WORLD BANK GROUP

Designing Fiscal Instruments for Sustainable Forests

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Foreword

The world is facing unprecedented macroeconomic and environmental challenges that are linked to one another. Climate change increasingly poses challenges to macroeconomic and fiscal stability, generating physical risks as a result of climate damages as well as transition risks as a result of uncoordinated mitigation strategies. Deforestation and forest degradation increase climate risks by impairing the ability of forests to act as carbon sinks and reducing the resiliency of local communities to climate damages. Beyond climate change, the loss and decay of forests threaten global biodiversity, the provision of ecosystem services, and other core ecological functions that economies worldwide rely on.

Against this backdrop, the COVID-19 pandemic has presented governments across the world with a serious public health emergency and thrust the global economy into crisis. Recovery packages must immediately address these crises, while long-term responses must also not forget the underlying causes of the pandemic, to reduce the chance of similar future crises. Deforestation and forest degradation increase the risk of and exposure to emerging zoonotic diseases; as humans encroach on natural forests, the chances for outbreak and transmission of such diseases from animals to humans increase. For these reasons, alongside climate stability and broader sustainable development, a comprehensive green recovery must not leave forests behind.

Responding to these multiple challenges will require massive investments. For example, the estimated investment needed for countries to achieve their Nationally Determined Contributions to the Paris Agreement exceeds $1 trillion per year over the next 15 years. Governments must mobilize and channel these resources during a time of limited fiscal space, especially as most categories of government revenue decline and available funding is committed to recovery efforts.

While increasing public expenditures for conserving forests is important and necessary, there exist additional, complementary fiscal policy options that can greatly reduce the overall cost of achieving sustainability. Fiscal policy can improve incentives for private sector stakeholders to co-invest in the sustainable use of forests. Environmental fiscal policy reforms that value natural capital can even contribute toward net domestic resource mobilization. Such fiscal instruments have so far been underutilized in addressing climate and development objectives. However, there is a growing interest among policy makers, who are responding to a developing body of evidence pointing to the effectiveness and urgency of green fiscal policies, including for forests and other sustainable land uses. This growing interest has coincided with the development of new fiscal instruments and policy combinations that can help policy makers better target and influence incentives to manage land use change and slow deforestation in a revenue-neutral or even revenue-raising manner.

This publication adds to ongoing work by the World Bank Group on how to better design and incorporate fiscal policy within the climate and sustainable development policy mix. The publication shows how various fiscal reforms can positively influence forest conservation while freeing up resources that can be used for national development. Environmental commodity taxation, previously much underused in the forest sector, can now be implemented through careful policy design in order to influence private incentives for forest conservation and land use change. Reducing distortionary agricultural subsidies is another key component of changing the balance of private incentives for land use change that can also free up additional revenues. Ecological fiscal transfers are a revenue-neutral instrument that can influence the incentives of public actors to enforce forest laws within their jurisdictions. While fiscal policy is not a "silver bullet," there are many fiscal instruments that can influence forest conservation and should be part of a comprehensive policy package that encourages sustainable land uses.

This publication builds the capacity to reform and implement fiscal policies that reduce private and public incentives for deforestation, forest degradation, and land use change and instead encourage forest conservation, sustainable management, and green global value chains. It is also an urgent call to action. Existing fiscal policies are already providing incentives one way or the other—oftentimes incentivizing short-lived growth through exhausting natural resources and merely turning natural into physical capital without creating net value. We need to empower decision-makers to harness the power of fiscal policy for consciously creating incentives that direct future development onto a more sustainable path. We hope that this book will serve as a vital reference for policy makers to do just that as we move forward.

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Acknowledgments

The publication team would like to thank the Climate Investment Funds (CIF) Evaluation and Learning Initiative for funding for this publication. In addition, the team would like to acknowledge and extend its deep gratitude to the International Tropical Timber Organization (ITTO) for providing funding for the project and Gerhard Dieterle for his guidance in developing the project. The project would not have been possible without and profoundly benefited from their generous support, which included funding for a workshop that brought together academics and practitioners across relevant disciplines to present and discuss the mechanisms proposed within the publication. We would also like to thank John Hontelez (FSC) for a great collaboration and for providing data on voluntary sustainability certifications.

This book was edited by Dirk Heine and Erin Hayde under the guidance of Garo Batmanian. We thank the following reviewers for providing feedback and suggestions: Timothy H. Brown, Tuukka Castren, Richard Damania, Stephen Davenport, Ann Jeannette Glauber, Anders Jensen, Emily Noel Gosse Kallaur, Angela Kallhauge, Nalin Kishor, Lindsey Knowles Larson, William Magrath, Stefano Pagiola, Grzegorz Peszko, Miria Pigato, Leela Raina, Rama Chandra Reddy, Stephen Rimmer, and Marijn Verhoeven. We also thank Jane Sunderland for copyediting the publication, Laura Ivers for overseeing production of the publication, and Taylor Henry at Patricia Hord Graphik Design for design and layout.

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Abbreviations and Acronyms

ASM	Artisanal and Small-Scale Mining
BAU	Business-As-Usual
BTA	Border Tax Adjustment
CFM	Community Forest Management
CIF	Climate Investment Funds
CIT	Corporate Income Tax
CO_2	Carbon Dioxide
CO_2-eq	Carbon Dioxide Equivalent
CSA	Climate-Smart Agriculture
DCSP	Directly Competitive or Substitutable Products
ECOWAS	Economic Community of West African States
EFT	Ecological Fiscal Transfer
EI	Extractive Industry
EITI	Extractive Industries Transparency Initiative
EPA	Economic Partnership Agreement
EU	European Union
FAO	Food and Agriculture Organization (of the UN)
FETHAB	State Transportation and Housing Fund (Fundo Estadual de Transporte e Habitação), Brazil
FIP	Forest Investment Program
FLEGT	Forest Law Enforcement, Governance, and Trade
FOB	Free on Board
FSC	Forest Stewardship Council
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GVC	Global Value Chain

ha	Hectare
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis)
ICMS-E	Imposto Sobre Operações Relativas à Circulação de Mercadorias e Serviços de Transporte Interestadual de Intermunicipal e de Comunicações-Ecológico (Brazil)
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ITMO	Internationally Transferred Mitigation Outcome
ITR	Impuesto sobre Propriedade Territorial Rural (Rural Property Tax) (Brazil)
ITTO	International Tropical Timber Organization
LSM	Large-Scale Mining
LULUCF	Land Use, Land Use Change, and Forestry
MRV	Monitoring, Reporting, and Verification
NDC	Nationally Determined Contribution
NWFP	Non-Wood Forest Product
OECD	Organisation for Economic Co-operation and Development
PEFC	Programme for the Endorsement of Forest Certification
PES	Payments for Ecosystem Services/Payments for Environmental Services
R&D	Research and Development
REDD+	Reducing Emissions from Deforestation and forest Degradation and the Role of Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks in Developing Countries
RIL	Reduced-Impact Logging
SCM	Agreement on Subsidies and Countervailing Measures
SDG	Sustainable Development Goal
SFM	Sustainable Forest Management
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax
WTO	World Trade Organization
WTP	Willingness to Pay

All dollars are U.S. dollars unless otherwise indicated.

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Executive Summary

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This publication responds to the growing demand for insights on how fiscal policy can be incorporated into the policy mix addressing deforestation and forest degradation. Before summarizing the key findings of this work, we provide context on why forests are important for people, economies, and the planet, and review how fiscal policy contributes to improved forest outcomes.

Importance of Forests for People and the World

Healthy forests and the biodiversity they contain provide essential services that sustain human livelihoods and the functioning of key sectors such as agriculture and energy as well as urban areas. These ecosystem services include provision of water and climate regulation, erosion prevention, crop pollination, soil fertility, and flood control. For instance, more than three-quarters of the world's food crops rely at least in part on pollination by insects and other animals, and up to $577 billion worth of annual global food production relies directly on pollinators (IPBES 2019). Biodiversity is essential to ecosystem health and the provision of these services. However, the Living Planet Index (LPI), adopted by the Convention of Biological Diversity (CBD), which is a measure of the state of the world's biological diversity, shows an overall decline of 52 percent over the last 40 years. Habitat loss and stress, unsustainable natural resource use, pollution, and climate change all contribute to this loss (WWF 2016).

People also depend on forests and landscapes, which provide food, fuel, shelter, and fodder. Forests and other natural ecosystems support rural economies in many countries and provide income sources for populations with few alternative off-farm employment options. Seventy-eight percent of the world's rural poor, including indigenous peoples, live in or near forests and their livelihoods depend on natural resources. These areas provide an important "hidden harvest" for rural populations, keeping many people out of extreme poverty. These rural and poor communities need to be engaged in creating and scaling up the solutions for achieving more sustainable management of forests and ecosystems in an integrated landscape approach. Estimates suggest that a third of the global population closely depends on forests and forest products, with 90 percent of people living in extreme poverty dependent on forests for at least part of their livelihoods (FAO and UNEP 2020).

Forests and terrestrial ecosystems are critical for both climate change mitigation and adaptation. The Intergovernmental Panel on Climate Change (2019) notes that "climate change creates additional stresses on land, exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure, and food system." The report also notes with high confidence that "all assessed modelled pathways that limit warming to 1.5°C or well below 2°C require land-based mitigation and land use change, …including different combinations of reforestation, afforestation, reduced deforestation, and bioenergy…. Sustainable land management…can prevent and reduce land degradation, maintain land productivity…. Reducing and reversing land degradation, at scales from individual farms to entire watersheds, can provide cost-effective, immediate, and long-term benefits to communities and support several Sustainable Development Goals (SDGs) with co-benefits for adaptation and mitigation."

