Does trade help or hinder the conservation of natural resources?

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Abstract

Trade exerts important influences over the exploitation and protection of natural resources. Indeed, recognition of this influence is codified in the GATT, which allows exceptions to the treaty obligations for measures "relating to the conservation of exhaustible natural resources," motivates the Convention on International Trade in Endangered Species, and underlies the Convention on Biological Diversity. Trade impacts operate through several vectors. Trade liberalization changes relative prices, which affect exploitation incentives. Trade can also have broader equilibrium effects, such as on factor markets and incomes, which may affect demand for resource-intensive products—or for ecosystem services. Trade interacts with and can influence the institutions governing the management of natural resources. Finally, trade can also be a direct vector for introducing threats to ecosystems in the form of invasive species. All of these factors pose special challenges for the conservation of renewable resources, which inherently involves dynamic economic and ecological processes. This article takes stock of the lessons from the recent resource economics literature on trade and conservation.

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Contents

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Introduction

The role of trade and trade-related measures in the use and conservation of natural resources is complicated by the context in which these resources are exploited. Renewable resources often suffer from ill-defined property rights, open-access problems, transboundary migration, and a host of management challenges raised by the complex biological process that determine their "renewability." As a result, the interdependence of trade and resource use has a long history in international dialogue and law, as countries have sought help from partners in facilitating their conservation goals. This dialogue stands in some contrast to the debate over the "outsourcing" of pollution-intensive industries, featured in the article by Arik Levinson in this symposium, where few (if any) of the presumed recipients of greater pollution have sought international assistance in preventing such shifts in production. Furthermore, the complexity of renewable resource management in a global context adds another dimension to the question of why countries might want to negotiate over environment and trade policies together, as developed in the article by Josh Ederington.

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An early example of international cooperation on conservation is the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, which included controls on international trade in protected fauna and flora. The treaty was adopted in 1940 and entered into force in 1942.

Five years later, negotiations began on the General Agreement on Tariffs and Trade (GATT), which evolved to form the foundation of the World Trade Organization (WTO). The GATT had as its primary goal more open trade, working to lower tariffs and eliminate non-tariff barriers to trade. Nonetheless, exceptions to trade policy obligations for the purposes of conserving natural resources have been codified from the beginning in the agreement (notably Article XX, paragraph (g)). WTO member states may engage in trade-restrictive policies "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption." However, the "chapeau" of the Article imposes the additional requirement, "that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade." Although the exception states "exhaustible" resources, it has generally been interpreted to include renewable resources that may be depleted. In the past, this particular exception has been argued for policies aimed at the conservation of tuna, salmon, herring, dolphins, turtles, and also clean air.[2]

[2] http://www.wto.org/english/tratop_e/envir_e/envt_rules_exceptions_e.htm

Environmentalists express two kinds of concerns about the multilateral trading system. First, that trade liberalization itself can place untenable pressures on resource stocks, especially in countries without the means to manage and protect them. Second, that trade policy obligations can hamstring governments in their attempts to manage their resources, by disallowing trade-restrictive measures. Perhaps the most famous dispute regarding renewable resource conservation is that of India etc versus US: "Shrimp-Turtle." The US Endangered Species Act of 1973 listed five species of sea turtles that occur in US waters as endangered or threatened, and required that US shrimp trawlers use "turtle excluder devices" (TEDs) in their nets when fishing in areas where there is a significant likelihood of encountering sea turtles. In 1989, Congress added requirements to imports, banning imports of shrimp originating from areas where sea turtles might be threatened unless the harvesting nation was certified to have comparable regulations and outcomes.[3] The appellate panel ultimately ruled against the US, to environmental groups dismay; but the reasoning was that the US policy was applied in an arbitrary manner, providing transitional assistance to some WTO members in the Caribbean but not to the complaining members in Asia. More important is what the panel did *not* find: "We have *not* decided that the sovereign nations that are Members of the WTO cannot adopt effective measures to protect endangered species, such as sea turtles. Clearly, they can and should." This statement indicates a clear shift from an earlier ruling of a GATT dispute panel that was less

[3] Section 609 of US Public Law 101–102.

deferential to the general exceptions.[4] Still, an additional statement by the Shrimp-Turtle Appellate Panel indicates a preference against unilateral trade measures: "And we have *not* decided that sovereign states should not act together bilaterally, plurilaterally or multilaterally, either within the WTO or in other international fora, to protect endangered species or to otherwise protect the environment. Clearly, they should and do."

