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Illegal Logging: A Market-Based Analysis of Trafficking in Illegal Timber

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FINAL REPORT

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Executive Summary

Over the past several decades, illegally sourced timber has contributed to a growing roster of problems that affect both producing and consuming countries alike. Within the United States, the effect of timber trafficking on the national economy, and its potential effect on American foreign policy, has raised serious concern – so much so that in 2002, President George W. Bush announced his Initiative Against Illegal Logging in an attempt to discern and curtail the causes, methods, and parties involved in illegal activities.

In 2005, the National Institute of Justice and Department of State, under the auspices of the President’s Council on Environmental Quality, commissioned a literature review by Abt Associates to answer two principal questions:

- Who commits the crimes of illegal timbering?
- How do they commit these crimes?

Project staff reviewed published and unpublished literature that identified original source material and the citations in those sources. Because sources often disagreed about the causes, consequences, and solutions to the problem, Abt Associates staff were selective in reporting from source literature that included academic papers, news accounts, and some material that was clearly advocacy. An early draft of this paper was reviewed by five external foreign experts (selected by the National Institute of Justice and the Department of State, in concert with Abt Associates), and by two anonymous reviewers (selected by NIJ). This final draft benefits from their thoughtful comments.

The literature review revealed that the causes, methods, and perpetrators of illegal timbering differ depending on the economies, societies, ecologies, and legal institutions where logging occurs. To provide a way to simplify and organize this diversity, this report develops a market-based description of present-day trade in illegal timber, focusing on the economic and political structures that create the environment and provide the incentives that make illegal logging possible and profitable. Four dominant patterns of economic and political structures (see Table 1 in the report) characterize illegal logging across nations and over time:

- Enforcement / Rule of Law
- Enforcement / No Rule of Law
- Some Enforcement / No Rule of Law
- No Enforcement / No Rule of Law

This market-based description does not explain everything about the crime, but it nevertheless provides a useful device for organizing the literature and presenting a coherent story about the logging, milling and trafficking of illegal timber.

Developing original estimates of the extent of illegal logging was beyond the scope of this study, but the Abt Associates team reviewed extant estimates, concluding that Seneca Creek Associates (2004) has provided credible estimates for gauging the scope of the problem. Seneca Creek Associates estimated

that the total wood products trade in 2002 was \$186 billion -- \$69 billion in wood products and \$117 billion in pulp, paper and paperboard trade.¹ Of that trade, Seneca Creek estimated that about 6 percent of the timber trade and 17 percent of the plywood trade was likely illegal. Most illegal timbering is concentrated in a few countries or regions.² However, because legally and illegally harvested timber is mostly indistinguishable in international commerce, few laws attempt to prohibit the importation of timber (except for certain specialty woods) that was illegally harvested.³ With some exceptions, then, timber and wood products are “legal” once they enter into international commerce, regardless of their legality at the source. This paper therefore says little about the international transshipment of timber, nor about the importation of timber into consuming nations.

Illegal logging is minimal in nations where the rule of law operates in concert with a strong and transparent national enforcement mechanism. The United States and Canada provide two illustrations of the *Enforcement / Rule of Law* model. Although illegal timbering happens in North America, it occurs at levels that contrast sharply with crime in other areas of the world. Of course, this does not mean that the U.S. and Canada (as well as the European Union) prevent the importation of timber harvested illegally.

In contrast, illegal timbering is significant in nations where the rule of law is inoperable, but there exists a strong national enforcement mechanism, which has the power and will to facilitate corruption on a grand scale. We call this the *Enforcement / No Rule of Law* model. Indonesia under the Suharto regime and both Cambodia and the Solomon Islands provide illustrations. The criminals in these nations are powerful politicians who have turned the state machinery to their direct advantage or to the advantage of their families and political associates. Although large companies may be complicit, the corrupt regime principally requires efficient businessmen who can log, mill and (as necessary) export efficiently to maximize profits diverted to corrupt leaders of state.

Illegal timbering is also significant in nations where the rule of law is inoperable (with respect to forestry) and there exists appreciable local enforcement but limited national enforcement – the *Some Enforcement / No Rule of Law* model. Brazil, Mozambique, Indonesia (post-Suharto), and the Eastern European nations of the former Soviet Union provide illustrations. Absent strong national enforcement, the enforcement of forestry laws has devolved on local units of government, where petty corruption has replaced grand corruption. The criminals are lower-level government officials who facilitate corruption, and typically local loggers, millers, and transporters who are willing to pay bribes as a cost of doing business. As implied by the estimates from Seneca Creek, illegal practices are widespread in the countries providing illustrations.

A variation on this theme results from a particular failure of the rule of law system, namely, failure to clearly define property rights. In both Brazil and Mozambique, loggers legitimately invested in logging equipment to later face unanticipated restrictions on their logging activities. Previously legitimate local businessmen, faced with financial ruin because of apparently capricious (from the perspective of loggers) changes in property rights, turned to bribery and other methods of avoiding regulations. This essay also

¹ Seneca Creek Associates (2004), p. 6.

² Ibid, p. 2.

³ Tacconi, Obidzinski, & Agung (2004). European League Tables of Imports of Illegal Tropical Timber: Briefing. Friends of the Earth (2001).

places both Malaysia and Singapore into this third model, although for these two nations the issue is trafficking rather than logging. Local Malaysian businessmen have found ways (apparently with the cooperation of the Malaysian government) to facilitate trafficking in logs that are illegally harvested in Indonesia. Singapore businessmen play a similar role, serving as a conduit between timber illegally harvested in Indonesia and importing nations. The Environmental Investigation Agency, for example, reports that the small island of Singapore has 181 timber importers and exporters.⁴ Laundering activities similar to those performed by Malaysia and Singapore are unnecessary for many source nations because public corruption or ineffective export enforcement negate any need to mask the illegal origin of exported timber.

The *No Enforcement /No Rule of Law* model differs from the three previous models described. Illegal timbering is appreciable in nations where the rule of law is inoperable and there exists neither local nor national enforcement. This scenario creates an environment that simulates an unfettered marketplace, although production may be limited by the absence of effective infrastructure for harvesting forests. The Democratic Republic of the Congo, Cameroon, Benin and other West African nations provide illustrations. Bandits account for some of the illegal timbering, but probably not much because timbering is a low profit operation compared with poaching and mineral exploitation. Furthermore, lumbering is capital intensive, so harvesting requires that a timber-rich area either have invested in an infrastructure, or that the harvesters bring sufficient capital to cut and transport timber. This probably explains observations by the Forest Monitor (2001) that European companies are active loggers in West African nations, and perhaps explains why China-based and Malay-based companies have reportedly entered into these markets.⁵ Comparatively small-scale (but not immaterial) bribes to national and local officials are a cost of doing business.

The purpose of this essay is to identify who participates in the lumbering, milling, and trafficking of illegal timber and how they commit their crimes. It does not name individuals, of course, but rather it reports on the type of offenders who have either facilitated or conducted illegal activities. In so doing, it reports systematic variations in the structure of illegal activity across producer nations. Depending on the setting, it identifies government complicity ranging from grand corruption to petty corruption to apparent indifference or an inability to regulate the nation's timber trade. It sometimes identifies conspiracies that resemble white collar and organized crime, but it also notes that in many settings loggers, millers, and transporters may be otherwise honest businessmen who are obliged to operate outside the law to deal with ill-defined property rights and ambiguous or contradictory laws and enforcement. It would be a stretch to conclude that illegal timbering occurs solely because incorrigible thieves are stealing the world's forestry inheritance.

Indeed, while not absolving loggers, millers, and transporters of fault – or excusing any practices that harm the economies and ecologies of producer nations – some see the centrality of consumer nations as “massive drivers of the problem.” And, if that is true, then the solution to reducing illegal logging may ultimately rest on future means of distinguishing between legally and illegally harvested timber. An appendix to this paper reports a separate review, also commissioned by NIJ and the Department of State,

⁴ Timber Trafficking: Illegal Logging in Indonesia, South East Asia and International Consumption of Illegally Sourced Timber. Environmental Investigation Agency and Telapak Indonesia (2001).

⁵ Sold Down the River. The need to control transnational forestry corporations: a European case study (March 2001).

of technologies for combating illegal logging. The review examines what technologies are available (or potentially available) for identifying illegal products, for monitoring illegal locations, and for discovering illegal practices (legal, false, and absent documentation).

This essay is a literature review. Its authors have been careful to validate information, sometimes by checking with multiple written sources, sometimes by conferring with on-the-ground experts. Not all sources and experts agree; multiple sources are not always available; and much of the literature is polemic. The authors hope that, when sifting through a large amount of information, they have been sufficiently selective to provide a credible explanation of logging, milling, and transporting while relying on a minimum of erroneous reports. The authors are mindful that many topics important to those who care about preserving the world's forests and the biodiversity they sustain fall outside the mandate for this literature review. They are mindful, also, that the advantages of using a market-based model to frame the literature review comes at a potential cost of marginalizing some topics that might otherwise be of interest. These limitations notwithstanding, this essay ties together a diffuse literature into a structure providing useful insights into the logging, milling, and transportation of timber in contravention of national and sometime international laws.

1.0 Introduction

Over the past several decades, illegally sourced timber has contributed to a growing roster of problems that affect both producing and consuming countries alike. Within the United States, the effect of timber trafficking on the national economy, and its potential effect on American foreign policy, has raised serious concern – so much so that in 2002, President George W. Bush announced his Initiative Against Illegal Logging in an attempt to discern and curtail the causes, methods, and parties involved in illegal activities. The President’s Initiative defines illegal logging as “timber that is harvested, transported, processed or sold in contravention of a country’s laws.”⁶ This definition not only incorporates the illegal activities that occur within producing nations, but also sets the stage for a discussion about the influence of consuming nations that import such goods.

The causes, methods, and perpetrators of illegal timbering differ depending on the economies, societies, ecologies, and legal institutions in question. Foremost, this essay provides a market-based description of present-day trade in illegal timber, focusing on the economic and political structures that create the environment and provide the incentives that make illegal logging possible (and profitable). Various governing practices are commonly cited when identifying the political and economic factors that contribute to illegal logging and trafficking – including unclear property rights, opaque governing practices, and a lack of law enforcement. A lack of law enforcement, for example, is often cited as a prime factor that incites corruption among government officials or business owners. And yet, varying degrees of law enforcement, coupled with a strong or weak rule of law, often affects the type of corruption that emerges, and the parties that engage in it. This essay will examine the issue of law enforcement through the lens of an economic model that simplifies the incentives that lay behind illegal timber trafficking. Throughout the course of this essay, we will identify four dominant patterns that characterize illegal logging across nations and over time: *Enforcement / Rule of Law*; *Enforcement / No Rule of Law*; *Some Enforcement / No Rule of Law*; and *No Enforcement / No Rule of Law* (Table 1).

⁶ See <http://www.whitehouse.gov/infocus/illegal-logging/> Retrieved February 13, 2006.

Table 1: The Effects of Law Enforcement on Timber Trafficking

Law Enforcement within Nation	Effects on Timber Trafficking
Enforcement / Rule of Law	Illegal logging is minimal in nations where the rule of law operates in concert with a strong and transparent national enforcement mechanism. (However, such nations may nevertheless be susceptible to the importation of timber that was illegally obtained within other countries.)
Enforcement / No Rule of Law	Illegal timbering is significant in nations where the rule of law is inoperable, but there exists a strong national enforcement mechanism (akin to a dictatorship), which has the power and the will to facilitate grand corruption.
Some Enforcement / No Rule of Law	Illegal timbering is significant in nations where the rule of law is inoperable and there exists appreciable local enforcement but limited national enforcement. This model describes nations whose policies are vulnerable to the effects of petty corruption, insurgencies, and organized crime.
No Enforcement / No Rule of Law	Illegal timbering is appreciable in nations where the rule of law is inoperable and there exists neither local nor national enforcement. This scenario creates an environment that simulates an unfettered marketplace, although production may be limited by the absence of effective infrastructure for harvesting forests.

Each of these four governing models hinges on the ability of a nation to enforce its own laws and maintain a transparent system of government that minimizes extortion and graft. While, for simplicity’s sake, we sometimes characterize timber trafficking as the *result* of corruption, it is important to emphasize reciprocity. Timber trafficking not only occurs as an effect of incompetent or corrupt governing, but can also contribute to the causes (and the financial coffers) that support and further enhance the existence of corruption. This has important policy implications for those countries that wish not only to halt illegal logging, but also to decrease the influence and power of regimes that thrive on lawlessness. According to the World Bank, illegal timber trafficking can overwhelm and overtake the lawful players in any given country, in which “legitimate forest enterprises are subjected to unfair competition and discouraged from making socially and environmentally responsible investments into the

sector.”⁷ In 2005, the World Bank estimated that illegal logging in producing countries contributed to over \$10 billion in lost revenue and assets worldwide – more than eight times the amount of money spent on the sustainable management of the world’s forests.

Most of the following report examines the economic incentives and political climates that allow illegal logging to occur overseas. Before we begin, however, we find it helpful to reiterate the urgency and timeliness of this discussion, and all that is at stake. Illegal logging contributes to the growing rates of deforestation in the world’s most densely forested regions (principally South America, Central Asia, and Central and West Africa), which in turn has had a negative impact on global biodiversity. Illegal logging and timber trafficking have also had the unfortunate effect of depleting timber as a potentially renewable resource within several Third World countries, while depriving revenue-starved populations of billions of dollars each year in lost tax income.⁸ And as mentioned earlier, timber trafficking depresses the market value of timber, while disadvantaging those companies (and countries) that engage in legal logging and trade. In the most extreme cases, illegal logging and timber trafficking can provide the financial resources to prop up rogue regimes (as was the case in Liberia during Charles Taylor’s rein), or help finance civil wars or coups by providing a steady flow of cash to groups that engage in human rights abuses. Even in less extreme cases, illegal logging and trafficking can undermine democratic reforms by providing opportunities for grand and petty corruption at all levels of government. This report, we hope, will contribute to current policy discussions by providing insights into the economic and political incentives at play among those who log, mill, and transport illegal timber.

The following report is based on a literature review of open sources, interviews with key informants who also provided written comments and pointed to additional reading, and two reviewers commissioned by the National Institute of Justice. The literature, informants, and reviewers sometimes disagreed about the causes, consequences, and cures for illegal logging, and this report provides a summary that sometimes diverges from the views of at least some experts who are knowledgeable about the logging, milling, and transporting of illegal timber. Furthermore, we use an market-based model to integrate a literature that otherwise provides a diverse way of describing illegal logging, and although there is a gain from providing a coherent and integrated picture, details and nuances are sometimes lost. Finally, this report is focused on the two issues of who does the crime and how it is done. This report necessarily excludes other topics that are important to understanding the etiology and sequela of illegal logging. Section 2.0 defines illegal logging, lists the ways in which these crimes are done, and estimates the scope of the problem. Section 3.0 uses the developed definitions to formulate four governing models that characterize

⁷ “Forest Law Enforcement and Governance (FLEG): Developing a Strategic Approach for the World Bank” (2005), p. 1.

