Corrupting Ecologically Unequal Exchange? India and Forest Loss in a Cross-National Perspective

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Abstract
Drawing on ecologically unequal exchange theory and previous cross-national research, the authors assess whether wood exports from peripheral nations to India are related to increased forest loss in the exporting nations. The authors also build on this perspective by assessing if corruption interacts with the ecologically unequal exchange of wood exports to India. In this regard, the authors hypothesize that corruption creates an "institutional context" whereby bribes, kickbacks, and embezzlement by government officials translate into the prioritization of consumptive practices in the short term rather than advocating for long-term investments such as conservation. Toward this end, the authors expect that wood exports to India increase forest loss more in peripheral nations with higher rather than lower levels of corruption. The authors find support for this hypothesis using ordinary least squares regression for a sample of 67 low- and middle-income nations. The authors conclude by discussing the theoretical, methodological, and policy implications that follow from the interaction finding.

Keywords
India, corruption, forest loss, wood, ecologically unequal exchange

Beginning in 1991, India put into place neoliberal economic reforms that ushered in rapid industrialization, urbanization, and economic growth averaging more than 6 percent from this time (Ghosh 2019). India’s industrialization centered on the creation of large service and manufacturing sectors focused on exports (Agarwal and Whalley 2015). As a result, the percentage of people living on less than $2 per day fell from 46 percent to 21 percent from 1990 to 2015 (World Bank 2020). During this same period, India’s middle class, or individuals earning $10 or more per day, increased from 300 million to 600 million people (World Bank 2020).

In India, such economic expansion and improvements created an increased demand for wood products. In fact, India has become the world’s second largest importer of wood, pulp, and paper, behind only China (United Nations 2018). These imports are used for two purposes. First, they are needed to support residential and office construction as well as publishing in India. There is also increased demand from the country’s middle class for middle-tier to luxury consumer wood products, including flooring, furniture, cabinets, doors, and windows (Norman and Canby 2020). Second, India uses these imports to produce products that are exported elsewhere by companies including Gillette, Johnson & Johnson, Kimberly-Clark, and Apple or their subcontractors (Norman and Canby 2020).

Thus, Hoang and Kanemoto (2021) noted that India may be externalizing its forest loss elsewhere by importing wood from other nations. However, we are not aware of any cross-national research that empirically evaluates this claim. The lack of research is surprising for a few reasons. To begin, Bunker (1985) theorized how exports from peripheral and semiperipheral nations to core nations tend to adversely affect the natural environment of peripheral and semiperipheral nations. Furthermore, sociologists, using cross-national data, have found support for ecologically unequal exchange theory; see Givens, Huang, and Jorgeson (2019) and Frey,

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Gellert, and Dahms (2017) for recent reviews. Finally, Ciplet and Roberts (2017) and Frame (2019) demonstrated that semiperipheral nations engage in ecologically unequal exchange in pursuit of their industrialization.

Thus, we use ecologically unequal exchange theory and previous empirical research as the starting point for this study. Nevertheless, we move the research frontier forward in three ways. First, we apply ecologically unequal exchange theory to a semiperipheral nation. Specifically, we empirically evaluate if wood exports sent from peripheral nations to India adversely affect forests in the peripheral nations.

Second, we evaluate arguments related to ecologically unequal exchange with India in context the of other theoretically relevant predictors of forest loss. We pay special attention to the contested effects of corruption on forest loss. For example, Sommer (2017) recently found that higher levels of corruption correspond to increased forest loss. However, Aisbett, Doupe, and Tacconi (2013) found no relationship between corruption and forest loss. Given such findings, we seek to evaluate the contested impact of corruption on forests.

Third, we move beyond considering if corruption has only a direct impact on forests by considering if it interacts with ecologically unequal exchanges among nations. Regarding this last point, we draw upon insights from Evans (1979), who argued that the governments of peripheral nations maintain policies and practices that shape international economic relationships, to inform this portion of our study. We argue that peripheral nations with higher rather than lower levels of corruption create “institutional contexts” that facilitate the ecologically unequal exchange of wood to India. We maintain that this is the case because corrupt government officials at various levels prioritize consumptive practices in the short term rather than advocating for long-term investments such as creating protected areas or replanting trees. Toward this end, we expect that wood exports to India should increase forest loss more in peripheral nations with higher rather than lower levels of corruption.

We now turn to a review of the theory of ecologically unequal exchange and the ways India engages in it to facilitate wood exports from peripheral nations. We follow with a discussion of how corruption may affect forests in peripheral nations. We go on to discuss why corruption may interact with the ecologically unequal exchange of wood to India to increase forest loss more in peripheral nations with higher rather than lower levels of corruption. We conclude by reviewing the sample, variables, modeling strategy, findings, and implications that follow from the results.

**Ecologically Unequal Exchange and Forest Loss**

The theory of ecologically unequal exchange has its origins in political-economic writings of the 1950s, 1960s, and 1970s. In particular, Prebisch (1950) argued that international trade between high- and low-income nations is “inherently unequal” because of the mobility of investment capital from high-income nations relative to the immobility of labor in lower income nations. Emmanuel (1972) formally described how the process works. The author demonstrated that high-income nations can purchase products from poorer nations for less than what they are worth. However, poorer nations end up paying more for products and services produced in high-income nations. Toward this end, Emmanuel noted that such exchanges are “unequal” because high-income nations can extract “surplus value” from poorer nations because workers’ wages in these nations are substantially less than wages paid to workers in high-income nations.

Using such insights, Wallerstein (1974) argued that the “external” relationships described above, along with “internal” dynamics linked to a nation’s historical context, determine its position at the core, semiperiphery, or periphery of the world system. At the top of the hierarchy, the economies of core nations center upon higher skill, capital-intensive production along with tertiary activities that include finance, real estate, insurance, technology, health, and education (Wallerstein 1974). At the bottom of the hierarchy, peripheral nations’ economic activity is derived largely from low-skill, labor-intensive agriculture and the extraction of natural resources (Wallerstein 1974). The semiperipheral nations in the world system have “a mix of core and peripheral forms of organizations” and “are in an intermediate form . . . found in adjacent core and peripheral areas” (Chase-Dunn and Hall 1997:67–68).

It is important to note that the world system has dynamic characteristics whereby nations move upward or downward over time (Chase-Dunn, Kawano, and Brewer 2000). However, core nations maintain their position at the top of the global economy by securing favorable terms of trade with peripheral nations and, to a somewhat lesser degree, semiperipheral nations (Wallerstein 1979). Favorable terms of trade with peripheral nations are largely the result of the prices of natural resources and agricultural commodities consistently falling in value relative to the prices of capital-intensive, highly skilled manufacturing goods and services from the core along with the manufactured products that require relatively low-skill labor to produce from semiperipheral nations (i.e., textiles, footwear, electronic consumer goods) (Chase-Dunn and Hall 1997). A similar process plays out in semiperipheral nations as these nations export a combination of natural resources and low-skill manufactured products to core nations (Chase-Dunn and Hall 1997). There has been additional research highlighting how other factors reinforce this international hierarchy of nations, including colonial legacies (Cardoso 1972), the repatriation of profits to core nations by multinational companies headquartered there (Dos Santos, Fávero, and Distadio 2016), and repayment of foreign debts (Sweezy and Magdoff 1984).
Although useful in explaining how development and underdevelopment occur across the world system, the writings have little to say about how unequal exchange may affect the natural environment. As such, Bunker (1985) took up this task. He argued that “modes of extraction organized in response to world system exchange opportunities focused on the single natural products for which there was greatest global demand” (p. 250) exacerbate environmental issues and underdevelopment in the Brazilian Amazon. The impacts are produced by local elites, who simultaneously benefit in the short term from extracting natural resources but undermine profits in the long term by depleting the resource base (Bunker 1985). Bunker’s research highlights how global economic linkages centered on the unequal exchange of natural resources affect the “socioenvironmental” context of the Brazilian Amazon (Givens et al. 2018).