Indeed, there are several international treaties related to resource conservation, and they explicitly recognize the role of international trade in achieving their goals. That trade may be a threat to species conservation is at the core of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In force since 1975, CITES places certain controls on international trade in specimens of selected species, according to their designated status of endangerment level (listed in Appendices). International trade in species threatened with extinction (Appendix I) is banned altogether, except in exceptional circumstances. Other species may not necessarily threatened with extinction, but are sufficiently endangered by trade to mandate controls. In some cases, one country with threatened species may enlist the help of CITES partners in controlling trade (Appendix III). For all these listed species, CITES requires their import, export, re-export and introduction from the sea to be authorized through a licensing system, developed and managed in each member country. However, the primary policy tool of CITES remains the trade ban.

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[4] In the also well-known dispute, Mexico etc versus US: "Tuna-Dolphin", the GATT panel rejected the validity of the exception, saying it did not allow for the regulation of production processes (as opposed to product qualities) used in imported products.

A more nuanced view of the role of trade in conservation may be evident in other agreements. In the late 1970s and early 1980s, alarm at the rate of deforestation occurring in many tropical countries, tempered with recognition that the tropical timber trade played a key role in the economic development of those countries, led to the first International Tropical Timber Agreement (ITTA) in 1983. In that and successor agreements, the ITTA aims "to promote the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests and to promote the sustainable management of tropical timber producing forests." Mechanisms include a variety of efforts to collect and share information, build capacity for monitoring and enforcement, develop guidelines for sustainable practices, promote technology transfer, and foster international cooperation through the forum of the International Tropical Timber Organization.

The Convention on Biological Diversity (CDB), a product of the 1992 Earth Summit in Rio de Janeiro, has as its main aims biodiversity conservation, sustainable use of the components of biodiversity, and equitable sharing of the benefits of commercial uses of genetic resources. Toward these goals, CBD activities include both trade promotion for products using biodiversity resources in a sustainable way,[5] and also analysis and mitigation of the effects of trade

[5] Examples of policies used in the implementation of the convention include individual transferable fishing quotas and other property right-based mechanisms, biodiversity prospecting, and the commercialization of medicinal plants or other biodiversity-based products, possibly including the use of certification or eco-labeling. (http://www.cbd.int/incentives/indirect.shtml accessed 9/20/2008).

liberalization on biodiversity. Thus, two ideas simultaneously underlie the CDB: that trade can be a boon to conservation goals, and that trade can be a threat to biodiversity.

Given the long history of international trade and conservation policies, it is somewhat surprising that the resource economics literature has made a concerted effort to understand the interplay only fairly recently. Still, we see all of these competing ideas emerging.

Economics of Renewable Resources and Trade

Renewable resources—like fisheries, forests, wildlife, and the benefits provided by ecosystems and biodiversity—pose some different challenges than those raised by pollution. Therefore, trade and renewable resources has emerged as a distinct literature unto itself (for a more technical review, see Barbier and Bulte 2005). The key factor is that these resources are indeed renewable: while they may be depleted by harvesting activities, they also replenish over time according to biological processes. As a result, the management of renewable resources is an intertemporal problem, and the static models common in trade and environment analysis can miss important lessons that arise from the dynamics.

These dynamics are determined by a complex interplay between economic, ecological, and institutional variables. Of course, weak institutions and lax regulation are also underlying issues for trade and pollution, as polluters do not take into account the environmental costs of their activities unless regulated. But in renewable resources, weak institutions lead to "open-access" problems, in which harvesters extract the resource without consideration of the effects of the smaller stock on other harvesters and future extraction opportunities.

Trade influences these dynamics through several vectors. Trade liberalization changes relative prices, which affect exploitation incentives. Trade can also have broader equilibrium effects, such as on factor markets and incomes, which may affect demand for resource-intensive products—or for ecosystem services. Trade interacts with and can influence the institutions governing the management of natural resources. Finally, trade can also be a direct vector for introducing threats to ecosystems in the form of invasive species.

