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Transaction cost theory of the firm and community forestry enterprises

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ABSTRACT

The share of production and processing acquired by community forestry enterprises (CFEs) in the forest products and service industries has increased considerably in developing countries. This paper is a review article that analyzes the importance of both vertical integration and governance of economic activity for communities aiming to benefit from commercial forestry. Transaction cost economic theory serves as a basis for the analysis. Organizational forms, also known as governance structures, set order and provide for mutual gain in commercial exchanges between parties. One of the most important tasks of economic governance is to reduce transaction costs stemming from opportunistic behavior from one or both of the transacting parties. Governance structures exist in a continuum with the market and the firm at opposite ends of the spectrum. A 'firm-type' organization is only one possibility in a continuum of enterprise governance structures. The Mexican experience with CFEs corroborates the existence of a range of governance forms that exhibit some of the characteristics described by TCE theory. The paper reflects on the transaction cost implications of these governance structures for a range of vertical integration levels in Mexican CFEs.

1. Introduction

Community forestry approaches have moved beyond their experimental stage to becoming consolidated alternatives to traditional government control and industrial management of forest resources (Barry et al., 2003). Transfers in forest tenure to families and communities through the process of devolution have been accompanied by a growing predominance of forest production and processing by communities and smallholders in the forest products and service industries (Molnar et al., 2011). This has been the case in Bolivia, China, Guatemala, Honduras, India and Mexico (Macqueen and Team, 2010) and Peru, Ecuador, Burkina Faso, Gambia, and Papua New Guinea (Donovan et al., 2006).

Antinori and Bray (2005:1529) referred to market-oriented community forest enterprises as "historically rare birds", but there has been growing interest worldwide in the application of business-oriented community forestry (Donovan et al., 2006). They have been promoted by governments, NGOs, and development agencies as a way of supporting poverty-reduction and conservation strategies by increasing economic incentives for sustainable forest management by forest-dependent people (Kozak, 2007).

Key features of CFEs include (Macqueen and Team, 2010):

a) a focus on commercial exchange of goods for profit not simply subsistence;
b) representation in management of the interests of the whole community and distribution of benefits in line with these interests;
c) 'community' being self-defined both in terms of people and area.

In contrast with vertically integrated industrial models of forest management, it has been argued that CFEs have micro-economic characteristics with multiplier effects in rural economies that translate into more skilled jobs, higher incomes, higher consumption and better terms of trade (Macqueen, 2012).

The creation of increased income and employment opportunities from the commercialization of timber depends to a large extent on the ability of communities to capture value added in the supply chain. A community's degree of participation in the value chain is reflected in its degree of vertical integration (VI) (Ezzine de Blas et al., 2009). Although vertical integration is not a measure of success in forest management, it can reflect organizational stability, levels of community participation and control of forest resources, existence of sound financial management structures and adequate ecological practices which are all success measures in community forestry (Barsimantov, 2010). It is not surprising then that a lot of the literature on CFEs has focused on the conditions that enable communities to capture value from their forests through VI, and VI's effect on poverty alleviation and local development. For example, Ezzine de Blas et al. (2009) look at a stratified sample of 20 community forests in Cameroon and find that lack of technical skills, excessive distance to markets, competition from industrial loggers and the intensity of external help they receive is limiting their ability to capture value added in the market chain, making the contribution of community forests to local development sub-optimal. Farmers in

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Eastern Amazonia have developed a vertically integrated local industry that is highly dependent on family ties, good neighbor relations and trustworthy partners in economic exchanges (Sears et al., 2007).

Mexico has a particularly rich experience with vertical integration in community forestry. In his analysis of 11 communities with different levels of VI in forestry production in Oaxaca and Michoacan, James Barsimantov (2010) suggests that strong community governance is a necessary but not sufficient precondition for vertical integration and that strong interactions with NGOs are critical. Antinori (2000) finds that the combination of a range of mechanical skills in forestry previously available in the community, higher resource endowments and history of participation in the federal concession system favors the probability that communities will form a CFE and integrate downstream. In general, the literature looking at vertical integration in community forestry enterprises associates higher levels of VI with greater commercial control by communities of forest resources, higher incomes, and therefore more benefits to be distributed among participants, some of which would be invested in forest maintenance and protection. It is also assumed to reflect greater stability, cohesion, and participation among community members.

There is benefit in understanding not only the process of vertical integration and its triggers but also the forms of economic organization required to govern new economic activity and to distribute its benefits. Transaction cost economics (TCE), a branch of new institutional economics, suggests that the process of vertical integration is accompanied by the formation of governance structures that have efficiency implications in terms of reducing transaction costs. Transaction costs are the result of one or both parties in an exchange being opportunistic and wishing to make additional rents from a transaction. Parties bargain, haggle, search for information and monitor each other in order to protect themselves from this opportunism. These activities are costly. Vertical integration will eliminate transaction costs, but VI must be governed through new forms of organization or governance structures. These governance structures present trade-offs and no single governance structure can possess all of the advantages of the others without costs.