Hornborg (2003) built on this work by specifying possible mechanisms that may generate ecologically unequal exchange. Following Amin (1974), Hornborg (1998) noted that when nations pursue their “comparative advantage” in exports to generate foreign exchange, it leads to flooding of the international market with similar products, which depresses their price (Amin 1974). Thus, it takes peripheral and semiperipheral nations, to varying degrees, more exports to buy the high-skilled, labor-intensive manufacturing and service imports from core nations (Hornborg 1998). A peripheral or semiperipheral nation can be successful at increasing its exports, but in return for their sale, the nation obtains fewer, not more, imports from core nations (Amin 1974).

As a result, it takes a peripheral or semiperipheral nation more natural resource exports to buy manufactured products and services from core nations (Muradian and Martinez-Alier 2001). A peripheral or semiperipheral nation may find economic success by exporting more and more natural resources in the short term. However, such nations will be able to afford fewer and fewer imports in relation to their natural resource exports in the long term (Giljum and Eisenmenger 2004). This situation translates into extensive forest loss at the periphery and semiperiphery as nations expand exports just to keep manufactured and service imports from declining (Roberts and Parks 2007).

McMichael (2004) described other factors that facilitate this phenomenon. For instance, the World Bank and the International Monetary Fund promote ecologically unequal exchange via their lending practices. The World Bank’s investment loans finance the building of infrastructure that helps bring crops and other natural resources to export markets (McMichael 2004). The International Monetary Fund’s structural adjustment loans require indebted nations to adopt macro-economic policy reforms centered upon increasing exports to receive the loans (Shandra, Shircliff, and London 2011). A government of a core nation may also finance projects carried out by companies headquartered in that nation via its export credit agency (Restivo, Shandra, and Sommer 2018). Furthermore, multinational corporations engage in a “race to the bottom” whereby they can extract various economic incentives and regulator concessions from peripheral and semiperipheral nations in return for investment (Dick 2010).

The earliest research to find support for ecologically unequal exchange theory involved material flow analysis that developed natural accounting frameworks to measure the flow of biomass and other natural resources from poorer to wealthier nations (Fischer-Kowalski and Amann 2001). These accounting methodologies continue to be refined to ensure a more accurate assigning of impacts to consumers and producers (Henderson and Ostwald 2014). However, such research is descriptive by design and does not consider if such flows have an impact on the natural environment of semiperipheral and peripheral nations that export to core nations.

In response to this concern, Jorgenson (2006) found that higher levels of total exports sent from poorer to wealthier nations tend to correspond to increased forest loss in the poorer nations that export to the wealthier nations (Jorgenson 2016). There has also been research on ecological footprints (Rice 2007), industrial water pollution (i.e., Shandra, Leckband, and London 2009), carbon dioxide emissions (i.e., Jorgenson and Clark 2012), biodiversity loss (i.e., Shandra Leckband, McKinney, et al. 2009), and fisheries (i.e., Longo, Clausen, and Clark 2015).

This work has been followed by studies that examine sector-specific export flows on forests. In this regard, Jorgenson, Dick, and Austin (2010) found that a weighted index of agricultural, forestry, and mining exports is related to increased forest loss. Shandra, Leckband, and London (2009) reached a similar conclusion using a measure of only forestry export flows. There have been additional refinements that consider the impact of ecologically unequal exchange and forests. For example, Austin (2010a, 2010b, 2012, 2017) found that soy, beef, and coffee exports from poorer to wealthier nations correspond to increased forest loss in the poorer nations. Noble (2017) found a similar pattern with regard to chocolate exports, while Henderson and Shorette (2017) made a similar argument with regard to palm oil.

**Ecologically Unequal Exchange: Beyond Core Nations**

The preceding review of the literature on ecologically unequal exchange describes how core nations externalize their environmental impacts onto peripheral and semiperipheral nations. Burns, Kick, and Davis (2003) are the first to describe and document a pattern of recursive exploitation whereby core nations externalize their forest loss onto semiperipheral and peripheral nations. However, semiperipheral nations can use their position in the world system to gain access to natural resources in peripheral nations and, in turn, facilitate forest loss in the periphery. They go on to describe this process as increasingly characterized by a company from...
a semiperipheral nation such as Indonesia supporting logging in peripheral nations of Southeast Asia or sub-Saharan Africa, which tend to have less stringent forestry regulations.

More recently, Ciplet and Roberts (2017) picked up ideas from Burns et al. (2003) in their work describing tensions that have emerged in United Nations climate change negotiations. According to Ciplet and Roberts, issues surrounding how to best reduce carbon dioxide emissions have emerged among peripheral and semiperipheral nations. In particular, peripheral nations have called for mandatory rather than voluntary carbon dioxide emission reductions not only for core but also for semiperipheral nations. This is because semiperipheral nations are increasingly among the largest emitters of carbon dioxide. Furthermore, semiperipheral nations have been able to put into place technologies that help mitigate some of the harmful aspects of climate change, while peripheral nations continue to be burdened the most by climate change and have received far less financial support to address it (Ciplet and Roberts 2017).

Similarly, Frame (2019) extended these ideas by demonstrating that China, Malaysia, Thailand, and Vietnam—all semiperipheral nations—increasingly consumed more minerals, fossil fuels, wood, and construction materials as they industrialized from 1970 to 2005. The author went on to show the degree to which each nation meets its need for these goods by importing them from Cambodia. Finally, Frame described how these semiperipheral nations promote ecologically unequal exchange by their governments’ or companies’ purchasing land in Cambodia to expand activities related to imports they need to support their industrialization processes.

From this discussion, we posit that it is important to consider whether semiperipheral nations are engaging in ecologically unequal exchange. In fact, it is the first goal of this study. We now turn to a discussion of how India may be promoting ecologically unequal exchange to gain access to forests of peripheral nations as it seeks wood to promote its industrialization.

**Applying Ecologically Unequal Exchange to India**

How does India promote ecologically unequal exchanges with peripheral nations? What are the potential impacts on forests in the peripheral nations that export wood to India? Beginning in the early 1990s with the implementation of neoliberal economic reforms and continuing today, India has been encouraging investment by its companies abroad.

In some instances, Indian firms set up trading companies that purchase timber from domestic producers or support joint ventures with governments or domestic firms in a peripheral nation (Malone 2011). For example, India’s Café Coffee Day entered into a $3 million timber sales agreement with Guyana’s Vaitarna Holdings. As part of this agreement, Vaitarna Holdings operates a 346,000-hectare forest concession from which it produces logs that are exported back to India. In other instances, Indian firms may directly lease or purchase forest concessions in a peripheral nation, with the intended purpose of securing access to wood to export back to India. For example, India’s Aditya Birla leased 50,000 hectares of timber concessions in Laos, under its subsidiary Birla Lao Pulp and Plantations, for 75 years. At present, the company is exporting logs back to India.