Role of relative prices

The primary effect of trade liberalization is to change the relative prices of resource-intensive goods to other goods. At the same time, for a small, open economy, as most of the literature has focused on, opening to international trade also means that the domestic resource price is no longer self-regulating. In autarky, prices adjust with the harvest size; large harvests relative to demand drive down prices and thereby incentives to extract the resource. But with trade, prices become fixed on world markets and insensitive to the degree of overexploitation. The long-run effects then depend on whether trade raises or lower prices for the resource good. In the typical case, for a resource abundant country, open trade tends to raise prices for the resource, which can have several effects.

The main effect of higher prices is to encourage intensified exploitation, causing resource stocks to decline (at least initially). If stocks are managed optimally, trade will increase welfare in present value terms, although steady-state welfare and stocks may ultimately be lower (Bulte and Barbier, 2005). However, if stocks are poorly managed, higher prices can exacerbate a pre-existing open-access problem. The country experiences temporary gains from trade, but these

new profits will attract new entrants until all the rents are again dissipated—or until all available labor has moved into the resource sector. Brander and Taylor (1997a) show that if the country can fully specialize and still receive enough rents from the resource sector, then it can benefit from more open trade in the long run; however, if all the rents are dissipated, then the country will be worse off under trade. On the other hand, if international resource prices are actually lower—such as if a country has already dangerously overused its resource for its own consumption—then opening to trade allows domestic demand to be satisfied by imports, relaxing pressure on the resource and allowing it to recover. In this way, trade can also be beneficial to countries with severe open-access problems.

Changing relative prices can also have important secondary effects on welfare and resource stocks as other factors of production adjust. For example, the reallocation of effort in resource exploitation can have additional implications if other sectors in the economy might be better engines of growth in the long run than natural resource commodities. Shifting production toward the resource-intensive sector will imply reducing employment in other sectors, like manufacturing. If manufacturing has spillover benefits for growth, or increasing returns to scale more generally, this diversion of labor can lead to lower welfare (Matsuyama, 1992).[6]

[6] On the other hand, if the other sectors exhibit diminishing returns to scale (say, as more fishers and foresters attempt to enter into manufacturing where they are unskilled), diversion of labor to the higher-earning resource sectors can improve overall productivity and welfare—even if the resource suffers from open access problems (Hannesson 2000).

Relative prices also influence the value of other factors of production, including the opportunity cost of land. When land can either serve as habitat for the resource or be converted for other uses, like agricultural cultivation, resource price changes can have counterbalancing effects. While higher resource prices increase exploitation, they also increase the value of maintaining habitat and expanding the resource base (Barbier and Schulz, 1997; Jinji, 2006). Which effect dominates will depend on the situation, but several authors caution that trade restrictions (like trade bans, import restrictions, or even certification schemes) that reduce the values of resources like ivory or tropical timber may have the counter-productive effect of hastening habitat conversion, weakening the support system for the resource in the long run (Barbier et al. 1990; Barbier et al. 1994; Barbier, 2001; Jinji, 2006).

While the focus in most studies is on the change in resource prices, we should recognize that trade liberalization may also affect the prices of other sectors. Some of these sectors may be in competition for the land or habitat that the natural resource relies; for example, increasing relative returns to agriculture can lead to greater rates of deforestation and soil depletion, while a shift to less land-intensive sectors would allow resources to recover (Lopez 2000). Other sectors might complement the resource or its habitat; for example, higher prices for shade-grown coffee can help the conservation of forest cover (Blackman et al. 2007). Or tariff reductions might affect sectors that demand resource products; indeed, given the tendency toward tariff escalation—that is increasing tariffs for more highly processed goods than raw materials—tariff liberalization is likely to have larger effects on resource-using products (like furniture) than on many resources themselves (like timber).

Demand for these goods may also be affected indirectly by trade through changes in real incomes and economic growth over time. Higher incomes at home and abroad can increase demand for resource (or resource-using) products, possibly intensifying price pressures. On the other hand, using the proceeds from resource exports to finance investments in human and industrial capital can ultimately decrease reliance on extraction (Sarraf and Jiwanji 2001). Income growth can perhaps increase demand for ecological services and the capacity for resource protection (as alleged in the voluminous Kuznets curve literature).

Thus, "trade liberalization" in general can have many complicated and competing effects on resource use. A key factors issue is not only the effect of trade on relative resource prices, but also the quality of a country's management institutions, which may themselves be influenced by trade.

