

The Tropical Timber Trade and Sustainable Development

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The tropical timber trade appears to have promoted neither sustained forest management nor sustained forest-based industrialization. The boom-and-bust export pattern is often blamed on demand by developed countries, high import barriers, and low international wood prices. In fact, it is rooted in tropical countries' own policies related to timber concessions and wood-processing industries. These policies suppress timber scarcity signals and must be revised if the trade is to promote sustained economic growth. Even if this is done, the trade may not promote sustained-yield forestry in individual countries.

The history of the tropical timber trade is discouraging both to foresters and environmentalists interested in sustained management of tropical forests and to policy-makers interested in sustained industrialization in the forest sector. Since the end of World War II, one tropical country after another has followed a boom-and-bust export pattern (1–3): High initial export earnings are followed by depletion of old-growth forests, a lack of management of second-growth forests (4), and a collapse of domestic processing industries. Logging and processing industries enjoy profits during the boom, but the economic activity is not sustained.

This pattern emerged in West Africa in the 1950s and 1960s. It became even more apparent in the 1970s and 1980s as the trade shifted toward Southeast Asia and expanded in volume. In Southeast Asia today, several countries have already gone bust (for example, Thailand and the Philippines), others will shortly (for example, the state of Sabah in Malaysia), and in most remaining countries the boom is either cresting or waning (1, 5).

Is the boom-and-bust pattern inevitable? If so, is the tropical timber trade inherently incompatible with sustainable development? International timber prices reflect the commercial value of tropical wood—not the diverse values of tropical forests as sources of biological diversity, clean water, and nontimber forest produce. Nevertheless, can the trade indirectly protect these nonmarket values by generating incentives to maintain permanent forest areas?

This article provides an economic perspective on these issues (6). Although the timber trade provides opportunities for a tropical country to enhance its overall economic performance, the trade does not necessarily create incentives for sustained forest management or for sustained industrialization within the forest sector. Policies

in tropical countries have generally reduced the economic benefits that those countries can reap from the trade and have reduced the likelihood that the trade can promote sustainable development of the forest sector.

Misconceptions About the Trade

The inability of tropical timber-exporting countries to break out of the boom-and-bust pattern is often attributed to three factors: developed countries' exploitation of tropical countries' timber resources (7, 8), high import barriers by developed countries against processed tropical timber products (9), and low prices for tropical timber in international markets (7, 8). Consumption in developed countries allegedly drives the boom. Import barriers allegedly inhibit the development of processing industries in tropical countries, reducing those countries' export earnings and the value of their forests as a source of raw materials. Low prices allegedly reflect market manipulation by developed countries and reduce the financial viability of forest management.

None of these three factors holds up well when trade statistics are examined (Table 1). In 1989, developing countries (excluding China), which are mainly tropical, exported 11% of their harvest of industrial roundwood. They exported 23% of their output of solid-wood processed products, and smaller percentages of their output of fiber products. Taken together, these figures indicate that only about a third of the industrial roundwood harvested in developing countries entered international trade in any form. Moreover, many of the exports were to other developing countries (10).

In 1989, developing countries (excluding China) imported only a slightly smaller value of wood products than they exported, \$11.5 billion versus \$12.7 billion (10). There is a significant international flow of tropical solid-wood products, which are mainly hardwood (nonconiferous), from developing to developed countries, but

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there is also a significant flow of temperate fiber products, which are mainly softwood (coniferous), in the opposite direction. The North uses the South's resources, but the South also uses the North's resources.

Global consumption of wood products is rising (11), but at a diminishing rate (12).

Table 1. Production and trade volumes for wood products in 1989 in developing countries (10), excluding China, which is a major producer but lies in the temperate zone.

Products	Pro- duction	Exports	Imports
Solid wood (1,000 m ³)			
Industrial roundwood*	306,256	34,199	12,767
Sawnwood	89,012	13,400	11,691
Wood-based panels†	21,200	12,050	3,016
Fiber (1,000 tonnes)			
Wood pulp	9,164	1,827	2,607
Paper and paperboard	20,923	2,548	6,904

*Logs and pulpwood. †Mainly veneer and plywood, but also includes particle board and fiberboard.