Forests are a critical component of nature-based strategies to meet the Sustainable Development Goals (SDGs) (Jenkins and Schaap 2018; WAVES 2020). SDG 15 aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (United Nations 2015). Forests and their biodiversity play a crucial role in sustaining the planet's balance, providing basic services such as soil retention, erosion control, water and climate regulation, and pollination, among others. These ecosystem services provide valuable contributions to the productivity and sustainability of the economy in many sectors. While it is difficult to precisely determine the monetary value of ecosystem services (Acharya, Maraseni, and Cockfield 2019; Costanza et al. 2017), a review of the literature finds that the marginal value of forests regarding air quality and water regulation is on average more than $1,500 per acre per year (Ojea et al. 2016). Deforestation and forest degradation reduce the ability of forests to provide these essential services, in some cases requiring governments to take over the costs of providing these services.

Forests are key components of national economic development. Forests provide about 86 million green jobs (FAO and UNEP 2020), while the formal timber sector alone contributes roughly $600 billion to the global economy (World Bank 2016b). The activities of collecting fuelwood and producing charcoal are especially important in some of the poorest regions; for example, charcoal production employs more than 7 million people in Sub-Saharan Africa (mostly informally). Non-timber forest products add an annual gross value of over $88 billion.[1] Nature-based tourism is rapidly expanding (Twining-Ward et al. 2018), already accounting for $100 billion annually (UNWTO and UNDP 2017). Deforestation and degradation of forest landscapes undermine these economic opportunities.

Forests are a major component of national wealth.[2] As a renewable resource, forests can produce benefits in perpetuity provided they are sustainably managed (Lange, Wodon, and Carey 2018). Natural capital is especially important to low-income countries, constituting 47 percent of their wealth in 2014.[3] Forests currently represent about $18 billion, or 2 percent of global wealth (see table ES.1). This figure is furthermore most likely underestimated owing to mismeasurement, mispricing, illegal logging, and other factors.

1 Including bushmeat, medicinal plants, nuts, and honey, among others.

2 Forests fall into the category of natural capital, which is measured as the discounted sum of economic rents generated over the asset's lifetime. For more details, see Lange, Wodon, and Carey (2018).

3 This is in contrast to high-income countries, where natural capital makes up only 3 percent of national wealth. While the share of natural capital is relatively small in high-income countries, their per capita value is three times that of natural capital in low-income countries (Lange, Wodon, and Carey 2018). Sustainable development of this natural capital involves the efficient use of resources, including through productivity increases, efficient land use policies, and institutional arrangements to attract investment, among others. See Lange, Wodon, and Carey (2018) for a country-level breakdown of per capita wealth in 2014.

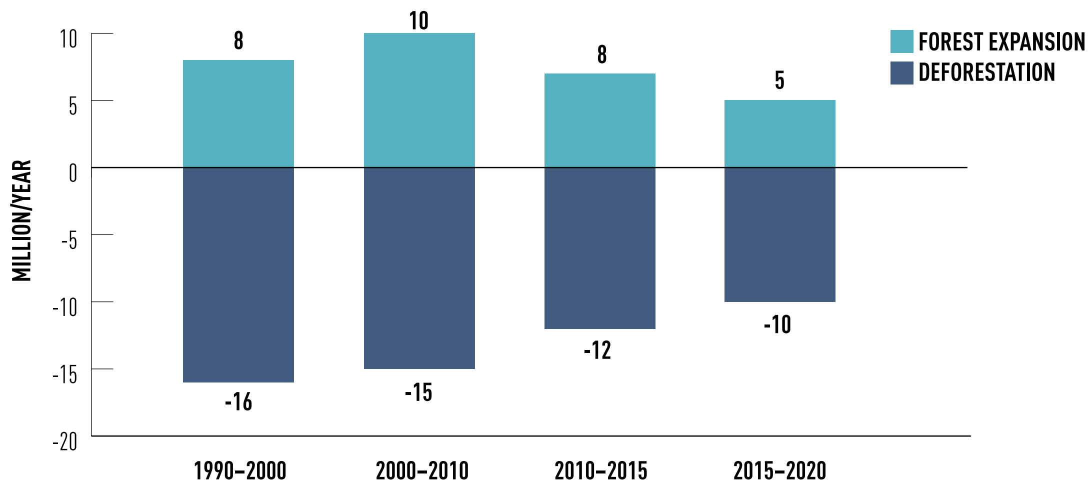
TABLE ES.1
GLOBAL WEALTH BY TYPE OF ASSET, 1995 AND 2014

	1995		2014	
	BILLION US$	PERCENT	BILLION US$	PERCENT
Produced capital	164,781	24	303,548	27
Natural capital	52,457	8	107,427	9
Forest and protected areas	14,515	2	18,290	2
Agricultural land	25,859	4	39,890	3
Energy resources (fossil fuels)	11,087	2	39,094	3
Metals and minerals	997	<1	10,154	1
Human capital	475,594	69	736,854	64
Net foreign assets	-2,890	<1	-4,581	<1
Total wealth	689,942	100	1,143,249	100

Source: Lange, Wodon, and Carey 2018.
Note: The contribution of forests to global wealth is most likely underestimated owing to mismeasurement, mispricing, illegal logging, and other factors.

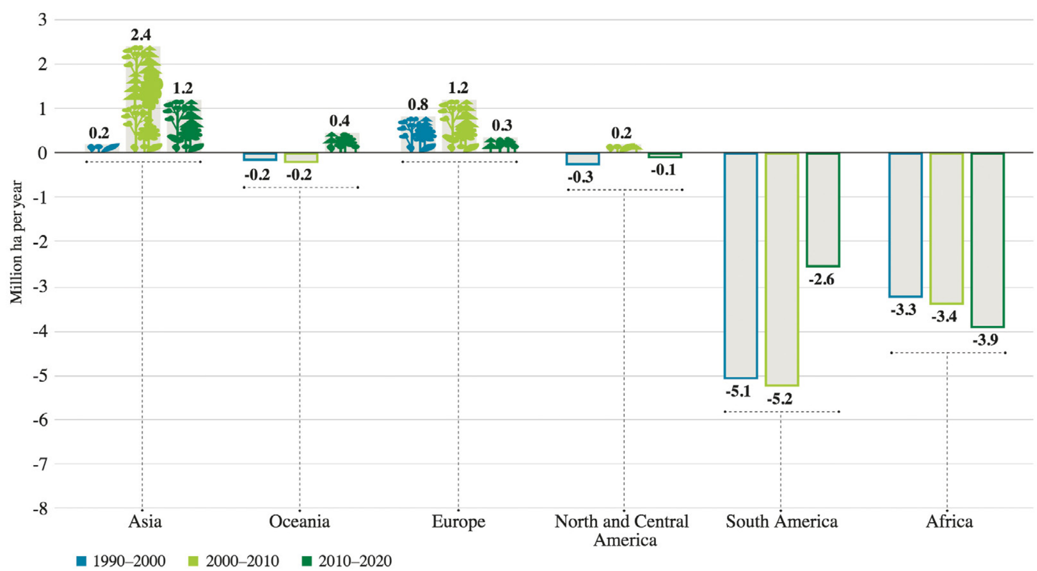
Deforestation has been an issue for centuries; however, forest loss has significantly increased in the last several decades. Since 1990, about 420 million hectares of forest have been lost to land conversion (FAO and UNEP 2020). However, the average deforestation rate has been decreasing from 16 million hectares per year during the 1990s to 10 million hectares per year between 2015 and 2020 (figure ES.1). Most of the deforestation is concentrated in tropical regions: more than half of all tropical forests have been lost since 1960 (IUCN 2017), and most of the deforestation and land degradation since 1990 have occurred in South America and Africa (figure ES.2).

FIGURE ES.1
GLOBAL FOREST EXPANSION AND DEFORESTATION, 1990–2020



Source: FAO and UNEP 2020.

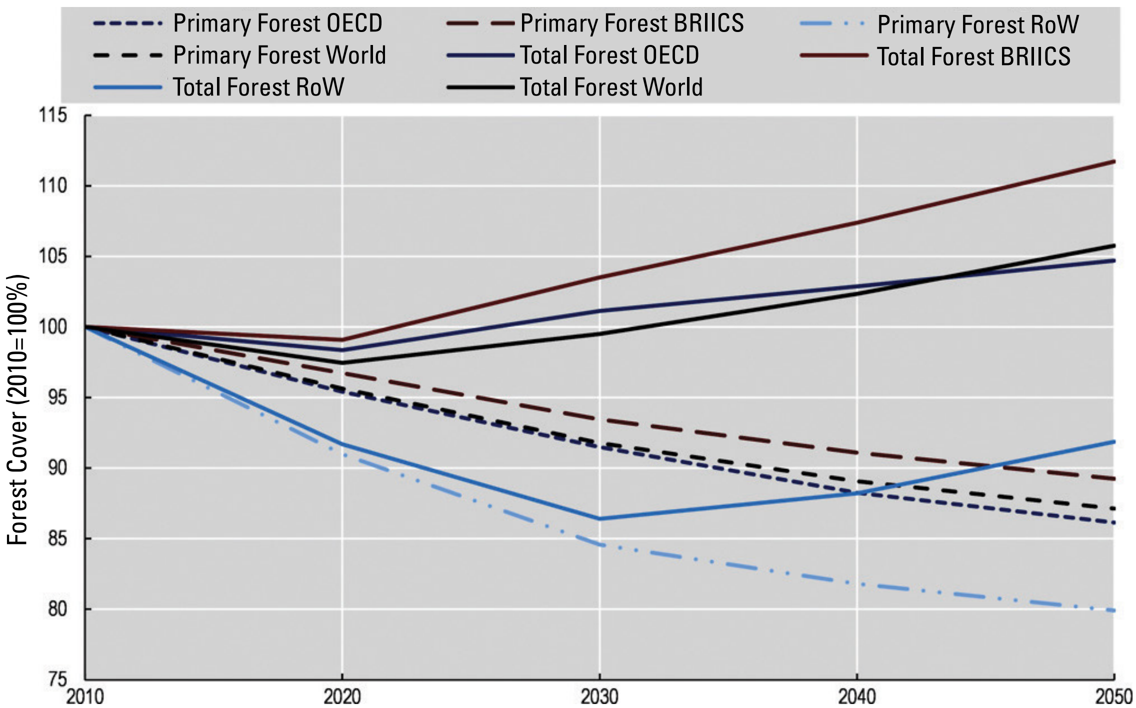
FIGURE ES.2
ANNUAL FOREST AREA NET CHANGE, BY DECADE AND REGION, 1990–2020



Source: FAO 2020.
Note: The estimates include data from planted forests; thus, increases in forest area may be the result of reforestation efforts or plantations (especially in Asia) and not necessarily increases in natural forest area. It is important to note that plantations do not always provide the same benefits (for example, ecosystem services) as natural forests.