The application of TCE to community natural resource management is not new and has proven to be of great value in understanding specific issues in community forestry. TCE has been used to analyze the size and distribution of transaction costs incurred by forest users (Adhikari and Lovett, 2006; Meshack et al., 2006) and for understanding the conditions under which vertical integration is an efficient decision to predict vertical integration levels for community forestry enterprises in Oaxaca, Mexico (Antinori, 2000). However, the insights that TCE provides about economic organization have not yet been applied to the analysis of organizational structure in CFE's nor the implications that these structures have for transaction costs faced by communities engaging in commercial forestry activity.

Existing information on the Mexican CFFs reveals the existence of a variety of forms of economic organization in community forestry enterprises (Antinori and Rausser, 2010; Antinori and Bray, 2005). In general, three forms of governance have been identified: individual level extraction and sales, work groups, and community enterprises. Humphries (2010) finds similar patterns in CFEs in Quintana Roo, southern Mexico: individual, workgroup, and 'ejido' level commercial activity. Taylor (2005) describes transitions between these three governance structures in the state of Durango. Understanding what types of organization are possible for governing different levels of VI can shed light on how community natural resource management interacts with the market and adapts to both its demands and community preferences.

The aim of this article was to review the literature on TCE and CFEs and use this as a basis for a descriptive classification of CFE economic organization based on transaction cost economics. It serves as a departing point for design and diagnosis of research in this area of community forestry.

2. Transaction cost economic theory of the firm

Economic theory attempts to understand firms by asking when it pays off to be part of a single organization or an atomized buyer or seller. Theories on the existence of firms date back to Adam Smith who argued that the division of labor within a firm led to specialization and skill enhancement through learning by doing, thus increasing productivity. However he did not consider that productivity could be enhanced even with workers acting as self-employed contractors (Hodgson, 1998). In 1937, Ronald Coase proposed in his landmark paper 'The Nature of the Firm' (Coase, 1937) that there are inherent costs to transacting in the market as a means of exchange and that the creation of firms economizes on these costs. Firms replace the coordination mechanism of the market with that of an organization led by a manager. There is efficiency to be gained from such a replacement. This was the first mention of transaction costs and their relationship with organization: organization can be explained to a large extent as an effort to minimize transaction costs.

The process of replacement of the external market with internal coordination is known as vertical integration. Under some circumstances it may be a good option for a buyer to make use of specialized skills available in the market and hire a seller to provide particular goods and services (Antinori, 2005). However, a buyer may decide to self-provide those goods and services if the costs of transacting in the market are particularly high (Antinori, 2005). TCE lays out very specifically when to vertically integrate and avoid market transactions: when one of the parties in an economic exchange could behave opportunistically and engage in rent-seeking behavior. When the costs of protecting oneself from this opportunistic behavior through the negotiation, writing, monitoring and enforcement of contracts i.e. transaction costs, are prohibitive then VI is the best option.

Markets and firms are two ways in which exchange can be governed, and which governance mechanism to use will depend on the level of transaction costs. This introduces a key concept of TCE: governance structure. Governance structures are continuous, not discrete choices, they exist in a continuum with the market at one extreme and the firm or hierarchy at the other extreme. In between lies a range of possibilities, including long-term contracts or hybrids. Governance is "the means by which to infuse order, thereby to mitigate conflict and realize mutual gains" (Williamson, 2003).

Governance structures possess different types of properties and have associated costs and benefits. This is where TCE makes one of its most important contributions in the understanding of organization. Market and hierarchical organization share some basic properties and the differences between governance structures lie in the levels of these properties. The main properties for economic governance structures are: adaptive or coordinated action, incentive intensity (ability to motivate people), administrative control, and the dispute settlement mechanisms (Bigelow, 2010; Williamson, 1991a).

The ability to motivate people is high in markets because participants do appropriate streams of net receipts almost instantly and no other party can make legitimate claims to these gains (Williamson, 1991b). Markets are said to possess 'high-powered' incentives. In the case of firms, the process of market replacement with managerial control introduces a set of complexities into the growing organization. Parties contributing to team production cannot expect direct retribution for their effort as in high-powered systems because in cooperative processes of production it is difficult to measure the respective contributions of parties to a transaction (Maitland et al., 1985). Changes in effort have little or no immediate effect on compensation, hence in hierarchies incentives are said to be flat or low-powered (Williamson, 1991a).

In markets, price changes reflect demand and supply changes which lead independent consumers and producers to adapt their behavior accordingly. Price is the only determinant of the final transaction and any other aspects of the transaction are non-negotiable (Hobbs, 1996). This

is known as autonomous adaptation: adaptations for which prices are sufficient information (Williamson, 1991b). The firm on the other hand is an organizational construction with its own set of adaptive capacities that can be set in contrast to those of the market (Williamson, 2005). Resource allocation is conducted through administrative exercise. Hence, firms are said to possess high cooperative adaptation. Markets and hierarchies also differ in terms of their dispute settlement mechanisms. If market exchange is used, any dispute resolution would take place in courts through reliance on contract law (Bigelow, 2010) which can be costly. Hierarchy solves disputes through internal, administrative mechanisms (Bigelow, 2010). 'Administrative control' refers to the use of an administrative apparatus (monitoring, rewards, penalties, surveillance mechanisms) to promote coordination (Folta, 1998; Williamson, 1991a). Administrative control mechanisms are necessary to align the behavior of parties with the interests of cooperative action.