Table 2. Import tariff rates in the early 1980s (%). Rates for wood products in the European Community (E.C.), United States (U.S.), and Japan are for imports from developing countries; all other rates are for imports from all sources. NA, not applicable. LDC, less developed countries.

Products	E.C.	U.S.	Japan	LDCs*
Wood (14)				
"In the rough"	0.0	0.0	0.0	14.4–34.1
Primary	1.9	5.6	7.4	16.2–57.8
Secondary	1.5	1.7	4.8	24.1–73.1
Other (15)				
Machinery, appliances	4.4	3.2	NA	NA
Textiles, textile articles	5.6	14.7	NA	NA
Footwear, headgear, other	6.6	12.2	NA	NA
All items (15)	2.4	2.9	NA	NA

*Range of the averages for developing countries in Africa, America, and Asia.

Table 3. Export prices for tropical hardwood products relative to those for temperate products: averages for 1945 through 1988 (39).

Tropical hardwood product	Corresponding temperate product	
	Hardwood	Softwood
Logs (from Asia)	0.58	0.98
Logs (from Africa)	0.88	1.50
Sawnwood	0.73	1.52

Economic models of the global forest sector predict that the rate will continue to diminish (12, 13). Developing—not developed—countries account for most of the increase in consumption that has occurred recently or that has been forecast. The timber trade is responsible for a shrinking share of consumption of tropical timber products.

In regard to the second factor, high import barriers trapping timber-exporting countries in the boom-and-bust cycle, import tariffs against processed wood products certainly exist in developed countries. Like most tariffs, however, these tariffs have been brought down markedly by the various rounds of the General Agreement on Tariffs and Trade (GATT) negotiations (14). Moreover, developed countries' tariffs on wood products are generally comparable to or lower than their tariffs on most products (15), and they are generally lower than corresponding import tariffs in developing countries (Table 2). In many cases, they are lower than developing countries' own export taxes on wood products (16). For example, in 1990 Peninsular Malaysia announced export taxes on sawnwood equivalent to 11 to 22% of the export prices of sawnwood.

Tropical timber-exporting countries have suffered some degree of economic harm from trade barriers on wood products imposed by trading partners and by themselves. Yet, import barriers have not prevented Peninsular Malaysia from becoming the world's largest exporter of hardwood sawnwood, tropical or temperate, or Indonesia from becoming the largest exporter of plywood. Studies indicate that import barriers on wood products in developed countries have modestly decreased the trade volume for most wood products, but that much of the increase in trade that would result from their removal would be captured by exports from temperate countries (14, 17).

The third alleged factor, low prices, holds up better. Since the end of World War II, average export prices for tropical hardwood logs and sawnwood have been substantially lower than corresponding prices for temperate hardwood products (Table 3). There is a simpler explanation than market manipulation: Although some tropical timber exports compete on the basis of quality with fine temperate hardwood products, most compete on the basis of price with commodity products made from temperate hardwoods and softwoods. If this is the case, then the international prices of tropical hardwood products would be expected to fall between those of temperate softwoods and hardwoods. This is precisely what Table 3 shows.

Although specialty woods such as mahogany, teak, and ebony are the best known tropical woods, most tropical woods

have commodity end uses for which there are many substitutes (18). Tropical timber became significant in international trade after World War II, when "lauan" plywood and other commodity uses were developed (19, 20). Tropical logs and plywood are traded primarily from Southeast Asia to East Asia. The logs are processed into plywood, which is used in concrete forms and for structural purposes, and into sawnwood, which is used in joinery products and for decorative purposes (21). Temperate softwoods provide potential substitutes in the plywood market, whereas both temperate softwoods and hardwoods provide substitutes in the sawnwood market. Tropical sawnwood is imported primarily by Western Europe, where it is used mainly in joinery products (22). Temperate hardwoods and, increasingly, temperate softwoods provide competition there.

Competition with temperate timbers has inhibited increases in the international prices of tropical timber products. Since the late 1940s, the export unit value for tropical logs exported from Asia has risen at a nominal rate of 4.1% per year, whereas the export unit value for tropical sawnwood (from all sources) has risen at 3.6% per year (23). These rates barely match general price inflation during this period.