India promotes investment by its companies abroad and, presumably, access to forests it needs for its industrialization vis-à-vis its export credit agency (Clapp and Dauvergne 2005). The Export-Import Bank of India provides its companies with loans and lines of credit at below market rates that can be used to help them expand abroad (Clapp and Dauvergne 2005). The loans tend to help India’s companies lease or purchase forest concessions along with constructing processing facilities. The Export-Import Bank of India also extends lines of credit to foreign companies to purchase goods or services from India (Export-Import Bank of India 2017).

For example, the Export-Import Bank of India has been especially active in peripheral nations that have enacted logging bans. In 2014, Myanmar prohibited the export of raw logs to slow forest loss in the country. In the following years, Credera and Fine Wood Products, two Indian companies, received financing from the Export-Import Bank of India to build sawmills to process timber for export back to India (Export-Import Bank of India 2019). The financing has also allowed the companies to purchase $188 million in capital goods from other Indian producers to support their projects (Export-Import Bank of India 2019).

India creates a demand for investment by its companies via technical training and institution building (McMichael 2004). The technical training and institution building occur through the Indian Technical and Economic Cooperation Program. In some instances, this process involves establishing research centers that facilitate knowledge and technology transfers from India to peripheral nations (Chatterjee and Sahasranamam 2018). Furthermore, the Indian Technical and Economic Cooperation Program holds training courses for public officials in peripheral nations to create or improve markets and distribution networks for export. In the end, the technical training and institution building are predicated on the neoliberal economic policies that India has put into place to attain its place at the semiperiphery. India especially prompts peripheral nations to pursue their comparative advantage in exports (Pradhan and Das 2013). For many peripheral nations, their comparative advantage involves the exporting of logs and rough-sawn lumber.

India has taken other steps that facilitate investment by its firms abroad to increase imports of wood. In this regard, India has put into place a preferential tariff schedule for the importing of raw and processed logs. India’s tariff rate on raw and processed logs is 5 percent, compared with the tariff...
rate for pulp and paper, which is equal to 30 percent (Williams and Sood 2014). Furthermore, India has signed free-trade agreements that have increased imports of wood in its various forms. In doing so, India has reinforced its preferential tariff schedule but to a lesser extent (Dubey 2008, 2009). In 2010, for example, India entered into the Association of Southeast Asian Nations–India Free Trade Area, which includes peripheral nations such as Cambodia, Laos, Myanmar, the Philippines, and Vietnam (Shira 2019). As part of this regional agreement, India has reduced its tariffs to 5 percent for wood imports from member nations (Government of India, Ministry of Commerce and Industry, Department of Commerce 2020).

Along these lines, India has also entered into duty-free tariff schemes with nations classified as “least developed” by the World Bank. Once these agreements are signed, many peripheral nations, especially in sub-Saharan Africa, have increased raw log exports to India (United Nations 2018). It is important to note that in instances in which India has not signed a trade agreement or put into place duty-free tariff programs, it sets up commissions to quickly resolve any issues pertaining to international trade (Sagar 2018).

Finally, India tends to limit monitoring, enforcement, and prosecution of exports that are logged illegally (Dubey 2009). Toward this end, India has no policies in place to mandate that all of the government’s wood purchases are sourced legally (Lawson 2014). It also limits monitoring of illegally harvested wood to only species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and even in such cases, enforcement efforts are well below those of other semiperipheral nations (Brack and Buckrell 2011). India’s poor enforcement record is largely the result of its not having a traceability system in place regarding how to handle reports from foreign governments about illegally harvested logs (United Nations Food and Agriculture Organization 2018).

From this discussion, we hypothesize that higher levels of wood exports from peripheral nations to India should lead to increased forest loss in the peripheral nations that exported to it.

Corruption and Forest Loss

In recent years, increasing attention has been directed at how corruption affects forests; see Fischer, Giessen, and Günter (2020), Sommer (2017), and Sundström (2016) for recent reviews of the literature. From such reviews, the authors describe several reasons why corruption may increase forest loss. These factors can be discussed in a variety of different ways. However, we follow Sommer and consider how petty and grand corruption may affect forests. Sommer defined petty corruption as involving everyday abuses by low- and midlevel public officials with citizens seeking to access basic services, while grand corruption entails the abuse of power by high-level government officials that benefits the few at the expense of the many.

How do petty and grand corruption affect forests? We start with a discussion of petty corruption. At the local level, Sommer (2017) and Sundström (2016) noted that public sector employees in the forestry sector engage in corruption in an attempt to supplement their low pay. This form of corruption may involve public sector employees’ accepting bribes in return for overlooking various illegal practices in the forestry sector.

The most common practices involve illegal logging, which can take several forms. Contreras-Hermosilla (1997) noted that such practices include logging of protected species, logging without authorization, removing over- or undersized trees, and logging on steep slopes, riverbanks, or water catchment areas. Once illegally removed, Contreras-Hermosilla argued that government employees may also help companies, communities, and individuals engage in timber smuggling or other forms of illegal transport. The illegal transport of timber may also involve allowing the exporting of species banned under the Convention on International Trade in Endangered Species or in contravention of national bans (Contreras-Hermosilla 1997). A bribe may also facilitate the movement of illegally harvested wood or the movement of legally sourced logs without appropriate permits (United Nations Food and Agriculture Organization 2001).

For example, in 2007 the United Nations Environment Programme reported large-scale deforestation on a UNESCO World Heritage site. This was a protected land area to preserve forests, especially for the endangered orangutan habitat. In this case, loggers and armed guards moved into parks to cut down forests by bribing, colluding with, or threatening park enforcement (Nellemann and INTERPOL Environmental Crime Programme 2012). Similar situations have occurred in the Democratic Republic of the Congo (Nellemann, Redmond, and Refisch 2010). In their protected Virungas National Park, militias drove villagers out and colluded with or killed forest rangers to cut wood for charcoal. This resulted in forest loss, more damage to the already endangered mountain gorilla population, and more than 200 rangers’ being killed from 2000 to 2010 (Nellemann et al. 2010).

The transport of illegally harvested wood is often accompanied by public employees’ engaging in illicit accounting practices. Contreras-Hermosilla (1997) noted that a customs official may declare lower values and volumes than amounts actually being exported or underestimate, undervalue, under-measure, or misclassify species exported or marketed locally. Similarly, a government official may declare higher purchase prices than prevailing market prices for equipment or services from related companies (United Nations Food and Agriculture Organization 2001).

For instance, in Albania, Romania, and Vietnam, artisanal loggers and other small tradespeople collude with government officials to work around national laws. Dorondel (2009)
found that a Romanian mayor circumvented a logging ban in a national park to bring business to his wife’s company. Even when logging quotas are no longer enforced, as in Albania, district forest managers overlook illegal logging in return for bribes (Stahl 2010). Similarly, Sikor and To (2011) reported how forest rangers in Vietnam fail to enforce forestry laws to personally profit from the harvesting and sale of illegal timber.