Therefore a 'firm-type' organization is only one possibility in a continuum of enterprise governance structures. The world is populated by different nuances of the three generic governance structures, market, hybrid and firm. Governance structures are aligned with a set of transactions and their associated costs. When transaction costs are low, the market is usually preferred, but when they are high, a shift towards hierarchy is warranted.

3. Mexican CFEs through the lens of TCE organizational theory

3.1. Community forest enterprises in Mexico

Large land transfers from state and private hands to local communities known as 'ejidos' and indigenous 'comunidades' have laid the foundation for the Mexican forestry sector and CFEs (Antinori and Bray, 2005). The Mexican constitution of 1917 recognized these two forms of rural property as well as national ownership of lands (Bray, 2005). The Agrarian Reform sets limits and controls over what ejidos and comunidades could do with these lands: agricultural lands retained individual usufruct rights and forests remained common use areas (Barsimantov et al., 2011). Mexican CFEs have developed complete vertical integration of production processes into a community enterprise, from production to processing and finally marketing (Bray, 2005). They are renowned for combining community governance traditions with enterprise forms (Antinori and Bray, 2005). Basic community governance structures obey the format prescribed in the Mexican Constitution with Comisariado de Bienes Comunales (CBC) in *comunidades* and Comisariado de Bienes Ejidales (CBE) in *ejidos*, with a vigilance committee (CV) elected by a General Assembly composed of official community members (Antinori and Rausser, 2010). However, community governance is distinct from economic governance, as will be described in the following section.

3.2. Application of TCE theory and concepts to community-forestry enterprises in Mexico

The following section will analyze the governance structures of CFEs identified by studies in Mexico using the concepts from TCE developed in Section 2. Antinori and Rausser (2010) find great internal variation in organization and management in CFEs. An important conclusion from this section is that a CFE may take on several organizational forms that can display some of the properties identified by TCE theory. However, organizational forms are also the local response to particular problems, therefore representing a unique structure that mixes both economic and social variables. They also have equity and efficiency implications (Antinori and Bray, 2005).

3.2.1. Distinct forms of economic governance and their properties

Different stages of vertical integration can be managed in many ways (Antinori and Rausser, 2010). Organizational forms implemented by forest communities to manage forestry activities range from individual appropriation of timber to group all the way to communal or 'ejidal' level forms (Taylor, 2005; Humphries, 2010; Antinori and Rausser, 2010; Antinori and Bray, 2005).

3.2.1.1. Individual. This is known as individual harvesting. Individuals are responsible for arranging business contracts and harvest arrangements. Individuals appropriate the timber on their land but operate under a community management plan coordinated by a forester. Individuals organize informally from year to year to conduct extraction and sales efforts. In some cases, individual forms of appropriation appear to be a 'next stage' of work groups for decentralized control of the flow of forestry benefits.

Individualized forms of production have higher incentive intensity than work-group or community forms. The seller accrues the net benefits from any transaction net of payments to anyone hired for extraction or coordination services almost immediately, and no other party can claim any form of appropriation over these net receipts. Individual landholders do not need to go through any kind of hierarchical mechanism to seek for authorization of sale price. They deal directly with buyers and sometimes negotiate advances with the buyers who must be authorized by the CBC. In individualized systems, individual stakeholders have a greater proportion of timber income. One would predict individualized production to have high autonomous adaptation since individual parcel holders will contact buyers on their own with little bargaining power.

3.2.1.2. Work group. Work groups devolve decision-making power over production and sale of timber to independent subgroups of 'ejidatarios' (ejido members). Work groups may form based on family affiliations or friends and may represent other non-forestry interests. Work groups elect or appoint a leader within the group and divide among individual parcels the annual authorized logging volume from the management plan on a proportional basis. The flow of benefits is appropriated by the groups and then individually. Work groups may subdivide further into annexes.

Workgroups are the result of a dissolved, community-level CFE which is reorganized into self-organized groups that operate as independent subcommunal private groups that log assigned volume (Bray and Merino-Pérez, 2002). Workgroups are the solution to conflicts over the administration of communal funds (Wilshusen, 2005; Antinori and Rausser, 2010; Humphries, 2010). There is a complex mix of high-powered and low-powered incentives that varies between workgroups and communities. The formation of workgroups has achieved higher appropriation of the gains from commercial activity by community members, net of direct costs paid by group leaders (Antinori and Rausser, 2010). Workgroup organization schemes in which the forest has been parcelized to individual households have been able to assign the most economic benefits to individual possessors (Taylor, 2005). The specialized activities of forest-planning and timber harvesting have forced some workgroups to adopt low-powered incentives systems that resemble those of ejido enterprises. Since these activities require specialized positions at specific times during the year many workgroups hire select members with technical capacity to carry out these jobs.