Role of institutions

Much of the focus on institutions reveals the concern that trade may prove costly for natural resource-dependent developing countries (the global "South"), where governance is generally weaker and open-access regimes more likely to prevail than in developed countries (the "North"). This concern was voiced by Chichilnisky (1994), that open access confers an "apparent" competitive advantage against a regime with perfect property rights, inducing trade that would not otherwise occur and possibly leading to lower welfare in the South as a result. Brander and Taylor (1997b) confirm some of this intuition in a dynamic resource framework. They consider trade between a "consumer" country, with open access to its resource pool, and a "conservationist" country that actively manages its resource. When, despite the open access

problem, resources remain relatively abundant in the consumer country before trade, liberalization causes this country to export the resource, exacerbating the open-access problem and leading to welfare losses. However, if the resource in the consumer country is severely depleted before trade, opening to imports from the well-managed country serves to protect the open-access stock and both countries experience gains from trade.

When neither country has perfect property rights or management strategies, though presumably somewhat better in the North than the South additional scenarios are possible. Overexploitation in the South can eventually lead to a reversal in the direction of trade, as the North becomes an exporter. With sufficient recovery rates, long-run gains from trade could be realized; on the other hand, since the North is not able to manage its resources optimally either, there is also the possibility that stocks in the North could ultimately be driven to collapse as well (Karp et al. 2001).

Part of the problem stems from the asymmetry of renewable resource management institutions. When only certain portions of global resources are "enclosed" with property rights regimes, although their owners are made better off, a side effect is to put more pressure on the remaining unenclosed resources (deMeza and Gould 1992; Fischer and Laxminarayan 2008). In this case, trade can have stronger effects on overharvesting of the unenclosed resources, and on the system as a whole, than if all resources were governed by open access.

Of course, there is no particular reason to believe that management regimes would stay fixed in light of significant changes in resource rents as a result of trade. On the one hand, higher resource values increase the return to better management and make more funds available for the enforcement of property rights. Greater enforcement leads to improvements in resource

conservation; however, society as a whole may not necessarily benefit, due to the costs associated with enforcement (Hotte et al. 2000). When enclosure occurs incrementally and incompletely, such as by private landowners monitoring their own parcels, there are likely to be ranges of relative prices in which society may be made better or worse off from trade (Margolis and Shogren 2002). A challenge is that higher resource prices not only increase the gains to enforcement, but they also increase the return to evading enforcement. Copeland and Taylor (2007) identify three additional factors in determining whether improved incentives to manage resources will be sufficient to protect the resource and allow society to benefit from trade. One is the power of the regulator, which is necessary to deter illegal harvesting effectively at sufficiently low costs. A second is the ability of the resource to generate competitive returns without being extinguished, a precondition for good management to be sustainable. A third has to do with the magnitude of the open access problem, and how much labor in the economy is available for harvesting, relative to what is sustainable. For economies with favorable conditions in these areas, sufficiently high resource prices can facilitate good management regimes and gains from trade. However, economies with serious challenges to enforcement, particularly facing resources with slow replenishment rates, trade can do more harm than good.

On the other hand, greater enforcement is not necessarily the outcome of higher resource prices. Larger rents can also increase the return to special interest lobbying and corruption; meanwhile more funds in government coffers can be used by officials to relieve pressure for better governance. For example, higher resource prices can increase lobbying pressures for greater access and larger quotas, at the detriment of welfare and stock conservation (Bulte and Barbier 2005; Barbier et al. 2005). Rent-seeking as a result of trade-related windfalls in resource

sectors can also have macroeconomic effects, as these nonproductive activities slow growth (Lane and Tornell 1999).

Institutional quality—and its potential deterioration with trade—has been a major focus of recent literature on the "resource curse," although most of these studies focus on exhaustible extractive resources, like oil and minerals (see Fischer 2006). The resource curse idea was initially substantiated empirically by Sachs and Warner (1995); however, recent evidence finds the pathway to be clearly associated with bad institutions, in interaction with resource abundance, rather than attributable to the resources themselves (e.g., Mehlum et al. 2006).