Furthermore, Sommer (2017) and Sundström (2016) described occurrences of grand corruption or corruption among high-level government officials in the executive branch, including presidents, prime ministers, and cabinet officials (Sundström 2016). In some instances, grand corruption involves a company or wealthy individual receiving preferential treatment in return for a bribe (Miller 2011). In turn, a company or individual may be given access to forest concessions for an indefinite period, access to forests previously off limits to logging, or waivers to log endangered species (Geist and Lambin 2002). In other instances, grand corruption involves embezzlement or misappropriating funds that should end up in government accounts via transfer pricing by foreign firms with help from high-level government officials (Haines 2019). We can see some of these processes at work in the Philippines. President Ferdinand Marcos granted logging concessions to political rivals during his entire tenure in office (Bryant and Bailey 1997). The recipients of the logging concessions exported valuable teak and mahogany to the United States and Europe even though it was prohibited under the country’s law (Palo 2001). In an interview with the Chicago Tribune, Ernesto Maceda, the Philippine minister of natural resources at the time, said,

$960 million worth of hardwoods has been cut by Marcos’ friends and associates between 1974 and 1980 and smuggled out of the country…. [They] were the only ones who got logging concessions… and their shipments were cleared for export on instructions from the top. (Crewdson 1986:25)

Maceda continued, “[They] never complied with the reforestation agreements or selective logging. What they’d do is go in with a bulldozer and uproot everything” (Crewdson 1986:25). In the end, approximately 7 million of the Philippines’ 12 million hectares of forests have been cleared, with less than half of the remaining 5 million hectares being untouched forests (Crewdson 1986).

In one of the first cross-national studies focusing on forest loss and corruption, Meyer, van Kooten, and Wang (2003) found that corruption increases forest loss. Bulte, Damania, and López (2007) replicated these findings for a sample of Latin American nations, while Laurance (2008) found a similar pattern among nations in Asia. More recently, Sommer (2017) found that corruption is related to increased forest loss (see also Koyuncu and Yilmaz 2013).

We make the following hypotheses from the preceding discussion. We hypothesize that higher levels of corruption should correspond to increased forest loss in peripheral nations.

Connecting Corruption and Ecologically Unequal Exchange

The theoretical discussions and reviews of the empirical research related to ecologically unequal exchange and corruption emphasize how each factor uniquely affects forests. However, we argue that such research may only offer a partial understanding of why forests are cleared in peripheral nations because these factors are related to one another in a specifiable way. In this regard, we draw on insights from Evans (1979), who demonstrated the importance of considering how governments in peripheral nations put policies and practices into place that shape international trade relationships. We seek to move the cross-national research frontier forward by arguing that corruption interacts with the ecologically unequal exchange of wood from peripheral nations to India to affect forests. Put differently, we hypothesize that wood exports to India from peripheral nations should increase forest loss more in peripheral nations with higher rather than lower levels of corruption.

Why might this be the case? A peripheral nation with high levels of petty or grand corruption is an institutional context in which government officials tend to prioritize consumptive practices in the short term rather than advocate for investments that promote improvements in the long term. In relation to the natural environment, it translates into peripheral nations with high levels of corruption being less likely to put into place and enforce policies that promote conservation and environmental protection (Evans 1996).

In terms of petty corruption, public sector employees, in return for bribes, may fail to monitor and enforce harvest and regeneration practices of a company, an indigenous community, a household, or an individual who leases forest concessions (Deacon 1994). Bribes may also prevent public sector employees from reporting or imposing fines for clearing trees within protected areas (Hayes and Persha 2010). In terms of grand corruption, a company or wealthy individual may bribe a president, prime minister, or cabinet official in return for access to forest concessions for an indefinite period of time or the ability to log endangered species without fear of prosecution. There may also be embezzlement when a high-ranking government official provides a company or wealthy individual with access to forest concessions at a below-market rate with profits.

At the same time, petty and grand corruption erodes trust between a government and its citizens (Murtazashvili, Murtazashvili, and Salahodjaev 2019). Thus, the government is not seen as an “honest broker” or a “trustworthy partner”
that provides stability to make long-term investments not only feasible but also profitable (Evans and Rauch 1999). Toward this end, companies, indigenous communities, households, and individuals may avoid making commitments that promote conservation in a peripheral nation with a high level of corruption and would most likely be diverted to paying bribes or kickbacks while government funds that could be invested are siphoned off via embezzlement and other forms of theft (Sommer 2017).

In such instances, actors are likely to exploit forests in the short term to maximize profits from the sale of wood exports. As such, forest loss is likely to increase in peripheral nations with higher rather than lower levels of corruption. We illustrate how corruption increases wood exports to India from peripheral nations and, in turn, increases forest loss in peripheral nations that export to it with the following example.

Myanmar has the largest naturally growing teak forests in the world, with India being one of the leading export destinations. For decades, however, the military dictatorship has been accused of engaging in corruption at the highest levels of government concerning the teak trade (Environmental Investigation Agency 2019). The grand corruption includes foreign investors from China, India, and Thailand bribing senior military officials to gain access to the best forest concessions in the country (Forest Trends 2020). The foreign investors have also been accused of paying tuition for the children of the government’s rulers in an attempt to buy influence with the next generation of leaders (Environmental Investigation Agency 2019).

However, corruption in forestry does not stop with bribery. Myanmar requires that the highest grade teak be returned to the government, which is then auctioned off to the highest bidders (Forest Trends 2020). However, military officials have been accused of ordering forestry officials to systematically misclassify teak as being of a lower grade or mix it with other species so that foreign investors can export it to India, China, and Hong Kong, by foreign investors (Environmental Investigation Agency 2010).

Maria-Sube and Woodgate (2019) also noted that petty corruption affects the exporting of teak from Myanmar to India. In this regard, it involves Indian firms’ bribing government officials at two border crossings between the nations. As a result, customs officials in Myanmar allow teak logs to be transported into India, which is illegal because Myanmar put into place an export ban on logs, and the teak tends to be harvested from protected areas (Maria-Sube and Woodgate 2019).

In the end, corruption has deprived Myanmar of millions of dollars annually. It has also lost 20 percent of its forests, or 290,000 km², since 1990 (Environmental Investigation Agency 2019). From the preceding discussion, we hypothesize that wood exports to India should increase forest loss more in peripheral nations with higher rather than lower levels of corruption.

Sample

We include the following 67 peripheral nations on the basis of Chase-Dunn et al.’s (2000) classification of countries by world system position, following listwise deletion of missing data. Note that we exclude peripheral nations in the Middle East and North Africa because they are predominantly desert (Tester 2020). Our sample thus includes the following peripheral nations: Albania, Angola, Armenia, Azerbaijan, Bangladesh, Belarus, Bhutan, Bolivia, Bosnia and Herzegovina, Bulgaria, Burundi, Cambodia, Cameroon, the Central African Republic, Colombia, Comoros, the Republic of the Congo, Costa Rica, Cote d’Ivoire, Cuba, the Dominican Republic, Ecuador, El Salvador, Ethiopia, Gabon, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Kazakhstan, Kenya, Kyrgyzstan, Laos, Liberia, Madagascar, Malawi, Malaysia, Mongolia, Mozambique, Nepal, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, the Philippines, Rwanda, the Solomon Islands, Sri Lanka, Suriname, Tajikistan, Tanzania, Thailand, Togo, Turkmenistan, Uganda, Ukraine, Uzbekistan, Venezuela, and Vietnam.

Dependent Variable

Forest Loss Ratio

See Table 1 for descriptive statistics and a bivariate correlation matrix for the analysis of forest loss.