Without policy change, primary and especially tropical forests are expected to dwindle (figure ES.3). Pressure to clear forests for land-intensive resources is forecasted to intensify. The global population is on course to grow to about 10 billion by 2050, increasing future global food demand by 50 percent (FAO 2018). The demand for forest products will also increase; for example, the total demand for timber is expected to quadruple by 2050 (World Bank 2016). Under a business-as-usual scenario, some tropical forests may disappear completely in less than 100 years (Tyukavina et al. 2018; Vidal 2017).

FIGURE ES.3
PROJECTED GLOBAL FOREST AREA CHANGE, 2010–2050



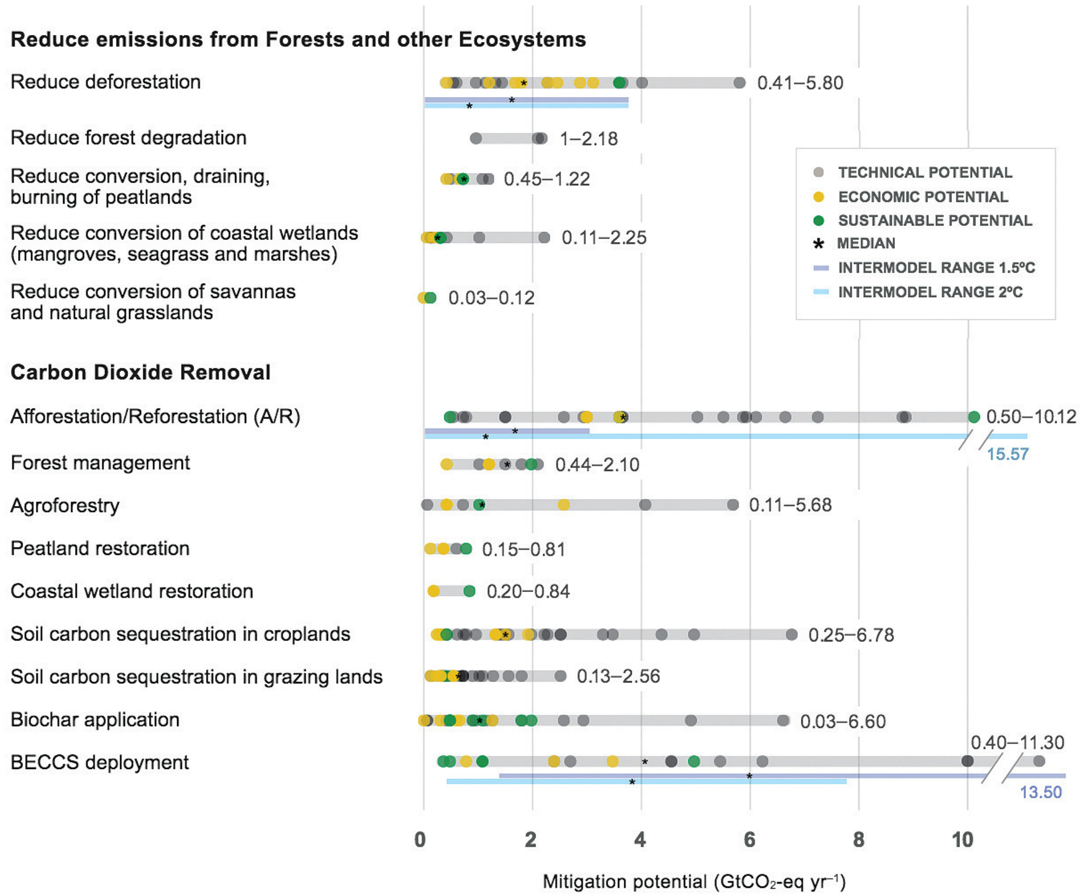
Source: OECD 2020.

Deforestation and forest degradation are key challenges to sustainable economic development, both domestically for the affected regions and through their spillovers for the world overall.

Deforestation and forest degradation impair the climate mitigation and adaptation role of forests. Forests protect the resilience of the broader ecosystem to changing weather patterns, provide safety nets for local communities against climate shocks, control and reduce desertification, and act as natural infrastructure mitigating the impact of floods and storms (for example, mangrove forests). They are thus a critical component of the transition to not just a low-carbon economy but a climate-resilient economy (figure ES.4).[4] The IPCC (2019) emphasizes that, to meet the goals of the Paris Agreement, addressing land-based mitigation and land use change will be indispensable. Essential components include reforestation, afforestation, reduced deforestation, and bioenergy. Furthermore, sustainable land management has been identified as a key strategy to prevent and reduce degradation while "providing cost-effective, immediate, and long-term benefits to communities and support several Sustainable Development Goals with co-benefits for adaptation and mitigation" (IPCC 2019).

4 Tropical forests, in particular, represent as much as 30 percent of potential climate change mitigation (Busch and Engelmann 2014). For example, the amount of carbon stored in the forests of the Democratic Republic of Congo is nearly three times the global annual fossil fuel emissions (Stolle et al. 2015).

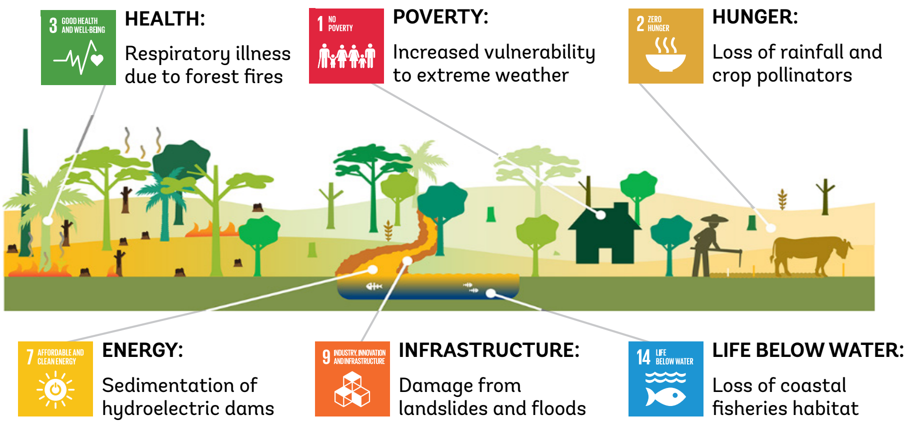
FIGURE ES.4
REDUCING EMISSIONS FROM AND INCREASING THE CARBON SEQUESTRATION POTENTIAL OF FORESTS WOULD MAKE SUBSTANTIAL CONTRIBUTIONS TOWARD CLIMATE MITIGATION



Source: Adapted from IPCC 2019.
Note: Mitigation potentials reflect the full range of estimates from studies published after 2010. Technical potential (gray bar) is the range of mitigation possible with current technologies. Economic potential (yellow dots) is the range of mitigation possible given economic constraints. Sustainable potential (green dots) is the range of technical and economic potential constrained by sustainability considerations. BECCS = bioenergy with carbon capture and storage.

Deforestation and degradation threaten the livelihoods of vulnerable populations by eliminating the resources these communities depend on. Low-income populations are furthermore among the most vulnerable to climate change. Deforestation significantly reduces the resilience of these communities to future climate and economic shocks (see, for example, Seymour and Busch 2016). Thus, the health of forests will greatly impact the ability to achieve both the SDGs and other interconnected development goals (figure ES.5).