The empirical question remains as to the extent to which resource abundance actually weakens institutions. Some evidence has been found for a link between natural resource abundance and increased corruption (Leite and Weidmann 1999) or the risk of armed conflict (Collier and Hoeffler 2004). Some scholars make a distinction between dispersed resources and "point-source" resources—those that generate concentrated resource rents, like most nonrenewable resources and plantation farming. Revenues derived from concentrated sources can be more easily collected and controlled, reducing the need for taxes, which in turn gives civil society less incentive to demand accountability from government, and lets government afford to mollify dissent, either by favors or by force. Some econometric evidence provides support for this theory that export concentration in point-source resources (Isham et al. forthcoming) or in nonrenewable resources (Sala-i-Martin and Subramanian 2003) has a negative influence on institutional quality. Controlling for these relationships, these studies find either a positive or no direct impact of resource abundance on growth. Of course, weak institutions could also leave a country more dependent on such resources, so the direction of causality is not completely clear.

Noting that some institutional differences precede resource discoveries, Boschini et al. (2004) find a low correlation between natural resources and institutional quality. Brunnschweiler and Bulte (2008) make an important point that the measure of resource abundance in most studies—the share of resource exports in GDP—is actually a better measure of resource dependence, whereas abundance can be measured by resource stock values. Making this distinction, they find that resource dependence is determined in part by resource abundance, as well as constitutions and institutions; however, dependence does not seem to affect growth, while resource abundance positively affects growth and institutional quality.

Thus, the consensus is growing that resources are a blessing after all, and even dependence on resource exports need not be a curse if institutions are strong. However, most of the results in this literature are dominated by the higher value mineral (nonrenewable) resources. For renewable resources, an important question is not only whether trade in resources confers economic benefits, but also how it affects the long-term sustainability of the stock. Looking at deforestation rates, Ferreira (2004) finds that trade, as measured by relative resource abundance, has little effect directly, but it does have strong effects in interaction with measures of institutional quality. In particular, openness increases deforestation when the provision of government services and bureaucratic quality is inefficient, but also as contract observance and enforcement by government becomes more efficient. Thus, with incomplete improvements in institutional quality, some aspects may actually speed exploitation, while others slow it down.

Clearly, however, the combination of trade and open-access harvesting does have the potential to cause the collapse of a species. Taylor (2006) tells the story of the North American bison, in which the innovation of new tanning techniques made the hides desirable, and the

ensuing European demand fueled a punctuated slaughter that brought the Great Plains population from 10 to 15 million buffalo down to 100 in a little more than 10 years.

Role of ecology

Of course, stock depletion is not merely a function of economic and institutional variables; for renewable resources, ecological variables play important roles. As we have already seen, the biological growth rate is an important factor, with low-growth species more likely to suffer unsustainable pressures from trade. The availability of habitat and ecological services also play a role in growth, and we have seen that their provision can also be affected by trade pressures. However, other characteristics of the species also bear mentioning, as they can create special challenges for resource management under trade.

For one, while some species (timber, for example) are largely stationary, others roam and migrate across jurisdictional borders (fish being the main commercial species example, but also non-commodity wildlife like birds, butterflies, or sea turtles). For migratory wildlife, the main question is the preservation of habitat across jurisdictions. However, for migratory "commodities", multijurisdictional harvesting becomes an issue. When two countries share a common resource pool, they have incomplete incentives to manage their own harvest practices—a national version of the open-access problem, though large players will want to engage in at least some regulation. Without trade, Bulte and Damania (2005) show that those policies tend to be "strategic substitutes," that is, if one country has lax controls and allows overfishing, the other country will respond with tighter controls, as higher domestic prices keep effort in the fishery. However, if trade liberalization leaves prices determined on foreign markets, regulatory policies

become “strategic complements,” which means a loosening of regulations in one country could lead to a race-to-the bottom—although better coordination is also a possibility.

Other challenges are raised when the resource has other characteristics than just as an economic commodity. Some species may be pests; for example, elephants are notorious for raiding and trampling crops and occasionally harming humans. Other resources, like forests, may have complementary impacts on biodiversity. Private resource harvesting decisions typically ignore these spillover costs (or benefits), leaving open-access regimes possibly closer to the social optimum than profit-maximizing regimes (or further away), and adding a further level of ambiguity to the effects of trade on conservation (Horan and Bulte 2004).

