets	<ul style="list-style-type: none"> – Large export share of country's total timber production (both certified and conventional forest products) – High proportion of exports sold to EU and North America 	Low	<ul style="list-style-type: none"> – Export share unknown (50%?) – 2% EU, 38% North America (52% Latin America) 	High	<ul style="list-style-type: none"> – Export share c. 50% – 27% EU, 51% North America (10% Latin America)
Government support for certification	<ul style="list-style-type: none"> – Official government support for certification – Preferential treatment of certified producers, e.g. tax benefits 	Low	<ul style="list-style-type: none"> – Officially supportive – No effective support 	High	<ul style="list-style-type: none"> – Strong official support – Effective tax measures
NGO and ODA support for certification	<ul style="list-style-type: none"> – Support by NGOs and Official Development Assistance agencies for certification initiatives, companies, and projects 	Low	<ul style="list-style-type: none"> – Isolated projects only 	High	<ul style="list-style-type: none"> – Coordinated efforts, especially at critical time – Supported favourable legal structure, capacity building, pilot projects
<i>B) Factors lowering the relative costs of certified forestry</i>					
Forest legislation and policy	<ul style="list-style-type: none"> – High compatibility of forestry laws with FSC certification – High predictability of future forest legislations and policy 	Medium	<ul style="list-style-type: none"> – Intermediate compatibility with FSC criteria – Highly predictable <i>weak</i> enforcement 	High	<ul style="list-style-type: none"> – High (but variable) compatibility with FSC – Very transparent regulation and control
Quality of law enforcement	<ul style="list-style-type: none"> – Little corruption in controlling agency – Sufficient and secure funding of enforcing agencies – Sufficient number of staff and control posts to monitor legality of timber harvested and transported 	Low	<ul style="list-style-type: none"> – Pervasive corruption – Insufficient funding – Ineffective control system – 4 control posts, no mobile units – Illegal logging widespread 	Medium	<ul style="list-style-type: none"> – Very low corruption – Insufficient funding – Strong controlling agency, effective control system for formalised large industry (about half of production) – 5 control posts, 16 mobile units – Illegal logging substantial and increasing outside formalised industry
Security of land tenure	<ul style="list-style-type: none"> – Existence of clear land titles or usage rights for most timber harvest areas – Low prevalence of squatting by farmers or illegal logging by third parties 	Low–Medium	<ul style="list-style-type: none"> – Formal legal security for most FM areas (widespread corruption in land titling) – Squatting and illegal logging widespread 	Medium	<ul style="list-style-type: none"> – Formal legal security for FM areas – Occasional squatting and illegal logging
Industry structure	<ul style="list-style-type: none"> – Mainly large forest land tenure units or usage rights for most producers (industry, community etc.) – Small number of intermediaries in production chain (low vertical integration) 	Low	<ul style="list-style-type: none"> – <50 ha on average – Very few vertically integrated companies, normally several intermediaries 	Low–High	<ul style="list-style-type: none"> – Highly variable – Concessions >60,000 ha, certified areas ~ 119,000 ha – Majority of FM area managed by vertically integrated firms
<i>C) Information availability</i>					
Information availability	<ul style="list-style-type: none"> – Knowledge of producers about eco-sensitive markets – Knowledge of different actors regarding principles, costs and benefits of certification 	Low (–High)	<ul style="list-style-type: none"> – Variable, low among governments, only high among NGO, ODA, and some companies 	(Low–) High	<ul style="list-style-type: none"> – Variable, high among NGO, ODA, government, and most companies

Findings on variables hypothesized to increase the relative benefits and lower the costs of certified forestry in Ecuador and Bolivia (data from stakeholder interviews and primary literature as of 2005).

predominantly regional, with Latin American countries accounting for 52% of the registered exports, while 38% are sold to North America and only 2% to Europe (AIMA, 2004). With only one exception, all interviewed exporters stated that certification would offer no advantage in accessing existing markets.

Bolivia exports roughly half of its forestry products. Fifty-one percent of these exports are sold to North America, 27% to Europe, and only 10% to Latin American markets (CFB, 2005) (Table 1, Online Supplement). Large companies with forest concessions export 70–80% of their products, while smaller producers and communities have less access to international markets and instead sell their products domestically. Overall, 130 companies export over US\$ 10,000 in wood products annually, with 30 firms accounting for 80% of the total. Interviewees considered certification to be a distinct advantage when selling to European customers, but not in other markets. Overall, 80% of Bolivian exports reached potentially green markets, with almost a third being sold to Europe.