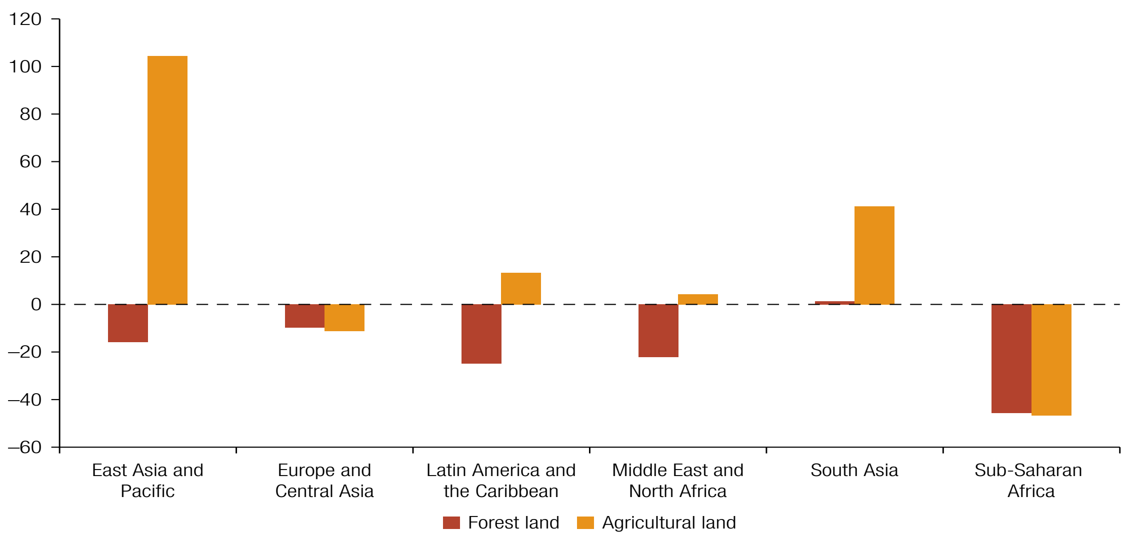
FIGURE ES.5
HIDDEN WAYS DEFORESTATION UNDERMINES THE SUSTAINABLE DEVELOPMENT GOALS



Source: Seymour and Busch 2016.

Deforestation led to losses in the per capita asset value of forests, while the value of renewable natural capital increased between 1995 and 2014 (figure ES.6).[5]

FIGURE ES.6
CHANGE IN PER CAPITA VALUE OF FOREST AND AGRICULTURAL LAND, 1995–2014



Source: Lange, Wodon, and Carey 2018.

Deforestation also increases the risks of epidemics and pandemics caused by zoonotic diseases (for example, HIV, Ebola, SARS, MERS, COVID-19). Studies indicate that changes in the mode and the intensity of land use are expanding hazardous interaction between people, livestock, and wildlife reservoirs of zoonotic diseases (Gibb et al. 2020). The risk of new zoonotic diseases is elevated in forested tropical regions experiencing land use changes (Allen et al. 2017).

5 These losses may be more substantial than indicated as environmental externalities (for example, ecosystem services) as well as forest quality (that is, degradation) are not included in the valuation.

Investing in conserving forests and the forest sector is, therefore, a win-win for governments that takes advantage of synergies across many social objectives. Reducing deforestation and forest degradation will help countries meet a wide range of objectives, including international objectives like the Paris Agreement, and provide many important social, environmental, and economic domestic benefits. For example, maintaining native forest cover will maintain or even increase carbon stocks and thus mitigate greenhouse gas (GHG) emissions, prevent soil degradation, and protect biodiversity and other ecosystem services (OECD 2020).

Role of Fiscal Policy in Setting the Right Incentives

Fiscal policy has a partial but critical and underused role in mitigating deforestation and forest degradation

Deforestation and forest degradation are caused by several interacting market failures. Policy action, therefore, requires using multiple policy interventions simultaneously. This includes, but exceeds, fiscal policy. So far, efforts to address deforestation and forest degradation have mostly relied on sectoral regulation, private certification, and public investments. These instruments have critical roles to play (box ES.1), but they do not substitute for the need to “get the price incentives right,” which is mostly the role of tax and subsidy policies. In general, taxes and other fiscal instruments are an underutilized but key component of climate-related land use policy interventions (IPCC 2019).

Environmental fiscal policies have been severely underutilized but are recently regaining political traction. In 2019, 53 finance ministers signed up to a set of ambitious principles for stepping up environmental fiscal policy (see photo ES.1). However, environmental fiscal policies for the land use sector are even further behind than in other sectors. For example, while environment-related taxes make up 3–10 percent of total tax revenues in Organisation for Economic Co-operation and Development (OECD) countries, almost all these taxes relate only to environmental problems caused by fuel combustion. Fiscal policies are just starting to be used actively for addressing deforestation and forest degradation.[6]

6 For example, the United Kingdom implemented a Timber Procurement Policy (TPP), which stipulates that publicly procured timber must be legally and sustainably certified. In the last decade, Brazil, India, and Portugal have implemented ecological fiscal transfers to promote forest and biodiversity conservation. Some governments also offer fiscal incentives for third-party forest sustainability certification (see chapter 6 for more details).

PHOTO ES.1
FINANCE MINISTERS AND LEADERSHIP OF THE UNITED NATIONS, OECD, IMF, AND WORLD BANK AGREE TO STEP UP ENVIRONMENTAL FISCAL POLICY

Source: © World Bank
Note: Meeting of the Coalition of Finance Ministers for Climate Action at the 2019 Annual Meetings of the World Bank Group and the International Monetary Fund (IMF). The Coalition agreed on a set of principles for domestic action on sustainable growth, which was unprecedented among finance ministries until that date.

BOX ES.1 ROLE OF FISCAL POLICY AMONG THREE 'DOMAINS' OF ENVIRONMENTAL POLICY

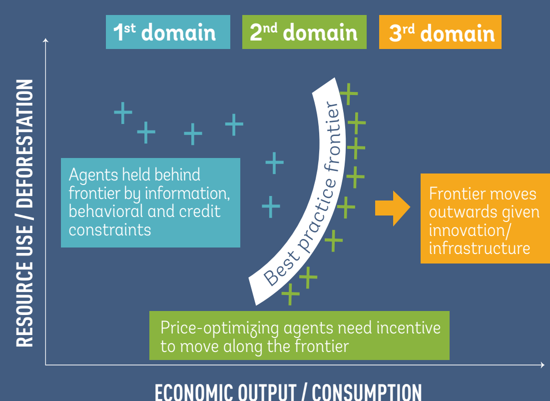
Responses to deforestation and forest degradation need to address several interacting market failures jointly. This complexity is a great challenge for policy design. To move forward, it is essential to find policy frameworks that are simple enough to both provide practical guidance and capture the essence of the problems faced in many country settings. A promising approach is to conceptualize the roles of taxes vis-à-vis other policy instruments along three types of market failures, or "domains," of environmental policy (Grubb, Hourcade, and Neuhoff 2014):

- The first domain encompasses the waste of resources owing to several barriers for price-optimizing decision-making by both households and firms. In the forestry sector, firms may engage in suboptimal decision-making for various reasons, such as credit constraints, a lack of knowledge or certainty, or risk aversion, among others.[a]
- The second domain relates to variations in privately optimal resource use. This relates to agents who do respond to price signals but lack the policy incentive to move to less resource-intense production. This lack of incentives arises when environmental damages (or externalities) are not incorporated into firms' cost structures (Bulte and Engel 2003).
- The third domain describes barriers to the innovation of more resource-efficient production techniques. This domain also encompasses changes to the production possibility frontier in the forestry sector that come from innovation to technologies and structural change—for example, as a result of investments by private and public actors into infrastructure that unlocks new production possibilities. Importantly, in the forestry sector, public investment is widely seen to be lower than the social optimum (Fowler et al. 2011).

From these domains follow policy pillars that describe the distinct types of policy action required to enable sustainable growth. The three domains are of comparable importance and are also interdependent.

Figure ES.1.1 illustrates the role of policy in addressing the three interacting types of market failures. For any given type of economic output, we can think of the resource use of price-responsive agents along a "best-practice frontier." For different prices of resources, the frontier describes the optimal available way to produce economic output (horizontal axis) for a given use of forest resources (vertical axis). Reducing the use of forest resources will also reduce economic output, as other inputs must be substituted instead and may not be readily available at comparable cost, at least in the short term. Where firms operate along the frontier is largely determined by relative prices, as information is transmitted regarding the scarcity and value of various resources. If the cost of resources rises (for example, through a deforestation-related environmental tax), firms have the incentive to reduce the resource intensity of their production either through efficiency gains or substitution. This incentive effect is the main role of environmental taxation within environmental policy approaches.

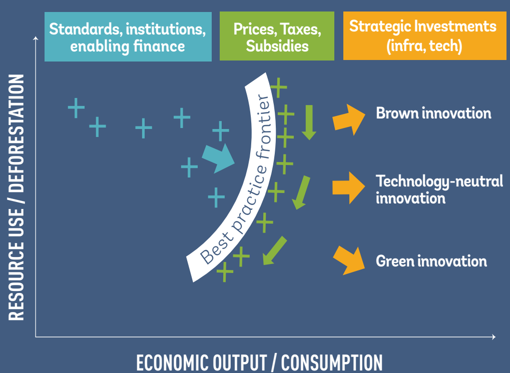
FIGURE ES.1.1
THREE SETS OF MARKET FAILURES



Source: Adapted from Grubb, Hourcade, and Neuhoff 2014.

Figure ES.1.2 introduces two additional domains. The first domain concerns firms that are not price-optimizing and that therefore operate to the left of the best-practice frontier; they produce less output per unit of resource usage than is financially optimal at the going price of natural resources. In forestry, firms or individuals (like small-scale informal chainsaw loggers) may not operate on the frontier for a variety of factors, such as personal behavioral traits, principal-agent asymmetries, organizational or market failures, or information and credit constraints. The third domain relates to the shifts in the best-practice frontier over time as improved technologies, infrastructure and organizational structures allow firms to produce the same level of output with fewer resources. For example, in many low-income countries, the majority of forest production may be lower than optimal because of outdated capital machinery or processes. Similarly, the creation of access roads into the forest by a mining project or the invention of a new type of agroforestry will unlock new opportunities for accessing timber independent from changes in timber prices. The frontier will move in different ways depending on the type of innovation/infrastructure driving the shift.[b]

FIGURE ES.1.2
ROLE OF FISCAL POLICY IN WIDER POLICY PACKAGES



Source: Adapted from Grubb et al. 2014.