⁸ According to former Secretary of State Colin Powell, “Illegal logging and bad environmental management equate to billions of dollars each year in lost revenue-billions, billions of dollars that, instead, could be used by governments to build schools, to get rid of debt, or to lift millions out of misery and poverty.” Earth Day remarks, April 22, 2003. <http://www.whitehouse.gov/infocus/illegal-logging/piail.html> Retrieved February 28, 2006. See also Nigel Sizer, Director, Asia-Pacific Forests Program for the Nature Conservancy in “Practical Actions to Combat Illegal Logging: A summary of a multi-stakeholder dialogue on best practices for business and civil society,” *TFD Review*.

illegal logging. Section 4.0 applies these four models to describe illegal logging and loggers in some of the most prominent countries that log, mill, and transport illegal timber.

2.0 Definitions and Scope of the Problem

Developing nations often exploit their forests at unsustainable rates, even though most commentators view sustainability as both prudent and beneficial for reasons of economics and ecology.⁹ And even when forests are *not* threatened, illegal timbering is pernicious because it distorts international commerce in timber and wood products.¹⁰

Illegal timbering usually involves one of two scenarios. In the first scenario, loggers, millers, and transporters defy national laws to harvest, mill, and transport timber and wood products under conditions that have been declared illegal in source nations. In the second scenario, logging may be legal, because national laws authorize officials to grant access, but the permission may have been gained through bribery or other corrupt business practices. For purposes of this essay, illegal behavior must meet one of these two standards: The behavior is illegal because it contravenes the forestry laws of nations, or the behavior is illegal because it involves corrupt business practices – such as bribery – that are themselves proscribed. Following Seneca Creek Associates (2004), we delimit this definition of illegality to abuses that “rise to a level of both domestic and international significance.” This removes from our purview illegal harvesting for personal or local uses, including forest use by indigenous populations, which often dispute forest ownership rights. Although the exploitation and depletion of forests by indigenous people for their own private needs can be a serious problem, we presume that that problem has a marginal effect on international commerce in timber.¹¹

Citing four sources, Callister (1999) provides a list of illegal and corrupt activities.¹² According to Callister, illegal practices “fall into three categories: illegal logging of various forms; movement of wood products, which may or may not have been harvested legally, without proper authorization or in contravention of controls; and activities directly aimed at avoidance of payment or forestry charges.”¹³

⁹ Illegal harvesting, milling and transporting of timber promotes forest depletion, but it is not a necessary condition. Source nations often lack laws suitable for sustaining forests, and this may be by choice or by poor governance. A nation may have chosen to exploit its forest, preferring current income to long-term sustainability of its forestry industry. (For example, the advancement of national interests in a developing nation may require the conversion of forest to agriculture. See Tacconi, Boscolo, & Brack, 2003.) This choice may be mistaken as a good domestic policy decision, and even if the choice is optimal domestic policy, it may conflict with good ecological decision making as viewed by the international community.

¹⁰ We will return to this latter topic when we discuss the economics of logging. Contreras-Hermosilla (2002); Tacconi, Boscolo, & Brack (2003); Seneca Creek Associates (2004).

¹¹ Ensuring Sustainability of Forests and Livelihoods through Improved Governance and Control of Illegal Logging for Economies in Transition. Savcor Indufor Oy (2005).

¹² Callister’s list is focused on illegal activities that affect the logging/milling/transporting of timber for commercial purposes. Contreras-Hermosilla (2002) provides a list that includes additional illegal activities such as illegal occupation of forestlands and woodland arson for converting woodland to commercial uses. Our essay is concerned with the conversion of forests for logging, milling, and transporting.

¹³ Callister (1999), p. 9-10.

Callister then offers a comprehensive list of the examples to help clarify the meaning of illegal logging, timber smuggling, extortion, and illegal timber processing. Callister's list comprises:

Illegal Logging

- Logging timber species protected by national law
- Logging outside of concession boundaries
- Buying logs from entrepreneurs that have been harvested outside the concession
- Contracting with local forest owners to harvest in their lands, but then cutting from neighboring public lands instead
- Logging in protected areas such as forest reserves
- Logging in prohibited areas such as steep slopes, riverbanks, and catchment areas
- Removing under or over-sized trees
- Extracting more timber than authorized
- Logging without authorization
- Logging while in breach of contract obligations
- Obtaining concessions illegally

Timber Smuggling

- Exporting or importing tree species banned under national or international law
- Exporting or importing tree species listed under CITES without the appropriate permits
- Exporting or importing logs, lumber, or other timber product in contravention of national bans
- Unauthorized movement of timber across district or national borders
- Movement of illegally logged timber from forest to market
- Exporting volumes of forest product in excess of the documented export quantity

Practices Specifically Aimed at Reducing Payment of Taxes and Other Fees

- Selling forest products below market prices to reduce declared profits and corporate income tax
- Buying inputs above market prices to reduce profits and corporate income taxes
- Manipulation of debt cash flows (i.e., transferring money to subsidiaries or a parent company where debt repayment is freer than the export; inflating payments allowing untaxed repatriation of profits; reducing the level of declared profits and, therefore, taxes)
- Overvaluing services received from related companies to reduce declared profits and corporate and income taxes
- Avoiding royalties and duties by under-grading, under-measuring, under-reporting, and under-valuing timber and misclassifying species
- Non-payment of license fees, royalties, taxes, fines, and other government charges

Illegal Timber Processing

- Processing timber without documentation (if required) that verifies its legal origin
- Operating without a processing license
- Operating without necessary licenses and approvals
- Failing to meet license provisions

To this list of illegal practices, Callister (p. 10) adds a list of corrupt practices:

Grand Corruption

- Companies providing support to political parties, or bribing politicians, senior government officials, or military officers to:
 - Obtain a timber concession
 - Obtain extensions to existing concessions
 - Obtain approval for a timber processing venture
 - Avoid prosecution for transgressions
 - Avoid payment of fines or other fees
 - Negotiate favorable concession/investment agreements, including tax holidays and other investment incentives
- Politicians and high-ranking military and government officers using their status to affect the same outcomes listed above, for their own companies or those of relatives or political allies
- Companies bribing local communities to influence them to agree to granting timber harvesting rights

Petty Corruption

- Companies bribing junior government officials, military personnel, and local government official to:
 - Falsify declarations of volume or species harvested
 - Avoid reporting prohibited species or diameters
 - Falsify export documentation or ignore document irregularities
 - Avoid reporting and prosecution for non-compliance with forest management regulations
 - Permit illegal movement of timber
 - Ignore logging in protected areas and outside concession boundaries
 - Allow timber processing without the necessary approvals
 - Ignore infringement of timber processing regulations, including pollution control

Many of the illegal practices cited by Callister are generic white-collar crimes that also occur in other industries. However, as Contreras-Hermosilla (2000, 2002) points out, timbering is especially susceptible to illegal activity. In developing nations, forestry usually occurs in remote areas, where it is difficult to monitor by either officials or the public. Developing nations do not typically take inventories of their forests, so there is no ready way to account for excess harvests. Additionally, official discretion to set limits on harvests, and to determine who can and cannot benefit from those harvests, breeds corruption in nations where the rule of law is underdeveloped. Thus, while a well-motivated government may struggle to control illegal lumbering, a corrupt government might contrive to promote it.

Callister's listing is clear, but identifying these illegal practices in real-world settings is complicated.¹⁴ When property rights are poorly defined, and when laws are ambiguous and contradictory, it can be

¹⁴ Dauvergne (1998).

difficult to distinguish between illegal activity and simply aggressive business behaviors.¹⁵ Another complication is that white-collar crime can be hidden through corporate operations, complicating any attempt to identify perpetrators.¹⁶ Many of the descriptions that we present later in the report identify what appear to be corporate conspiracies, but the evidentiary basis and the correct interpretation of whatever data are available, is often obscure.

Readers of this essay will almost certainly understand the difficulties that researchers encounter when developing estimates that reflect the prevalence of illegal logging throughout the world. Timber “disappears” both because it is logged for domestic and international markets and simply to clear land for other development. Because illegal lumbering occurs so often under the cloak of secrecy and corruption, speculation is required to apportion the amount of timber losses that are due to illegal logging. Groups that are interested in forest sustainability have provided many estimates, but these estimates may include an upward bias designed to emphasize the need for aggressive and immediate countermeasures. Furthermore, there is considerable ambiguity regarding the definition of “legal.” Government corruption often provides a legal patina to what is in fact illegal activity.

Developing original estimates of the extent to logging was beyond the scope of this study, but we reviewed extant estimates, concluding that Seneca Creek Associates (2004) has provided credible estimates for understanding the scope of the problem.¹⁷ Seneca Creek Associates estimated that the total wood products trade in 2002 was \$186 billion -- \$69 billion in wood products and \$117 billion in pulp, paper, and paperboard trade.¹⁸ Of that trade, Seneca Creek estimated that about 6 percent of the timber

¹⁵ Writing about forest exploitation in the Solomon Islands, but stressing that his observations extend beyond that location, Dauvergne (1998) emphasizes:

“These practices seem to suggest that corporations ... are mischievous or devious resource exploiters. In some ways they are. But generally they are also rationally responding to market signals, the viability and profitability of operations, and the extent of state and societal controls” (p. 2).

¹⁶ Again, Dauvergne was writing about the Solomon Islands, but he observed that forms of illegality extend beyond that setting (pages 16-17):

“Complex corporate structures and opaque links between firms facilitate tax avoidance. A company sometimes sells a product to its parent company at a significant discount. The parent company then sells the product for its full market value. The product only leaves the host company on paper, but this allows the company to register its profits in a tax haven or a country with lower corporate taxes than the host company. (This also enables the companies to reduce export taxes.)”

“Double invoicing is another common scheme to reduce or evade taxes. In these cases, a buyer receives two invoices that together equal the value of a single purchase. [The producers appear to have sold their goods at a low price. The buyer appears to have purchased the rest from a third party. Thereby the producer avoids part of the export tax.]”

“Corporate groups will also sometimes lower a subsidiary’s income taxes by shifting debts from the parent company to the subsidiary.”

¹⁷ The American Forest & Paper Association commissioned the Seneca Creek work. One objective was to “analyze the impacts of illegally produced and traded wood products on the ability of U.S. producers to export into key overseas markets,” so if one anticipated a bias, it might be in the direction of overstating illegal shipping. On the contrary, the Seneca Creek estimates of illegal shipping tend to be lower than estimates provided by others.

¹⁸ Seneca Creek Associates (2004), p. 6.

trade and 17 percent of the plywood trade was likely illegal. Most illegal timbering is concentrated in a few countries or regions.¹⁹ Some principal sources, and the percentage of their forest industry deemed illegal or at least suspicious in the Seneca Creek review, include:

- Russia – 20-50 percent of forest production
- Indonesia – 70-80 percent of forest production
- Brazil – 20-90 percent of forest production (with high end occurring in the Amazon)
- Malaysia – 35 percent of forest production
- West and Central Africa – 34-70 percent of forest production
- Other Latin America countries – 42-90 percent of forest production
- Other Asia – 20-90 percent of forest production
- Eastern Europe (Latvia and Estonia, especially) – 20-50 percent of forest production
- Illegal logging is seen as infrequent in the United States and Canada.

According to Seneca Creek, some nations are especially susceptible to importing illegal timber: Japan (20-80% of imports), China (32%), and the European Union (up to 80% of tropical wood products). Seneca Creek estimates that up to 10 percent of U.S. imports may be from illegal sources, including 25 percent of plywood (hardwood), 10 percent of lumber, and 1 percent of logs. Note, however, that the percentage of illegal timber entering specific countries is inferential based on the source of that timber; because once timber enters into markets, legal and illegal timber is virtually indistinguishable, so direct estimates are impractical or impossible to obtain.²⁰

The Seneca Creek report further argues that:

Illegal logging is, in many respects, a symptom of corruption, graft, lax law enforcement, and poor social conditions. In fact, published measures of political and judicial corruption reveal a close correlation between corruption and illegal logging.²¹

The rest of this essay elaborates on this theme. The next section develops a four-cell model (see Table 1) that explains the connection between “corruption, graft, lax law enforcement, and poor social conditions” and illegal logging. Then the following section uses this four-cell model to characterize illegal logging, milling and transportation in the nations and regions identified by Seneca Creek Associates as suffering from pervasive illegality in their forestry sectors.

¹⁹ Ibid, p. 2.

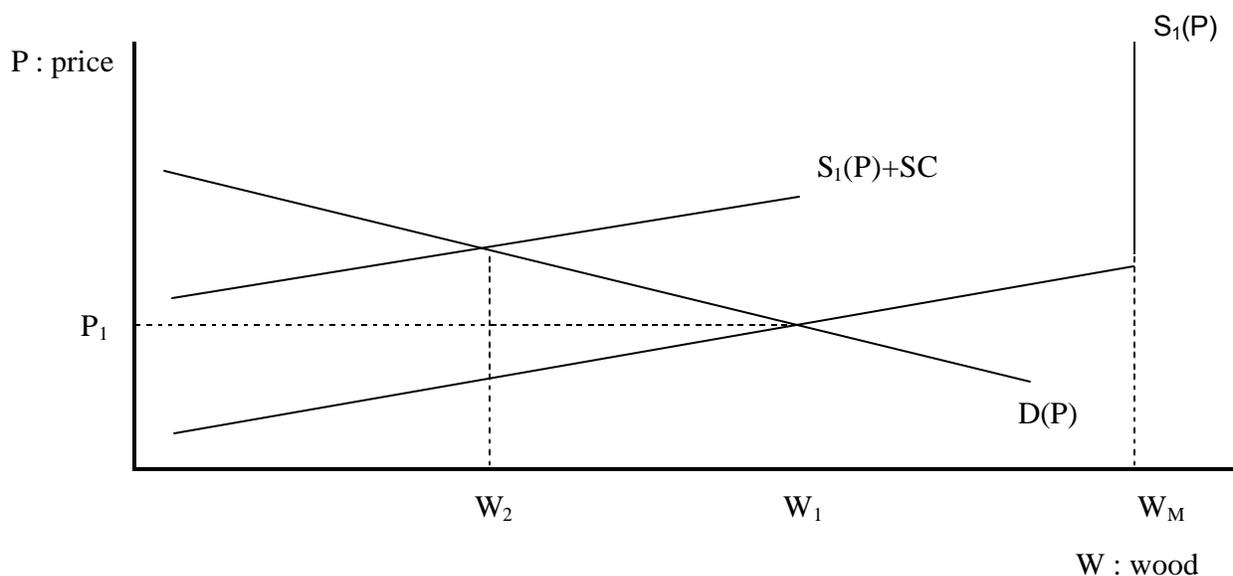
²⁰ Tacconi, Obidzinski, & Agung (2004). European League Tables of Imports of Illegal Tropical Timber: Briefing. Friends of the Earth (2001).

²¹ Seneca Creek Associates (2004), p. 6.