Until recently, cross-national research on forest loss was based largely upon data made available in “Global Forest Resources Assessment,” a report published every five years by the United Nations Food and Agriculture Organization (2020) (e.g., Shandra, Rademacher, and Coburn 2016; Tester 2020). However, the reliability of these data has been called into question because they are gathered using different data collection methods. In some places, forestry statistics are highly reliable because they are based on remote sensing surveys (United Nations Food and Agriculture Organization 2015). In other places, estimates may be of low reliability because they are based on expert opinion or extrapolated from an outdated forest inventory (Grainger 2008).

Thus, we use newly available data on forest loss derived from high-resolution satellite imagery (30 × 30 m) to eliminate these potential sources of error. The data we use may be obtained online from the World Resources Institute’s (2016) Global Forest Watch Web site. See Hansen, Stehman, and Potapov (2010) for an in-depth discussion of the methodology used to arrive at the estimates.

We calculate forest loss ratio using the following steps. First, we set the minimum tree cover density level (i.e., the thickness of forest canopy) upon which to base the estimates. We follow Rudel (2017) and set the density equal to 75 percent or greater for each nation. This density is used to represent the loss of wet forests. The tree cover density for a
nation represents the estimated percentage of a pixel taken from satellite imagery that is covered by tree canopy (World Resources Institute 2016). Second, we obtain the total number of hectares of land that is covered with forests at the 75 percent tree cover density. These data are only measured for 2000 by Global Forest Watch (World Resources Institute 2016). As such, it limits us to a cross-sectional analysis. Third, we gather the number of hectares with at least 75 percent tree cover density that has been cleared between 2001 and 2015 for each nation. Fourth, we divide the total number of hectares cleared between 2001 and 2015 by the total forest size in 2000 to arrive at the forest loss ratio (Rudel 2017).

Main Independent Variables

Wood Exports to India

This variable measures a nation’s wood exports sent to India as a percentage of a low- or middle-income nation’s wood exports in 2000. The data are from UN Comtrade, the United Nations’ commodity trade statistics database (United Nations 2018). This database reports export statistics in constant U.S. dollars for a given nation by commodity and trading partner (United Nations 2018). We use the first revision of the Standard International Trade Classification to identify wood exports by using code 24 (cork, fuelwood, wood charcoal, wood chips, wood waste, wood in the rough/logs, wood simply worked/processed). The data on total wood exports also come from UN Comtrade (United Nations 2018). According to ecologically unequal exchange theory, we hypothesize that higher levels of forestry exports sent from peripheral nations to India are associated with higher rates of forest loss in the peripheral nations.

Corruption

Our other main independent variable of interest is corruption. To measure this concept, we use the average level of grand and petty corruption within a nation for 2000 from the Varieties of Democracy database (McMann et al. 2016). The measure of grand corruption involves “members of the executive sector, or their agents, granting favors in exchange for bribes, kickbacks, or other material inducements” and how often members of the executive sector of their agents “steal, embezzle, or misappropriate public funds or other state resources for personal or family use” (McMann et al. 2016:297). The measure of petty corruption involves the extent to which “public sector employees grant favors in exchange for bribes, kickbacks, or other material inducements, and how often do they steal, embezzle, or misappropriate public funds or other state resources for personal or family use” (McMann et al. 2016:297). The corruption data originate from expert surveys at the ordinal level and are then converted into an interval measure using a Bayesian ordinal item response theory measurement model. See https://www.v-dem.net and http://qog.pol.gu.se/data for more information on these innovative data sets. It is important to note that higher scores correspond to more corruption. From the above, we hypothesize that higher levels of corruption should be related to increased forest loss.

Other Relevant Independent Variables

Population Growth

We also include the average annual percentage change in total population growth from 2000 to 2015. These data come from the World Bank (2020). Rudel (1989) argued that geometric population growth outstrips arithmetic growth in the means of subsistence. Toward this end, growing populations clear forests to raise crops. Thus, we hypothesize that population growth should correspond to increased forest loss.

Total Forestry Exports

It is also necessary to control for a country’s total forestry exports to determine if it is the flow of exports to a given nation or overall exports that may be contributing to forest loss (Shandra, Leckband, and London 2009). Thus, we include total forestry exports as a percentage of total exports.
of goods and services in 2000. The forestry export data come from the United Nations Food and Agriculture Organization (2018). We log this variable because it is skewed. We expect higher levels of forestry exports to correspond to more forest loss.

**Forestry Sector Size**

This variable measures a nation’s forestry sector size. It includes the metric tons of round wood and fuelwood produced by a nation in 2000. The data may be obtained from the United Nations Food and Agriculture Organization (2017). We expect that nations with larger forestry sectors should have higher levels of forest loss.

**Forest Proximity to Infrastructure**

This variable is the percentage of a country’s total forests that are located within 10 km of infrastructure, including roads, highways, rivers, and ports. The data may be obtained from the United Nations Food and Agriculture Organization (2015). This variable is logged because of its skew. We expect that a country with a larger percentage of forests within 10 km of infrastructure should be related to increased forest loss. This is because the forests can be exploited and brought to market more easily than when they are located in remote regions farther away from transport infrastructure (Rudel and Roper 1997).

**Democracy**

We use Vanhanen’s (2014) measure of democracy, which is calculated by taking the average of his political competition index with his political participation index, in the models. According to Vanhanen, political competition captures the representation of smaller parties in national elections, while political participation measures how many people relative to the population voted in national elections (Vanhanen 2014). Previous research showed that democracy is associated with less forest loss because democratic nations have more accountability to their citizens’ activism for environmental protection (Li and Reuveny 2006). This is a result of democratic nations guaranteeing freedoms of speech, press, and assembly while also being held accountable by voters at the polls (Marquart-Pyatt 2004).

**Nongovernmental Organizations**

We include international nongovernmental organizations working on environmental and animal rights issues in a nation in 2000 per capita. The data were collected by Smith and Wiest (2005). The cross-national research on forest loss finds that higher levels of nongovernmental organizations are associated with lower rates of forest loss because they support conservation projects, help organized social movements concerned with the environment, and write forestry laws (Schofer and Hironaka 2005).

**Gross Domestic Product**

We include gross domestic product per capita for 2000 in our models. This variable is logged. The data come from the World Bank (2015). Burns et al. (2003) found that higher levels of economic development are associated with less forest loss. They argued that this is the case because wealthier nations tend to externalize their environmentally damaging activities by importing natural resources.

**Economic Growth**

We include the average annual economic growth rate from 2000 to 2015. The data also come from the World Bank (2015). The cross-national research that examines how economic growth affects forest loss has yielded contradictory findings. On one hand, economic growth has been associated with higher rates of forest loss and other environmental issues (Clausen and York 2008). This may be the case because nations experiencing rapid economic growth may invest money in environmentally damaging activities that lead to forest loss (Rudel 1989). On the other hand, economic growth may be related to decreased forest loss. The economic growth taking place offers rural populations an incentive to migrate to urban areas for work in manufacturing and other industries (Ehrhardt-Martinez 1998). As a result, fewer people work in agriculture and forestry, putting less pressure on forests (Ehrhardt-Martinez, Crenshaw, and Jenkins 2002).

