Economics of transaction costs saving forestry

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Abstract

Following the arguments concerning the problems of traditional forest economics in Putz (2000), this article shows that transaction cost economics can overcome some of the shortcomings of the main stream forest economics. The public forestry, subsistence forestry, non-industrial private forestry, China’s share-holding forestry, and their revolutions are analyzed by the relative transaction costs of labor, capital, land and forest products. Potential implications of transaction cost economics in forest policy, including regulated access to commons, sustainable forestry criteria, ecological certificates and land tenure decentralization, have also been discussed. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

“Economics of home grown forestry” by Franciz Putz (2000) in this journal challenges main stream forest economists. I intend to advance discussions using transaction cost economics. The concept of transaction costs originated from Coase (1937) where he investigated why firms exist and found that firms emerge to organize whenever their costs were less than the costs of carrying out transactions through the market. This theory has been subsequently developed by Coase (1960), Alchian and Demsetz (1972), Cheung (1969, 1983), Williamson (1975, 1985), among others. Transaction costs can be distinguished from production costs, which is the cost category with which neo-classical analysis has been preoccupied. North (1990) divided the total costs of production into transformation costs, the costs of inputs of land, labor, and capital involved in transforming the physical attributes of a good, and transaction costs, the cost in defining, protecting, and enforcing the property rights to goods.

Transaction cost economics provides a very useful tool to understand several seemingly unrelated and non-economic issues: the law, ethics, organization, governments, family, state. Unfortunately, it has been applied only in a very limited number of forestry studies (e.g. Leffer and

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Rucker, 1991; Geodecke and Ortmann, 1993; Wang and van Kooten, 1999; Zhang, 2000a). The Putz article collectively identified that various opportunity costs should be used in evaluation at various management regimes, but he did not use the concept of transaction costs. ‘Home grown forestry’ has its basis both in institutional economics as has been discussed in many important works (e.g. Commons, 1934; Knights, 1965; Williamson, 1985), and in the specific nature of silviculture as will be briefly discussed in the following section. Then, I will use public-owned forestry, subsistence forestry, non-industrial private forestry, and the currently popular shareholding forestry in China to show that transaction cost economics help to explain that many problems exist in the traditional economic analysis.

2. The nature of silviculture

Traditionally, comparative advantage is examined by means of the relative cost of the inputs and technology. Clague (1991) presents an interesting model of comparative advantage using the institutional approach. He separates commodities and services into two groupings as ‘self-contained’ and ‘non-self-contained’. ‘Self-contained’ production does not benefit much from an elaborate division of labor that would require coordination within large organizations or across firms. The operations of restaurants, taxicabs, low-class hotels, barber shops, repairing services, and even agricultural production may be classified as ‘self-contained’. He argued that less developed countries (LDCs) have a comparative advantage in the production of primary products because many of these production processes are ‘self-contained’.

It is quite clear that silviculture is in the category of a primary industry. However, unlike many other primary industries, it is not ‘self-contained’ as can be seen from the following points:

1. Trees and forestland are both immobile and slow-maturing. Brokensha and Castro (1984) and Bruce (1986) argue that planting trees more closely resembles the digging of a well or the construction of a fence than the planting of annual crops because the value of the investment is regained quite slowly. There is a strong positive relationship between the security of tenure and the willingness to invest in tree-planting. The security of tenure relates not only to political stability and the tenure applied, but also to the status of theft and protection against theft (more about on property rights and theft, see Barzel (1997)).

2. Since many forest products are environmental goods and services, it is sometimes costly to delineate and transfer the property rights. They may be more easily exposed to the public domain. Free rider problems come from the costly transaction costs. Many environmental goods are public goods (or at least mixed public and private goods) — with characteristics of non-rivalry in consumption and difficulty in exclusion. The transaction costs involved in trading environmental products may be high compared with the production costs.