3.2.1.3. Community-level production. Community-level production tends to overlap with the traditional community structure. In Mexico it is the most common form of production. A leader is appointed to take charge of forestry activities sometimes with the appointment of additional managers and serves as contact for potential buyers (Antinori and Rausser, 2010). Timber production activities are organized at the community level; contracting sales, extraction, processing and distribution of revenues from forestry occur with decision-makers who represent the entire community. The CFE is formed to administer the flow of timber from the resource that is considered communal property. There is no individualized ownership. Community level organization has been

associated with issues of corruption, inefficiency, and takeover of decision-making by ejido elites.

Community enterprises have low-powered incentives. The flow of benefits from forestry is divided among community members only after the sale of timber (Antinori and Bray, 2005). Individual members of the ejido can be employed in the enterprise and are compensated through wages but there is no direct appropriation of timber benefits as in the preceding cases.

This set of governance structures may not be exhaustive and it is possible to encounter a combination of structures within one community. For example, Antinori and Bray (2005) found that in at least four ejidos of the Union de Ejidos Forestales de Tamaulipas, half of the members of the communities divide the annual authorized logging volume into proportional amounts that are then individually logged, while several work groups manage the rest of the volume. Although the community enterprise model is sometimes deemed as an ideal type with others to be avoided, sub-communal forms of organization appear to be functioning (Bray, 2003).

3.2.2. Governance, vertical integration and transaction costs

As mentioned in Section 3.2.1, economic governance in Mexican CFEs is a hybrid of both economic and social factors. Although ideally, TCE theory suggests that as vertical integration increases, more hierarchical forms of organization are required to coordinate production, the Mexican experience suggests that it is possible to have any variety of organizational modes for different levels of vertical integration (Antinori and Rausser, 2010). The following discussion will analyze how different forms of governance tackle on the typical transaction costs faced by communities engaged in commercial forestry.

3.2.2.1. Transaction costs of commercial community forestry. Participation in the timber industry and its markets exposes communities to different forms of opportunistic behavior from timber buyers because external service providers control the quality of harvesting practices, marketing of goods, and jobs (Antinori, 2005). A crucial element of community forestry is the community's ability to align a contract relationship with its monetary and non-monetary objectives, this in turn affects the size of transaction costs (Antinori, 2005). CFEs may decide to address some transaction costs or not, depending on whether it affects their access to other valued timber and non-timber forest benefits.

Major sources of transaction costs for communities stem from opportunistic behavior from external service providers. Conventional logging practices can cause severe ecological impacts on residual forests, which also have considerable economic consequences in terms of watershed protection, carbon sequestration, harvest of non-timber forest products and conservation of biological diversity (Holmes et al., 2002). However, the behavior of logging service providers is notoriously difficult to monitor and they often exploit this advantage (Leffler and Rucker, 1991). This imposes high transaction costs for communities that negotiate with logging companies and can lead to considerable conflicts and hold-ups. In Cameroon, nonrespect or difficulties in setting up a logging contract with an industrial operator is among the top 10 conflicts of community forestry (Ezzine de Blas et al., 2011). Benneker (2008) finds that in Bolivia, CFEs that outsource the entire management plan lose power to interfere with logging activities and have difficulty guaranteeing that logging activities are done within the frame of the law; this has made the outsourcing of logging activities unattractive to CFEs. Distance to the forest and size of the forest stand can also inflate transaction costs, as in Bolivia where these factors affect the monitoring activity to the point that it becomes "costly, tiring and hardly ever done" (Benneker, 2008:179). When enforcement is lax and they are not held responsible for irregularities committed by private enterprises, communities will let private enterprises do all logging and management activities without any oversight (Benneker, 2008).

Additionally, monitoring logging activity can require technical knowledge to indicate exactly what must be monitored and identify potential breaches. This is especially true in communities that have decided to engage in sustainable forest management practices and reduced impact logging. Opportunistic behavior from contractors can also occur when CFEs must rely on external providers for necessary equipment and services (Benneker, 2008), and must supervise their behavior closely for hauling, transportation and milling (Pacheco, 2012). Other forms of transaction costs faced by CFEs include information costs, since communities may be heavily reliant on outsiders such as NGOs to access market information or the information is controlled by industry and traders; and price bargaining and negotiation in markets that tend to be dominated by a few companies and buyers who exercise considerable influence over the final price (Pacheco, 2012). The presence and magnitude of these transaction costs will change depending on the different products being sold, the environment in which the CFE operates (markets, enforcement of existing regulations) and the monetary and non monetary benefits that communities value in their forests.

3.2.2.2. Experimenting with different forms of governance for the same product. As mentioned previously, the harvesting activities of logging companies impose considerable transaction costs on communities in terms of monitoring. This type of transaction cost is highly relevant for communities that engage in the sale of stumpage or standing timber. The context in which the CFE operates will wield strong influence on transaction cost size, for example whether a community practices sustainable forest management and reduced impact logging, whether compliance with forest management plans is enforced and non compliance is costly, and whether non-timber forest products are harvested both for livelihood consumption and sale in local and outside markets. In such cases, community-level production may attenuate transaction costs and keep logging practices in line with local community interests more effectively. For example, Mexican CFEs with community-level production have an organizational structure that supports long term forestry activity, with Jefes de Monte (JM) or forest foremen, managers, documenters and logging foremen as positions in the enterprise (Antinori and Rausser, 2010). The Jefe de Monte (JM) oversee extraction while documenters are hired to measure and keep records of extracted volumes. The buyer also hires a documenter who works in conjunction with the community documenter. Maintaining both the JM and documenter positions within the community structure, with oversight from the CBC or CV, offers advantages in terms of keeping the JM's and documenter's work in line with the community's interests as they are also paid by the community. Through community governance, the funds from timber extraction flow through to pay for a personnel engaged in monitoring and oversight. The costs of monitoring in this case are spread among the community, and there can be additional benefits such as poaching and fire control, as well as integrated forest management practices.