3.0 Simple Economics of Illegal Logging

Economic models can be useful because they simplify, and thereby clarify, what is otherwise a complex interaction of market and political forces.²² Our model assumes there is just one marketable product: wood. (In fact, there are multiple marketable products, but assuming a single one simplifies without distorting conclusions.) Our model assumes that the “wood industry” in a given country faces a single demand curve that has two components. First, there is domestic demand for wood and wood products, which according to Seneca Creek Associates (2004, Table 2), is the largest component of the demand.²³ The second source is international: wood and wood products are exported from the source nation to consumer nations, often through intermediary nations.

Figure 1: Supply and Demand for Wood



A demand curve is a simple summary of the amount of wood that can be sold to domestic and international buyers given the prevailing market price. The higher the price, the lower the demand. Let:

D(P) Figure 1 represents the national demand for wood at price P. The demand curve slopes downward from left to right, because the demand will be high if the price is low, and the demand will be low if the price is high. This demand curve comprises both the demand for the nation’s wood within the supplier nation and the demand for its wood outside the supplier nation.

²² Palmer, C. (2001) has developed and applied an economic model for somewhat different purposes. Our arguments have benefited especially from a paper by Smith (2003).

²³ Seneca Creek Associates estimate that 1,662 million meters cubed of roundwood is produced but only 128 million meters cubed enters into international trade. For lumber, the respective numbers are 402 million and 120 million, and for plywood they are 59 million and 23 million.

A supply curve is a simple summary of the amount of wood that would be offered to domestic and international buyers at given prices. The higher the price, the greater the supply. Let:

$S_1(P)$ This represents the national short-run supply for wood. In Figure 1, the supply curve slopes upward, implying that the marginal cost of producing a large amount of wood products (which requires harvesting comparatively inaccessible timber) is higher than the marginal cost of producing a small amount of timber (which requires harvesting readily accessible timber). The supply curve is truncated at W_M , which represents the maximum amount of timber that could be produced.²⁴

Figure 1 shows the supply and demand curve on the same graph. The vertical axis is the price, and the horizontal axis is the amount of wood transacted. $S_1(P)$ is the supply curve that would prevail at a point in time if loggers were uninhibited from logging. $D(P)$ is the sum of domestic and international demand at the same point in time. W_1 is the resulting amount of wood transacted in domestic and international commerce at price P_1 . The intersection of supply and demand determines the market price. If the price is higher, then suppliers would seek to sell more wood, and buyers would seek to purchase less wood. If the price is lower, then suppliers would produce less wood, but buyers would seek to purchase more. Thus, P_1 is the price at which buyers and sellers agree about the sale and purchase of timber.

Economists sometimes use terms that are confusing for non-economists. When an accountant balances his company's books at the end of the year, he computes profits as the difference between revenues and costs. Those profits are then transferred to the owners, or they are reinvested on behalf of those owners. In a competitive industry, the bookkeeping profit is in fact a return to capital, a factor of production. Without the bookkeeping profit, owners would not provide the capital, and the industry would not exist. Economist who worry about industrial organization expect profit earning potential to send the correct signal to capitalists, so that they invest in industries that have the greatest need for capital.

For simplicity's sake, we assume that the logging industry is competitive. This assumption is convenient principally because it allows us to assume that the supply curve represents the average cost of providing wood. In a competitive industry, revenues cover costs, including the cost of capital, and no single producer earns an excess profit, or *rent*. Competitive markets send the correct signal *provided* that loggers/millers/transporters incur the complete costs (including what might be deemed social costs) of harvesting wood and producing wood products. The problem is that this proviso fails to hold absent some mechanism for forcing loggers/millers/transporters to account for social costs. In Figure 1, $S_1(P)$ represents the average costs of harvesting different amounts of wood, and as we have noted, market forces

²⁴ The cost of harvesting timber may actually decrease over some range due to fixed costs and other scale economies. A downward sloping cost curve may have important implications for the rate at which loggers seek to exploit forests, because loggers would prefer to harvest at the least cost to satisfy an international demand whose price is relatively fixed. Adopting a model with falling costs would not materially alter the conclusions, however, so we ignore the possibility.

cause W_1 units of wood to be produced. At this level, the marginal cost (to the logging industry) of producing additional wood just equals the marginal value (to consumers) of consuming additional wood.²⁵

Suppose, however, that the unit social cost of producing wood exceeds the logging industry's cost by a fixed unit amount: SC. Then the cost curve that includes both the industry cost and the social cost is represented by $S_1(P)+SC$. From a social standpoint, the logging industry should produce W_2 units of wood. At any lesser amount, the marginal value of the wood exceeds the marginal cost of its production, making the nation better off if it produces more wood. At any greater amount, the marginal cost of producing wood is greater than the marginal value to consumers, making the nation better off if it produces less wood. The level W_2 is optimal, and the objective of social policy for a nation concerned with public welfare is to discern how to get its forestry industry to produce W_2 units of wood.

3.1 Free Access Versus the Public Interest

When profits are excessive, they send the wrong signal – that is, when profits exceed the competitive market return for capital.²⁶ Given the problem that concerns us, excessive profits can occur in two ways. Monopolistic markets allow one or a few producers to restrict others from logging, milling, or transporting, which reduces the wood supply to an artificially low level and increases prices to artificially high levels. (We will see that certain nations are especially adept at creating and exploiting monopolies, with serious consequences for logging markets.) A second way that the logging industry earns excess profits is when some loggers fail to pay all the costs of logging – for example, when they fail to pay export taxes, or when they log more timber than a contract allows. Provided that most loggers pay all costs, “cheaters” have the advantage of selling at market prices but producing at lower costs. Of course, cheating does not work very well if every manufacturer cheats, because universal cheating would simply drive the market price down to this artificially low level. Nevertheless, widespread cheating does occur, for reasons that we will explain below. These two situations – monopoly and cheating – are regrettably common across the logging industry.

Serious problems can arise when loggers have uninhibited access to a nation's forests. Such access can harm the interests of other parties, even through the loggers themselves bear no burden to take that harm into account. Consequently, the cost of harvesting trees (which includes the monetary-equivalent of the harm felt by interested parties) almost always exceeds the value of the resulting wood products when there is free access.²⁷

²⁵ Suppose that W units of wood were produced. The marginal cost is the additional costs of producing the $W+1^{\text{st}}$ unit of wood. Similarly the marginal benefit is the additional benefit to consumers of consuming that $W+1^{\text{st}}$ unit of wood. In a competitive market, the marginal benefit is reflected by the market-clearing price.

²⁶ We abstract from a number of issues. In emerging markets, profits may exceed a competitive level and send exactly the correct signal: entrepreneurs should invest in those industries. High profits also occur in the short-run due to transitory factors, and such profits are not considered excessive. In this essay, excessive profits arise from market imperfections, principally a manufacturers' ability to monopolize trade or to avoid paying the full costs of producing its product.

²⁷ Economists refer to the failure of manufacturers to take costs into account as “externalities.” There is an extensive economics literature on this subject. The pernicious effects of externalities are reduced or eliminated by clearly

Free access also harms the logging industry itself. Taken as a collective, the logging industry has a future discount rate that reflects how the industry would trade current earnings for future earnings. Looking at Figure 1, unless forestry is sustainable, the supply curve will shift to the left over time. Logging will become increasingly costly, and eventually impossible, so that future earnings will be significantly lower than present earning. Given a control mechanism whereby the industry can impose a standard on its members, the industry might agree to restrict logging below W_1 . In the absence of an effective control mechanism, however, some individual loggers can always do better for themselves by cheating on any agreement. Absent a control mechanism, then, every logger has an incentive to cheat, and hence, without a control mechanism there can be no industry agreement. Loggers have an incentive to exploit the forests as quickly as possible.²⁸

3.2 Enforcement / Rule of Law

In almost all cases, free access harms the national interest. A nation has a future discount rate, and so it sees an optimal level of forest exploitation. This may be at a sustainable level, or it may not.²⁹ It may be at a level consistent with industry interests, or it may not. It may be at a level consistent with international interests, or it may not. Developing nations may be especially prone to maximizing current income from international commerce to the detriment of future income, thereby allowing forest exploitation at levels that are not sustainable.³⁰ Almost certainly, however, the national interests will require some restrictions on the unfettered harvesting of trees.

defined, enforceable property rights and adequate mechanisms for contracting. For a discussion of externality in the context of forestry, see Contreras-Hermosilla (2000, 2002).

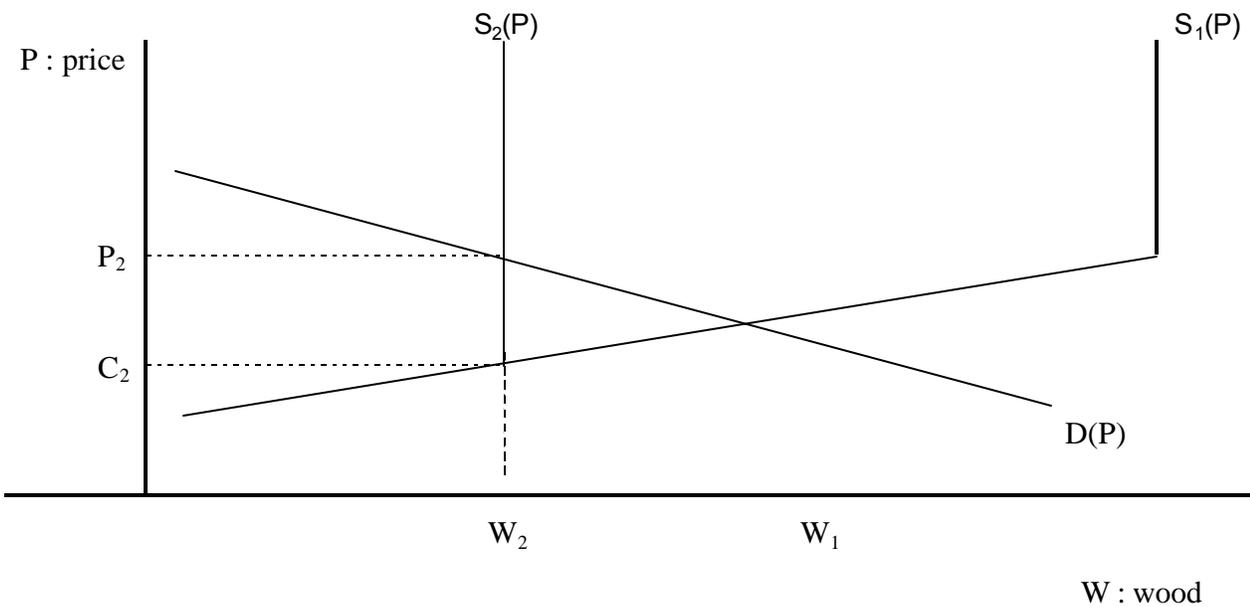
²⁸ Dauvergne (2004) and Contreras-Hermosilla (2001) argue that loggers may have very high discount rates because of the uncertainty they face regarding access to harvestable lands. If those rights can be readily terminated, there is considerable incentive to exploit the land quickly and completely, and little incentive to reforest the land. When the rule of law operates, so that the granting of property rights is not capricious, we would expect the domestic logging industry to have lower future discount rates. The rate of forest exploitation would be lower. Rice, Gullison and Reid (1997) agree that ambiguity about long-term access can lead to high discount rates, but they also emphasize that a scarcity of capital coupled with high interest rates (18 percent in Bolivia compared to 4 percent in the U.S. at the time of their writing) necessitates a high discount rate.

²⁹ Contreras-Hermosilla (2000, 2002).

³⁰ Contreras-Hermosilla (2002) observes "...the debate on illegal forest activities is both dominated and encumbered by a desire to impose certain values, considered of global validity, on all countries. To a certain extent, this is motivated by the fact the counties and their forest resources are interdependent. Forest fires tolerated in one country affect negatively its neighbors. ... Therefore, it is felt, some global rules of the game should be imposed. ... What the international community ... may consider as undesirable and therefore as a candidate for prohibition and condemnation as an illegal activity, may not coincide with the values that are prevalent in a particular country" (p. 16). As an illustration, when writing about the former states of the Soviet Union, Savcor Indufor Oy (2005) noted a fundamental conflict between sustainable forestry and national interests:

The fundamental conflict is between environmental protection and satisfaction of social needs; in many cases it is difficult to achieve both. The existing legal frameworks are founded on strict principles of environmental protection but, as a result, the legal supply of firewood is often grossly inadequate to satisfy people's basic needs (p. viii).

Figure 2: Restricting the Supply Wood by Prohibitions

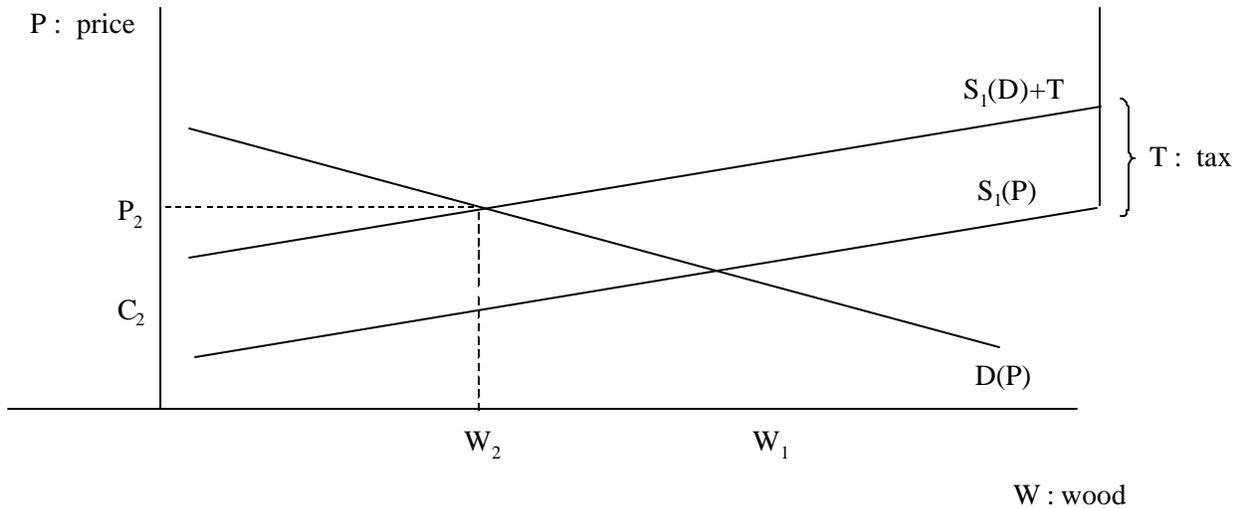


The solution from a national perspective is to restrict the ability of the domestic forest industry to harvest trees. This can be done in various ways, either directly through prohibitions and limitations on harvesting, milling, or transporting, or indirectly by increasing unit costs (for example, through a user fee or by placing a tax on the amount of wood or wood products put into commerce), or more likely, a combination of the two. Given adequate enforcement, prohibitions and limitations can reduce harvesting to levels that the nation considers optimal, principally by truncating the supply curve to level $S_2(P)$ in Figure 2. As the figure shows, this policy results in higher prices and, of course, lower supply.³¹ A key observation here is that the domestic price for timber P_2 exceeds the logging industry cost C_2 of supplying W_2 , and loggers/manufacturers/traffickers will secure excessive profits or rents equal to the dash-marked area in the curve (which is $W_2[P_2 - C_2]$). The logging industry may be very pleased with this result, because essentially the state has provided monopoly profits.³²

³¹ Although the inference is speculative, we would expect that truncating the supply curve would shift the allocation of timber so that a higher proportion would flow to domestic uses. This seems likely, because the domestic demand is likely to be inelastic, or price insensitive, given that transportation costs, import duties, and other restrictions hinder foreign suppliers from offering much competition in the domestic market. The demand for export is likely to be more price-sensitive, or elastic, because other nations can provide competing supplies for nations that import timber.