3. Difficulties arise in evaluating and monitoring the silviculture activities because they are less standardized than factory work, or even the work in the agriculture. The quality as well as quantity of the silviculture can only be accurately evaluated after a long period of time. Difficulty in evaluation is also caused by the difficulty in measuring elements of the natural environments, such as soil, water, temperature, etc. So we may not able to correctly identify the contributions from the labor or from the natural factors. Consequently, moral hazard (alternatively, monitoring cost) could be serious by the use of hired labor or by team work, particularly when the work is conducted manually.1

The nature of silviculture causes the transaction costs of hiring, monitoring labor, getting capital and marketing the products to be relatively high. Therefore, silviculture is not “self-contained”, and suffers some disadvantages from market exchange. The socio-economic history before industrialization to a large extent is a history of the

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1 The moral hazard basically comes from information problems and an inflexible labor market (see, for example, Holmstrom, 1982; Dong and Dow, 1993).
evolution of the relationship between land and crops, and contractual relationship between owner of labor and owner of land and capital (see, for example, North and Thomas, 1973; Smith, 1975). The evolution of forest land tenure and persistency of public forestry, community forestry and household forestry can be well explained by the transaction costs.

3. Transaction cost saving forestry

3.1. Public-owned forestry

Public ownership\(^2\) is often justified by arguing that forests have multiple functions that conflict with the single product objective that provides profits to most private owners. However, the high share of public forests in the world can be better explained by looking at transaction costs. If we say property rights in public ownership are less well defined\(^3\), the ambiguous property right arrangement results in less market-oriented exchange as well as non-market controlling, which means less cost required in defining and transferring the property rights.

Community forests are very important in most LDCs because the transactions of the labor, capital, as well as forest products through markets, are relatively costly. The labor and capital are often rooted within the community. The interests of a community are more homogenous, collective actions and non-market exchanges are easier to conduct. Ostrom (1986) argued that groups arise when the user population lives close to a resource and is relatively small, supply is moderately scarce compared to demand, and is subject to multiple uses requiring management and coordination.

As populations grow and economic development takes place, population migration becomes more common, the individual interests become more heterogeneous, trees and land are more subject to rapid exogenous changes — settlement by outsiders and logging by local and multinational firms. Consequently, non-market exchange within community become most costly, the forest ownership becomes worth being devolved into private ownership. In most DCs, community forestry is shrinking\(^4\), but still persists.

3.2. Subsistence forestry and non-industrial private forestry

The economic reasons behind forest managed by subsistence farmers in LDCs have been well elaborated in Putz (2000), among others. Off-farm employment, risk aversion, means of investment and non-market products seem to be the most important reasons. One could perhaps interpret these as forms of transaction costs. Self-sufficiency (home grown) forestry is chosen when the transaction costs are larger than the gain from market exchange.

The non-industrial private forests (NIPFs) in industrial countries are essentially also transaction costs saving forestry. It is generally believed that NIPFs have lower economic efficiency than industrial private forests (e.g. Doll and Orazen, 1978; Cubbage, 1983). In Finland, some attempts have been made to circumvent the partitioning process. It was proposed by the Finnish Forest 2000 program that the partitioning of NIPF holdings into

\(^2\) Most public forests are state-owned, meaning that only a small share is owned by municipalities, communities, villages and other public entities below national level. We should note that this distinction is arbitrary. It is often the case that state and local communities share the same forests.

\(^3\) It should be noted that property rights in public ownership are not necessary ambiguous for all ‘bundles of property rights’. Public ownership is found in almost all city parks. But the ownership of the city parks in land is never ambiguous. They only leave some of the rights (for instance walking in the parks) to the public domain.

\(^4\) Some community forests seem still competitive in some DCs (see Carlsson 1999 about Swedish community forests), but we cannot deny the fact that community forests had been decreasing in the last century. Presently, community forest management has been receiving attention. The reason is the increase in demand and value of environmental products from forests. Trading of environmental goods and services through markets is still costly, so community forests regain some advantages. Of course, some institutional innovations do help the survival and the competitiveness of community forests. Similarly, some private forests are purchased by states for nature reserves.
units smaller than 10 ha should be made illegal, but this has never been implemented in practice (Ripatti, 1996). NIPFs are generally less efficient only when viewed from the perspective of mainstream microeconomics without considering transaction costs. Table 1 explains the economic reasons for NIPFs. We should note that the capital, labor (techniques), wood product markets have been well developed, their transactions become less costly in most DCs, and it might become less economic to own NIPFs for purely investment and employment purposes, but more likely for recreation purposes. The number of NIPF owners is increasing, but holding size is decreasing (Ripatti, 1996). This fact might support this hypothesis because building a summer house does not require large forests, while other recreation such as hunting, strawberry collecting and walking in the forests are open to everyone in Finland and many other countries.

Big wood-based processing firms, like pulp and paper mills, often prefer to have their own trees and forestland to provide raw materials, or at least they have long-term contracts with some forest owners. A convincing explanation could be the transaction of timber through the markets is more costly than other products, therefore, in-house supply of raw materials is favored.