In the past, Bolivia exported the majority of its timber products to Argentina and had a regional export market orientation similar to Ecuador's current situation. However, in 2003 Bolivian exporters were forced to seek out new markets when an economic crisis hit Argentina. This shift occurred at a time when international markets for certified products were emerging and when a radically reformed Bolivian forestry law was introduced. This law presented producers with regulations very similar to those required by the FSC and which were effectively enforced. Another supportive factor was a coordinated effort by NGOs to promote certification, mainly in the context of the "Bolfor I" programme, which focused on capacity building, trade fairs and pilot projects at this critical time (Quevedo, 2006). Many exporters realised that this combination of market and regulatory factors created potential synergies, and they began to target new markets in Europe and North America, where the campaigning efforts of environmental NGOs had created a demand for certified products. As a consequence of these developments, Bolivia now differs from most other South American countries in that it sells a large proportion of timber exports to Europe and North America rather than to regional markets.

3.2.2. Government support for certification

In Ecuador, there is limited awareness about certification among government officials. Moreover, there are no tax incentives for certified forest managers and, aside from rhetoric, no tangible government support for certification. In contrast, in Bolivia, certified concession-holders enjoy tax benefits of 14–28%, which roughly offset direct certification costs. Certified producers are also exempted from government audits, saving them time and money (Contreras-Hermosilla and Vargas Rios, 2002; SF, 2003). In addition, Bolivian government officials have greater and much more detailed knowledge about certification. They also encourage certification efforts by companies because, among other things, the better documentation and more transparent management of certified companies reduce administrative costs, and because the monitoring exemptions directly free up government resources.

3.3. Additional costs of forest certification

3.3.1. Forestry legislation and policy

In Ecuador, all interviewees stated that legal forest management requirements are fairly compatible with FSC certification. The main difference is that certification demands more detailed planning and written documentation (Villacrés, 2004). The additional costs incurred by certified forest production are therefore likely to be slightly greater in Ecuador than Bolivia, where forestry laws have been explicitly designed to be compatible with FSC certification (Quevedo, 2006). The forestry law reform of 1997 in Bolivia was

initiated shortly after the international FSC guidelines were laid out, and several key actors involved in founding the FSC – mainly environmental NGOs – actively contributed to the design of the Bolivian law with the direct intention of facilitating certification. Several legal criteria for sustainable forest management in Bolivia, for example, draw directly on FSC guidelines (Segura, 2004). Most interviewees in Bolivia stated that the planning and documentation requirements for certification were only a minor additional step from those for legal timber production.

In Ecuador, industry and NGO actors suggested that there is little predictability in the direction of future forestry regulation. This is because different government agencies have been responsible for forestry legislation and enforcement, and in recent years Ministers of the Environment, who oversee the National Forestry Agency, have stayed in their posts for an average of only 6 months. This political uncertainty is likely to contribute to Ecuadorian timber companies adopting short planning horizons, whereas management changes needed for certified timber production require long-term planning. In Bolivia, in contrast, the same agency has fairly consistently applied forestry laws since a structural reform in 1997. The semi-autonomous agency is virtually independent of changes in government, and the responsible superintendent has a stable 7-year mandate (Contreras-Hermosilla and Vargas Rios, 2002).

3.3.2. Enforcement of forestry laws

There is generally no effective enforcement of forestry laws in Ecuador, according to virtually all interviewees. Harvesting and transport permits – in theory two integral components of Ecuador's system to track legal timber – are commonly sold illegally and re-used, and corruption in the sector is rampant. It is even common practice for field inspectors to sell pre-approved blueprints of forest management plans for areas they never inspect and on which there may not even be any forest left standing. The National Forestry Agency is severely under-funded and receives an annual budget of under US\$1 million from the Ministry of Environment, a sum barely covering administrative costs. Moreover, there is a significant incentive within the Ministry of Environment itself to maintain high timber harvest levels because two-thirds of the Ministry's annual income comes from stumping and timber transport fees. There are no mobile field units and only four control posts in the entire country, which are staffed by a total of eight people and can be easily avoided using alternative roads. Threats and physical violence against control posts have occurred, and agency staff have reportedly sold previously seized illegal timber for personal profits. There are also insufficient personnel to ensure that harvest plans are followed, check the validity of timber transport permits, or assess the legality of timber arriving at processing plants. Moreover, a data management system to link the timber that arrives for processing to specific transport permits or harvest areas and harvest permits is not operational, making it virtually impossible to filter out falsified or illegally obtained documentation. In practice, most logging is carried out illegally and usually involves several levels of intermediaries (ITTO, 2004; El Comercio, 2005).