³² Brown (1999) provides some estimates of the size of these rents for Indonesia. He argues that if market distortions were removed, Indonesian logs would sell for US\$80 per cubic meter of red meranti. The cost of extraction is US\$17 and a competitive profit would be about US\$5. The difference – US\$58 – could be considered rent (p. iii). Rice, Gullison and Reid (1997) provide estimate for the Chimanes region in Bolivia: “...unrestricted logging is from two to five times more profitable than logging in a way that would ensure a continued supply of mahogany” (p. 46).

Figure 3: Restricting the Supply Wood by Tax-Equivalents



Of course, the state is unlikely to be indifferent to this windfall for loggers; more likely, the state will seek to appropriate the excessive profits or rents by using taxes or tax-equivalents such as concession charges, reforestation requirements, and so on. The taxes and tax-equivalents provide a device to transfer all or some of the profits from the loggers to the state. In theory, the state could rely exclusively on taxes or tax-equivalents. In Figure 3, the state charges a unit tax (T) for wood, with the consequence that loggers will voluntarily restrict their supply to W_2 . (This presumes that the state sets the tax at a level that covers social costs.) In reality, the two policies – prohibitions/limitations and tax-equivalents – would probably be used in concert to protect especially vulnerable forests and to retrieve excess profits.

In an ideal world, the state would have set the tax at a level that captures all the social costs that logging imposes on the nation but that loggers would not otherwise take into account. By the use of a tax (or tax-equivalent), the state forces the logging industry to take social costs into account. We call this market the *Enforcement / Rule of Law* model, thereby implying that the state enforces its laws (Enforcement) using conventional legal procedures to control logging and collect rents (Rule of Law). This classification is silent about whether or not the state makes good choices about the exploitation of its forests. It simply says that the state sets a rule and enforces that rule using legitimate legal procedures.

3.3 Enforcement / No Rule of Law

In the *Enforcement / Rule of Law* model, we assume that the tax-equivalent is optimal from a social benefit standpoint. The rent that is generated can enter general government revenues, or be used to promote sustainable forests (including paying for environmental enforcement and reforestation). However, the taxes or tax-equivalents that are optimal from a social benefit standpoint are not necessarily

the ones that are optimal from the perspective of maximizing the potential rent.³³ Absent the rule of law, this disjuncture can also be used either directly or indirectly to benefit corrupt government officials. A short digression may be useful here: We use the term “tax” as a stylized device to represent some payment beyond the production costs that loggers/millers/transporters are obliged to pay by authorities who have power to compel payment. If the payment is direct toward public coffers, it is indeed a conventional tax. Otherwise, it is not a conventional tax, but more likely, a pure bribe. We do not distinguish between these two situations analytically, but from this point forward we will refer to both as “tax-equivalents.”

How can corrupt public officials maximize and then capture part or all of this rent? The answer is relatively straightforward: The corrupt official needs to restrict the supply or set the per-unit tax equivalent T (or otherwise restrict the wood production) at a level that earns the most profit. That is, the corrupt official needs to act as a monopolist. This assumes that the corrupt official and his conspirators have sufficient political control to maximize profits. There are then diverse ways to appropriate some or all of the revenue in excess of costs. A public official can embezzle funds. (This would be especially effective if the tax-equivalent were set at a level that maximized profits, so the official would not have to deal directly with producers.) A public official can also work cooperatively with suppliers in exchange for payments. Or, the public official could have an ownership share in the timber business.

When this situation occurs, we refer to it as the *Enforcement / No Rule of Law* model. Enforcement is a prerequisite: Enforcement is required to restrict supply to a level where price exceeds costs. Without this restriction, revenues would not exceed costs, and graft would be irrelevant. Obviously, the rule of law must be inoperative. Instead, corrupt government officials manipulate the law so that those officials capture all or large portions of the rent either as income (bribes) or as income-in-kind (donations to a political party) or even through ownership rights in the timber companies. Making this crime work typically requires that the government restrict timbering to a small number of large firms, which facilitates enforcement.

3.4 Some Enforcement / No Rule of Law

We have identified two models – *Enforcement / Rule of Law* and *Enforcement / No Rule of Law*. Yet, in fact, there are gradations in a state’s ability to enforce its laws. In some places, strong central authority with the ability to enforce the state’s laws will also have the ability to maximize rents by restricting the supply of timber to levels that maximize monopoly profits. In other places, the authority for enforcement has devolved to the local level, with important consequences.

Suppose, for example, that instead of having one strong central government that can enforce the nation’s laws, a country has twenty local authorities that can enforce laws at the local levels. The local authority may have authority to grant concessions, for example; or, it may have the delegated responsibility for inspecting timber used by millers and for checking timber shipped out of the local territory. This shift in

³³ Rent maximization would always require that less than W_1 be produced. It may require more or less than W_2 depending on the elasticity of the demand for wood.

authority means that local governments and potentially corrupt local officials are now positioned to capture the rents. Because the ability to collude with loggers, millers, and transporters is worthless if the timber industry returns a per-unit tax equivalent T to the national government, the collusion would typically take the form of helping loggers, millers, and transporters avoid restrictions imposed by the national government. The logging industry would in turn share some of its profits with the corrupt officials.

In this scenario, there are some questions about how the profits would be divided, and in this regard, local government interests are at some disadvantage. Loggers will tend to deal with local governments that provide the best deals. Local governments – unlike their monopolistic national counterparts – are at a disadvantage when bargaining because they face a form of competition from other local governments, some of which may be able and willing to grant more lenient concessions. Moreover, emoluments for local officials may be a minor or irrelevant consideration. Local governments may have very different interests from those of the nation, preferring for example to promote local employment, perhaps by facilitating the ability of loggers to avoid onerous national regulations and tax-equivalents.

We refer to this model as the *Some Enforcement / No Rule of Law* model. We can expect this model to encourage more wood production and lower wood prices than the earlier discussed model, *Enforcement / No Rule of Law* – which works partly by restricting the number of suppliers so that the monopolistic agreements can be more readily enforced.³⁴ When national enforcement is effective, both the suppliers and the corrupt government officials have an incentive to see that the suppliers restrict their output and “pay” the tax-equivalent, which maximizes the total profits from the wood industry.³⁵ The “tax” then gets divided between the corrupt officials and the industry. But when national enforcement is ineffective, this mechanism for restricting supply and appropriate profit is less effective because local authorities wield less bargaining power.

Under the *Some Enforcement* model, we can also expect to observe the emergence of new, often criminal, agents to help oversee and enforce agreements. These local enforcers might be organized crime members or insurgents. That is, as a large number of local governments take responsibility for enforcement, and as that enforcement becomes increasingly discretionary, suppliers may take non-legal measures to enforce what they see as their property rights. (While we might expect criminals to resemble organized crime under the *Some Enforcement* model, we would expect criminals to engage in white-collar crime under the *Enforcement/ No Rule of Law* alternative.) Under the *Some Enforcement* model, we might also expect an increased presence of corruption at the level of minor national government officials, such as customs officials. A central national authority will seek to minimize such petty corruption, which reduces profits for the central authority. Absent strong national enforcement, however, petty corruption can thrive.³⁶

³⁴ By contrast, the *No Enforcement* model allows a large number of suppliers to deal with a large number of government agencies. The result is that exclusive, restrictive agreements are difficult to negotiate.

³⁵ The word “pay” is in quotations because the industry may not actually pay the tax. In exchange for the ability to avoid the tax, the industry may make a payment to the corrupt official. But this is really equivalent to paying the tax and then redistributing it partly to the industry and partly to the official. The point is that the government and the industry would agree that enforcing restrictions on wood production is profitable and therefore desirable.

³⁶ Note, however, that we would not expect the *Some Enforcement / No Rule of Law* model to resemble a model of unfettered competition. Local officials have an incentive to bring some rationality to the local use of forest

3.5 No Enforcement / No Rule of Law

Many producer nations lack a mechanism to enforce payment of the tax-equivalent. When enforcement is completely lacking, then the market for timber reverts to the unfettered market, and excess profits or rents disappear. We refer to such a market as the *No Enforcement / No Rule of Law* model. The non-enforcement part of this name is determinative. When a state lacks the resources to enforce its own laws, it is irrelevant *from an economic perspective* whether that lack-of-enforcement is in concert with, or in violation of, the nation's law. Of course, if a nation has laws that are being broken, then the behavior is illegal; and if a nation lacks laws, then the behavior is not illegal. There is often great ambiguity about what behavior is permitted and what behavior is prohibited, but without enforcement, the differences are irrelevant.³⁷

The key characteristic of this type of market is that *property rights* are un-enforced.³⁸ Wood production is excessive because it does not cover the social costs of production. While some have described this model as arising from rent-seeking behavior, in fact, the wood industry may earn no excess profits as we have defined that term. Simply put, this is a market in shambles. When property rights are not enforced, a large number of suppliers will drive down the price of timber to levels that just cover manufacturing costs (including the return to capital). These prices, unfortunately, almost always fail to cover all the nation's social costs.

However, exploiting forests when enforcement is totally lacking appears to be self-limiting. Timbering, for example, requires capital investments and technical knowledge to be efficiently exploited. Those nations that lack any semblance of legal control are unlikely to attract the requisite capital investments. Moreover, efficient enforcement of forest resources requires infrastructure in the form of roads, river and sea transport, and perhaps semi-skilled indigenous labor. Nations that completely lack enforcement are also likely to lack the sufficient infrastructure to support a major forestry industry. The result of this is that both legal and illegal forestry is likely to be lacking.³⁹

resources. The problem is that local enforcement may be limited by the lack of enforcement resources, and also, local interests may depart from national interests. Still, local governments should have both the incentives and some limited means to prevent forest exploitation from approaching the *No Enforcement / No Rule of Law* extreme.

³⁷ As with the *Some Enforcement / No Rule of Law* model, organized crime sometimes takes advantage when the rule of law is lacking. For example, in the United States, cocaine is illegal, and contracts between dealers are not enforceable under law. Cocaine dealers have adopted their own enforcement mechanisms, which often involve the use of violence. This way they can monopolize small segments of the cocaine market. With respect to timber, we will see in the following sections that bandits, rebels, and terrorists in certain nations have exploited this niche to their advantages.

³⁸ Property rights include traditional property such as ownership of the forest. Property rights also include nontraditional property, such as a nation's desire for biodiversity.

³⁹ The observation seems perverse, but in the end, corrupt public officials may be relatively effective at *preserving* forests (see Smith et al., 2003). High profits in the form of rents are earned by restricting the supply of timber to levels that are lower than would be dictated by market forces alone. For example, we will see subsequently that the downfall of Indonesia's Suharto in 1998 altered illegal lumbering in Indonesia from a level restricted by a corrupt central government / multi-national company conspiracy to more expansive harvesting promoted by

4.0 Illustrations of the Four Models

Through a series of case studies, the following section will illustrate the ways in which the economic model described in Section 3.0 can help us understand and differentiate between the activities of various countries that engage in illegal logging. Before we begin, however, we have listed five overarching points (below) that will help set the framework for our discussion.

1. *On the Criminality of Producers of Illegal Timber:* Frequently, the producers of illegal timber are cast as criminals. And while this casting is by and large accurate, a sober accounting raises some questions about the ability of regulators to distinguish between aggressive, legitimate businesspersons who operate in an ambiguous and uncertain business environment, and aggressive, illegitimate businesspersons who willfully breach national and international laws. For example, one of our key informants reacted to an earlier draft of this paper by observing that Brazilian loggers would be offended and mystified to be called “criminals” or “thugs” (a term we had adopted from one published account). Instead, our informant asserted that these loggers would characterize themselves as businessmen forced to operate in an environment where regulatory laws are both ambiguous and contradictory. To do business, many loggers create paper trails and pay minor bribes to avoid legal entanglements, but are not otherwise incorrigible despoilers of Amazon forests. In this regard, we also note that international buyers may knowingly or unknowingly purchase illegal timber, but that (to our knowledge) these purchases are not typically considered a crime in the countries that receive the imported goods.
2. *On the Role of Indigenous Peoples:* We acknowledge that some of the “criminals” who engage in illegal logging are indigenous peoples who are ignorant of conventional property rights or who dispute rights when they are cognizant of them. The Center for International Forestry Research (CIFOR)⁴⁰ has provided case studies of rural households that use forest resources. CIFOR, along with other organizations and research groups, point out that many indigenous populations have lived on forestlands for generations, yet have no clear title to the land, and hence are cast as poachers engaged in lumbering. Furthermore, these groups typically lack the capital resources to

the interests of local governments and multiple criminal enterprises. In the absence of corrupt officials who are able to enforce restrictive logging agreements, loggers will seek to evade whatever laws are operative, and the supply of timber will expand past W_2 toward W_1 . Again, it is speculative, but centralized corrupt officials who exercise control bestow a kind of property right in forest that can be rationally exploited. (Rational means rational from the perspective of the officials and their corporate clients, not from a general social perspective.) Absent that centralized control, property rights may erode to such an extent that maximizing short-term profit may lead to a higher level of forest waste.

⁴⁰ A description of the Center for International Forestry Research, taken from its web site:

http://www.cifor.cgiar.org/docs/_ref/aboutcifor/index.htm

“CIFOR is an international research and global knowledge institution committed to conserving forests and improving the livelihoods of people in the tropics. ... CIFOR's high impact research helps local communities and small farmers gain their rightful share of forest resources, while increasing the production and value of forest products.”

legitimize their logging activities, often because local laws require the use of paid professionals and sometimes bribes.⁴¹ This form of illegality is outside our purview.⁴²

3. *On the Culpability of Multinational Corporations*: Many commentators place much of the blame for illegality on multinational corporations, and the demands that they satisfy within consumer nations. According to Contreras-Hermosilla (2002), “corporations from industrialized countries are often associated with illegal operations in host countries.” His assessment is that “illegal acts in the forest sector are common in many countries and there are important linkages between exporting and consumer nations... Companies, [by] using imaginative procedures, can conceal their illicit operations through complex methods of documentary fraud and corruption.”⁴³ Sears, Davalos, and Ferras (2001) support this point, arguing that multinational corporations are responsible for exploiting forests under conditions that are either illegal or border on illegality. Citing a study by Mayers and Bass (1999), the authors state that fewer than 50 multinational corporations exploit approximately 140 million hectares on public land worldwide.⁴⁴ Yet, while this is true, throughout

⁴¹ Ensuring Sustainability of Forests and Livelihoods through Improved Governance and Control of Illegal Logging for Economies in Transition. Savcor Indufor Oy (2005).