As the mode of organization shifts towards the individual, forest management decision-making and the burden of transaction costs fall on workgroups and finally on the individual possessor (*parcelero*, *dueno*). When workgroups have a stake in sustainable management of the forest, there will be an incentive to preserve the forest's integrity and will monitor contractor behavior. Some workgroups organize forest management activities much like ejido enterprises with JMs and documenters as part of a long-term structure with the task of overseeing forestry activities. However conflicts do arise because in sub-community forms of organization groups and individuals can make resource-related decisions sometimes to maximize their own benefits. Negotiations between forestry technicians and groups can be an expensive and conflictive task, and hence a considerable source of transaction costs for work group organization. Some workgroups with highly individualized timber activities (such as Canela in Durango, (Taylor, 2005)) face the additional complicated task of monitoring harvesting practices of multiple buyers for several individual possessors, with the additional complexity of having to align individual holder interests

with group and community interests. In some cases, individual possessors pressure community foresters to mark more trees than allowed even if it violates the established management plan (Taylor, 2005).

Individual owners who decide to sell timber to an outside contractor are responsible for harvesting and business arrangements (Antinori and Rausser, 2010). Factors affecting the decision of an individual possessor to engage or not in monitoring and oversight include: the size of the parcel and its distance from where the landholder lives; the value the individual owner places on sustainable forestry and other monetary and non-monetary benefits of the forest; the costs of not complying with the forest management plan; and community pressure to guarantee sustainable harvesting practices. Depending on these contextual factors, an individual possessor would need to take on the costs of oversight, with the possibility that the contractor may be willing to take on these costs and pay for foresters and documenters, which could create conflicts of interest. Antinori and Rausser (2010) find in their research that JMs in communities either do unpaid work or can be paid by communities, whereas documenters can also be paid by buyers or *parceleros*. JMs can keep deals between individual landholders and logging contractors in line with community interests, whereas documenters paid by the possessor can ensure that loggers are not engaging in opportunistic behavior and extracting more timber than negotiated.

In general, as the production of standing timber becomes more atomized through groups or individuals, communities face the challenge of monitoring the behavior of not only multiple buyers but also multiple landholders, who are given priority in resource-related decision-making (Taylor, 2005) and who may have an incentive to engage in opportunistic behavior themselves and extract more timber than permitted by the community. Sub-community organizational forms could lead to fragmentation of forest management and unsustainable harvesting practices. This is particularly true when the responsibility of forest management is left to individual and group buyers. However, there are examples where sufficient trust among community members exists for individual parcel holders to respect the common forest management plan and harvest only what is permitted in a kind of "sustainable logging covenant" (Bray, 2003:8).

Community-level organization could also be strategic when it comes to the costs of bargaining and negotiating prices with buyers of standing timber. Antinori and Rausser (2010) find that the relationship between internal organization and trade price is statistically significant. Community-level and workgroup CFEs have higher price premiums although other factors such as location and specific contract agreements also come into play. When it comes to the sale of timber, community production holds an important advantage over other forms of organization in which division leads to a greater number of sellers competing for prices in a scenario of few buyers with a strong influence over price determination. Given the fact that communities have the sole rights over forestlands, logging companies do not have the option of upstream integration (Antinori, 2005). Unlike many individual sellers, a community organization can exert cartel-like powers over price and other variables in a contract with an outside buyer. This could be applicable for all products, including roundwood and sawnwood. Some buyers may also find that negotiating with multiple groups is costly, and could pressure for a single negotiator even if it means paying a premium. Humphries (2010) finds that some work groups in Quintana Roo reverted to selling at the ejidal level because buyers faced higher transaction costs when they had to negotiate prices with individual groups instead of ejido leadership.

If a CFE decides to harvest the timber on its own and move it to a patio for buyers to collect it, it will require specialized equipment (such as tractors, skidders, winchers) to engage in the sale of roundwood, the next step in vertical integration. Any CFE wishing to produce roundwood must either own the equipment to carry out the necessary tasks or hire the equipment. The sale of roundwood usually involves felling and debranching trees and loading and transporting the processed logs. Road construction into the forest is also necessary. If a CFE decides to hire the necessary machinery, it must deal with service providers who are in control of the quality of the equipment. Depending on the availability of such providers and the types of relationships developed with them, high transaction costs can be incurred in negotiations between these providers and communities. CFEs in Bolivia for example have refrained from selling processed trees because dealings with external providers cost more than the additional benefits (Benneker, 2008).