Of course, some pests are invasive alien species that actually arrive as a function of trade, raising different kinds of issues. A controversial one, from a trade policy perspective, is that the optimal policy response to invasive pest differs in stringency according to the country of origin, since organisms from more similar climates are more likely to invade and spread successfully (Costello et al. 2007). This strategy, however, would go against the National Treatment mandate of the GATT; while it might qualify under an exception, the danger is that distinguishing between legitimate discrimination and protectionism can be rather difficult (Margolis et al. 2005). Less controversial is that invasive species can substantially reduce the ecological productivity of native resources, at potentially great cost to the economy. In addition to undertaking control efforts, domestic resource managers must adjust harvesting activities to respond to infestations and also to maintain habitat resilience against invaders by avoiding overharvesting; the appropriate portfolio of trade inspections, control, restoration, and resource management is a complex spatial and dynamic problem (Sanchirico et al. 2008). However, the

overall effect of trade liberalization is not just increased volumes of trade that bring invaders; if trade induces changes in production away from the resource-dependent sectors, it can also reduce a country's susceptibility to damage from invasions (Costello and McAusland 2003).

Finally, an important issue is whether we are concerned with resource stocks at a local or at a global level. While trade raises the relative prices of resources for some countries, it lowers them for others; thus, while some countries will want to intensify resource exploitation, others will want to decrease harvesting. If the resources and their associated benefits are similar, the net effect on global stocks will be smaller than the country-specific effects. Although increases in incomes may increase harvesting overall, and asymmetry in institutions (as just explored) will certainly matter, a large portion of the effect of trade is to shift the location of harvesting activities (and their consequences) across countries. However, if the benefits associated with natural resources are quite different across countries, this shifting can have more pronounced ecological consequences at the global level. For example, if the land types that serve as host for commodity production also serve as habitat for biodiversity, and there is a high degree of endemism (i.e., low overlap of species across countries), trade-induced specialization that reduces the diversity of land uses in each country will cause a decline in global species conserved (Polasky et al. 2004).

Implications for policy

The literature review in the preceding section reveals the many complexities in the relationship between trade liberalization and renewable resources. The presence of so many ambiguities makes it difficult to draw clear policy prescriptions, as they are highly situation (and resource) dependent. Perhaps the clearest recommendation is to support the improvement of

resource management institutions and property rights in the resource-dependent countries that lack them, as they are (in most cases) essential for those countries to truly benefit from trade. Management regimes that are global in scope also help avoid the pressures on certain stocks arising from asymmetries in regulation.

However, until that goal is reached, can we use trade-related measures to support conservation goals? We next discuss some of the additional considerations for evaluating the effectiveness of the more popular measures: trade bans and trade certification, or "ecolabeling".

Trade bans

One would expect the effect of international trade bans to be generally opposite of that of liberalizing trade, which from the preceding discussion is already highly ambiguous. An additional complicating factor is that trade usually goes on despite a trade ban, either in domestic markets or in illegal markets. Thus, it is also important to capture the demand-side effects and the effects of the enforcement regime.

Trade bans are more likely to reduce harvesting pressures if they lower prices for the threatened wildlife products and thereby the return to poaching.[7] However, the combination of illegal demand and enforcement policies can undo these effects. For example, if captured illegal harvests are confiscated and removed from markets, the result of stricter enforcement is

[7] As noted earlier, though, lower values can also reduce the return for communities or private property owners to protect the resource or its habitat. The following discussion is largely based on the ivory trade literature, which is voluminous; I have tried to pull out a few points of particular relevance to the trade and renewable resources theme.

simultaneously to raise the price by restricting the supply and to raise the number of species poached for a given supply to reach the market. The net result can possibly be to increase poaching, leading some economists to recommend reselling confiscated products, in order to satisfy demand and drive down prices (Heltberg 2001, Bergstrom 1990). Alternatively, in the case of storable goods like ivory or rhino horn, they suggest stockpiling the confiscated goods with a threat to dump them on the market if prices get too high (Kremer and Morcom 2000; Brown and Layton 2001). On the other hand, governments with such stockpiles—or cartels, for that matter—could see an incentive to hasten extinction and thereby raise the value of their now-exhaustible resource (Bulte et al. 2003).