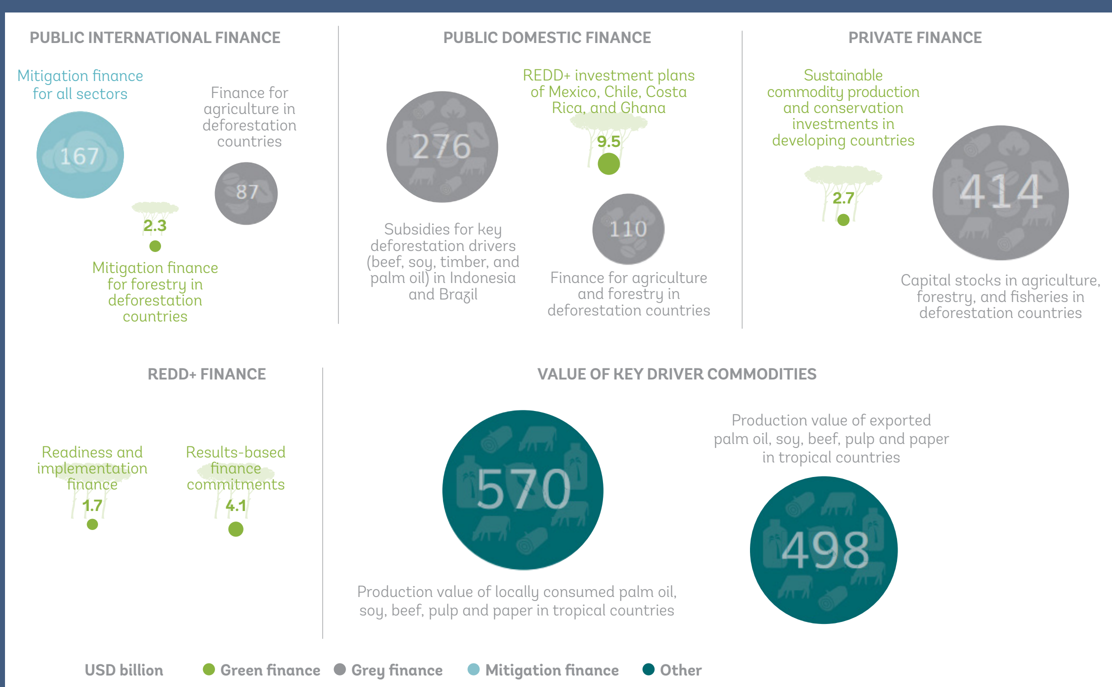
Different domains call for different policy responses. To address market failures that do not primarily stem from missing price incentives (the first domain), it is not efficient to use price-based tax policies. Instead, policy makers should focus on promoting smarter choices through regulations, information provision, project finance, and community engagement, creating institutions, among others. Key regulations include environmental standards, indigenous property rights, and the designation of protected areas. Engagement policies include public awareness campaigns and the creation of institutions to overcome collective action and principal-agent problems. Project finance can provide funding to enable credit-constrained firms and individuals to move closer to the best-practice frontier. Conversely, to influence optimization decisions (the second domain), policy makers should focus on market and other economic interventions. Here, economic measures that affect prices (such as environmental taxation) will tend to be the most effective and efficient. To address innovation and technology (the third domain), policy makers should identify areas of strategic investment, such as electrification, that can transform market structures to create new low-carbon markets, creating business opportunities for the long-term transition to less resource-intense production and economies.

Regulatory policies are commonly used to reduce deforestation stemming from market failures in the first domain, but using them to substitute tax policy acting on the second domain causes inefficiencies. Regulations often set minimum conditions for the market access for forest products. Examples of regulatory policy include the US Lacey Act, the European Union Forest Law Enforcement, Governance, and Trade (FLEGT) initiative, protected areas, log export bans, and moratoriums on timber harvesting, among others. While regulatory policies are generally effective at impacting firms that do not respond to price signals, they often struggle with providing the necessary marginal incentives to price-optimizing producers to reduce deforestation and forest degradation. In addition, in countries where governance capacities are limited, regulatory policy may face enforcement challenges. For example, protected area boundaries may not be strictly enforced (Nolte et al. 2013), and forest law enforcement itself can lead to a variety of negative impacts (Kaimowitz 2003). Another standard problem is that the regulatory policies struggle at creating dynamic incentives for agents to keep reducing their enviromental impact once they have complied with regulatory minimum standards. Therefore, regulatory policies need to be supported with complementary policies that act on other domains, such as taxation and results-based expenditure policies.

Expenditure policies have a critical role to play on the first and third domains, but using them to substitute policy action on the second domain can be costly. Strategic public investments are needed to push the best-practice frontier. However, they should be combined with incentives from tax policy for the private sector to have the right incentives for co-investing. Public expenditures for project finance are critical in helping actors who are not responding well to price signals (for example, because of credit constraints) move to the best-practice frontier. Furthermore, expenditure policies such as payments for ecosystem services (PES) and Reducing Emissions from Deforestation and Forest Degradation (REDD+)[c] help improve price incentives (second domain) of agents who are not well reached by tax policy. However, these policies face important funding constraints; REDD+, in particular, requires substantial levels of funding from developed countries (Angelsen 2008). If the funding is available, these policies can be highly effective, but funding has traditionally been in much shorter supply than identified needs. Achieving the second domain of sustainability transitions with expenditure policy then seems to be chronically limited. To be able to scale incentives when faced with budget constraints, it is essential to integrate alternative, cheaper price-based instruments like environmental taxation and the reductions of environmentally harmful subsidies.

Policies intended to impact one domain have spillover effects in other domains. Even though the first domain is mostly about non-price barriers to sustainability transitions, policies like project finance or regulations function more efficiently when they are accompanied by environmental taxation. For example, public campaigns to spread information about environmental problems work better if simultaneous environmental taxation ensures that resources are sufficiently expensive for the public to pay attention to the campaign (rational ignorance problem). Project finance is more transformational if agents who receive start-up finance to overcome credit constraints at the same time face incentives from environmental taxation to choose efficient technologies. Regulations can effectively raise the agents to minimum sustainability standards, but integrating environmental taxation will keep their efforts going (dynamic incentives, rebound effect). On the third domain, there is again primarily a need for nontax policies (for example, innovation policies), but environmental taxation from the second domain has positive spillover effects for private sector co-investment into innovation efforts and for tilting the direction into which the best-practice frontier moves. All this together implies that, first, three broad types of market failures call for policy makers to use more than environmental taxation to unlock sustainability transitions and, second, environmental taxation does nevertheless play a central role and failures to use it as part of the broader policy package come at large efficiency costs.

FIGURE ES.1.3
TOTAL GREEN AND GRAY FINANCE FLOWS, SINCE 2010



Source: Climate Focus 2017.
Note: Figures are in US$ billions.

a. For more details on satisficing in the forestry sector, see, for example, Díaz-Balteiro and Romero (2003); Emery (1998); Geiger and Barnett (1991); Radke et al. (2017); Rauscher et al. (2007); von Detten (2011); and Yousefpour et al. (2017).
b. Innovation also applies to rules and institutions that help determine how resources are used.
c. REDD is an effort to create a financial value for the carbon stored in forests and thereby offer incentives for developing countries to reduce carbon dioxide emissions from deforestation and forest degradation. REDD+ goes further and rewards forest conservation and management practices that sequester carbon.

Fiscal policy will always impact forest production and conservation incentives; thus, the question is not *whether* to use it, but *how* to use it consciously. Fiscal interventions in land use sectors impact forest management decisions as long as firms respond to price signals (see second domain in box ES.1). Different types of fiscal instruments have different incentive effects regarding the choice between sustainable forest management and land use change, between intensification and expansion, and between formal and informal production, to name a few. Any fiscal policies relating to land use generally have these impacts, even when finance ministries do not use them consciously for setting incentives. Hence, the incentives from existing fiscal policies may contradict government objectives, and in this case attaining overall forest policy objectives becomes costlier than necessary. Conscientious design of fiscal policies will help minimize the costs of forest conservation and sustainable management goals.

Designing fiscal policy to take into account environmental objectives does not need to deflect from achieving other, non-environmental development policy objectives. Environmental fiscal policies can contribute toward domestic resource mobilization that can then be used to support other development policy objectives. In many cases, the potential exists for environmental tax policies to increase fiscal space. For example, fiscal mechanisms like carbon taxes on land use emissions may be eight times less costly than command-and-control policies (Souza-Rodrigues 2018); therefore, relying more strongly on fiscal mechanisms can reduce necessary outlays while accomplishing the same amount of forest preservation. Reforms to existing fiscal policies can also free up domestic revenues, for example, by removing contradictory incentives that encourage land use change or deforestation. Certain designs for environmental fiscal reforms can also reduce informal production in forest-related industries, which could increase tax revenues and provide better jobs (see chapters 2 and 6).

This book adds to increased efforts by the World Bank Group to increase its support to developing countries that pioneer environmental tax reforms. Complementary initiatives include the Coalition of Finance Ministers for Climate Action, which supports developing countries in increasing their capacity to align fiscal and climate policy; the Partnership for Market Implementation, which supports individual countries as they undertake domestic policy changes toward carbon markets; and the Carbon Pricing Leadership Coalition, which promotes public-private collaboration on carbon taxation and emissions trading. The publication supports the implementation of the World Bank's 2016 Forest Action Plan, which highlights the need for a coordinated approach to the sector and includes a commitment to work with clients to build capacity regarding sustainable forest management. The target audience of the publication includes World Bank staff and policy makers in government ministries and other public institutions, especially finance ministers. This publication is designed to build the capacity of client countries and World Bank staff to reform and implement fiscal policies that reduce private and public incentives for deforestation, forest degradation, and land use change and instead encourage forest conservation and sustainable management.