In the case of Mexico, community level organization tends to have more investments in forestry equipment (cranes, trucks, tractors) although the difference with work group investments in this area is less marked than with individualized modes (Antinori and Rausser, 2010). Community-level organization for roundwood production can be advantageous in that it owns the equipment, therefore eliminating the service provider and the associated negotiation costs. Although some workgroups in Quintana Roo have also managed through collective action to purchase equipment and provide the necessary maintenance and repair others have not (Wilshusen, 2005). Some workgroups work with the remnants of what were once the assets of a community-level CFE and find it hard to obey rules established to service and maintain these assets. This forces workgroups wishing to sell roundwood to at least hire the necessary machinery if available, with little control over its quality or functionality.

Individuals wishing to sell roundwood would also need to either own the equipment for processing felled trees or rent the equipment, facing similar transaction costs to those of workgroups. However, a single individual would not face the problems of collective action faced by workgroups, making it feasible to own equipment and provide maintenance so that productivity is not affected.

The sale of sawnwood eliminates the transaction costs associated with monitoring and oversight of harvesting and logging practices typical in the sale of stumpage and roundwood, but introduces a different set of transaction costs that hinge on quality issues. Classification systems are a key component in the production and sale of sawnwood and lumber. Classification allows buyers to purchase the type of wood most suited to their needs and gives them confidence that they will receive the same class every time they purchase, regardless of who sells it (Forster et al., 2004). Buyers are willing to pay premiums for pieces of certain sizes, classification, and additional value adding such as kiln drying. Sawing activity is highly technical, requiring specialized skills that can make a considerable difference in terms of productive efficiency, the quality of product, its classification and therefore prices fetched. Done incorrectly, sawing will generate high amounts of waste that affect efficiency and pieces of lesser quality that will not meet the specifications of buyers.

Community-level production in Mexico includes qualified sawmill managers and timber volume measurers to oversee milling activity. Quality control is within the enterprise and in the hand of managers who control the activity of sawmill operators and other staff. A sawmill manager can apply the necessary quality standards and formalized training that enable consistency in production. Oversight can also control the production of waste and its associated losses. A community-level organization would still incur on transaction costs derived from negotiations and bargaining with potential buyers. Opportunistic buyers may attempt to gain rents by negotiating with communities that are unfamiliar with criteria used in determining prices, but a community-level CFE that has developed and retained this knowledge would be less susceptible to buyers wishing to exploit on this weakness.

Workgroups in Mexico have experimented with sawnwood production by contracting services, including sawmilling, among themselves. They are in fact service providers to each other. In this case, transaction costs in terms of assuring quality standards and waste minimization emerge. A workgroup of timber owners who hire a sawmill workgroup to perform milling services would need to ensure that waste is reduced to a minimum and that quality specifications are met. Some workgroups have hired a sawmill manager who derives his salary from profits attained and hence increases short-term efficiency (Wilshusen, 2005).

This is a way of creating incentives to assure better wood processing techniques that materialize into higher price premiums. Others have a sawmill manager to oversee processing but hire their own crews to do the milling (Wilshusen, 2005). Depending on the markets and availability of logs of a certain diameter and characteristics, other transaction costs may emerge. For example, export markets that are very stringent on quality require newer sawmills with sophisticated technology and know-how that tends to be specific to that particular market. Supposing that a workgroup is able to purchase the correct machinery to satisfy the market and operate it successfully, the group that owns the sawmill may be tempted to engage in haggling and rent-seeking because it is the only one able to provide the correct processing service to the timber owners. On the other side, timber owners could also behave opportunistically if they are the only ones able to provide logs of the correct dimension and characteristics to the existing sawmill.

The previous section has discussed the typical transaction costs faced by communities engaging in forestry activities. The list does not intend to be exhaustive. The types of transaction costs incurred and their magnitude will depend on specific contexts such as the product being sold, the benefits that communities value from their forests, the types of markets where a CFE is selling (international, local) and enforcement of regulations regarding forest management. The main challenge for communities is to align contract relationships in the production and exchange of a particular product, with community preferences for monetary and non-monetary benefits derived from the forest. Transaction costs lie in the way of this alignment. The different organizational forms of production with which Mexican CFEs experiment, can address some of these transaction costs, although cases in which organization becomes more atomized, new transaction costs may arise. When individual owners are given priority in resource management decisions, this could compromise integrated and sustainable forest management and community interests in general. However, if a group or individual has a stake in sustainable use of the forest, a motivation will exist to align any contract relationships with that objective.

4. Conclusions and policy implications

This paper has discussed the importance of vertical integration for communities aiming to benefit from commercial forestry. It reviewed what economic theory has to say regarding vertical integration and the forms of economic organization, or governance structures that set order and mutual gain in commercial exchanges between parties. One of the most important tasks of economic governance is to reduce transaction costs stemming from opportunistic behavior from one or both of the transacting parties.

Governance structures exist in a continuum with the market and the firm at opposite ends of the spectrum. A 'firm-type' organization is only one possibility in a range of enterprise governance structures. The Mexican experience with CFEs corroborates the existence of a variety of governance forms that exhibit some of the characteristics described by TCE theory. Although the community-level enterprise, with both stocks and flows of the timber resource managed as communal property, has been conceptualized as an 'ideal' or 'classical' type the other governance forms are a response to local and market needs (Bray, 2003). In this sense, they are more complex than TCE theory would predict, because they are the product of both economic and social factors. These governance forms can occur at any of the different levels of vertical integration.