**Statistical Modeling**

We analyze the data using ordinary least squares regression in Stata 14. It is denoted by the following formula:

\[ y_i = a + b_1 X_1 + b_2 X_2 + \ldots + b_k X_k + \epsilon_i, \]

where \( y_i \) is the dependent variable for each country, \( a \) is the constant, \( b_1 \) to \( b_k \) are unstandardized coefficients for each independent variable, \( X_k \) are independent variables for each country, and \( \epsilon_i \) is the error term for each country.

We must ensure that we are not violating any regression assumptions. First, we calculate mean and highest variance inflation factor scores for each model. We report the values in Table 2. There do not appear to be any potential problems with multicollinearity, as mean and highest variance inflation factor scores do not exceed 2.5 (Tabachnick and Fidell 2013).

Second, we use Stata 14’s ladder and gladder commands to determine if a variable is normally distributed or needs to be transformed. The ladder command reports a \( \chi^2 \) test for eight different transformations. The null hypothesis for the \( \chi^2 \) test is that a specific transformation does not approximate normality (Tukey 1977). If the \( \chi^2 \) statistic is statistically
significant, then we reject the null hypothesis and conclude that the specified transformation does a better job at approximating normality than the variable in its original form (Tukey 1977). We confirm the statistical tests by visually inspecting graphical distributions for each variable using the gladder command. We transform variables on the basis of the results of these procedures and note any transformations below (Tabachnick and Fidell 2013).

Third, we calculate standardized residuals to determine if outliers are a problem. We identify Gambia, Senegal, and Zambia as multivariate outliers because their standardized residuals exceed an absolute value of 2.5 (Tabachnick and Fidell 2013). We removed these nations from the analysis and report results on the basis of their exclusion. We also examined Cook’s distance statistics to detect influential cases. The results indicate no potential problems with influential cases.

Fourth, we calculate Breusch-Pagan heteroskedasticity tests for each model. The null hypothesis for this \( \chi^2 \) test is that the error variances are homoscedastic or equally distributed (Tabachnick and Fidell 2013). The coefficients for the \( \chi^2 \) statistics do not reach a level of significance in any model. It appears that there are no potential violations of the heteroscedastic error term assumption (Tabachnick and Fidell 2013). We report conventional standard errors as a result.

### Findings

In Table 2, we present the ordinary least squares regression estimates of forest loss. The first number presented is the unstandardized coefficient, the second number is the standardized coefficient, and the third number (in parentheses) is the robust standard error. *p < .05, **p < .01, and ***p < .001 (one-tailed tests).

#### Table 2. Ordinary Least Squares Regression Estimates of Forest Loss (2001–2015).

| Independent variables | Model 2.1          | Model 2.2          | Model 2.3          | Model 2.4          | Model 2.5          |
|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Wood exports to India, 2000 | .307** (0.113)   | .306** (0.108)   | .344** (0.108)   | .333** (0.106)   | .361** (0.111)   |
| Corruption, 2000      | .080 (.053)       | .053 (.055)       | .026 (.035)       | .035 (.024)       |
| Total population growth rate, 2000–2015 | .169 (0.056)   | .112 (0.054)   | .054 (0.055)   | .074 (0.059)   | .050 (0.060)   |
| Total forestry exports, 2000 | .027*** (0.010) | .029*** (0.010) | .334 (0.011) | .439 (0.011) | .369 (0.012) |
| Forestry sector size, 2000 | .310 (.010)   | .002 (.007)       | .001 (.001)       | .001 (.001)       |
| Forestry proximity to infrastructure, 2000 | .169 (.056)   | .074 (0.059) | .050 (0.060) | .050 (0.060) | .050 (0.060) |
| Democracy, 2000       | .045* (0.021)    | .053*** (0.022)  | .288 (0.022) | .247 (0.023) |
| Nongovernmental organizations, 2000 | .243 (.021) | .273 (0.011) | .280 (0.011) | .280 (0.011) | .280 (0.011) |
| Gross domestic product, 2000 | −.001          | −.001            | −.043 (0.004) | −.029 (0.005) |
| Economic growth rate, 2000–2015 | −.019         | −.196 (0.014)    | −.019            | −.036 (0.004) |

\( R^2 \)    |   .124 |  .217 |  .272 |  .325 |  .349 |
Sample       |   67  |   67  |   67  |   67  |   67  |
Highest variance inflation factor score | 1.00 | 1.04 | 1.17 | 1.60 | 1.68 |
Mean variance inflation factor score    | 1.00 | 1.03 | 1.10 | 1.30 | 1.37 |

Note: The first number is the unstandardized coefficient, the second number is the standardized coefficient, and the third number (in parentheses) is the robust standard error. *p < .05, **p < .01, and ***p < .001 (one-tailed tests).
We begin by examining the factors related to ecologically unequal exchange and corruption. First, we find support for ecologically unequal exchange theory. The coefficients for wood exports from peripheral nations to India are positive and significant across Table 2. However, we do not find that corruption is related to increased forest loss. The coefficients for this variable do not reach a level of statistical significance. The failure of corruption to affect forest loss is somewhat surprising. However, we argue that a more complex relationship needs to be examined, specifically an interaction effect between corruption and ecologically unequal exchange in Table 3.

We find that other factors are related to forest loss. First, we find higher levels of population growth are related to increased forest loss. The coefficients are positive and significant in every model. This finding contradicts previous research. However, Ehrhardt-Martinez et al. (2002) argue that it may be the result of corporate money influencing elections in democratic nations in the periphery.

There are nonsignificant factors that merit discussion too. First, we do not find that domestic forestry size explains significant variation in forest loss. Second, we find that our remaining political characteristic of a peripheral nation is not related to forest loss. The coefficients for nongovernmental organizations do not reach a level of statistical significance. Third, the two economic factors fail to explain significant variation in forest loss. The coefficients for gross domestic product and economic growth do not reach a level of statistical significance.

We find mixed support for the main hypotheses of this study with ecologically unequal exchange being related to increased forest loss but corruption not being related to it. In Table 3, we evaluate the hypothesis that a corrupt government creates an institutional context that prioritizes

| Independent variables | Model 3.1 | Model 3.2 | Model 3.3 | Model 3.4 | Model 3.5 |
|-----------------------|----------|----------|----------|----------|----------|
| Wood exports to India, 2000 | .256* | .256* | .295** | .276** | .301** |
| Correlation, 2000 | .266 (.114) | .265 (.108) | .306 (.109) | .287 (.107) | .312 (.114) |
| Wood exports to India × corruption | .029 | .002 | −.018 | −.015 | −.017 |
| Total population growth rate, 2000–2015 | .060 (.060) | .004 (.058) | −.039 (.059) | −.032 (.062) | −.037 (.063) |
| Total forestry exports, 2000 | 1.045* | .1037* | .938* | 1.062* | .941* |
| Forestry sector size, 2000 | .253 (.535) | .251 (.508) | .277 (.508) | .257 (.495) | .228 (.515) |
| Forestry proximity to infrastructure, 2000 | .027** | .029*** | .039*** | .035*** | .035*** |
| Democracy, 2000 | .309 (.019) | .332 (.010) | .447 (.011) | .399 (.012) | |
| Nongovernmental organizations, 2000 | .002 | −.001 | .001 | −.001 | |
| Gross domestic product, 2000 | .001 | .001 | .006 (.001) | −.016 (.001) | |
| Economic growth rate, 2000–2015 | .002 | .002 | .007 (.008) | −.057 (.004) | |
| Effect at low levels of corruption | .049 | .050 | .109 | .066 | .115 |
| Effect at high levels of corruption | .462 | .461 | .481 | .486 | .487 |
| Constant | .076*** (.011) | .032* (.019) | −.143 (.092) | −.222* (.099) | −.108 (.153) |
| R² | .174 | .267 | .311 | .375 | .386 |
| Sample | 67 | 67 | 67 | 67 | 67 |
| Highest variance inflation factor score | 1.28 | 1.28 | 1.33 | 1.60 | 1.78 |
| Mean variance inflation factor score | 1.19 | 1.16 | 1.17 | 1.34 | 1.42 |