3.3. China’s share-holding forestry

McMillan et al. (1989), Lin (1992) and Wen (1993), among others, support the claim that decollectivization (privatization of land-use rights) was the major reason for the growth of agricultural output in China from the late 1970s until the early 1980s. In forestry, similar reforms have been carried out and also have helped forest development. However, the positive effects on forest management are still limited and vary from place to place (e.g. Yin and Newman, 1997; Zhang et al., 1999, 2000). Several concrete reports (e.g. Ruiz-Peres et al., 1999; Kant and Chiu, 1999) on the positive impacts on forestry are about economic forests (e.g. fruit-trees) and bamboo in southern China. We must keep in mind that economic forest and bamboo are more agriculture than silviculture.

Compared with privatization in agriculture, the share-holding system is growing more popular and acceptable in forestry (see Song et al., 1997). As argued above, the costs associated with defining, protecting and transferring property rights in trees, land and products are much higher in forestry than in agriculture. The agricultural land is also never well defined; however, farmers have little doubt about harvesting their annual crops and the land-use rights under the contracted years (1–5 years in the beginning, 10–20 years recently). While it is much more uncertain in the distributed or contracted forestland and trees, this was particularly true during the early period of economic reforms. The privatization of agricultural land immediately promoted agricultural development, both reflected in farmer income from agriculture and outputs, while the privatization of forestland immediately promoted the early harvesting of the existing trees, but not investment in the contracted land. It is generally believed that the early economic reforms in forestry were the third largest cause for destruction of forests, only after the Great-Leap-Forward in 1958 and the Cultural Revolution (1966–1976).

Political uncertainty is only one aspect (same as in agriculture), exposure to theft is another important aspect for silviculture. Farmers hesitate to plant and manage forests because a significant cost is required to prevent illegal trespass and logging. According to MOF (Ministry of Forestry) (1992), there were one million people employed to prevent illegal logging, of which more than one-third were full-time jobs in the early 1990s. Another 200 000 officials were employed in jobs associated with designing and implementing regulations, assisting in setting disputes associated with forest property rights. From these figures, we can imagine how big the costs for protection are. Even with these massive efforts, illegal logging is still rampant due to nature of the trees, the lack of laws, policing forces, and widespread poverty. According to MOF (Ministry of Forestry) (1996), there were 144 000 lawsuits on illegal trespass and logging in 1995. This figure is clearly only small share of real happenings.
<table>
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<tr>
<th>Factors</th>
<th>Conditions of using markets</th>
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<tr>
<td>Labor owner</td>
<td>(value for potential employer) − (value by self-employment) &gt; transaction costs of labor</td>
<td>(i) Since it is more costly when only part-time in transaction (the transaction costs also can be divided into fixed and variable costs), the relative transaction costs for searching jobs (or hiring) are relative high for relative short work time, farmer and periodically unemployed workers are more likely to own some NIPFs. (ii) The opportunity cost of occasional and self-chosen time could be very small, even negative: the work may be for recreation. Minimum wage (or prevailing wage level) is irrelevant for this category of work. Investment in NIPFs is unlikely very attractive, but still better than the deposit interest rate, or more secure. The prevailing interest rate (loan)-based criterion of investment may not be very well grounded for NIPFs.</td>
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<tr>
<td>Capital owner</td>
<td>(value for potential user) − (value by own-use) &gt; transaction costs of capital</td>
<td></td>
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<td>NIPF owner (the land owner)</td>
<td>(value for potential buyer) − (value for holding) &gt; transaction cost of the land</td>
<td>(i) High taxation existing between the land transaction leads to higher transaction costs. (ii) Transaction costs are relatively lower between relatives; it is quite often that NIPFs are transferred between relatives who become new NIPF owners rather than between strangers and private industrial forest owners. (iii) The value of cultural and heritage of the forests for the current owner is often higher than potential buyers.</td>
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<td>Products consumers</td>
<td>(Production cost for the consumers) − (Production cost for the producer) &lt; transaction cost of the product</td>
<td>(i) The transaction of recreation goods (e.g. weekend or holiday in the forests) is still costly and the demand for the products is increasing rapidly. It is not difficult to imagine how costly it is to go through the stages of searching, contacting, negotiating and implementing of the exchange on these products, such as renting a house in the forests. Especially, the demand for the recreation is frequent. (ii) Recreation products cannot be moved, do not have standards. Asymmetric information is serious (e.g. see Akerlof, 1970).</td>
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<td>Multi-factors owner and consumer</td>
<td>$\Sigma$(value for others) − (value for own use) &gt; $\Sigma$(transaction costs)</td>
<td>Many NIPF owners have multiple objectives (e.g. Bliss and Martin, 1989; Kuuluvainen et al., 1996), and own multiple input factors and demand multiple products from forests. NIPF is the exact form resulting from optimisation of choosing market and non-market areas for the multiple inputs and outputs.</td>
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Illegal extraction in forests, particularly distributed forests that were from previously community-owned, is often regarded as less criminal than theft in agriculture because historically trees are considered ‘wilderness’ and were once community-owned, while agricultural crops are more obviously planted by households. Organized illegal logging by one community on another community-owned forests is not rare. A tree worth one month’s work may be stolen without a big risk of being caught and with no serious penalty if caught, thus illegal logging is difficult to prevent. The economic reforms have not reduced the number of crimes in general, and the number of illegal logging crimes in particular.