This publication is organized into 13 chapters that can be broadly grouped into three areas of study. The first four chapters discuss how to approach environmental taxation and wider fiscal reforms for the forest sector, considering key political economy challenges like informality. Also discussed are the potential environmental or conservation benefits from adapting existing forestry fiscal regimes, considering challenges like governance capacity. Chapter 1, "Environmental Taxation and Sustainable Forest Management," argues that fiscal policy has so far been underutilized and has a critical role to play within the forest policy landscape. Chapter 2, "Forestry Fiscal Reforms and the Informal Sector," discusses the role of informality as a driver of deforestation and challenge for environmental tax policy, and how (new) fiscal policies might be designed to overcome this challenge. Chapter 3, "Designing Forestry Taxes to Promote Conservation," discusses how reforms to existing fiscal regimes in the forest sector can change the incentives for forest conservation and sustainable management. It analyzes the impacts of recurrent annual charges, output taxes, and income taxes on incentives for deforestation and sustainable forest management. Chapter 4, "Using Fiscal Incentives in Fragile States," outlines the challenges of using fiscal incentives for forest conservation and sustainable management in the context of low governance capacities and identifies some potential solutions to these challenges.

The next group of chapters discusses potential designs for environmental taxation within the forest sector, discussing how these might be extended beyond the forest to other land use sectors and how to design these mechanisms to conform to international trade law. Chapter 5, "Rationale for, and Design of, a Feebate for Forest Carbon Sequestration," presents a fee-and-rebate ("feebate") mechanism for revenue-neutral sustainability incentives.[7] Chapter 6 explores a mechanism for "Letting Commodity Tax Rates Vary With the Sustainability of Production." Chapter 7, "National Tax Policy for Cross-Border Deforestation Problems," expands this mechanism to apply to deforestation resulting from traded commodities in a feebate type of border tax adjustment. Chapter 8, "Export Tariffs as a Policy Tool to Reduce Deforestation," describes the potential for the combination of agricultural export taxes and public investments to combat deforestation and forest degradation. Chapters 9 and 10, "Fiscal Incentives for Decreasing Deforestation: Does International Trade Law Restrict Export Taxes?" and "WTO Law Compatibility of a 'Feebate' Scheme on Imported Products," discuss how to design a border tax feebate mechanism (such as that described in chapter 7) for compliance with international trade law.

The final three chapters identify potential reforms for land use sectors beyond forestry that might have a particular impact on reducing deforestation and forest degradation, notably through changing the incentives of public actors (chapter 11), agricultural subsidy reform (chapter 12), and reforms to extractive industry fiscal regimes (chapter 13). Chapter 11, "Addressing Public and Community Actors in Biodiversity and Forest Conservation: Ecological Fiscal Transfers and Land Tenure," discusses how to influence the incentives of public and community actors toward investment in forest restoration, forest conservation, and sustainable management. Chapter 12, "Agriculture, Subsidies, and Forests," examines the relationship between agricultural support policies and forest loss and suggests potential reforms. Chapter 13, "Forest-Smart Fiscal Reforms for Extractive Industries," discusses prospective reforms to extractive industry fiscal regimes that may promote a greater degree of forest conservation. The overall publication's key findings and policy recommendations are summarized below.

The scope of this publication is necessarily limited by space and other constraints. First, discussion is limited to environmental fiscal policy instruments—especially tax policy. Given the budget constraints in most countries, instruments included in the compendium are largely revenue neutral or revenue raising; this publication does not analyze expenditure mechanisms as these policies have been covered in great detail elsewhere.[8] Second, while this publication mainly focuses on instruments to influence the incentives for forest resource management and conservation, it also includes a discussion on how the mechanisms discussed can be adapted to

7 Carbon sequestration is the process of removing carbon from the atmosphere and depositing it in a reservoir (for example, forests).
8 See, for example, CIF (2019); Alix-Garcia et al. (2018); World Bank (2014); World Bank (2012); Viana et al. (2012); FONAFIFO, CONAFOR, and Ministry of Environment (2012); Cavelier and Gray (2012); and Pagiola (2011).

impact the incentives for larger land use change (see chapters 6–8 and 11–13). Third, the focus is largely on fiscal instruments for forest-producing and forest-exporting countries. However, some consideration for demand-side measures and policies for forest-consuming or forest-importing countries is included in chapters 7 and 12. Fourth, this publication is not a definitive implementation road map: Fiscal regimes differ significantly around the world and specific reforms and instruments should be evaluated, designed, and implemented in the context of the overall fiscal, economic, political, and administrative systems of the individual country. Finally, the reforms suggested in this publication are complementary to other, nonfiscal forest sector interventions that impact other barriers to effective forest policy (see box ES.1). For example, crucial forest sector governance and revenue management reforms are described in more detail in the complementary reports *Mobilizing and Managing Public Forestry Revenue* (World Bank 2019a) and *Regulatory Tools, Effective Markets, and Private Sector Participation in the Forestry and Wood Products Processing Sectors* (World Bank 2019b). As such, the fiscal policies contained in this compendium should not be viewed as substituting for other key forest sector interventions and instead should be considered complementary to those policies.

Key Findings

Fiscal policy today seldom supports and often undermines the sustainability of forests

Tax policies in place today rarely target sustainability incentives. Fiscal policy in the forest sector is usually implemented with the goal of capturing some share of the rent and promoting industry development rather than sustainable forest management. Indeed, incentives for sustainable forest practices may be lacking entirely. The impact of fiscal incentives provided to the forest sector may not have been considered in a systematic and holistic way; thus, existing fiscal frameworks may be far from optimal in terms of both economic and environmental objectives.

Sectoral taxes and fees may be set too low in relation to marginal social costs and current market prices available for forest sector products. This gap can have various impacts, such as reducing government revenues, allowing inefficient logging firms to operate profitably, and reducing the price of forest products and therefore increasing consumption above optimal levels (EFI 2005; Goetzl 2006; Sizer 2000; Trofymow and Porter 1998; World Commission on Forests and Sustainable Development 1999). Evidence from a wide range of countries suggests that governments collect low shares of potential rents from forests; in certain forest-rich countries, between 3 and 30 percent of the potential economic rent from timber have been collected as tax revenues (Boyd et al. 2005; Gray 2002).

For example, during the 1990s, Indonesian forest sector taxes and fees averaged between \$20 and \$25 per cubic meter whereas free-on-board (FOB) prices of logs averaged between \$81 and \$300 per cubic meter (Leruth, Paris, and Ruzicka 2001). The situation is similar today: Indonesia collects about \$272 million annually in forest sector fees, 70 percent of which comes from a fee schedule that does not consider market prices and has remained unchanged since 1999 (KPK 2015).

Evidence on allocating forest concessions through competitive auction reinforces the idea that administratively set sectoral taxes and fees may be lower than optimal. After a public, competitive auction system was put in place in various African countries as well as Malaysia, tax authorities saw substantive increases in revenues (Boyd et al. 2005; Krelove and Melhado 2010).

For example, revenues tripled after an auction system was introduced in Cameroon (Collomb and Bikié 2000; Karsenty 2000), suggesting that what firms were willing to pay for a forest concession was much higher than assumed.

Low sectoral taxes, combined with high agricultural subsidies irrespective of the impact on forests, send a signal that policy makers do not consider forests to be a priority (Boyd et al. 2005). Especially when compared with other land use sectors, forests are not provided the same level of incentives as (for example) agricultural land uses. In addition, environmental fiscal incentives may be low or absent for various reasons, including low technical or enforcement capacity of fiscal administrators (Leruth, Paris, and Ruzicka 2001).

Policy design matters. Standard forestry taxation already in use may inadvertently incentivize forest degradation or deforestation. For example, area fees are a common instrument as they are administratively easy to establish and provide up-front revenues. While area fees can discourage land speculation and waste in logging and processing, they are also a fixed cost and therefore constitute a greater risk to industry operators who might not be able to cover these costs if market prices decline. Thus, area fees may encourage firms to intensify production, which may be more or less desirable depending on the forest characteristics and methods of intensification undertaken. Relying less on area fees and more on output-based charges (like stumpage fees) in the forestry sector can help mitigate these incentives and improve sustainability outcomes (see chapter 3). A careful consideration of the incentive impacts of various existing and proposed forest sector taxes and fees should thus be undertaken.

Contradictory and perverse fiscal incentives for deforestation and forest degradation exist across land use sectors

Fiscal policies for non-forest land use sectors may not be well aligned with governmental objectives for forest conservation and sustainable management. Fiscal policy for land use sectors typically aims to promote industry development in line with national priorities such as food security. Many land use sector fiscal policies have not been evaluated in terms of their impact on incentives for land clearing and other environmental damages (see chapter 12). For example, fiscal incentives are commonly provided to landowners depending on the area being used for agriculture, irrespective of tree cover. In many cases, fiscal incentives for agriculture may actually prioritize forestland clearing for new greenfield agricultural plots. If fiscal incentives encourage forest conversion while other policies encourage conservation, environmental and developmental objectives are achieved at a higher cost (see chapter 1). Furthermore, the private sector then lacks incentives to develop and adopt production methods that minimize trade-offs between different land use objectives, such as agroforestry or low-impact mining.