In Bolivia, the semi-autonomous Forestry Superintendence exerts a reasonably effective control over the majority of timber production. Corruption within the agency is very limited. Harvest and transport permits are issued following a transparent procedure and are effectively monitored. The Superintendence has an independent income base derived mainly from receiving a third of the fees for harvesting and transport permits. However, funding is nevertheless insufficient for on-site monitoring of operations, partly because municipalities do not contribute their share of resources derived from those fees. At the time of the study, there were only 171 field officers in the entire country, which technically leaves about 637,000 ha of forest in the responsibility of each

officer. In total, there were 16 mobile control units in addition to five fixed posts, which did create a credible deterrent for transports of illegal timber. However, recent funding cuts have greatly reduced on-the-road control (SF, 2004; Quevedo, 2006). In addition, due to funding constraints, control of harvesting activities is mostly restricted to and credible only for large, formally established companies, which also tend to export a greater proportion of their production. In contrast, there is little control over small “informal” producers who are responsible for most illegal logging in Bolivia (FAO and MACA, 2004). Moreover, the very limited planning and documentation requirements for small (less than 200 ha) and very small (less than 3 ha) management areas, intended as a support measure for small producers, has effectively turned into a legal loophole for illegal harvesting (Cronkleton and Albornoz, 2004). The lack of law enforcement regarding small producers also widens the standard gap, lowering their economic incentives to become certified, in contrast to large, formal producers (many of which are exporters). Considering that many of the latter are now certified, complying with official forestry laws in turn has become a prerequisite for a substantial share of producers.

3.3.3. Security of forest land tenure

Despite efforts to formalise and streamline the land-titling process, land tenure and timber harvesting rights are insecure in both countries. Although formal land titles exist for most managed forests in Ecuador, legal titles are often contested and multiple titles for the same land are not uncommon. In addition, assistance by police forces against illegal squatting and logging by third parties is difficult to obtain. Similar issues exist in Bolivia, and concession-holders complain about a lack of support from police regarding the enforcement of property rights. Fortunately, the much larger forest area and lower population densities in Bolivia compared to Ecuador (eight versus 53 persons per km², respectively) (UNDP, 2007) greatly alleviate this problem. Some interviewees in Bolivia were concerned, however, that the movement of Andean immigrants would press the government into redistributing large areas of public land in the forested lowlands, which could undermine the legal security of forest concessions and other land titles (see Fundación Tierra, 2007).

3.3.4. Structure of timber industry

High population densities and high historical deforestation in Ecuador mean that few connected large forest areas remain for which the government could grant concessions. Although no reliable data exist, the average size of forestry units is probably below 50 ha in Ecuador (Echeverría, 2004). The size of forest management areas is highly variable in Bolivia; however, extensive concessions exist in state forests and indigenous territories, and the average sizes of industrial and certified concessions are approximately 60,000 and 123,000 ha, respectively (CFB, 2005; FSC, 2007). The greater size of certified forest management areas is in itself an indication of the importance of economies of scale in the implementation of certified practices.

Timber supply chains in Ecuador are highly fragmented. Due to the small size of forest management units in Ecuador, processing companies are forced to source most of their timber through several intermediary suppliers. Even larger companies own very few forests or harvesting rights. Substantial transaction costs would thus have to be incurred to establish the controlled CoC required for certification.

In contrast, Bolivian concession-holders, which account for most of the country's forest management area, are mostly large, vertically integrated companies that export the majority of their production (FAO and MACA, 2004). Within Bolivia, 30 companies account for 80% of timber exports. These companies can establish direct control over their whole supply chain, making CoC

certification feasible. However, small companies in Bolivia have limited capacity to harvest their own timber. Like Ecuadorian companies, these companies source their timber through intermediaries, and most communities leave even the harvesting of their timber to third parties. Overall, small management areas and fragmented supply chains make certification more costly to implement for producers in Ecuador than in Bolivia. Similarly, within Bolivia the costs of certification are greater for small producers with fragmented supply chains than for large companies managing their own forests.