Prices of tropical timber are unlikely to increase substantially in the future because the world has many alternative sources of roundwood for making commodity wood products. In 1989, developing countries (excluding China) produced less than a fifth of the world's industrial roundwood (10). At the global level, the forces that lead to rising scarcity of timber (tropical and temperate combined) appear to be diminishing, not intensifying. As noted earlier, increases in global roundwood consumption are slowing. Roundwood supplies are increasing in many temperate countries both directly, because of increasing areas of plantations and second-growth forests, and indirectly, because of the development of technologies for making reconstituted wood products from mixed species and low-quality timber (12).

Economists measure timber scarcity by examining changes over time in stumpage value, which is the surplus that remains after deducting logging costs from log prices. Stumpage values at the global level have risen in real (inflation-adjusted) terms during the 20th century, which indicates rising scarcity. The rate of increase has steadily diminished, however, which indicates that the causes of the scarcity are slackening (12, 24). Forecasting models predict that global stumpage values and roundwood prices will increase more slowly in the future than they have in the past (12, 13, 24).

Boom-and-Bust as Sustainable Development

Competition with temperate timbers has limited the impact that physical depletion of timber stocks in tropical forests has had on international timber prices. This observation provides a clue to the causes of the boom-and-bust pattern.

By communicating information about timber scarcity, stumpage values govern the supply and demand adjustments that occur as a country's forest sector develops (3, 12). Imagine a tropical country that has not exploited its old-growth forests and does not have an opportunity to import or export wood products. Harvests (Fig. 1A) would be high early in development, as the country converts forestland to agriculture and uses timber as a source of capital for industrialization. Stumpage values (Fig. 1B) would be low because timber is abundant. As timber is depleted, however, rising scarcity would cause the stumpage value to rise, dampening timber demand and stimulating investments in forest management (because their returns increase). These adjustments would promote a transition to a sustained-yield state in which harvests equal growth and stumpage values are constant (the forest earns a return solely through timber growth).

The gradual transition depicted in Fig. 1 would not necessarily occur in a small tropical country that is open to timber trade. Such a country would face international prices for roundwood and processed products. Because the country is small, these prices would reflect the global economic scarcity of timber, not the physical

scarcity of timber within the country's forests. If competition with temperate timber prevented international prices for tropical timber from rising substantially over time, then stumpage values within the country would not increase substantially either.

The country's forests would not be earning a return from either rising stumpage values or net timber growth, which by definition is nil in old-growth forests. From a purely financial standpoint, the country should harvest all its forests as quickly as possible, because it has the alternative of "cashing in" the stumpage value of the standing timber at the prevailing international price and investing the capital in opportunities that do earn a positive rate of return. Hence, in the face of slowly rising international timber prices, the tropical timber trade will tend to lead to boom-and-bust logging in small countries unless policies directly constrain the rate of harvest.

Does this mean that the tropical timber trade is inconsistent with sustainable development? The answer depends on how the phrase is defined. If only the forest sector itself is evaluated, and according to a traditional forestry definition of sustainability—for example, "harvesting forests to produce an even flow of timber over time"—then a timber boom is obviously not sustainable (25). If sustainable development is defined as sustainable macroeconomic growth, then a timber boom can be an integral phase of a sustainable development process. Stumpage value that is invested efficiently can provide fuel for an economy's takeoff into sustainable economic growth (26). By investing timber capital in other industries or public services (for example, infrastructure and education), a country can sustain economic growth after the forest sector goes bust.

Although "sustainable development" is usually defined at an aggregate, not a sectoral, level, it tends to be defined more broadly than as sustained growth in economic output (27). Boom-and-bust logging might be considered unsustainable because it creates environmental costs or social problems that reduce human welfare, if not economic growth, either now or in the future. To the extent that stumpage values fail to reflect these nonmarket costs, timber prices are indeed "low." Whether the costs are so great that a small tropical country should refrain from boom-and-bust logging is an empirical question.

The First Policy Failure: Timber Concession Policies

Unfortunately, government policies in tropical countries have increased the prevalence of the boom-and-bust pattern. They have created the possibility that, far from being part of an optimal development pro-

cess, boom-and-bust, forest-sector development has generated economic losses due to excessively rapid harvests, insufficient investments in forest management, and inefficient wood processing. Two sets of policies, which have occurred in almost every tropical timber-exporting country, are most responsible for these problems. They have in common the effect of suppressing timber scarcity signals and the necessary responses to these signals.