Existing fiscal policies for non-forest land use sectors—in particular agriculture—can increase the incentives for deforestation. Public funding, including fiscal incentives, is heavily biased toward agriculture and therefore provides landowners with an incentive for forest conversion and land clearing. For example, Brazil and Indonesia provided more than $40 billion in subsidies to four key deforestation-driving commodities, more than 100 times the amount these countries received through REDD+ funding (McFarland, Whitley, and Kissinger 2015).[9] Existing agricultural support policies may also contribute to forest loss by distorting production decisions and encouraging expansion (see chapter 12). Some countries have already begun reforming previously adverse

9 About $346 million in REDD+ financing over the same period (McFarland, Whitley, and Kissinger 2015).

incentives; for example, prior to 2001, the European Union (EU) Common Agricultural Policy provided subsidies based exclusively on the surface area of crops; this policy was then reformed to include agricultural plots with high levels of tree cover (Buttoud 2012). In Austria, the government removed subsidies that promoted wetland drainage for agriculture and implemented incentives for sustainable land use practices instead (Kissinger 2015). Responding to the devastating peat fires of 2015 and resulting air pollution, Indonesia implemented a tax on peatland use and reformed fossil fuel subsidies (Kissinger 2015; McFarland, Whitley, and Kissinger 2015).

The incentives of public actors may also be misaligned regarding forest conservation and sustainable management. Where policy makers have control over land use and related decisions, allocation may be biased toward land uses that generate higher short-term returns. This bias may be a result of elite capture, political favors, the desire to maximize short-term government revenues, or other factors. Fiscal mechanisms like ecological fiscal transfers improve the incentives of public actors to invest in forest conservation and sustainable management and enforce national forest laws (see chapter 11).

Environmental fiscal policy for the forest sector faces institutional, governance, and other implementation challenges

As with other types of environmental policy in the forestry sector, enforcement can be a major challenge for standard designs of environmental forestry taxes too. The forest sector in many countries is characterized by a high number of operators spread over large distances. Fiscal administrations in charge of collecting forestry taxes may be underfunded and understaffed, leading to low institutional capacity to implement and oversee environmental fiscal policy. The enforcement of forest sector fiscal policies is also complicated by high levels of informality and illegality within the sector: Informal and illegal production account for 30–90 percent of production in various forest-producing countries (Jianbang et al. 2016). Traditional forestry taxes cannot reach informal and illegal operators, leading to suboptimal revenue collection in the sector.
The large number of operators, high proportion of informal production, lack of transparent and operational monitoring and verification systems, and other characteristics of the forest sector have meant that fiscal administrators cannot access the level of information needed to implement conventional environmental fiscal policy (see chapter 2).

Fiscal policy also impacts the level of both informal and illegal production: High tax rates can cause firms to exit the formal sector to avoid such costs (see chapter 2). In many countries, the World Bank finds that the current tax system is a significant barrier to including a greater proportion of workers and companies in the formal sector (Benhassine et al. 2016; Bruhn and Loeprick 2016; Gatti et al. 2014; Mele 2017).

Many challenges can be overcome through new types of fiscal policy designs

Forest sector fiscal regimes should conform to a set of best practices, dependent on country-specific contexts. Most countries could improve fiscal incentives for sustainable forest management by modifying the structure of forestry taxes. For example, it is possible to improve the environmental incentives of most forestry-related taxes by letting the rates vary according to whether the good is certified “deforestation-free” or (even just) “legal” (see chapters 6 and 7). Forestry fiscal frameworks can also be improved through a revision of more traditional mechanisms like stumpage and area fees (see chapter 3). Independent of the tax instrument, it is important to reflect current market prices in environmental tax rates and update them for changes in environmental damages, inflation, and growth to maintain effective price signals. In many countries, the effectiveness of taxes on forest-related commodities to reach informal production could also be improved by shifting the point of imposition to chokepoints (see chapter 6).

New fiscal mechanisms and policy combinations can help minimize challenges to the implementation and effectiveness of environmental forest sector taxation. The rates of taxes on both forest products and deforestation-related commodities should vary according to the sustainability of production per unit of the taxed product (see chapters 5 and 6). This can be achieved using information on production techniques from sustainability certificates (see chapters 6 and 7). Taxation-and-rebate mechanisms combined with these information instruments can help governments with limited capacity overcome monitoring, reporting, and verification (MRV) and enforcement challenges, as well as help reduce informality (see chapters 2 and 6). Importantly, these mechanisms can be easily adapted for global value chains that are driving deforestation beyond forestry products (see chapter 7). Ecological fiscal transfers can provide incentives for public actors to complement mechanisms targeting the incentives of private actors (see chapter 11).

Policy Implications

The 13 chapters contained in this publication yield six major policy implications for policy makers in developing countries.

1. Forests are a valuable component of national wealth and fiscal policies should reflect this fact.

Fiscal planning and budget frameworks should accurately reflect the value of forests. Forests are a significant feature of countries' national wealth and an indispensable component of both the environment and economy, and fiscal policies should reflect this. Forests are frequently described as undervalued; many forest benefits are not monetized and thus are not reflected in traditional or official measures of economic output and welfare (Lange, Wodon, and Carey 2018). For example, in 2012 the Ethiopian government estimated that the forest sector contributed about 3.8 percent of gross domestic product (GDP); however, a United Nations Environment Programme report determined that the total contribution of the forest sector was closer to 12.8 percent of GDP (UNEP 2016). The undervaluation of forests generally reduces support for the sector (Fowler et al. 2011; Kengen 1997; United Nations 2018) and is considered a significant cause of deforestation and forest degradation (Cavatassi 2004). A first vital step would be the systemic valuation of forest benefits (for example, as part of the preparation for natural capital accounts), which includes not only the total value of forests but also their contributions to various sectors and the sensitivity of this value to forest loss.[10]

Policy makers should implement "forest-smart" fiscal policy across land use sectors.[11] Fiscal policy for forestry, agriculture, extractive industries, and other land use sectors always influences incentives for sustainable forest management (SFM) and conservation. However, this incentive effect may not have been considered when the policy was implemented or in subsequent evaluations. Policy makers should evaluate how fiscal incentives in all land use sectors contribute to deforestation and forest degradation (or land use emissions) to

10 See the *Forest Accounting Sourcebook* (Castañeda et al. 2017) for more details.

11 In the 2016 Forest Action Plan, the World Bank committed to "forest-smart" policies (World Bank 2016a).

identify which fiscal policies should be reformed. Such reviews are already underway for the environmental expenditure policy of some countries but are lacking for tax policies.[12]

Policy makers should take a multisectoral and integrated approach to designing fiscal policy for sustainable forests. While selecting the right mix of fiscal instruments along the forestry value chain can help incentivize sustainable forest management, production, and conservation, other factors are also key drivers of forest outcomes (Kishor, Castillo, and Nguyen 2015; Ongolo and Karsenty 2015). Therefore, policy makers should take an integrated approach to land use planning, incentive instruments, and broader environmental policies. An integrated landscape approach helps clarify and manage trade-offs between various land uses to ensure land is used productively and in a sustainable manner, without compromising resilience (World Bank 2016c). Additionally, policy makers should coordinate widely with stakeholders to ensure all concerned parties are involved in the reform process, which is critical to facilitate the enforcement of policies, generate needed information, and provide important checks and balances.

2. Using fiscal policies more actively for environmental policy can improve national economic development.

Whether they are used consciously or not, fiscal policies incentivize firms to employ practices that are either more or less sustainable. Fiscal policy impacts the choices about land use, the size of the informal forest sector, logging intensity and harvesting methods, and other decisions central to forests. The choice of fiscal instrument can have a variety of implications, depending on how it is designed and targeted, and some mechanisms have the potential to be very effective in incentivizing SMF. In addition, fiscal policy is a unilateral action that all countries can take, without needing to wait on international funding as with REDD+ or other PES programs. If used in combination with other instruments, environmental fiscal policy can also help overcome institutional and governance issues, such as weak capacity for MRV.[13]

However, trade-offs can exist between the implementation of climate or environmental commitments and other development issues in low-income countries. Minimizing those trade-offs requires using least-cost environmental policies and designing such policies to contribute toward achieving other development objectives such as equitable and sustainable growth. Environmental fiscal policy to incentivize SFM and conservation can achieve both.

Using fiscal policy in such a way not only minimizes costs of environmental and climate policy but also can improve national economic development. Many scholars suggest that environmental taxation features among the most cost-efficient climate mitigation policies, and that it can enhance rather than contradict economic development (Acemoglu, Golosov, and Tsyvinski 2011; Fullerton 2001). In particular, the revenue-generating capability of

12 Several countries have started to implement "Public Environmental Expenditure Reviews" for individual spending programs and "Climate Budgeting" for tracking and managing the ensemble of several expenditure programs at the macro level. Creating transparency over spending policies through the tagging of expenditure lines is seen as a first step to better management of both direct outcomes of public programs and private sector incentives. See World Bank (2016d) for more details.

13 Measuring, reporting, and verification refers to procedures for understanding countries GHG emissions as reported to the United Nations Framework Convention on Climate Change (UNFCCC). The three steps include data collection or estimation of countries GHGs and their sources; compiling this information in standardized inventories; and periodically submitting the reported information to independent review.

environmental taxation creates many opportunities for synergy between the achievement of national development and climate or environmental objectives. "Revenue-neutral shifts toward environmental taxes can have extremely low or negative costs" (Liu 2013), depending on how they are designed, and as such they represent an efficient policy option that can at the same time improve national economic development.