*Notes: The first number is the unstandardized coefficient, the second number is the standardized coefficient, and the third number (in parentheses) is the robust standard error. 
*p < .05, **p < .01, and ***p < .001 (one-tailed tests).
consumptive behaviors in the short term that enhances the harmful impacts of unequal exchange of wood to India from peripheral nations. We do so by including interaction terms between the two variables. We organize Table 3 in the same way as Table 2 with the exception of the baseline model including the interaction term and its components.

It is important to note that we calculate the interaction term in the following manner. We begin by mean centering corruption, the moderator variable to reduce issues with multicollinearity. We multiply the moderator variable by our focal variable, exports of wood to India from peripheral nations. We go on to provide estimates of the effect of wood exports to India from peripheral nations on forest loss at low (i.e., at 1 standard deviation below the mean), at medium-high (i.e., at the mean), and at high (i.e., at 1 standard deviation above the mean) values of corruption for each model. Because we mean center the moderator variable, the effect of wood exports to India at mean levels of corruption is equal to the unstandardized regression coefficient for wood exports to India.

In Table 3, we find substantial support for the hypothesis that corrupt governments create an institutional context that enhances the harmful impacts of ecologically unequal exchange on forest loss. The coefficients for the interaction term between corruption and wood exports from peripheral nations to India are positive and statistically significant in every model in Table 3. The calculations reveal that wood exports to India increase forest loss more in peripheral nations with higher rather than lower levels of corruption.

How might we interpret this finding in relation to the amount of forest cleared as a result of the interaction between ecologically unequal exchange and corruption? To answer this question, we use the predicted values listed in Table 3 and actual data on forest loss for Lithuania. We use data on Lithuania because it has a forest loss ratio equal to the effect of wood exports to India at low levels of corruption with the other independent variables held at zero.

The forest area in Lithuania was equal to 1,647,310 hectares in 2000, while 188,679 hectares of forest were cleared from 2001 to 2015 (World Resources Institute 2016). From this information, we can calculate Lithuania’s actual forest loss ratio: .114 = 188,679/1,647,310. We can conclude from this information that 188,679 hectares of forest would have been cleared as a result of a peripheral nation such as Lithuania exporting wood to India at low levels of corruption if all the other independent variables are held at zero.

The predicted value of forest loss in a peripheral nation that exports wood to India at the mean level of corruption is equal to .301. This is a 164 percent increase in the forest loss ratio compared with the predicted value of forest loss at low levels of corruption. As a result, a peripheral nation such as Lithuania would clear an additional 309,433 hectares of forest from 2001 to 2015 (164 percent of 188,679 hectares). At high levels of corruption, the predicted value of forest loss due to wood exports to India in a peripheral nation equals .487. This is about a 327 percent increase in the forest loss compared with the amount cleared in a peripheral nation such as Lithuania if it had low levels of corruption. As such, it would be equivalent to a peripheral nation such as Lithuania clearing 616,980 hectares of forest from 2001 to 2015 (327 percent of 188,679 hectares).

It is important to note that other findings remain stable and consistent. In this regard, we find that total population growth, proximity of forests to infrastructure, and democracy, are related to increased forest loss. The coefficients for these variables are positive and significant in Table 3. The other independent variables fail to reach a level of statistical significance.

Robustness Checks

The validity and reliability of the corruption data have been subject to criticism. In particular, Boese (2019) discussed several issues that emerge when cross-national data are based on expert surveys. First, it is often easier to find experts for certain nations and specific time periods. For example, Munck (2009) noted that organizations have difficulty identifying experts in particular nations because participation is dangerous for them and their relatives. Second, experts may disagree on how to classify a nation with regard to a specific concept. For instance, Bush (2017) argued that the opinions of experts tend to correspond to a large extent with the perceptions of how scholars in the United States and Europe define corruption. Third, experts may have different thresholds for how to classify the level of corruption in a nation. In this regard, Bollen and Paxton (2002) found that experts systematically rate Marxist-Leninist nations lower than other nations. Clearly, there are issues with equivalence across experts and nations that may compromise the corruption data.

These are serious concerns that can undermine our findings. However, scholars involved in collecting the data have taken several steps to address such problems. These steps include having a network of more than 3,500 country experts with a minimum of 5 experts for any given nation, with approximately two thirds being citizens or residents of the nations for which they provide information (Varieties of Democracy 2022). Furthermore, the identities of country experts are held confidential and are not publicly revealed (Varieties of Democracy 2022). Additionally, experts come from diverse backgrounds that include not only academics but other professionals with specialized knowledge about a given nation (Varieties of Democracy 2022).

Finally, Boese (2019) noted that Varieties of Democracy (2022) uses a Bayesian item response theory estimation strategy to calculate its estimates, which allows for the possibility that experts have different thresholds.
and classifications for their ratings. These thresholds are estimated on the basis of patterns in the data and then incorporated into a final estimate of a latent concept being measured. This makes it possible to correct for the concern that one expert may respond with “never” while another expert may respond “always” to a given question (Varieties of Democracy 2022). Furthermore, the item response estimation strategy allows the reliability of the experts to idiosyncratically vary on the basis of the degree to which they agree with other experts. The experts with higher reliability have a greater influence on concept estimation, thereby considering the concern that not all experts are equally knowledgeable (Varieties of Democracy 2022). This methodology also calculates a discrimination parameter that assesses the degree to which expert opinions agree or disagree with one another. This is used to provide plausible values or credible regions, which are synonymous with confidence intervals (Varieties of Democracy 2022).

To demonstrate the reliability of our results, we estimate the models with the data having a high level of measurement error. We present these results in Table 4. Table 4 has the same organization as Table 3.