⁴² One of this paper’s reviews was concerned with dismissing logging by indigenous populations:

The authors note that “personal and local” uses – particularly by indigenous populations - are excluded from the definition of “illegal logging.” The rationale given by the authors is that these logs are not entering international commerce and thus beyond the scope of this project. Perhaps that is true, but I would like to see some more discussion/analysis of this issue before it is dismissed out of hand. For example, it would not surprise me if much indigenous population logging does enter the international market through selling to middlemen. This might be solely for raising cash – or simply because they are trying to clear cut forests for growing crops or other “local” uses. They might also cut logs for use in making crafts (e.g. mahogany bowls, furniture) that make their way into international commerce – although this might be small. In addition, I wonder if deforestation by indigenous populations affects other illegal logging in an area. For example, if there is no culture of preserving forests in an area, this will make enforcing laws more difficult.

The reviewer’s comments are well taken. Indigenous people almost always run or assist illegal logging by providing labor, and when they play that role, this essay includes them as illegal loggers. Furthermore, indigenous populations can and do create climates that are conducive to illegal logging. As discussed later, Indonesia will provide an illustration. Nevertheless, we seek to exclude logging for personal use as fuel and other small-scale users. See the discussion regarding the use of timber by indigenous populations in the former Soviet Union.

⁴³ Contreras-Hermosilla (2002), p. 8.

⁴⁴ With respect to illegal practices, Sears, Davalos & Ferras (2001) observe: “...some companies will choose to avoid compliance by conducting illegal practices and engaging in corrupt interactions. It is widely recognized that the political and financial influence of large corporations interested in gaining profits from forest products in some countries allows them unfettered access to otherwise restricted areas. Under current practices, the majority of logging operations in Southeast Asian countries is illegal ... activities include ... logging before obtaining exploitation permits, logging in wildlife refuge areas, clearing undersized logs or logging after bans, illegal exports, underreporting of logs. ... These MNCs [multinational corporations] and the local logging companies will profit from unrestricted access to timber as long as governments of producer countries lack sufficient capacity and/or political will to implement, monitor, and enforce national or international regulations” p. 355.

the rest of this paper we will see that multinational corporations are not the only problem – or even the principal problem. Exporting nations have developed their own domestic industries that are adroit at using illegal means to exploit forest resources. We describe some of these examples below.

4. *On Timber Laundering and Transnational Corruption*: Most timber illegalities appear to occur primarily in producer nations. However, illegal trafficking is not an exclusive intra-country problem. Barden (1994) identifies the practice of “transfer pricing” to evade taxation, in which: “...colluding companies control the export and import of timber. At export the timber is priced at less than the market price, it is sold to a company in an intermediary country, and then sold on to the importing country at full value.”⁴⁵ This practice of transfer pricing often goes hand-in-hand with a form of product laundering, in which illegally harvested timber is rendered “legal” at some point in the international distribution chain, often through the use of falsified documentation. We should emphasize, however, that the prevalence of this practice does not mean that all buyers and sellers are indifferent to the legality of the timber they purchase. International concern about the origins of timber has incited many world markets (especially in the European Union) to move toward a chain-of-custody certification process to reduce the inadvertent purchase of illegal wood.
5. *On “Conflict Timber”*: The role of timber trafficking in funding and perpetuating corrupt regimes and lawless activity has been well expounded in recent articles by environmental NGOs and development agencies. (The classic example of this is Charles Taylor’s Liberia, in which the government exploited the country’s natural resources – especially timber and diamonds – to fund its wars and other military endeavors.) In 2003, the United States Agency for International Development (USAID) published a report entitled, “Conflict Timber: Dimensions of the Problem in Asia and Africa,” in which the authors emphasize that timber can either be a source that *funds* conflict, or be itself the commodity over which people fight.⁴⁶ That same year, a paper submitted to the United Nations Security Council described the way in which the exploitation of natural resources provides revenue to sustain conflict and arms trafficking.⁴⁷ However, while timber is frequently involved in financing conflict, it is rarely the *principal* commodity upon which corrupt governments or rogue regimes depend. As USAID notes, “timber’s commodity characteristics discourage its use as a conflict commodity in situations where less bulky, more easily lootable, higher weight-to-value options exist.”⁴⁸ As we discuss the link between timber trafficking and political and economic corruption, it is important to remember that the role of timber is often only a

⁴⁵ Barden (1994), p. 56.

⁴⁶ USAID distinguishes between two types of conflict timber: Type 1, in which “conflict [is] financed or sustained through the harvest and sale of timber,” and Type 2, in which “conflict emerges as a result of competition over timber or other forest resources.” Conflict Timber Vol. I (p. iii).

⁴⁷ This report provided the documentation needed for the UN Security Council to issue a formal condemnation of forest plundering in the Democratic Republic of the Congo. This report is also noteworthy because its authors were the first to coin the term “conflict timber.” However, the report did not provide a concrete definition of “conflict timber.” For that, we have turned to USAID. See Report by the Panel of Experts on the Illegal Exploitation of Natural Resources and other Forms of Wealth of the Democratic Republic of the Congo. United Nations Security Council. (October 15, 2003).

⁴⁸ Conflict Timber Vol. I (2003), p. 25.

piece in a much larger picture that describes the corruption and lawlessness of several of the worst offenders throughout the world.

The following subsections provide examples of particular countries whose practices might aptly be categorized using the models that we put forward in the previous section.

4.1 Illustration: Enforcement / Rule of Law

United States of America and Canada: Producer Nations

The United States and Canada both represent producer nations that have strong balance between national and local enforcement and operate under a rule of law. There is undoubtedly illegal logging in the United States and Canada, but it is episodic and offenders are typically punished when caught. For example, the Canadian Forest Service (2004) reports "...Canadian forest companies operate in a highly regulated environment that is subject to regulatory scrutiny and audit..."⁴⁹ and as a result "...the Federal, Provincial and Territorial Governments do not consider illegal logging as a serious issue in Canada."⁵⁰

However, this does not mean that illegality is absent. A combined report from the Sierra Legal Defense Fund and Earthroots (2002) claimed that Ontario was not faithfully applying a law regarding the size of clearcut area (i.e. the removal of all or most trees).⁵¹ A press release from the Rainforest Action Network (2005) identified what was reputedly illegal cutting that exceeded allowances by Weyerhaeuser.⁵² Nevertheless, Canadian companies appear to operate principally within the law.⁵³ The Rainforest Action Network has made similar accusations about Weyerhaeuser in the U.S., but this report notwithstanding, illegal logging does not appear to be extensive within the United States.

United States of America: Consumer Nation

While the prevalence of illegal logging on American soil is relatively negligible, as a *consumer* nation, the U.S. may be tied to illegal logging networks. All of our interviewees emphasized the power of consumer demand as a driving mechanism that perpetuates timber trafficking. The residual effects, according to our interviewees, are quite substantial. Several made the link between the importation of

⁴⁹ Illegal Logging and Trade of Illegally-Derived Forest Products in the UNECE Region: Causes and Extent. (September 2004), p. 1. The Canadian Forest Service report cites a study by Cashore & McDermott (2004).

⁵⁰ Ibid, p. 3.

⁵¹ Brooks, R., Mandzy, K., & Molloy, L. (November 2002). Clearing the Forest: Cutting the Rules. A report on clearcutting in Ontario. Sierra Legal Defense Fund and Earthroots.

⁵² Saskatchewan: The Province of Weyerhaeuser. Rainforest Action Network (2005).

⁵³ The Forest Practices Board is a non-government entity responsible for monitoring forestry use in British Columbia. The Board gathers information from random, field-based audits. Abt Associates reviewed ten audits done during 2005. With one exception, the audits reported high compliance, or at least no non-compliance. In the only exception: "The board found a high level of compliance with forest practices legislation by the district and licensees, and cases of non-compliance were dealt with promptly and appropriately." Forest Practices Board (2005).

illegal timber in the world's end-consuming markets, and the impact of these consumer markets (in the United States, China, Japan, and the EU, among others) on the governance problems in producing countries. One interviewee, in particular, noted that within the United States, there currently exist no laws that prevent the wholesale importation of illegally acquired plants – including the importation of illegally sourced timber. This provides few (if any) avenues for repercussions once illegally sourced timber reaches American shores.

4.2 Illustration: Enforcement / No Rule of Law

Cambodia

Both Cambodia and Indonesia (under the Suharto regime) provide illustrations of enforcement absent the rule of law. De Lopez (2002) reports that:

The process of deforestation in Cambodia is part of a broader trend of large-scale degradation perpetrated by multinational logging firms in the Asia Pacific regions. ... The industry is skilled in extracting timber resources rapidly, in building political and military support ... Patterns in Cambodia of corruption of government officials, client-patron relationships, and military involvement ... are reminiscent of the forestry sectors of Indonesia, the Philippines, and the Solomon Islands.⁵⁴

According to De Lopez (2002), Cambodia restricts timbering to 33 concessions managed by Cambodian, Chinese, Indonesian, Japanese, Malaysian, Russian, Taiwanese, and Thai companies. He reports that corruption is rampant:

Ministers, military commanders, provincial governors, and members of parliament have issued cutting permits to logging companies. Royalties from concessions must in theory be paid to the state's treasury. In practice, corruption has pervaded the system of concessions ... When a high-ranking official grants a cutting permit to a company, he expects to receive unofficial payment for his intervention. Part of this payment is distributed to the official's protégés, and part of it is transferred to higher echelons for the official's own political survival. The armed forces either directly harvest timber resources themselves or do so in collusion with concessionaires. In turn, military commanders are expected to transfer part of their revenues to central government authorities.⁵⁵

Indonesia

Writing about Indonesia during the latter part of the 1990s, Palmer (2001) reports:

Logging concessions and milling capacity have become concentrated into the hands of a relatively small number of companies, with the resultant near-monopolistic effect on market

⁵⁴ De Lopez (2002), p. 365.

⁵⁵ Ibid, p. 364.

structure, due to the system being used in political patronage (Brown, 1999). Consequently, superprofits are captured by integrated timber concession-plywood companies, or transferred to them via official channels to their political patrons.⁵⁶

Brown (2000) writes:

The informal capture of timber rent is achieved through a three-step process: (1) Timber concessions and plywood mills are discretionarily licensed to a narrow and politically privileged group of companies. (2) Domestic log prices are kept low through the use of non-tariff barriers. (3) Rents arising from the enormous price spread between low Indonesian forest product prices and high world forest products prices are captured at the export gate exclusively by concession-plywood operations and their political patrons.

Solomon Islands

Dauvergne (1998) find the fault with large corporations in the Solomon Islands and elsewhere:

As more and more companies, especially from Malaysia, have spread throughout the country, the capacity of the state and societal groups to develop and enforce effective rules has become increasingly strained. Corporate bribes and pressure on state and community leaders further contribute to inappropriate policies and weak enforcement. ... Companies in the Solomon Islands have ignored environmental and harvesting guidelines, broken promises to landowners and communities, evaded export and income taxes, developed informal and formal arrangements that lower prices and increase production, and constructed complex corporate structures that obscure financial and environmental accountability (Abstract).

Given the ambiguity that surrounds property rights, however, Dauvergne finds it difficult to label these multinational companies as practicing white-collar crime. He adds: “These practices seem to suggest that corporations in the Solomon Islands are mischievous or devious resource exploiters. In some ways they are. But generally they are also rationally responding to market signals, the viability and profitability of operations, and the extent of state and societal controls.”⁵⁷ And he observes:

Some (Malaysian companies) undeniably have poor records; yet some perform relatively well. It is also too simplistic to claim that multinational companies have better environmental records than local ones. In some cases, multinational companies – with more sophisticated equipment, more money, higher technical expertise, and perhaps greater concern with international criticism – have better environmental records. But in other instances, multinational companies exploit lower environmental standards and weak enforcement in developing countries.⁵⁸

⁵⁶ Ibid, p. 17.

⁵⁷ Dauvergne (1998), p. 2.

⁵⁸ Ibid, p. 3.

4.3 Illustration: Some Enforcement / No Rule of Law

Brazil

Brazil is a country in transition. Over the past decade, Brazilians have made strides to move from a system of relatively ineffective and corrupt forestry oversight, to one in which the rule of law is active and government enforcement is increasing. Most of the country's illegal logging is done within the Amazon forest, which covers approximately 59 percent of Brazil's national territory, and figures largely in the nation's consciousness – politically, economically, and environmentally. Recent estimates by the forestry research group IMAZON suggest that within the past decade, approximately 50 to 80 percent of all logging in the Amazon forest was done illegally, meaning that companies and individuals were logging on both private and public land, using either forged documents or otherwise illegal permits (usually obtained through bribes to local forestry officials).⁵⁹

Throughout the 1990s, the country's rate of deforestation remained relatively constant. Beginning in the late-1990s, however, deforestation began to increase, in large part because of Brazil's growing presence as a major exporter of beef and soybeans, which required the clearing of a substantial amount of land for crops and cattle. In an attempt to combat this increase in deforestation, Brazil passed the Environmental Crimes Law in 1998, which created stronger penalties for logging crimes. However, the ultimate success of this legislation as a deterrent against illegal logging has been difficult to discern, given the inability of Brazil's chief environmental agency, IBAMA (Brazilian Institute of Environmental and Renewable Natural Resources), to enforce several of the penalties within the law.⁶⁰

Over the past several years, the problem of enforcement has loomed large within Brazil's environmental sector and governing agencies. Between 2002 and 2003, the rate of deforestation in the Amazon reached its second all-time high, inciting public outcry from within Brazil and abroad.⁶¹ This sudden spike in logging – which highlighted some of the problems within the Environmental Crimes Law – reinvigorated a newly elected government and the country's Public Minister (MP, or *Ministerio Publico*) to prosecute forestry crimes. In June of 2005, an unprecedented crackdown occurred within Brazil to combat illegal logging and deforestation. Brazil's MP arrested a total of 89 people, nearly half of whom were government employees at IBAMA (including several senior officials at the agency). Most of the arrests of IBAMA officials involved charges surrounding the taking of bribes, the falsification of illegal logging permits, and other forms of corruption. By all accounts, the arrests helped – compared to 2004, deforestation decreased by 31 percent in 2005.

⁵⁹ Brito, Barreto, & Rothman (2005), p. 3.

⁶⁰ According to one of our informants, the Environmental Crimes Law has not corrected several of the bureaucratic loopholes within Brazil's current governing structure. For example, IBAMA cannot withhold the granting of logging permits when companies fail to pay fines for environmental violations. (IBAMA's inability to withhold permits stems from issues surrounding its jurisdiction and legal authority.) The unfortunate result of this loophole is that the total number of fines *levied* over the past few years has increased, but not the total number of fines *paid*. In this regard, the penalties created by the Environmental Crimes Law are *not* a deterrent against illegal logging.

⁶¹ MSNBC News Services (2005). "Amazon bust: Dozens arrested for illegal logging. Half are employees of Brazil's environmental protection agency."

