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Forestry taxation for sustainability: theoretical ideals and empirical realities

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We review the literature linking taxation and sustainable forest management (SFM) in humid tropical forests. This literature broadly falls in two strands. One emphasizes economic theoretical ideals and seeks to define optimal taxation designs with incentives for SFM. The other strand documents political-economic empirical realities that fall far from the theoretical ideals and which may help explaining why taxation reforms for SFM have had mixed outcomes. We conclude that future research could benefit from further integration and interaction between the two strands and argue for dynamic forest taxation policies that can respond to changing market demands, technologies, and context conditions to provide the right incentives and signals for SFM.

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Introduction

In the search for ways to promote sustainable forest management (SFM)[1] in the tropics, scholars and policy-makers have in recent decades increasingly turned away from command-and-control forest governance approaches towards policies that incentivize socially beneficial forest use and management practices [1•,2,3•,4–7]. While recently overshadowed by various payments for ecosystem services modalities, taxation is one way of incentivizing such sustainable forest management. Forest taxation has the potential to deliver on the triple aims of revenue generation, environmentally sound forest practices and value addition; all three intimately associated with SFM [8,9]. In this review, we focus on these aims, and the trade-offs between them in humid tropical forests, that is, closed-canopy, naturally-regenerated forests, typically with a high species and age/size diversity, and managed under selective cutting systems.[2] This focus is justified by the global interest in these forests (high biodiversity, carbon storage, and livelihood benefits) and because they present a particular challenge to SFM; it is estimated that less than 5% of the world's humid tropical permanent forest estate is sustainably managed [10]. The forest taxation literature focuses largely on timber given its value and the negative externalities associated with timber harvesting; our review follows suit. Finally, our review excludes the impact of corporate (profit) taxes because they have little effect on firm's behavior vis-à-vis SFM, and property taxes because humid tropical forests are typically publicly owned [11]. The review focuses on the peer-reviewed literature, but also, when considered relevant, draws on case studies, discussion papers and policy documents.

We find that the literature broadly falls into two strands. Most studies adhere to a neo-classical economics approach, where the government is seen as a neutral social planner working in the interest of society at large and other actors are construed of as rational agents. Typically, research within this strand employs theoretical mathematical models to examine how different taxation regimes may generate public revenue while incentivizing sustainable management. The second, and smaller, strand, rooted in political economy and political science, seeks to explain observed outcomes of forest taxation and SFM policies. This strand largely relies on empirical case studies. We review both strands, seeking to highlight their main contributions, differences and similarities.

[1] In accordance with the United Nations Forum on Forests we broadly understand SFM as 'the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems' [35].

[2] In Africa and Asia, less so in South America, humid tropical forests with timber production are typically under public ownership and managed under concessional arrangements. Under selective cutting systems, only trees above the set minimum diameter may be cut, but only those with desirable traits are cut; low-quality trees and/or trees of undesirable species above the minimum diameter are left [15,21,62].

Forest taxation and SFM: the neoclassical economics strand

A central tenet in the forest taxation literature is forest rent, that is, the difference between the marginal revenue from timber sales and the marginal cost of extracting it considering all payments to factors of production (labor, capital and enterprise, including 'normal' profits on these factors) [12]. Forest rent is often equaled with the stumpage value; the maximum amount that the most efficient company would be willing to pay for the right to harvest a tree [13,8,14]. Yet, this disregards societal opportunity costs, including on-site environmental externalities associated with changes in forest structure, species diversity, biodiversity and soil erosion, and off-site effects like soil sedimentation, reduced water quality downstream and CO_2 emissions [1•,9,15,16]. While the introduction of taxes that reflect the environmental and social costs of logging would be theoretically possible, the challenges associated with estimating such costs are, in practice, insurmountable [3•]. Thus, forest taxes do not normally function as Pigouvian ('the polluter pays') taxes [4,17]. Yet, as we shall see, if appropriately designed, taxation may change the incentive structure facing economic agents.

The importance of capturing the forest rent; overall taxation level

There is considerable disagreement on the relation between forest rent capture and SFM. Some have argued that low fees incentivize overharvesting by: first, giving operators an incentive to act with a 'rent seeking', short-term focus [18]; second, inflating profit levels associated with concessions leading to an overexpansion of the forestry sector [19]; third, inducing inefficiencies in downstream processing thereby increasing resource pressure [13,8,9]; fourth, reducing the financial resources available for enforcement, training, forest inventory, forest improvement and mitigation of negative environmental impacts of logging [6,9,20]; and fifth, speeding up conversion of forests to other land uses because it creates a too pessimistic perception of the fiscal potential of forestry [6,21–24]. Low rent capture may also have indirect effects on SFM by concentrating harvesting on public lands (as opposed to private lands) and disincentivizing the establishment of private plantations or wood lots, that is, creating perverse incentives [15].

Conversely, others have argued that, given imperfect enforcement, a high tax level designed to collect 'above normal' profits from a fly-by-night operator directly discriminates against long-term minded operators, who comply with SFM rules and regulations at high cost [17]. Along similar lines, and also introducing an infant industry argument, it has been suggested that integrated (domestic) loggers-processors who have made investments in processing plants, should benefit from lower taxation [3•]. Others argue that the government's rent capture is primarily a distributional issue: it allocates the rent between the public treasury/Forest Department and the concessionaire, but it has no predictable influence on the practice of operators. The latter varies with context and differences in risk perception and objectives [3•,11,16,25]. Further, it has been suggested that it is an empirical question whether the national economy, the forest and local population would gain more from private rent capture and re-investment, than from state's rent capture and management [16,25].

Tax structure matters

There is general agreement that the specific configuration of the taxation regime matters [26]. To support sustainability, the tax regime should focus on 'upstream' charges, that is, fees that put a value on standing timber, for example, cutting royalties (stumpage fees) and/or area fees, rather than 'downstream' charges, that is, levies on log exports or processed products, because the former provides an economic incentive for firms to make efficient use of raw material during logging, hauling and processing [3•,27,28]. This incentive dimension is often neglected in forest taxation regimes, which typically rely to 'downstream' charges because they are technically easier to collect and less prone to corrupt practices [3•,9].

Cutting royalties are often set at levels so low that they do not function as a behavioral incentive [3•,9]. If cutting royalties are not appropriately differentiated according to species, qualities, and accessibility, they may distort marginal harvesting decisions and encourage operators to remove only the most valuable stems of 'primary species' and leaving less profitable 'secondary species'. This is called high-grading or creaming. This may appear to be of little importance for sustainability because bypassed trees can always be harvested later, but high-grading typically leads operators to expand the cutting area in search of the preferred species with associated damages to the residual stand and the environment. It also leads operators to re-enter closed compartments as and when market conditions change, making a second cut economically feasible [21]. The incentive to high-grade/cream cannot realistically be fully removed but it can be dampened by differentiated cutting royalties with frequent revisions that reflect market preferences and prices [21,29].

Area fees, that is, fees charged annually on the area of the concession, have been increasingly promoted, either to fully replace cutting royalties or in combination with them [9]. Low area fees may lead firms to retain larger forest areas than they need for their operation, resulting in either encroachment and/or illegal logging by other agents as a result of non-enforcement, or the concessionaire using the excess area for non-intended purposes, notably plantations [6,7,11,9]. Increases in area fees have in a number of jurisdictions led to a return of large