### Table 4. Ordinary Least Squares Estimates of Forest Loss with Corruption at Levels of High Measurement Error.

| Independent variables | Model 4.1       | Model 4.2       | Model 4.3       | Model 4.4       | Model 4.5       |
|-----------------------|----------------|----------------|----------------|----------------|----------------|
| Wood exports to India, 2000 | .254* (.114) | .253** (.108) | .293** (.110) | .274** (.107) | .299** (.114) |
| Corruption, 2000      | .028 (.059)   | .002 (.057)   | −.019 (.058)  | −.013 (.060)  | −.014 (.061)  |
| Wood exports to India × corruption | 1.029* (.524) | 1.023** (.497) | .029* (.497) | 1.043* (.484) | .922* (.504) |
| Total population growth rate, 2000–2015 | .027*** (.010) | .029*** (.010) | .039*** (.011) | .035*** (.010) |          |
| Total forestry exports, 2000 | .002 (.011) | .001 (.011) | −.002 (.011) | .001 (.011) | .001 (.011) |
| Forestry sector size, 2000 | .002 (.001) | .007 (.001) | −.015 (.001) | .001 (.001) | .001 (.001) |
| Forestry proximity to infrastructure, 2000 | .041* (.011) | .050* (.011) | .223 (.021) | .267 (.021) | .241 (.022) |
| Democracy, 2000       | .003** (.001) | .003*** (.001) | .301 (.001) | .303 (.001) |          |
| Nongovernmental organizations, 2000 | −.002 (.001) | −.001 (.001) | −.054 (.004) | −.043 (.004) | −.013 (.014) |
| Gross domestic product, 2000 | .001 (.001) | .005 (.001) | .007 (.001) | .003 (.001) | .006 (.001) |
| Economic growth rate, 2000–2015 | .049 (.011) | .050 (.012) | .067 (.012) | .115 (.015) | .115 (.015) |
| Effect at low level of corruption | .457 (.011) | .455 (.012) | .475 (.012) | .481 (.013) | .482 (.013) |
| Effect at high level of corruption | .076*** (.011) | .032* (.019) | −.143 (.092) | −.233* (.099) | −.110 (.153) |
| R²                    | .174 (.019)   | .267 (.019)   | .312 (.021)   | .376 (.021)   | .386 (.021)   |
| Sample                | 67            | 67            | 67            | 67            | 67            |
| Highest variance inflation factor score | 1.28          | 1.28          | 1.32          | 1.60          | 1.78          |
| Mean variance inflation factor score | 1.19          | 1.16          | 1.17          | 1.33          | 1.42          |

Note: The first number is the unstandardized coefficient, the second number is the standardized coefficient, and the third number (in parentheses) is the robust standard error. *p < .05, **p < .01, and ***p < .001 (one-tailed tests).

In Table 4, we continue to find support for the hypothesis that corrupt governments enhance the harmful impacts of ecologically unequal exchange on forests. We again see that the coefficients for the interaction term between the two variables are positive and statistically significant. The calculations of predicted values again reveal that wood exports to India increase forest loss more in peripheral nations with higher rather than lower levels of corruption.

**Discussion and Conclusion**

We begin by noting that most theory and empirical research on ecologically unequal exchange is concerned with how core nations exploit semiperipheral and peripheral nations. We follow work by Ciplet and Roberts (2017) and Frame (2019) that demonstrates the importance of considering how semiperipheral nations engage in ecologically unequal exchange. In this regard, we apply the theory to India and demonstrate that it externalizes its forest loss by importing wood from peripheral nations. The coefficients for wood exports from peripheral nations to India are positive and significant (Table 2).
We also evaluate the contradictory impact of corruption on forest loss. Initially, we do not find support that corruption is a relevant predictor of forest loss despite evidence from previous research to the contrary. However, we argue that this conclusion may not be entirely accurate. Thus, we draw on insights from Evans (1979) to argue that ecologically unequal exchanges of wood exports interact with corruption to influence forest loss. Put differently, wood exports from peripheral nations to India increase forest loss more at higher rather than lower levels of corruption. We argue that this is the case because peripheral nations with high levels of corruption create institutional contexts that prioritize consumptive practices over long-term investments in environmental protection. From this insight, we hypothesize and find support for the idea that the ecologically unequal exchange of wood to India from peripheral nations increases forest loss more at higher rather than lower levels of corruption. In Tables 3 and 4, the coefficients for the interaction terms are positive and significant and calculations reveal this pattern.

There are theoretical and methodological implications that follow from the interaction finding. Bradshaw (1987:235) pointed out that most cross-national research avoids “current theoretical and ideological particularism” by including predictors from competing perspectives in the same model “without giving logical priority to either paradigm” like considering ecologically unequal exchange and corruption in the same model. Smith (1996) noted, “More critically, it represents a retreat to eclecticism. It sidesteps the real challenge, which is to construct a synthetic theoretical approach that melds the useful elements of competing approaches into coherent guiding principles and explanations” (p. 145).

We attempt to overcome such critiques by drawing on Evans’s (1979) idea that peripheral governments create institutional contexts that facilitate ecologically unequal exchange. We do so because such “allegedly antithetical” factors such as corruption and wood exports to India from peripheral nations “are related to each other in a specifiable and meaningful manner” (London and Smith 1988:41). Thus, we concur with London and Williams (1988), who write, “Intranational and international…dynamics are so interwoven in the modern capitalist system that any analysis that does not specify how effects of both sets of factors interact is seriously deficient and offers at best a partial explanation” (p. 288).

We offer the following policy suggestions in an attempt to address forest loss. The need to address corruption is essential to reduce forest loss, especially because it enhances the harmful impact of wood exports from peripheral nations to India. In this regard, any efforts should focus not only on peripheral nations but also on India.

In India, the government can improve limit monitoring, enforcement, and prosecution of exports that are logged illegally (Dubey 2009). This includes ensuring that all of the government’s wood purchases are legally sourced. Furthermore, India can monitor not just illegally harvested species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora but all species that have been illicitly obtained. India can start to address the issue by putting into place a traceability system that handles reports from foreign governments and nongovernmental organizations about illegally harvested wood being exported to it (United Nations Food and Agriculture Organization 2020).

A peripheral nation should consider several options that include simplifying the regulatory framework in the forestry sector while also reducing the discretionary power of government officials (Tacconi and Williams 2020). A peripheral government should also partner with the media, nongovernmental organizations, and concerned citizens not only to monitor and publicize corruption in the forestry sector but also in policy formation (Abman 2018).

According to Bolivia’s constitution, for example, its natural forests are property of the government. During the early 1990s, logging was done by companies under short-term contracts with the government that were based on volume charges (United Nations Food and Agriculture Organization 2001). Contreras-Hermosilla (1997) noted that the system allowed corruption to flourish in the forestry sector, and as a result, so too did forest loss. In 1996, however, Bolivia put into place a new framework to address the issue, and forest loss decreased.

The system eliminated interpretation and discretionary power in assigning forest concessions. In its place, companies pay an annual fee of $1 per hectare for a concession (United Nations Food and Agriculture Organization 2001). There is now a clear and simple calculation of what companies have to pay for their concessions annually. Furthermore, Bolivia requires management plans, in line with government regulations, to be prepared by independent forestry professionals, who are responsible for their implementation by the companies (United Nations Food and Agriculture Organization 2001). The companies are also required to produce audits every five years in conjunction with an independent certification organization such as the Forestry Stewardship Council to prove that the prescriptions of the management plans are being implemented (United Nations Food and Agriculture Organization 2001). The concessions are auctioned off in a public bidding process and last for 40 years pending approval of the audits (United Nations Food and Agriculture Organization 2001).

There are some caveats that should be noted and three possible directions for future research. First, we measure wood exports sent to India from peripheral nations in 2000. This is due to the availability of forest loss data (World Resources Institute 2016). However, wood exports to India have only increased over time (United Nations Food and Agriculture Organization 2020). Although we most likely underestimate the impacts on forests, additional research needs to be carried out when more forest loss data become available. Second, we consider the effect of wood exports from peripheral nations to India. However, China also...
imports amounts of natural resources from the periphery (Bunker and Ciccantell 2005). It is essential to understand the extent to which China may be engaging in ecologically unequal exchange at the expense of the natural environment elsewhere in pursuit of its development (Givens et al. 2019).

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