Brazil approximates the *Some Enforcement / No Rule of Law* model because of its continued susceptibility to petty corruption at the local and state levels, and its ongoing struggle to effectively enforce its own laws. Most of Brazil's illegal logging is committed by small-scale businesses – many of which are family owned – that engage in petty corruption as a survival tactic, in order to function in an uncertain business environment. As our key informants noted, a large part of Brazil's problems with illegal logging stems from the fact that the country has no concession system for public lands. Its existing permit system allows for logging on private land only, which in the past has tempted companies to use false environmental permits that identify public land as private. (In recent years, the deforestation of private land has caused logging to encroach upon public lands.) However, the current political climate is promising: As of February 2006, the Brazilian Senate was debating the passage of a bill that would create the nation's first public concession system.⁶² The proposed concession system would require all companies to submit a forest management plan to be approved by an environmental agency. Brazilian officials hope that by regulating public land, they can halt what is quickly becoming the tragedy of the commons – a so-called “rush to beat the next guy” to pillage public lands.

Mozambique

One of this report's reviewers shared his or her experience in Mozambique. This reviewer reported that having

...just returned from a field research study of natural resource theft in southern Africa, this reviewer had the opportunity to examine the illegal timber trade in northern Mozambique. The trade in this region was not the result of corruption or incompetent government. Rather it was the result of a conscious government policy to reduce the loss of hardwoods in the region. For example in 2003 the Mozambique government granted 100 one-year duration logging concessions to small scale operators in the region. The following year they only renewed 50 of the concession licenses. However, in 2003 these small scale operators typically bought equipment (trucks, tractors or power saws) to operate their concessions. Now half of them were out of business though still obligated to pay off their loans for these equipment purchases. These individuals were often solicited by large-scale loggers as a source of cheap hardwoods – keep cutting even if it's illegal and we'll buy it! The larger scale loggers would buy timber from these now illegal loggers at reduced prices cheaper than their own operations could cut timber.

The plight of loggers in Mozambique is reminiscent of the problems faced by loggers in Brazil. One is sympathetic toward the government of Mozambique, which sought to reduce or otherwise regulate logging on public lands, presumably because such restrictions were in the public interest. Yet one might be equally sympathetic toward loggers who invested in necessary equipment with the expectation of recovery costs through future forest exploitation. We disagree with the reviewer's opinion that this is not incompetent governance, however. Had property rights been clearly defined so that loggers had reasons to understand the future exploitation of forest would be strictly restricted, the wasteful investment in equipment would not have occurred; nor would the resulting criminality by otherwise legitimate small-scale businessmen. We have frequently seen that nontransparent governance and ill-defined property rights to be the ultimate culprit behind illegal logging.

⁶² At the time of this writing, the National Assembly had already approved the bill.

A report from the Southern African Regional Poverty Network (SARPC, 2005) confirms the view that the illegal loggers are small operators, but does not place asymmetrical blame on pirate logging operations.⁶³ Rather, the report recognizes that the application of Mozambique's laws lack transparency. In the words of the SARPC, the report:

...demonstrates how the Government - and by association - the donors who support it, have failed to deliver on these commitments. The report compares government rhetoric with the reality of forest management practices in Zambezia, and finds not a lack of technical capacity or resources in the forest service, or simply a lack of political will. Rather, it reveals a direct conflict of between the public responsibilities and private interests of government officials - notably the National Directorate and Provincial Services for Forestry and Wildlife (DN/SPFFB) and Provincial Directorate of Agriculture (DPA) - and others, including senior political party (FRELIMO) members. Together with local business interests and Asian traders these public servants constitute a "timber mafia". Rather than combating illegal logging, they are, through measures including the manipulation of forest regulations, technical information and statistics, taking bribes and personal involvement in logging, are facilitating and personally benefiting ...⁶⁴

In this regard, too, the situation in Mozambique is similar to that in Brazil. National laws to restrict logging have confronted an institutional reality characterized more by avoidance than by compliance with the law.

Indonesia (post-Suharto)

Casson and Obidzinski (2002) argue that the nature of illegal logging in Indonesia has changed since the fall of Suharto in 1998, and that the new structure of the logging industry represents what we refer to as the *Some Enforcement / No Rule of Law* model. Essentially a strong centralized government under Suharto had been able to enforce so-called "property rights" to the benefit of the central government (or at least to its corrupt operatives) and Indonesia's relatively large-scale logging enterprises. Casson and Obidzinski argue that with the erosion of that authoritative structure, "political developments and changes in legislation have created conditions that have contributed to a boom in the 'illegal' logging sector ... [partly because of] ... the new decentralization laws."⁶⁵ According to Obidzinski and Suramenggala (2000):

...the culture of corruption instigated by the Suharto's regime almost certainly encouraged the growth of petty corruption due to a complete lack of government by good example. As a result, this led to the formation of local-level networks of illegal logging, generally comprising of sawmills/pulpmills, agents/middlemen, crews felling timber in the forest and various government institutions co-operating and/or providing protection for such enterprises.

⁶³ Forestry in Zambezia: Chinese takeaway, ORAM, Mozambique. (June 19, 2005).

⁶⁴ Ibid.

⁶⁵ Casson & Obidzinski (2002), p. 2136.

Although it is difficult to tell from Casson and Oblidzinski's account whether or not the favorable positions of large companies have eroded,⁶⁶ their account suggests that small-scale criminal enterprise has flourished. Concurring with that view, Smith et al. (2003) identify "...joint ventures between Indonesian regional entrepreneurs ... and Indonesia and Malaysian timber buyers...." An interesting perspective is that the rents accruing to these small-scale operators have been partly captured by local governments through the imposition of innovative taxes and the acquisition of other concessions. Through the sufferance of local governments, the "illegal" trade has taken on the resemblance of a "legal" trade. As Casson and Obidzinski summarize:

Perhaps most importantly, the 'illegal' timber sector has progressively become more institutionalized as a result of two concurrent processes. First, the legalization of hitherto 'illegal' forms of logging has contributed substantially to district budgets; and secondly, whether 'illegal' or formalized, the informal timber sector has continued to be an important source of income for both civilian as well as military bureaucrats in the districts. As such, 'illegal' logging can be viewed as a structurally important element of life in rural Kalmantan and in some cases, it is no longer considered to be 'illegal.' (p. 2148).⁶⁷

Slattery (2005) reports that major U.S. corporations are involved with this Indonesian trade, although he makes no definitive claim that their behavior is criminal. According to Slattery:

BlueLinx Holdings, Inc., the largest wood distributor in the United States, is exporting undocumented timber out of Indonesia's critically endangered rainforests, flooding the U.S. marketplace with artificially cheap plywood ... Information obtained from the U.S. Custom and Border Protection ... proves that BlueLinx ... is knowingly purchasing wood from eight Indonesian mills that have well-documented histories of trafficking illegal timber.⁶⁸

Malaysia and Singapore

Once timber has been laundered, it enters into international commerce, where it is indistinguishable from legitimate timber.⁶⁹ There are probably exceptions – for example, those transporting Ramin, mahogany, and other woods restricted by CITES – but typically international commerce is not characterized by illegality.

⁶⁶ Dauvergne (2005) says that they retain a favored position.

⁶⁷ Casson & Obidzinski (2002), p. 2148. The Environmental Investigation Agency agrees with Casson and Obidzinski: "By the time of Suharto's fall in 1998 all the conditions were in place for an upsurge in illegal logging, supplanting the state-sponsored exploitation of the country's forests. This was orchestrated by a powerful regional timber bosses⁶⁷ often linked to smuggling networks in neighboring countries and beyond." Timber Trafficking: Illegal Logging in Indonesia, South East Asia and International Consumption of Illegally Sourced Timber (September 2001), p. 11.

⁶⁸ Slattery, S. (2005). BlueLinx Buys Illegal Indonesian Timber. CorpWatch.

⁶⁹ Tacconi, Obidzinski, & Agung (2004). European League Tables of Imports of Illegal Tropical Timber: Briefing. Friends of the Earth (2001).

At least two nations have been implicated as facilitators of illegal activity in other nations. Although illegal logging occurs in Malaysia, the Environmental Investigation Agency reports that the Malaysian processing capacity (including mills) has outstripped the availability of Malaysian lumber, so that now Malaysia serves as an intermediary for the movement and laundering of timber from Indonesia and elsewhere. The description provided by the Environmental Investigation Agency suggests that Malaysian commerce in illegal timber resembles a legitimate business more than it resembles a criminal enterprise. The claim is that “investigations carried out by EIA/Telepak Indonesia reveal the involvement of Pontianak-based businessmen in illegal sawmills and timber transport...”⁷⁰ Also, “as Sarawak does not allow the import of logs, Sibu-based businessmen have set up sawmills along the road ... on the Indonesian side of the border.” The EIA report explains:

Once (the sawn timber) reaches the Malaysian border town ... the illegal timber is processed by the Harwood Timber Company, a subsidiary of the state-owned Sarawak Timber Industry Development Corporation ... effectively laundering the stolen timber....⁷¹

According to the EIA, the Harwood Timber Company operates at two additional Malaysian locations, with the same effect. The report also asserts that Malaysian military personnel are involved in the trade.

In addition to Malaysia, the EIA report also claims that Singapore plays a middleman role in timber trafficking. In a different report, the Environmental Investigation Agency stated that during 2000:

The proximity of Riau province in Sumatra to Singapore offers a simple smuggling route. Field investigations ... found boats and barges belonging to a Singapore company loading logs, despite the expiry of legal logging concessions in the area.

...activists in Pontianak, West Kalimantan, forced port officials to order a cargo ship bound for Singapore back to port. The ship was found to have 42 containers of timber onboard, but only seven had the proper documents. A company called VC Brata, linked to a police foundation, owned 16 of the illegal timber containers.

...Indonesian authorities stopped a cargo ship off Riau. It was loaded with illegal meranti and was bound for Singapore ... plays a key role as a transit point for illegal timber bound for international markets. Singapore, a small island state, has 181 timber importers and exporters listed in the telephone book.⁷²

It seems that the laundering functions provided by Malaysia and Singapore would be unnecessary for *Enforcement / No Rule of Law* model. If a strong centralized authority allows illegal timber to be exported, it can also provide legal documentation for that timber. Likewise, if enforcement is lacking at both the central and local levels (the *No Enforcement / No Rule of Law* model), laundering seems

⁷⁰ Timber Traffickers: How Malaysia and Singapore are Reaping a Profit from the Illegal Destruction of Indonesia's Tropical Forests. (May 2003). Environmental Investigation Agency and Telapak Indonesia, p. 12.

⁷¹ Ibid, p. 13.

⁷² Timber Trafficking: Illegal Logging in Indonesia, South East Asia and International Consumption of Illegally Sourced Timber. (September 2001). Environmental Investigation Agency and Telapak Indonesia.

unnecessary.⁷³ (This presumes that purchasers are indifferent to the legality of the source, which would not hold if certification were widespread.) However, the laundering functions provided by Malaysia and Singapore may be particularly instrumental when timber is harvested under the *Some Enforcement / No Rule of Law* model, which explains the linkage between Indonesian timber and Malaysia/Singapore intermediaries.

Former Soviet Union

According to Savcor Indufor Oy (2002), the breakup of the Soviet Union created a similar situation in the former states of the Soviet Union.⁷⁴ To a large measure, the illegality pertains to cutting by indigenous populations for fuel and personal building. Nevertheless, where forests are sufficient to support a for-profit trade, illegal timbering has been promoted by the disappearance of strong central direction of economic activities, which have not yet been replaced by state enforcement of clearly defined property rights. To the extent that enforcement exists, it has been diluted by corruption.

The Savcor study reports both theft and corruption, and notes that "...these distinctions become blurred. The same perpetrator may be responsible for outright theft or corruption related illegal logging depending on the local situation. Commercial operators and poor people may have common interests where illegal logging generates jobs ... While largest profits are captured by the contractors, the wages they pay may still be an important source of income for rural areas with limited employment opportunities."⁷⁵

The root causes of the illegality described by the Savcor study are not unlike the causes identified with illegal timbering in post-Suharto Indonesia. National interests can differ from local interests, and if enforcement devolves to the local level, it is weakened by conflicting demands. In this regard, the Savcor study reports that locally managed forests suffer from more illegal logging than do state-managed forests. There are two explanations. One is that local authorities lack enforcement resources, but the second explanation is more to the point here: local communities "...seldom benefit from responsible managers interested to manage the forests on a sustainable basis."⁷⁶

⁷³ One of this paper's reviewers agreed that laundering is unnecessary where enforcement is absent, as appears to be the case where nations lack the means to enforce timber regulations:

...much of the illegal timber trafficked in Africa for example does not even involve [laundering]. Customs inspectors at border stations in many African nations simple lack of knowledge or desire to be able to identify legal from illegal-to-harvest species and/or determine if the logs meet the legal export size requirements on trucks in transit from central Africa to ports such as Durban in KZN or Port Elizabeth in the Eastern Cape in South Africa. The trucks simply get waved through and are shipped out on container ships. Furthermore, timber laundering is often avoided since the logs are commonly containerized at the mill rather than at a port. The Chinese owned logging operations in northern Mozambique implicated by local officials and legitimate loggers in actively taking illegal timber, pack containers at their mills, not at the port. Once in transit the likelihood that the container will be searched is nil.

⁷⁴ Ensuring Sustainability of Forests and Livelihoods through Improved Governance and Control of Illegal Logging for Economies in Transition. (May 21, 2005). Discussion paper for the World Bank. Savcor Indufor Oy.

⁷⁵ Ibid, p. 11.

⁷⁶ Ibid, p. 12.

Often citing a report by Newell and Lebedev (2000), advocates see extensive illegal harvesting of timber in Eastern Russia. As was true of the other states of the former Soviet Union, illegal logging for the use of indigenous population is a problem, but one whose scale is dwarfed by illegal logging for export.⁷⁷ Logging companies are apparently domestic operations that circumvent the law by using forged documents to sell hardwood to Chinese buyers. Much of that hardwood is then exported from China into Japan. The practice is facilitated by an underfinanced forestry sector, resulting partly from the breakup of the Soviet Union.

4.4 Illustration: No Enforcement / No Rule of Law

Democratic Republic of the Congo

The Democratic Republic of the Congo (DRC), formerly known as Zaire, stands out as one of very few African countries today whose forests have been relatively untouched during the past ten years. While deforestation over the past several decades has steadily depleted much of the Africa's forests (especially in the west and central regions of the continent), the DRC still contains much of its original forest cover, which today constitutes the largest intact forests in all of Africa.⁷⁸ However, the DRC's ability to preserve its supply of natural resources (including timber) was not a result of strong governance. Quite the opposite: According to USAID (2003), the DRC qualifies as a "failed state" whose civil and economic institutions have been crippled to the point of desperation by eight years of civil war.⁷⁹ Perhaps ironically, it was this chaos and lack of law enforcement that preserved the country's timber supply. According to USAID:

...war imposed a very effective logging ban [in the DRC]. Insecurity prevailed in those parts of the country with the richest forest resources, putting a virtual end to commercial logging from 1996 to early 2003. DRC government, rebel and invading forces have all felled and marketed some trees in efforts to defray the costs of their military efforts. But the overall impact of logging on the environment and on the country's forests has been moderate. This situation reflects as well the dilapidated state of the DRC's road network, and the fact that rebel forces were able to interdict transportation on the country's major river, the Congo. This made it difficult (through not impossible for some parties) to move felled timber to markets.⁸⁰

During the civil war, a lack of law enforcement existed throughout the country, which, coupled with a weakened infrastructure, prevented the exploitation of timber resources throughout most of the DRC's forests.⁸¹ However, as the country transitions into a period of peace, many experts expect logging rates to

⁷⁷ Illegal Logging (undated). All About Russian Forests.