3.4. Availability of information on certification

In Ecuador, only companies exporting at least a portion of their production were aware of eco-sensitive markets. Even though none of the large Ecuadorian timber companies are certified, exporters seemed to have a basic understanding of FSC certification and appeared to have no difficulties obtaining related information. In Bolivia, most large certified and non-certified companies had detailed knowledge about FSC certification. Bolivian exporters (over 100 firms) actively monitored markets for CFPs. However, knowledge about certification was limited among non-exporting firms, with several interviewees holding overly optimistic views of the size of eco-sensitive markets. The Bolivian Forestry Chamber and environmental NGOs are important information brokers for CFPs and jointly operate an online data exchange to link certified producers with interested buyers. There was greater awareness of forest certification among small producers and forestry communities in Bolivia than in Ecuador. Environmental and development NGOs were generally well-informed in both countries; however, NGOs in Bolivia had more realistic views concerning certification's costs and benefits than their Ecuadorian counterparts. In Ecuador, very few government officials possessed detailed information about forest certification, whereas this knowledge is widespread within the Bolivian Forestry Superintendence and beyond.

4. Discussion

4.1. Framework conditions for a success of certification

Our study illustrates how policies, economics, and industry structure interact to influence the profitability and feasibility of certified forest management in Ecuador and Bolivia. We show that several factors influencing the costs and benefits of certification differ markedly between the two countries, as well as – within Bolivia – between small producers and large, formalised industries. This paper thereby provides the first comparative country-level case study exploring success factors for forest certification in developing countries.

In Bolivia, a combination of forest policy reform, stricter enforcement, and changes in export markets fortuitously occurred during a time when certification was gaining international momentum. This created both “pull” (market demand) and “push” factors (greater enforcement) that led numerous forest managers to make economically rational decisions to switch to certified forestry. Meanwhile, industry structure and in particular the size of forest management units do not represent hurdles for implementing certifiable practices. In Ecuador, in contrast, extremely weak forestry law enforcement and rampant corruption, along with the small size of forest tenure units and fragmented supply chains, have contributed to a general culture of destructive and illegal logging. For almost all producers in Ecuador the standards gap to certification is thus too significant to make additional investments for sustainable production worthwhile.

A number of variables influence the potential and actual success of certification in Ecuador and Bolivia. The two most important

factors in our study seem to be the quality of law enforcement in the forestry sector and the availability of large, homogenous forest management areas. These two factors can help create other conditions that enhance the potential economic benefits of certification. For example, predictable and effective law enforcement may encourage companies to seek out eco-sensitive markets that reward the costs of certification through preferential purchase or a price premium. Larger forest management units may promote vertical integration of timber production, which can enhance the industry's international competitiveness and thereby lead to a greater share of the production being exported, partly to eco-sensitive markets. In Bolivia, it is difficult to assess the relative importance of effective law enforcement and large forest management units for the uptake of certification because these factors co-vary: large producers are more closely monitored by the government and also happen to be more likely to seek and achieve certification.

Additional research could help to assess the wider applicability of our results, particularly regarding how national policies that shape the effectiveness of law enforcement also influence the success of market-based conservation in tropical countries. In our study, stricter enforcement for larger Bolivian producers corresponded with a higher uptake of certification; however, it is unclear what the effect of higher regulatory scrutiny alone might have been. It may be instructive to compare countries with similar levels of law enforcement that have had different success in certification, or to compare Bolivia to a country such as Indonesia (Muhtaman and Prasetyo, 2006), where large forestry concessions exist but law enforcement is weak.

4.2. Certification as an effective approach for tropical forest conservation

The findings of this study point to the important interactions between market-driven environmental governance and environmental law enforcement by the state. Although demand for certified wood is growing, price premiums have rarely materialised as of yet. Thus, current eco-sensitive markets do not appear to be sufficient to widely promote forest certification on their own. In many industrialised countries, effective enforcement of forestry regulations leads to a small gap between actual forestry practices and certification standards. Consequently, there are small opportunity costs to conforming to certification standards. In contrast, poor environmental law enforcement in most developing countries – the original impetus for non-state market-driven forest certification – arguably creates a formidable hurdle for certification.

Nevertheless, several examples from Ecuador demonstrate that even with poor law enforcement, under certain conditions a small number of producers may find certification economically attractive. Such conditions can be an extremely strong market pull, for example when traditional customers begin to insist on certified products, or the assumption of certification's costs by third parties in externally funded projects. However, these mechanisms can only lead to insular effects and are unlikely to have significant impacts on a larger scale.

Similarly, concerns about a green corporate image usually are of sufficient importance only to international producers that are active in Europe and North America, whereas such considerations are still largely irrelevant in the domestic context of most developing countries. However, the one example from Ecuador involving a globally active agro-business with FSC certified plantations indicates that, for companies with a vulnerable international standing, image gains can be a crucial factor in their decision to become certified.