Of course, part of the effect of a well-publicized trade ban is to split demand, removing the demand of law-abiding consumers and leaving only illegal demand. Part of the success of the ban on the demand side then are the factors that encourage law-abiding behavior. One is the availability of substitutes to absorb the previous demand. Another is the effectiveness of the social stigma against consuming products that may have been obtained illegally. A common fear expressed by environmental groups opposed to the sales of confiscated ivory is that the appearance of legal ivory on the markets will undo the stigma effects and unleash new demand that will raise the return to poaching. If the two kinds of consumers are distinct, Fischer (2004) shows that sales of certified ivory will either satisfy legal markets, if the price is higher, or illegal markets, if that price is higher. If the latter occurs, the sales should help drive down prices and poaching, and if the former occurs, it should have no effect on illegal market incentives. However, if the markets are linked, such as through smuggling and laundering operations, then the impact on stigma is a concern. If legal sales do raise the willingness to pay by law-abiding

consumers, and it is difficult to distinguish authentic legal products from illegally harvested ones, then large sales can exacerbate the poaching problem. Sufficiently small sales, though, can still have a primary effect of satisfying illegal demand, while keeping law-abiding demand low.

A variant of the argument of limited legal sales is the proposal for legitimized captive breeding as a way to divert demand from illegal sources. In addition to some of the stigma and demand-side issues just discussed, supply-side issues may also be a concern. As long as customers remain, trade bans have the effect of creating black markets, in which the trade is usually concentrated in the hands of a few criminal organizations. Bulte and Damania (2007) show that the effectiveness of wildlife farming in deterring poaching then depends on how the illegal traders respond to the competition. If they see reduced demand remaining after captive-bred products, they might choose to maintain prices by restricting supply and poaching; however, if they decide to compete aggressively, reducing prices, the effect will be to increase poaching levels.

Trade certification

Certifying sales of sustainably harvested products is more often applied as a policy in lieu of a trade ban, rather than alongside one. Ecolabeling is growing in popularity, particularly for renewable resources, and has been applied to such products as timber, fish, coffee, and other agricultural products and practices associated with biodiversity conservation. The goal of such programs is to offer market-based incentives for better resource management by leveraging consumer demand for products harvested from well-managed stocks. While some case studies indicate that certain niche markets can be successful, some skepticism remains about the effectiveness of such voluntary programs on resource management at a larger scale.

Wood products may be the most commonly certified, with labels indicating compliance with standards for environmental or ecological purposes. Sedjo and Swallow (2002) cautioned that the overall market may not generate a price differential between labeled and unlabeled wood to the extent indicated by surveys of consumer demand alone. Furthermore, if eco-consumers fail to generate a sufficient incentive to attract a large enough portion of suppliers to volunteer for certified production, compared to the demand diverted by the choice, the non-certified producers may lose. Swallow and Sedjo (2000) consider market feedback effects, finding that as consumers respond to price changes, it is theoretically possible that certification may lead to a reallocation of land toward less ecologically sustainable uses, with the possibility of sufficient impact to diminish global biodiversity or sustainability of forest products.

Ferraro et al. (2005) contrast the use of price premiums through ecolabeling to the use of payments that are tied directly to ecosystem protection. They find that payments for ecosystem services are likely to be more efficient as a conservation policy instrument, as they target the goals much more directly. In terms of achieving rural welfare objectives, however, which policy dominates depends in part on the funds available to spend, compared to the magnitude of the price premium. Still, they find that the price premium approach is likely to be more effective at achieving both conservation and development objectives than some alternatives, including a popular policy of subsidizing the cost of capital in eco-friendly commercial activities.

Conclusion

The literature on trade and renewable resources is evolving rapidly. Although clear-cut answers are few and far between, much of the contribution has been to add economic rigor to

ideas we have already seen in the policy sphere and arguments we have heard on both sides of the trade and conservation debate. Namely, trade liberalization can be a boon to resource-rich countries, but not always. Trade can lead to the depletion of natural resources, but not always. Trade bans can be appropriate, and certified trade can be helpful—but not always.

The key lesson is the importance of understanding the full economic, ecological and institutional context of the resource, or policies can indeed backfire. Furthermore, one common theme does emerge: unless underlying secondary problems are addressed—particularly the lack of secure property rights and good governance—trade is much less likely to be beneficial. Toward that end, the existing conservation-oriented international agreements, regardless of their approach to trade promotion or restriction, are all promoting capacity development for the management of resources, as well as improving monitoring and the collection and exchange of information. Even the WTO is recognizing a need to address the interactions between counterproductive trade policies and resource depletion; the current Doha round is attempting to tackle fisheries subsidies, which both distort trade and encourage overfishing. However, the scale of these activities remain modest relative to the size of the global problems of resource depletion and species loss. Therefore, one can expect an ongoing and expanded role for economic and interdisciplinary analysis of second-best resource management in the context of trade policies, and vice-versa.

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