⁷⁸ According to USAID, forests throughout Central and West Africa have been felled at a yearly rate of millions of cubic meters of wood since 1988 (p. 11). Conflict Timber Vol. III (2003), p. 11.

⁷⁹ Ibid, p. 15.

⁸⁰ Ibid, p. 11.

⁸¹ Throughout the war, rebel armies from Uganda and Rwanda invaded DRC from the east and were able to plunder (relatively) small amounts of timber. A majority of DRC's forest resources remain untouched.

increase substantially, despite the fact that this transition may be long in the making. The DRC has yet to fully recover from the breakdown of civil authority that it experienced during the war. Its infrastructure remains dilapidated, and its rule of law is weak – corruption exists at all levels of government. Because of this, most legitimate businesses will be slow and somewhat wary of investing in the DRC’s economy, which may further clear the landscape for rogue players and corrupt parties. All of this leads us to categorize the DRC – as it existed during its war, and as it exists today – as a country that approximates the *No Enforcement / No Rule of Law* model.

Cameroon

Several West African nations have taken a different route to forestry, granting lenient concessions to international forestry companies. This may be because many centralized African governments have been either too weak to enforce forestry laws or too weak to effectively benefit from appropriating a large slice of the rent from logging. They approximate the *No Enforcement / No Rule of Law* model.

The Forests Monitor (2001) suggests that multinational corporations are culpable in Africa.

...EU-based logging companies continue to be significant players in the forestry sector of the region controlling most of the logging concessions and processing plants and playing an active role in international fora dealing with forest management in the region. ... Other issues compound the problem: corruption is often endemic; a small elite benefits from development policies while the majority of the population remains in poverty; the state’s capacity to monitor and enforce legislation is minimal, and exacerbated by structural adjustment policies which limit the number of civil servants and their pay.⁸²

According to the Forests Monitor, exploitation of the Cameroon forests are characterized by corruption:

In the July 2000 round of allocations, three concessions ... were allocated ... to a company connected to the son of President Paul Biya. The Secretary General for Defense owns one concession ... which he has subcontracted to ... a company known by the government to be logging illegally on a massive scale. ... Six concessions were suppose to have been withdrawn as a result of irregularities, but three of the concessions retained their logging rights – all three were generals in the Cameroon army.⁸³

After identifying government officials as culprits, the Forestry Monitor report emphasizes that illegal logging is extensive because of two reasons. The first is that concession fees are high, so exploitation is required to overcome costs. The second is that enforcement is non-existent. The implication is that many, if not most, “legitimate” companies (or their subcontractors) break the law. European companies are frequent concessionaries, or else they perform the logging for Cameroon concession holders. China-based or Malay-based companies have recently entered this market.⁸⁴

⁸² “Sold Down the River: The need to control transnational forestry corporations: a European case study. Forest Monitor Ltd. (March 2001), p. 3.

⁸³ Ibid, p. 13.

⁸⁴ Cameroon is not the only West African country to see its forests pillaged at the hands of EU-based logging companies and corrupt public officials. Siebert and Elwert (2002) report that Benin, which lacks an extensive

forest and is not an exporter of timber, lacks a foreign logging industry. Nevertheless, Siebert and Elwert estimate that most of Benin’s logging is illegal, done with the consent of state forest officials (p. 2). The loggers are characterized as “small-scale entrepreneurs” (p. 6); bribing low-level officials is the principal means of operation and ambiguous ownership rights is a facilitator. The discussion by Siebert and Elwert is detailed, but we presume that Benin’s illegal logging is of such a small scale as to be relatively unimportant for this essay.

5.0 Conclusions

The purpose of this literature review has been to identify who participates in the lumbering, milling, and trafficking of illegal timber. We have reported systematic variation in the structure of illegal activity across producer nations. Depending on the setting, we have identified government complicity ranging from grand corruption to petty corruption to apparent indifference or an inability to regulate the nation's timber trade. We have sometimes identified conspiracies that resemble white collar and organized crime, but we have also noted that in many settings, loggers, millers, and transporters may be otherwise honest businesspersons who are obliged to operate outside the law to deal with ill-defined property rights and ambiguous or contradictory laws and enforcement. It would be a stretch to conclude that illegal timbering occurs solely because incorrigible thieves are stealing the world's forestry inheritance.

Indeed, while not absolving loggers, millers, and transporters of fault – or excusing any practices that harm the economies and ecologies of producer nations – our informants nevertheless stressed the centrality of consumer nations as “massive drivers of the problem.” According to one informant, “The actual impact of decisions made in the U.S. market, for example, on illegal logging in Indonesia far outstrip what one may expect based on simple estimates of the percentage of illegal timber that ends up in the international market.” He went on to say that “The current structures of the global value chain, especially in the timber sector, place enormous leverage and thus governance responsibility, in the U.S. (and Japan and the E.U., etc).”

Multinational corporations that serve consumer nations may be a catalysts that drives timber trafficking, either through conducting or abetting the illegal exploitation of forests in producer nations, or by being complicit in the transportation of illegally harvested timber, even if that transportation is itself “legal” within the borders of particular host countries. In recent years, however, some multinational corporations have recognized the leverage that they possess, and have tried to serve as correctives to the problem of timber trafficking. One key informant mentioned the recent efforts of Home Depot to require all of its lumber to be legally sourced, with appropriate documentation.⁸⁵ According to this informant, the efforts of corporations like Home Depot – along with state-sponsored projects like the European Union's Forest Law Enforcement Governance and Trade initiative to stem illegal logging – have had a positive impact on producer nations (in this case, Brazil), by exerting international pressure on local timber markets and insisting on the legality and transparency of the country's logging practices.

However, while recognizing some of the successes that we may attribute to corporate self-regulation, another respondent worried that “the observed steps by some corporations to pressure suppliers to find legal timber are not systematic, transparent, or reliable solutions to governance. They are based on vagaries of, among other things, consumer campaign pressures.” As this respondent points out, “The U.S. consumer herself does not have the information to internalize the price of illegal logging in her buying

⁸⁵ One of our reviewers objected that the Home Depot program was not yet operational. We lacked independent confirmation. Nevertheless, plans for the Home Depot program at least illustrate a step that might be taken in an environment where businesses are sensitive to forest depletion and are willing to incur costs to take proactive steps to reduce forest despoliation. See Home Depot's wood purchasing policy at: http://corporate.homedepot.com/wps/portal/Wood_Purchasing. (Retrieved May 22, 2006).

decisions. And there is currently no mechanism in place to systematically hold big corporations accountable to any promises they make on timber procurement.” He goes on to emphasize the critical necessity of consumer governments in assisting in the exclusion of illegally sourced timber from their markets. Indeed, this is not a new concept, says this respondent: “We’ve got it for diamonds and endangered species.” His solution was a simple amendment to the Lacey Act, which currently forbids the importation of illegally captured wildlife. (The Department of Justice uses the Lacey Act extensively in this capacity.) In the view of that expert, by amending Lacey to include illegally imported plants, U.S. law enforcement would have an avenue through which to prosecute, and eventually prevent, the importation of illegally sourced timber.

Of course, for this extension of the Lacey Act to be most effective, and for other chain-of-custody solutions to be most useful, require means of distinguishing between legally and illegally harvested timber. An appendix to this paper reports a separate review, also commissioned by NIJ and the Department of State, of technologies for combating illegal logging. The review examines what technologies are available or potentially available for identifying illegal products, for monitoring illegal locations, and for discovering illegal practices (legal, false and absent documentation).

Concern with the depletion of the world’s forests and the loss of biodiversity alone provide ample motivation to combat illegal timbering. In addition, illegal logging continues to hurt U.S.-based timber producers, by driving down the price of American timber by two to four percent. (Seneca Creek estimates this loss to be approximately \$460 million per year.⁸⁶) By establishing a mechanism through which to exclude illegally sourced timber from U.S. markets, the U.S. can accomplish two worthy goals: it will support the reformist efforts of producing countries abroad, while supporting the timber producing sector at home.

⁸⁶ Seneca Creek Associates based its estimates on a computer model of global forest markets maintained at the University of Wisconsin. The model is described in Buongiorno et al. (2003). See also Zhu, Tomberlin & Buongiorno (1998).

Appendix: Review of Technologies for Combating Illegal Logging

Illegal Products

One of the chief effects of illegal logging is the loss or great diminution of certain species of very high value trees. In Brazil, for example, the value of mahogany has caused it to be the chief target of illegal loggers for years. At \$1,400 per cubic meter, the price of mahogany sawnwood was so high that loggers were willing to take significant risks in procuring the wood.⁸⁷ The high value of ramin wood in Southeast Asia and Korean Pine in Russia⁸⁸ are equally attractive targets of loggers. Yet while the price incentive for logging these species is high, the risk of detection is also high. When the product itself is illegal, examination of the product at any stage of the chain of custody can reveal illegal activity.

Harvesting of illegal products is not limited to protected species. This category also includes the removal of under- or over-sized trees, which can limit the ability of a forest to regenerate after logging. Clear-cutting of trees slows a forest area's recovery rate, and reduces productive capacity for future years. Mislabeled species and the felling of oversized trees can often be readily identified through visual inspection. However, identifying species that are closely related to a legally logged species or identifying logs from undersized trees both pose significant challenges. We found the following approaches to have some use in combating this type of illegal logging.

Visual inspection: In order to effectively enforce forest law, forestry officials and dockyard inspectors should be both knowledgeable of regulations and well-trained in the identification of tree species. Deliberate misclassification of species can often be detected through a simple visual examination. Lumber can be differentiated by any number of characteristics including grain, color, and hardness. Species that are most valuable and most likely to be targeted by illegal loggers are valuable because they are exceptional in one or more of these characteristics. In these cases, simple legislation and training can reduce the logging of protected species. For several years, forestry authorities in Brazil have ceased issuing permits for harvesting and transporting mahogany. Because mahogany is easily differentiated from other types of wood, the legislation was easily enforced and mahogany wood has almost disappeared from exports.⁸⁹ Misleading generalizations, such as labeling valuable Korean Pine simply as "pine" are more difficult to identify. With a hand lens or optical microscope, basic cellular features of the wood can be used to identify a piece of lumber down to the genus or sub-generic level, but rarely to the exact species.⁹⁰ To be more exact, genetic testing may be the only way to differentiate them.

Genetic testing: In some cases, genetic testing of lumber can differentiate legal from illegal products. However, the technology for testing wood DNA is still being developed and is not yet ready for widespread use.

⁸⁷ Seneca Creek Associates (2004).

⁸⁸ Newell, J. & Lebedev, A. (2000).

⁸⁹ Seneca Creek Associates (2004).

⁹⁰ Wood Identification Procedures. USDA Center for Wood Anatomy Research.

Within each living cell of a tree, DNA is found in the nucleus as well as in the chloroplast and mitochondrial organelles. Genetic material from any of these three sources can be used to identify tree species. However, DNA is difficult to isolate from wood (as opposed to shoots or leaves) for several reasons. Even in a living tree, wood is essentially dead material. Sapwood, or the outer set of rings, contains some living material from which DNA can be extracted. However, heartwood, or the central core of a tree, is composed entirely of dead cells. A piece of sawn wood may contain all sapwood, all heartwood, or some combination of both depending on the part of the log from which it was cut.⁹¹ (See Figure 1) In heartwood, the only DNA available for testing is what remains adsorbed onto the cell wall after the cell dies. Because DNA is found in such small quantities, it must first be amplified through PCR in order to obtain enough material to test. Although PCR always involves some amplification, wood DNA samples are so small that they require higher than typical amplification rates. Researchers have had the best results when testing for fragments that are already found in multiple copies within a single cell, such as mitochondrial or chloroplast genomes.⁹²

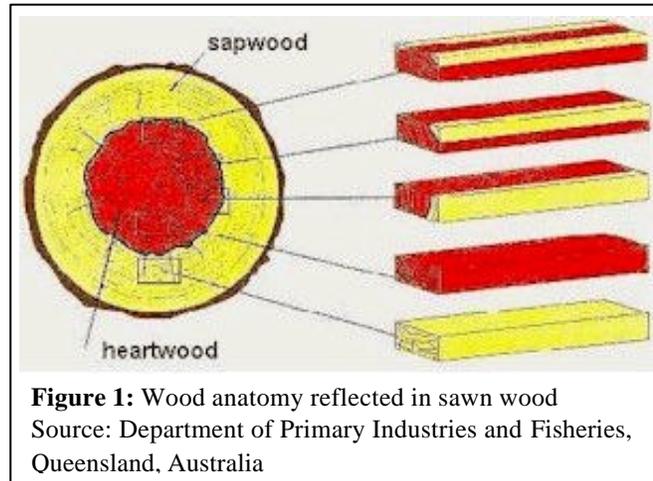


Figure 1: Wood anatomy reflected in sawn wood
Source: Department of Primary Industries and Fisheries, Queensland, Australia

A further difficulty with genetic testing of wood is the presence of compounds known as ellagitannins. These compounds gradually oxidize and become insoluble as wood ages, inhibiting PCR amplification of the samples. Also, DNA degrades more rapidly if logs are stored outdoors or in moist environments. All of these difficulties aside, DNA has been successfully isolated from wood up to ten years old including from fully processed wood (such as window frames). Although genetic testing is not yet at a stage to be useful in the field, improvements in the technology may make it useful for identifying protected species from sawn or processed wood.

Regulating Size: Size of felled timber is regulated in order to ensure a sustainable harvest schedule. Theoretically, regulations can specify the maximum diameter of trees to be harvested. However, in practice diameter minimums are the norm. By specifying a minimum diameter, forestry officials ensure that young trees remain to seed the area so that the same area can be reharvested in 20 to 35 years. Maximum diameter is limited less by regulations than by natural processes within the tree. Older trees can decay, yielding unprofitable wood and are unlikely to be targets of illegal loggers. The specific diameter limits vary depending on local regulations and the species of tree. In Indonesia, all commercial trees larger than 50-60 cm dbh (diameter at breast height) can be logged⁹³ while in Ghana regulations require trees to be at least 70cm dbh and at least 110cm dbh for eighteen protected species.⁹⁴ Limits are set at least 20-30cm below the natural maximum at which decay begins.

⁹¹ Forestry (undated). Department of Primary Industries and Fisheries, Queensland, Australia.

⁹² Deguilloux, M-F., Pemonge, M-H., & Petit, R.J. (2002).

⁹³ Sist, P., Dykstra, D., & Fimbel, R. (1998).

⁹⁴ The Best Managed Forests in Ghana (undated). Ghana Timber Export Development Board.