In analyzing these situations, a clear distinction is required between differences in the nature of activities incorporated that are driven by transaction costs versus those driven by governance structures. There are various economic factors that might cause communities to integrate or outsource certain activities, such as lack of skills, access to markets, or different income strategies. For example, internalizing sawnwood production and avoiding the market for roundwood are driven by transaction costs but an ejido that used to sell sawnwood but disaggregates to work groups that sell roundwood may be the result of internal politics or other factors.

Communities that want to benefit from commercial forestry face considerable transaction costs in their relationships with external service providers and buyers. Opportunistic behavior from buyers and contractors to secure additional rents can occur at all levels of vertical integration. Governance structures have the task of taking on these transaction costs and aligning contracting relationships between CFEs and their commercial partners. Although sub-community forms of organization can and are functioning, they can face additional complexity. When groups or individual landholders are given priority in resource-related decision-making, they can also behave opportunistically and seek to reap additional group or individual benefits from commercial exchanges. This can add to the transaction cost burden, which is already considerable given that timber and related-product markets are dominated by few and powerful companies and buyers. In community-level organization, individuals are not given the opportunity to defect from the collective, and are not able to negotiate individually to benefit from exclusive commercial exchanges with buyers. The CFE is able to concentrate and focus on its relationships with commercial partners and deal with the transaction costs of those exchanges.

As mentioned previously, the context in which CFEs operate can have considerable impact on the nature and size of transaction costs. More detailed information and analysis on typical transaction costs for specific markets and products, and experiences of different governance structures with these markets are required. An important question to be answered would be whether certain markets, be they local or international, with their specific institutions, are more suited for certain governance structures than others. Are workgroups or community-level organization both able to produce sawnwood for international markets with the same level of success? Domestic and local markets for example tend to be more lenient towards quality, which favors smallholders and communities running small-scale and low intensity forestry operations (Pacheco, 2012) which could represent an opportunity for individual holders wishing to sell at higher levels of vertical integration such as sawnwood. Future research must also build on the work done by Antinori and Rausser (2010) on how these governance forms fare in terms of certain outcomes of interest, such as public goods investments, health of forest resources, participation, and per capita share of benefits from forestry.

Community forestry enterprise programs around the world emphasize the acquisition of technical, managerial and organizational capacity, business skills and certification in order to promote 'success' in these CFEs. There is also a strong drive for vertical integration. Forcing a particular organizational structure or pushing for value adding within the CFE could result in inefficiencies that reduce the benefits accruing to the community as a whole. Given that Mexican CFEs have embraced opportunities to reorganize and adapt organization both to market and local needs, they represent a valuable opportunity to understand the key design principles for the promotion of CFEs in different contexts around the world.

References

Adhikari, B., Lovett, J.C., 2006. Transaction costs and community-based natural resource management in Nepal. J. Environ. Manage. 78, 5–15.
Antinori, C.M., 2000. Vertical Integration in Mexican Common Property Forests. University of California.
Antinori, C., 2005. Vertical integration in the forestry enterprises of Oaxaca. In: Barton-Bray, D., Merino-Perez, L., Barry, D. (Eds.), The Community Forests of Mexico: Managing for Sustainable Landscapes. University of Texas Press, Austin.
Antinori, C., Bray, D.B., 2005. Community forest enterprises as entrepreneurial firms: economic and institutional perspectives from Mexico. World Dev. 33, 1529–1543.
Antinori, C., Rausser, G.C., 2010. The Mexican common property forestry sector. CUDARE Working Papers. University of California, Berkeley.
Barry, D., Campbell, J.Y., Fahn, J., Mallee, H., Pradhan, U., 2003. Achieving significant impact at scale: reflections on the challenge for global community forestry. CIFOR Conference on Rural Livelihoods, Forests, and Biodiversity, Bonn, Germany.