The first set of policies relates to tropical timber concessions. In most tropical countries, forests are government-owned. Harvesting is carried out by private parties who receive timber concessions (28). Unfortunately, timber concession policies fail to combine forest tenure with capture of stumpage value. This prevents either the government or concessionaires from detecting and responding to rising stumpage values.

Although governments are the owners, the fees they levy on timber extracted by concessionaires bear no relation to stumpage values (2, 29, 30). These fees are set administratively and arbitrarily. They are generally a fraction of stumpage values, and they do not mimic the trajectory depicted in Fig. 1. Because they are much lower than stumpage values, the value of forests as a source of government revenue is artificially reduced, inducing governments to favor the conversion of forests to uses that yield greater tax revenue. The reduction in revenue also means that potential funds for forest management are reduced. The lack of funds for forest management in many tropical countries results not so much from low international timber prices as from the failure of governments to capture the existing stumpage value (31).

Although concessionaires capture most of the stumpage value (2, 29, 30), they have little incentive to invest in forest management because their concession contracts are typically short and of uncertain duration. The uncertainty stems from the allocation of concessions as part of a political patronage process in many countries (32). Higher international timber prices would simply increase concessionaires' windfall profits, with little impact on investments in forest management.

What is needed is clear: to combine secure forest tenure with sufficient capture of stumpage value by the party holding the tenure rights (3, 33). The stumpage value provides the financial incentive for forest management, and the tenure provides confidence in this incentive. Obviously, there are two broad approaches to combining the two. One would be to maintain government ownership but to increase the amount of stumpage value captured by the government to a level sufficient for financing forest

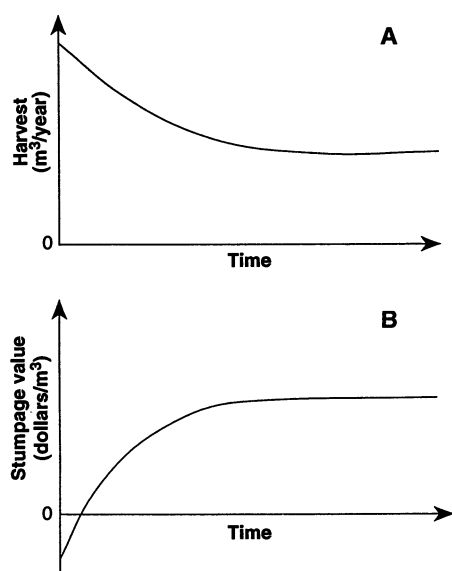


Fig. 1. Transition from mining old-growth timber to sustained-yield forestry in a closed economy (40). (A) Harvest and (B) stumpage values.

management. The other would be to allow concessionaires to continue to capture the lion's share of stumpage value but to restructure concession contracts so that concessionaires had rights comparable to those of a private owner. This would involve lengthening contracts and making them renewable and transferable, so that they would have asset value. In the extreme, forests might be privatized.

The two options have quite different implications for the distribution of the wealth that flows from harvesting a country's tropical forests and for the efficiency with which this wealth is invested (33). For this and other reasons, the two options may not be equally appropriate in all countries. One or the other is necessary, however, to link timber scarcity signals and forest management responses.

The Second Policy Failure: Log-Export Restrictions

The second set of policies relates to wood processing. Policy-makers in developing countries have repeatedly assumed that the export of raw materials is wasteful and that export revenue and jobs are forgone whenever natural resources are exported in unprocessed form. In the forest sector, this line of thinking has led numerous countries to attempt to stimulate domestic wood processing by restricting log exports.

Such policies fail to recognize that a country endowed with a natural resource does not necessarily have a comparative advantage in processing that resource (34). The raw material provided by the natural resource is just one of the inputs needed to manufacture the processed product. If a country does not have a comparative advantage in wood processing, then the promotion of wood-processing industries drains labor, capital, and other nonwood factors of production from more efficient sectors of the economy. Although log-export restrictions might succeed in building up a large domestic wood-processing industry, the net impact on economic growth may be negative.