Forest certification currently does not appear to be a universally applicable, effective international conservation tool. In our study, even under conditions of relatively effective forest law enforcement

in Bolivia, certification seems to be an attractive land-use option only for large industrial operations. This seemed to be due to the better ability of these companies to access eco-sensitive export markets and to lower transaction costs of implementing controlled supply chains. This is a concern in Bolivia and other tropical countries where small-scale logging is responsible for a substantial share of forest degradation and conversion (Geist and Lambin, 2002; FAO and MACA, 2004). Moreover, demand for sustainable wood is currently restricted to only a handful of countries. Even in Western Europe, the region with the strongest demand for certified wood, the market share for CFPs is still below 5% (UNECE, 2006). Even if this number were to increase, this would only affect a small portion of all timber traded internationally and would have no impact on the significant share of wood products consumed domestically in tropical countries (see Sierra, 2001).

It is important to remember that destructive logging is only one of many drivers of forest degradation and conversion (Geist and Lambin, 2002). For example, in South America, agricultural expansion is the main cause of deforestation. It is still indirectly supported by subsidies and other policies, and can be more lucrative than forest management. This creates high opportunity costs for any kind of forest management, whether certified or not. Therefore, in order for certified forestry to succeed, it must not only be competitive compared to conventional forestry, but also to other types of non-forestry land uses.

Despite these limitations, forest certification clearly has other significant "indirect" environmental benefits that are not captured by the pure number and extent of certified forests. In Ecuador and Bolivia, as well as many other tropical countries (Cashore et al., 2006a) certification contributes to fostering a constructive discussion about forest governance and destructive logging practices, increasing awareness of sustainable management alternatives, and enhancing the dialogue and cooperation between environmentalists, timber producers and buyers, and governments.

5. Conclusion

Effective conservation relies on identifying and implementing appropriate interventions in the context of specific socio-economic or ecological conditions (Brooks et al., 2006). This study sheds light on the necessary framework conditions for a particular market-based conservation strategy. The success of forest certification in Bolivia demonstrates that, under certain conditions, certification can thrive even in the challenging socio-economic and political environment of developing countries. It is promising that certification of natural forests has been more successful in Bolivia than in any other tropical country, although, at the time of this study, Bolivia scored less favourably than Ecuador regarding corruption indices (TI, 2004), average income, human development, dependence on official development aid, and price stability (UNDP, 2004).

Markets do not work in isolation from public policy; instead, both interact in multiple ways. In the same way as a poor policy framework can stifle market-driven conservation, the right policy signals can lead firms to seek out green markets. In turn, market benefits can provide the critical marginal incentives for private actors to comply with legal frameworks. Moreover, certified producers can be expected to lobby for additional policy incentives, such as tax cuts, that do not only affect them but that create spillover effects for the whole industry. Since certification involves direct control of sustainable and legal forest management by private actors, more certified areas also mean that states can effectively deploy resources for monitoring and enforcement capacity elsewhere. In sum, forest certification is an example of how private environmental rule-making does not supplant hierarchical regulation but can effectively complement it and thereby play an important role in global environmental governance.

To enhance the amount of forests managed in an ecologically and socially sustainable manner, our findings suggest that conservationists should focus on countries with promising framework conditions in their efforts to promote certification. Conservationists also need to confront the dilemma of certification being most feasible in jurisdictions where an adequate governance framework is already in place, despite the fact that these are often the areas with least deficiencies in forest management. In addition, environmental organisations and international development assistance agencies should consider allocating more resources towards addressing the necessary policy and market conditions instead of project-based interventions. Furthermore, given the obvious challenges of complying with complex certification rules and of competing on international markets, it appears sensible to better engage with companies that manage large forest areas for export production and to re-evaluate the long-term economic feasibility of certification in the context of community forestry (see Molnar, 2003).

Overall, conservationists need to have realistic expectations about the potential of forest certification and other market-based strategies to improve management practices on the ground. Certification is clearly no silver bullet, but could be a valuable tool in a comprehensive conservation strategy for tropical forests, which would also include enhanced environmental law enforcement, effectively implemented and ecologically-minded land-use planning, expanded protected area networks, and agricultural policy reforms. Importantly, a comprehensive forest conservation strategy must not be limited to the forestry sector itself but instead address all drivers of deforestation and forest degradation.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found in the online version, at [doi:10.1016/j.jenvman.2008.05.003](https://doi.org/10.1016/j.jenvman.2008.05.003).

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