Barsimantov, J., 2010. Vicious and virtuous cycles and the role of external non-government actors in community forestry in Oaxaca and Michoacán, Mexico. Hum. Ecol. 38, 49–63.
Barsimantov, J., Racelis, A., Biedenweg, K., Digiano, M., 2011. When collective action and tenure allocations collide: outcomes from community forests in Quintana Roo, Mexico and Petén, Guatemala. Land Use Policy 28, 343–352.
Benneker, C., 2008. Dealing with the State, the Market and NGOs: The Impact of Institutions on the Constitution and Performance of Community Forest Enterprises (CFE) in the Lowlands of Bolivia. Wageningen University.
Bigelow, L., 2010. Beyond make-or-buy: advances in transaction cost economics. In: Free, R.C. (Ed.), 21st Century Economics: A Reference Handbook. SAGE Publications, Inc., Thousand Oaks, CA.
Bray, D., 2003. Mexican community forestry: perspectives on common property enterprises and asset building. International Conference on Rural Livelihoods, Forests, and Biodiversity, Bonn, Germany, CIFOR; Bogor.
Bray, D.B., 2005. Thematic introduction: can common property regimes alleviate poverty? Markets and their absence in the common property literature. In: Robson, L.M.A.J. (Ed.), Managing the Commons: Markets, Commodity Chains and Certification. The Christiansen Fund, Palo Alto.
Bray, D.B., Merino-Pérez, L., 2002. The rise of community forestry in Mexico: history, concepts, and lessons learned from twenty-five years of community timber production. Report Prepared for the Ford Foundation.
Coase, R.H., 1937. The nature of the firm. Economica 4, 386–405.
Donovan, J., Stoian, D., Macqueen, D., Grouwels, S., 2006. The Business Side of Sustainable Forest Management: Small and Medium Forest Enterprise Development for Poverty Reduction. Overseas Development Institute (ODI).
Ezzine de Blas, D., Ruiz Pérez, M., Sayer, J.A., Lescuyer, G., Nasi, R., Karsenty, A., 2009. External influences on and conditions for community logging management in Cameroon. World Dev. 37, 445–456.
Ezzine de Blas, D., Ruiz-Pérez, M., Vermeulen, C., 2011. Management conflicts in Cameroonian community forests. Ecol. Soc. 16, 8.
Folta, T.B., 1998. Governance and uncertainty: the tradeoff between administrative control and commitment. Strateg. Manag. J. 19, 1007–1028.
Forster, R., Arguelles, A., Aguilar, N., Kaatz, S., 2004. In: TRL, T.R.L. (Ed.), Opciones y Barreras de Mercado para Madera Aserrada de Michoacan, Oaxaca, Guerrero, Campeche y Quintana Roo, Mexico.
Hobbs, J.E., 1996. A transaction cost approach to supply chain management. Supply Chain Manag. Int. J. 1, 15–27.
Hodgson, G.M., 1998. Competence and contract in the theory of the firm. J. Econ. Behav. Organ. 35, 179–201.
Holmes, T.P., Blate, G.M., Zweede, J.C., Pereira Jr., R., Barreto, P., Boltz, F., Bauch, R., 2002. Financial and ecological indicators of reduced impact logging performance in the eastern Amazon. For. Ecol. Manag. 163, 93–110.
Humphries, S., 2010. Community-based Forest Enterprises in Brazil and Mexico: Timber Production and Commercialization Models, Market Engagement, and Financial Viability. University of Florida.
Kozak, R.A., 2007. Small and medium forest enterprises: instruments of change in the developing world. Rights and Resources Initiative Washington, DC, USA.
Leffler, K.B., Rucker, R.R., 1991. Transactions costs and the efficient organization of production: a study of timber-harvesting contracts. J. Polit. Econ. 1060–1087.
Macqueen, D., 2012. Recommendations for a market-led approach to community forestry in Myanmar. Report of an Advisory Mission, 3–16 December IIED Forest Connect Pyoe Pin Programme UK aid Sida.
Macqueen, D., Team, T.L.-F., 2010. Building Profitable and Sustainable Community Forest Enterprises: Enabling Conditions. International Institute for Environment and Development, Edinburgh, UK.
Maitland, I., Bryson, J., Van de Ven, A., 1985. Sociologists, economists, and opportunism. Acad. Manag. Rev. 10, 59–65.
Meshack, C.K., Ahdikari, B., Doggart, N., Lovett, J.C., 2006. Transaction costs of community-based forest management: empirical evidence from Tanzania. Afr. J. Ecol. 44, 468–477.
Molnar, A., France, M., Purdy, L., Karver, J., 2011. Community-Based Forest Management The Extent and Potential Scope of Community and Smallholder Forest Management and Enterprises. Rights and Resources Initiative, Washington D.C.
Pacheco, P., 2012. Smallholders and communities in timber markets: conditions shaping diverse forms of engagement in tropical Latin America. Conserv. Soc. 10, 114–123.
Sears, R., Padoch, C., Pinedo-Vasquez, M., 2007. Amazon forestry transformed: integrating knowledge for smallholder timber management in eastern Brazil. Hum. Ecol. 35, 697–707.
Taylor, P.L., 2005. New organizational strategies in community forestry in Durango, Mexico. In: Barton Bray, D., Merino-Perez, L., Barry, D. (Eds.), The Community Forests of Mexico: Managing for Sustainable Landscapes. University of Texas Press.
Williamson, O.E., 1991a. Comparative economic organization: the analysis of discrete structural alternatives. Adm. Sci. Q. 36, 269–296.
Williamson, O.E., 1991b. Strategizing, economizing, and economic organization. Strateg. Manag. J. 12, 75–94.
Williamson, O.E., 2003. Examining economic organization through the lens of contract. Ind. Corp. Chang. 12, 917–942.
Williamson, O.E., 2005. The economics of governance. Am. Econ. Rev. 95, 1–18.
Wilshusen, P., 2005. Community adaptation or collective breakdown: the emergence of "work groups" in two forestry Ejidos in Quintana Roo, Mexico. In: Bray, D.B., Merino-Perez, L., Barry, D. (Eds.), The Community Forests of Mexico: Managing for Sustainable Landscapes. Texas University Press.