Recognizing illegally felled logs by size is more difficult than it might at first appear. Legal size is regulated by dbh, or diameter at breast height. Once a tree is felled, it can be difficult to determine where to measure the diameter of the tree. Under-sized trees can be relatively close in size to legally logged trees and all logs cross below the diameter threshold at some point in the upper extremity of the tree. That is, there is no way to differentiate between roundwood from an undersized thirty-foot tall tree and the top thirty feet of a mature, legally felled tree. Because the tissue from a young tree and from the upper portion of a mature tree is equally young, visual inspection of the wood with a hand lens or microscope will not be able to differentiate them. While less common a problem, felling of over-sized trees can also be difficult to monitor. If still unprocessed, over-sized logs can be recognized at their widest point, but sawn wood from over-sized trees will be indistinguishable from wood from legally-sized trees. Once again, the upper portions of an older tree will be just as young as legally-sized trees and thus cannot be differentiated. Because of the difficulties in identifying illegally-logged trees after felling, the most straightforward way of eliminating this type of illegal logging is through field investigation of the site. On-site monitoring of logging operations can ensure that enough trees remain after logging is complete to ensure a full recovery.

Violation	Solution
Logging protected species	Visual inspection Genetic testing
Removing under- or over-sized trees	Field investigation (no sure methods identified)

Illegal Locations

The second major category of illegal logging is harvesting outside of the legal concession area. Logging may be geographically restricted for many reasons, ranging from concerns about environmental protection (such as preserving a particularly biodiverse region or wildlife habitat) to preserving property ownership for indigenous peoples. The following types of illegal logging are included in this category:

- *Logging in protected areas*
- *Logging outside of concession boundaries*
- *Logging in prohibited areas (such as steep slopes, riverbanks, and water catchments)*

Because these types of illegal logging are tied to location, rather than any aspect of the timber post-harvest, they are easiest to identify by monitoring the locations in question. A fourth type of illegal logging is also included in this section because it can be most easily detected by monitoring the location:

- *Damaging trees (girdling or burning) so they can be legally logged*

Many countries allow logging of dead trees in areas not originally slated for logging in order to reduce the hazard of forest fire or damage from fallen trees. Some loggers take advantage of this rule by illegally damaging the trees first, thus necessitating their removal. Illegally damaged or burned trees often cannot be differentiated from naturally damaged trees after felling, so the most practical way of combating this type of illegal activity is through the monitoring of locations.

Monitoring the locations of illegal activity can be difficult because a significant portion of illegal logging is conducted in remote regions to avoid detection. However, certain techniques are in use today:

- *Field investigations:* Perhaps the most effective technique is simply field investigations by authorized personnel. There should already be a mechanism for forestry officials to conduct surveys of forest resources. Surveillance of logging operations in these locations can identify illegal logging before it damages an area extensively. Trees that are damaged prior to logging through girdling may not be identifiable after they have been felled, but field investigations can uncover girdled trees and a more in depth investigation may be able to attribute the damage to the perpetrators. Although this type of surveillance can identify illegal logging very early, the resources required are too great for comprehensive monitoring of large or remote areas.
- *Remote sensing:* The most promising method for identifying logging in unauthorized areas is remote sensing. Remote sensing refers to the use of aerial over-flights, aerial photographs, or satellite imagery to identify areas where new logging roads and logged areas are visible. Photographs can be compared against previous photographs of the same area and against records of logging concessions to ensure that the logged areas are permitted. Aerial overflights can be conducted frequently over suspected areas, while satellite photos can be used to monitor more remote locations. Malaysia performs forest surveys through aerial surveillance twice yearly. When suspicious areas are identified, an investigation team is sent in.⁹⁵ In Cameroon, officials

⁹⁵ Aerial surveillance to detect illegal logging (April 10, 2003). Berita Harian.

have teamed with Global Forest Watch to share satellite imagery for compliance monitoring.⁹⁶ Both of these have proven effective in identifying areas of concern.

- *Video surveillance:* While this cannot be used on a truly wide scale, video surveillance is used in areas of special value, such as the monarch butterfly habitat in Mexico. In 2004, twenty-nine video cameras were installed in this 56,000 hectare butterfly reserve to discourage illegal logging.⁹⁷ This type of surveillance can be invaluable in identifying the specific perpetrators of illegal logging, but it also has several drawbacks. Video cameras can only cover a small proportion of the total area of the park. Given the least possible circumference of the butterfly reserve, cameras positioned on the circumference would each have to cover 84 kilometers of the park border. Cameras can be positioned at the most likely entry and exit points of a protected area, but officials may not be able to predict where illegal loggers are most likely to access the region. Furthermore, cameras cannot be used in more remote locations where installation of equipment would be disruptive. For these reasons, video surveillance is only useful in specific instances to cover a small area of highly valuable terrain.

Monitoring through field investigation, remote sensing, or video surveillance can provide evidence of the visible effects of deforestation in an area, but other techniques can be used to measure other environmental impacts on the region:

- *Silt testing:* Areas such as steep slopes and waterways are often prohibited from logging because logging can contribute to rapid soil loss. Soil loss can be detected not only through examination of the soil in logging concession areas, but also in the increased levels of silt in nearby waterways. Monitors are available for testing silt density and turbidity. Some automated monitors involve a reverse osmosis filter that captures particles. In these systems, the filters must be changed regularly and processed to evaluate siltation. Alternatively, a field spectrophotometer can be used to measure turbidity in water. Both of these methods require regular monitoring to identify trends. Unfortunately the turbidity and siltation of a river may change very rapidly with inclement weather, so the results may or may not be directly correlated with illegal logging. In addition, the siltation of water downstream can implicate any number of concessions upstream. This technology is perhaps best used in conjunction with some sort of remote sensing to identify the area that has had the most soil loss.

In some cases, analysis of the timber itself can show whether it was logged in a legal or illegal area. This technology is still in development, but may show promise for the future of logging enforcement. This technology includes:

- *Genetic testing:* In some cases genetic fingerprinting of lumber can identify legal from illegal products. The difficulties of isolating DNA from wood have been discussed in the previous section on Illegal Products. In that description, genetic testing was being used to differentiate one species of tree from another. However, genetic testing can also be used to differentiate trees of a single species from different regions. In a study of a tropical wetland tree in the Caribbean basin,

⁹⁶ Workshop on Promoting Transparency in the Forest Sector: Best Practices for Detecting Illegal and Destructive Commercial Logging (May 29-31, 2002).

⁹⁷ Butterfly cameras (January 9, 2004). San Diego Union Tribune.

tree DNA in the form of amplified length fragment polymorphisms (AFLP) were found to be highly variable, with genetically unique trees grouped into several different regions.⁹⁸ While genetic analysis may not be able to differentiate between trees inside and immediately outside a concession boundary, it may be helpful in identifying widely different populations of trees such as trees of the same species grown in forestry plantations of Brazil versus those growing in protected areas of the Amazon. In order to use this technology, we need not only continued improvements in techniques for testing cut logs and processed wood, but a database of genetic material to compare against. This information is not yet available, although research institutes have begun to coordinate genetic libraries of timber DNA from around the world.

Violation	Solution
Logging in protected areas	Field investigation Remote sensing Video surveillance Genetic testing
Logging outside of concession boundaries	Field investigation Remote sensing
Logging in prohibited areas (such as steep slopes, riverbanks, and water catchments)	Field investigation Silt testing
Damaging trees (girdling or burning) so they can be legally logged	Field investigation

⁹⁸ Rivera-Ocasio, E., Aide, T.M., & McMillan, W.O. (2002).

Illegal Practices: False or Absent Documentation

A broad category of illegal logging involves false or absent documentation, regardless of whether the species of timber, the location of logging, or the contracted logging operations are legal. Undocumented logging often leads to excessive harvesting of forest concessions, and prevents any effective management of natural resources, especially in locations where forest resource surveys are infrequent. In these instances, individuals or groups log without authorization, using either fake documentation or real documentation obtained through bribing local officials. These types of illegal activities can all be identified through auditing documents and tracking the chain of custody of timber. Fake felling licenses can be made more difficult through the application of appropriate anti-counterfeiting methods in labeling timber as described below.

A wide array of technologies are used for tracking timber from the location of harvesting, through transport to production facilities, and further to export or domestic sale of goods. Every step, from felling trees, to transport, to processing of the wood, requires permits. Labeling of wood and wood products allows inspectors to check that shipments of wood match what is licensed in terms of species, volume harvested, and origin. In addition, documentation will provide a chain of custody, establishing responsibility for the wood in each stage of the process so that reporting errors can be corrected and illegal activities detected.

Many methods exist for labeling wood at different stages of the chain of custody. From the first felling of a tree, each log is marked to identify it as part of a particular shipment. Hammer branding and paint marks have historically been used on roundwood, but more advanced technologies which prevent or deter counterfeiting are being introduced into the forestry trade, while other technologies such as genetic fingerprinting and satellite sensors are still being developed. An ideal labeling technology will provide a maximum of information for a minimum of cost and effort, will be durable enough to remain with the wood throughout the chain of custody, and will be difficult to counterfeit. In practice, labeling techniques vary widely in their cost, ease of use, durability, and information capacity. The following section details the types of technologies available from the very basic to the most complex. Information on these technologies was taken primarily from two sources, a discussion paper by the World Bank on technologies for wood tracking (TWT)⁹⁹ and the Royal Institute of International Affairs' (RIIA) report on illegally logged timber.¹⁰⁰

Conventional paper, plastic, or metallic labels

- *Branding hammers (TWT/RIIA)*: Marking logs with hammer brands is a traditional method of marking ownership still used in many places today. The hammer brand is a metal tool, shaped into a symbol representing the company, which is hammered into the base of the log. The resulting indentation identifies the log for as long as it remains unprocessed. While the mark is easily applied, it only provides custodial information and tracking must rely on other documentation to provide information about log origin, dimensions and species. Furthermore hammer brands are easily counterfeited and can be difficult to read even when applied correctly.

⁹⁹ Dykstra D, et al. (2002).

¹⁰⁰ Brack, D., Gray, K. & Hayman, G. (2002).

This method is simple to use, but has many deficiencies that are not present in other tracking methods.

- *Paper labels and bar-coded tags (TWT)*: Labels made of treated paper or plastic tags can be attached to logs with staples, glue or nails. When barcodes are used, these labels contain all the information necessary to track an individual log. This information is easily and quickly collected with a barcode scanner. However, the labels themselves are easily counterfeited unless they are specifically designed to include security mechanisms. Furthermore, a certain percentage of labels fall off in every shipment (estimated at 1%-5%) yielding anonymous logs with no tracking information.
- *Nail-based labels (TWT)*: Labels made of hard plastic or metal with similar information can be nailed onto the log for longer lasting identification, but these labels must be removed prior to processing. These labels are more difficult to counterfeit than paper labels and are currently used in both developed and developing countries.
- *CIRAD/Foret (RIIA)*: The CIRAD/Foret system developed in France identifies logs by the average diameter at each end, the full length of the log, and a brief sketch of the growth rings at both ends. In combination with counterfeit-proof documentation, this provides a simple way of identifying individual logs uniquely.

Paints and color-coded tracers

- *Paint and chisel labels (TWT)*: Using paints or chiseling to mark cut logs is one of the oldest forms of identifying logs. Paints are easy and quick to apply. However, these labels cannot contain much information and must be accompanied by other documentation for full accounting of the source and ownership of the lumber. These labels are also very easy to duplicate by those wishing to fake documentation.
- *Chemical tracer paint (TWT/RIIA)*: Since 1988, the U.S. Forest Service has used brightly colored chemical tracer paint to mark timber. This paint, which is only available for use by the USDA authorities, can be identified by a very simple chemical drop test for reactivity. Further laboratory analysis can yield more identifying information. Currently the U.S. Forest Service is the only agency using this method, but similar methods could be developed to ensure that harvested logs are from official sources.
- *Microtaggant tracers (TWT/RIIA)*: Microtaggant tracers are microscopic particles composed of up to ten layers of colored polymers, a magnetic layer and a fluorescent layer. By creating different sequences of layers, millions of permutations are possible. The tracer can be added to paint and applied with a spray gun and it is virtually impossible to counterfeit. It is also long-lasting and can survive most wood processing. The identifying tracer particles can be viewed with a 100x microscope in the field. This method is generally not used to identify individual logs, but can be used to label a shipment with information about the source of the logs, timing of cutting, permit issuing authority, and more. While the initial costs of instituting such a system are high, the actual operating costs are fairly low with one \$127 bottle of microtaggants lasting through 2,000 applications.

Information cards

- *Magnetic stripe cards (TWT)*: While inefficient for labeling individual logs, these cards can be used in conjunction with other documentation to carry further information about a shipment and make counterfeiting more difficult. Proprietary encoding is possible and stripe readers can be programmed to read custom encodings. Because most stripe readers are not mobile, stripe cards may be inappropriate for inventory checks at certain stages of the chain of custody.
- *Smart cards (TWT)*: Cards that include an imbedded microchip, also known as “smart” cards, can contain more information than a standard magnetic stripe card. Smart cards are too expensive to be used for labeling individual logs, but because of their large data carrying capacity, they can completely replace the paper documentation usually accompanying a shipment. While they are not currently used in the forestry sector, they are used widely in the transportation industry for shipments of high-value products.

Additional technologies

- *Radio Frequency Identification (RFID) tags (TWT/RIIA)*: Radio Frequency Identification tags transmit information in response to a signal from a RFID reader. They can be included in sturdy labels nailed to lumber and are durable and easy to read. Furthermore, they can be read remotely within a short distance and while underwater. RFID labels can contain a broad range of information about the shipment, but the technology is still relatively expensive at about \$3,000 for one applicator and reader. There is no manual backup for reading the tags if the equipment fails.

Violation	Solution
Logging, transporting or processing timber without documentation	Branding hammers Paper labels and bar-codes Nail-based labels CIRAD/Foret
Logging, transporting or processing timber with forged documents	Paint and chisel labels Chemical tracer paint Microtaggant tracers Magnetic strips cards Smart cards Radio frequency identification tags

Illegal Practices: Legal Documentation

Anti-counterfeiting technology will help to identify those using fake logging documentation, but will not reveal any wrongdoing for those misusing legal documentation. Only careful review of documentation and audits of multiple concession documents can recognize the following types of illegal logging:

- *Extracting more timber than authorized (on legally obtained documents)*
- *Duplication of (legally obtained) felling licenses*

Both of these types of illegal logging lead directly to overexploitation of forest resources. Remote sensing may help show areas where more timber was logged than allowed, but will not assist in attributing the logging to a particular culprit. Matching the volumes and sources of timber shipments to the forest concession documents should ensure that excessive logging is identified. Comparison of multiple concessions documents should identify those instances where documents have been duplicated.

One final illegal activity addressed here is illegally obtaining legal documentation through such means as bribery. In this instance, the documentation accompanying lumber shipments is official. Bribery, which merely leads to favoritism in granting logging concessions, cannot be identified through audits of logging permits and documentation alone. However, when bribery results in grants of concessions in excess of those that are allowed or in areas where logging is not allowed, audits of multiple concession documents for a season or year can identify the forestry officials who appear to be at fault.

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