The net impact may be negative even if the loss of output in other economic sectors is ignored. Within the forest sector, there is a tradeoff between the value of wood (log price) and the value added to wood. By reducing foreign demand, log-export restrictions depress the domestic price of logs, causing the value of wood itself to decline. This provides the domestic processing industry a cost advantage in cheaper raw materials. Hence, processing capacity expands. When wood is processed, value is indeed added: Payments must be made to employees, managers, machinery suppliers, investors, and others who provide the inputs used in processing. However, although

value is added to wood, it is done at the cost of reducing the value of wood itself.

Empirical evidence generally indicates that the value added to wood does not offset the loss in the value of wood when processing expands because of log-export restrictions. In the case of Indonesia, studies have estimated that both export earnings and economic rents (surpluses) were less during the 1980s because of log-export restrictions than they would have been otherwise, in spite of rapid growth by the plywood industry (35). In the case of Peninsular Malaysia, one study has estimated that for every \$2,200-per-year sawmill job generated by log-export restrictions during 1973 through 1989, the region gave up \$6,100 in economic value added (value added to wood, minus the reduction in the value of wood) and \$16,600 in export earnings (because of forgone revenue from log exports) (36). Log-export restrictions stimulated expansion of processing capacity and created jobs in Indonesia and Peninsular Malaysia, but at an extraordinary cost.

The most deleterious consequence of log-export restrictions is that they interfere with the price signals that balance timber demand and timber supply. Restrictions are typically imposed after complaints by domestic processing industries about rising domestic log prices. Industries blame the rising prices on log exports, which are often destined for countries whose markets are perceived to be closed to imports of processed wood products. Given their faith in the good of the value added, and a sense that log importers' trade practices are unfair, tropical country governments willingly acquiesce to industry demands that log exports be curtailed.

The industry-government perspective tends to focus on foreign demand for logs as an explanation for price increases. The supply side must also be considered. Log prices rise in a tropical country when timber is becoming more scarce, because of timber depletion either within the country (if it is relatively large) or at the global level (if it is small). For the timber industry to develop along a sustainable path, domestic processing industries must respond to this scarcity signal. The market is signaling that additional capacity expansion is not profitable and that the industry must increase its processing efficiency to remain internationally competitive.

Log-export restrictions artificially suppress this signal. They create an illusion that wood is still abundant. The restrictions are often moderate initially, for example, low levels of export taxes or export quotas on just a few species. As depletion proceeds, they are typically escalated to maintain the illusion. Although protection is sometimes justified for "infant" industries,

tropical countries tend not to wean their wood-processing industries off of cheap wood.

Consequently, too much processing capacity develops, too much forest is converted to other uses, and too little management occurs on the remaining forest. Too much capacity develops because mills pay an artificially low price for roundwood. Too much forest is converted because log-export restrictions reduce the stumpage value of timber and hence the value of forests relative to alternative land uses. The log-export restrictions in Peninsular Malaysia reduced stumpage values, on a per-cubic-meter basis, by 31% (36). Too little management, whether active management such as enrichment planting or passive management such as careful logging, occurs because the lower stumpage values reduce the returns to management activities.

For all these reasons, log-export restrictions promote boom-and-bust development (37). Although permitting log exports does not guarantee that stumpage values will be high enough to financially justify the retention of forests or investments in forest management (30, 38), it does improve the chances.

Conclusions

The boom-and-bust nature of tropical countries' participation in the international timber trade has not resulted from developed countries' consumption of tropical timber or from developed countries' import barriers. It is related to the fact that international prices for tropical roundwood have not risen rapidly over time, but this is more likely due to the fact that the world is not running out of wood than to market manipulation by developed countries. Tropical countries' own policies, particularly those related to timber concessions and wood-processing industries, have exacerbated the tendency toward boom-and-bust development. The tropical timber trade can promote sustainable development of a tropical country's economy, but not necessarily even-flow harvesting of its forests. Tropical countries must relax log-export restrictions and link capture of stumpage value to forest tenure if they are to reap maximum benefits from the trade.

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 37. Tropical timber boycotts, which have been advocated by environmental organizations and debated in the legislatures of many developed countries, would have similar effects because they too reduce timber prices and therefore stumpage values. [See (3) and J. R. Vincent, *J. For.* **88**, 56 (1990).]
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 40. Adapted from figure 1 in (3).
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