The rural market institutions are also generally sufficient for agriculture. The still poor capital and labor markets cannot seriously impede small-scale household agriculture. Transfer of contracted agriculture land was not officially allowed between farmers, but this in practice was usually permitted by informal institutions, even at the earliest time of economic reforms. Most agricultural products can be easily traded on the local rural market, or even in nearby cities. However, silvicultural investment requires much more secure capital market, and the outputs require more distant markets.

It is exactly because of the transaction costs that the share-holding system prevails after two decades of reforms. There are several forms of share-holding systems across China. A typical form is to convert certain forests within the community into monetary shares which are then evenly redistributed between households in relation to family size. These shares were defined as ‘basic shares’ or ‘initial shares’, which can be inherited or transferred, but cannot be withdrawn by any holder. Later, a new type of share was issued in return for investment of labor and capital. These are known as an ‘added share’ or ‘investor share’, which are permitted to be withdrawn. A shareholding committee is then formed, and an executive is elected to take charge of the company.

The share-holding system stands between the private forest ownership and traditional community forest ownership. It can save some transaction costs in: (1) defining and distributing the trees and land (as discussed above, it is not a easy task to value and mark, particularly monitor the boundaries of trees and land); (2) protection of the trees owing to its scale and internal-cross-monitoring; (3) transaction of capital (it is less costly within a more integrated group (Ben-Porath, 1980; Williamson, 1985)); (4) job searching (or labor hiring) for the periodically free labor besides their private agriculture; (5) marketing timber product due to its scale and information and solving the conflicts regarding environmental issues within the community.

The problems of the share-holding system, such as unnecessary bureaucracy, and lack of incentive, are also obvious. Its evolution into a more market-oriented system is unavoidable when the socio-economic environments change. Some evidence has already shown leased-contract and open-auction to individuals are becoming important ways of land tenure changes in recent years.

4. Final conclusions

Regarding the relatively large magnitude of the transaction costs to production costs in forestry, transaction costs need to be seriously considered in evaluation of forest management and formulating forest policy. For instance, the most widely suggested policy remedy for ‘the tragedy of the commons’ is to change open access to regulated access. Another is to strengthen institutional regulations of the commons. However, whilst the benefit of change from open access to regulated access has been widely recognized, the cost is often neglected. Building such institutions is not costless. The costs of ownership, or termed transaction costs, not only include the cost of obtaining titled or recognized rights, but also the cost of protecting the rights. That is why understanding ‘the tragedy of the commons’ cannot alone solve the problems. Many regulated access schemes cannot survive and finally fail. Most allocable cut regulations on timber felling probably become less efficient when the costs of regulation are considered.
A growing number of the versions on sustainable forestry criterion and ecological certificates are emerging (e.g. see Kiker and Putz, 1997). However, very few studies have been conducted on calculation of the potential costs associated with formulation and implementation. I doubt whether the gain can be larger than the cost in implementing the criterion and timber certification.

Presently, decentralization and devolution become an important theme in forest management (see Fisher, 1999). However, we should not be limited to the two extremes (state-owned, private-owned), or the one between (community-owned); testable implications may be found somewhere in between along the continuum. Institutional change is not costless or instant (North, 1990; Zhang, 2000b). Institutions are important factors for forestry development, but the potential costs and time for institutional transformation, i.e. the transaction costs, should be carefully considered.

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