Awareness of the benefits from environmental taxation is spreading. About 100 countries have included environmental taxation or other price-based mitigation policies in their Nationally Determined Contributions (NDCs) (World Bank, Ecofys, and Vivid Economics 2017). Despite this improvement, the world is quickly running out of time if we are to stay on track to meet the objectives of the Paris Agreement. In emerging and low-income economies, the lack of environmental taxation makes environmentally damaging investments more lucrative. Developing countries' rising interest in introducing environmental taxation is therefore even more relevant.

3. Reforming existing fiscal incentives is a low-cost option that can free up additional domestic revenues while accomplishing environmental goals.

Domestic fiscal policies for land use sectors can provide contradictory incentives, (indirectly) promoting deforestation, and should be reformed. Unequal fiscal treatments between sectors should be evaluated to determine if one land use is being prioritized over another and whether this conforms to domestic and international commitments. Where possible, blanket subsidies that support any type of agriculture irrespective of the production method should be reduced (World Bank 2018a, 2018b). Agricultural support policies should be reformed to avoid incentives for land expansion and instead encourage sustainable intensification (Foley et al. 2011; Mahon et al. 2016; Cunningham et al. 2013).[14] Additionally, fiscal incentives that prioritize the clearing of trees on agricultural land should be replaced with subsidy designs that promote agroforestry (Angelsen and Kaimowitz 2001; World Bank 2012b). For example, under French tax law, trees decreased the surface area eligible for subsidies until a reform in 2010 (Buttoud 2012). Reforms need to be careful though: In the French example, the design of this reform removed one deforestation incentive but also expanded the area eligible for agricultural subsidies and hence increased government outlays.

Reforming fiscal incentives for land use sectors like agriculture[15] will reduce the costs of forest conservation and may in some cases free up additional government revenues (see chapter 12). For example, to promote productive land use, Brazil uses a land tax that taxes forested land more heavily than agricultural land. This provides an incentive for landowners to clear trees from their land. At the same time, Brazil also participates in the REDD+ program, which encourages landowners to plant or maintain trees on their land. These two policies provide contradictory incentives and reducing deforestation is then achieved at higher cost; hence, an integrated reform process is needed. Where reforms make additional government revenues available, these revenues could be used to further address environmental objectives or, alternatively, be used for other development projects. For example, Brazil provided about $10 billion in agricultural support between 2010 and 2012—an amount exceeding REDD+

14 See Pretty and Bharucha (2014) for an overview of sustainable intensification principles in practice.

15 In the agriculture sector, for example, implementing direct payments to farmers instead of market price supports or other coupled forms of support can help reduce distortions (and excess production) and improve conservation outcomes, especially when implemented alongside other reforms. See chapter 12 for more details.

financing by a factor of 70 (McFarland, Whitley, and Kissinger 2015). If even just 10 percent of this contradictory agricultural support was reformed, it could free up as much as $1 billion that could be used for forest-smart projects. Subsidy reforms could then be accompanied by public investment spending in key areas, such as electrification to reduce fuelwood use (see chapters 8 and 12).

Specific reforms to the forest sector itself may be particularly effective in reducing the incentives for deforestation and forest degradation. Most forest sector fiscal frameworks include several mechanisms, which generally fall into two categories: recurrent annual charges (property taxes, area fees) and output-based taxes (yield or stumpage taxes, export tariffs). Output-based taxes generally provide better environmental incentives than recurrent charges. Though both types of charges reduce the amount of land allocated to forestry, output-based taxes represent less risk for firms, can expand the area of unexploited natural forest, and extend the optimal rotation period (see chapters 3 and 4 for more details on forest sector fiscal reforms). However, governments may prefer to use recurrent annual charges because they represent a stable and immediate source of income. Supplementing recurrent annual charges with output-based taxes combined with subsidies and other instruments can improve incentives for firms to conform to SFM as it incorporates environmentally efficient (Pigouvian) pricing (see chapters 3–7 for more details). Additional reforms include changes to the general business sector taxation framework, implementing a competitive bidding system for concession allocation (where not already in place), and updating administrative FOB prices, including potential adjustments for the location of concessions (see chapter 3).

4. New policy combinations may be especially effective at combating deforestation.

Policy makers have faced and continue to face barriers to the implementation of environmental tax rates. One barrier against providing the "right" incentives for SFM and conservation was the inability of fiscal administrators to offer variable tax rates based on the sustainability of production (Leruth, Paris, and Ruzicka 2001). The large number of operators spread over wide distances combined with low governance and institutional capacity issues (such as corruption, lack of funding, and lack of personnel, among others) made it impractical to let tax rates vary depending on environmental impacts.

However, new policy developments have made variable tax rates available to forest-fiscal administrators. In particular, mechanisms that improve the targeting of fiscal policy have emerged (table ES.2). For example, there have been substantial developments in MRV systems since the creation of the REDD+ program. In some countries, MRV systems are developed enough to support fiscal policy (see chapter 5). For other countries, this is not yet possible. However, the recent growth of information instruments—in particular, third-party sustainability certifications such as the Forest Stewardship Council sustainable forest management certification—allows for a particularly effective policy combination that may also work for governments with low capacity (see chapters 6 and 7).

Variable tax rates can be implemented through a taxation-and-rebate, or "feebate," mechanism. A feebate scheme, using an excise tax combined with tax discounts, would provide a positive incentive for firms to participate in a third-party sustainability certification scheme, which itself raises sustainability standards. Remote-sensing MRV systems like lidar can be used to apply revenue-neutral feebates on changes in the forest stock (see chapter 5). This system gives landowners and users an incentive to conserve (or even increase) the overall physical forest stock and use agroforestry systems that minimize the trade-offs between forestry and agricultural uses. The efficiency effects of this system can be further improved by letting the tax and subsidy rates vary according to the marginal external damages and benefits from changes in the forest stock. Most likely, the effects on sustainability from a negative change are stronger than for a positive change, and hence the tax rate for reducing the forest by a given quantity will be greater than the subsidy rate for increasing the forest by that same quantity.[16]

A separate or complementary type of feebate system uses information from third-party certification systems for sustainability incentives. In this case, the rates of commodity taxes vary by production method. A preferential rate is given to producers who certify with a third party that the commodity was sourced sustainably, giving firms a direct incentive to verifiably adopt sustainability standards. This scheme can be extended to a credit system (with preferential credit supplied to sustainable producers). This feebate certification is applicable beyond timber to other commodities as sustainability certification systems already exist for many global value chains.

Another important fiscal instrument to combat deforestation is ecological fiscal transfers (EFT). Many countries use intergovernmental fiscal transfers of budgets from the central to regional and local governments. These transfers often use formulas to determine the size of the budget transfers. EFT build on that existing system of intergovernmental fiscal transfers by distributing a portion of central revenues to regional or municipal governments based on selected environmental indicators. EFT are currently used in Brazil, France, and Portugal, and most recently in India.[17] The Brazilian EFT distribute revenues based on the percentage (and quality) of local land designated as protected area, whereas Indian states receive a portion of central revenues based on the percent of forest cover in the region. Alternative indicators can be used, such as the quality of ecological services provided, reduced forest fires, avoided or reduced deforestation, and areas certified under a forest management plan or those with a third-party sustainability certification, among others. For some indicators, the needed data would already be available, although it could be improved. For other indicators, the use in an EFT would first require investments into MRV systems.

EFT provide incentives to *public actors* to enforce forest conservation and management policies. EFT are complementary to environmental fiscal instruments, which provide incentives to *private actors*, like taxes and subsidies. EFT compensate local governments for the revenues lost as a result of the restriction of economic activities on protected land. Thus, EFT mitigate local budget constraints and provide incentives for increased provision of local conservation by reducing opportunity costs at the local level (Droste et al. 2017). EFT may also enhance welfare by alleviating the budget constraints of municipal governments while allowing locally important projects to be implemented.[18]

16 In addition, the taxation and rebates applied may be staggered to account for the time it takes to rebuild the biodiversity lost in a given area.

17 EFT have also been proposed for Germany, Indonesia, Poland, and Switzerland.

18 While EFT are tied to environmental indicators, they are not usually earmarked for specific purposes. Transfers go to general funds of municipal governments and can be allocated to necessary public functions. This allows municipalities maximum financial autonomy (Ring 2004). Maintaining local government fiscal autonomy can reduce political problems, reduce the risk of violence, and improve local development, especially in countries with high ethnic or regional heterogeneity (Faguet 2014; Tranchant 2007). However, whether or not to earmark revenues is a design feature, and policy makers can make this decision as is appropriate for the given context; for example, there are some specific-purpose EFT in Germany for environmental purposes, but not for conservation or protected area–related indicators.

EFT can represent a substantial source of income for subnational governments and therefore might provide strong public incentives for sustainable forest management and conservation. For example, the Brazilian EFT accounted for between 28 and 82 percent of municipal revenues (Campos 2000). The Indian EFT is expected to bring $6.9 billion to $12 billion per year to Indian states, amounting to around $174–$303 per hectare of forest per year (Busch and Mukherjee 2018; McFarland, Whitley, and Kissinger 2015). During the first year of its operation, the Indian EFT accounted for between 0.1 and 41.3 percent of state revenues (Busch and Mukherjee 2018). Evidence shows that EFT in Portugal and Brazil have led to an increase in land area designated as protected. In India, however, the change in policy was too recent to tell if it has encouraged an increase in forest cover (Busch and Mukherjee 2018).

TABLE ES.2
A SELECTION OF FISCAL MECHANISMS AND THEIR RELATIVE IMPACT ON INCENTIVES FOR SUSTAINABLE FOREST MANAGEMENT

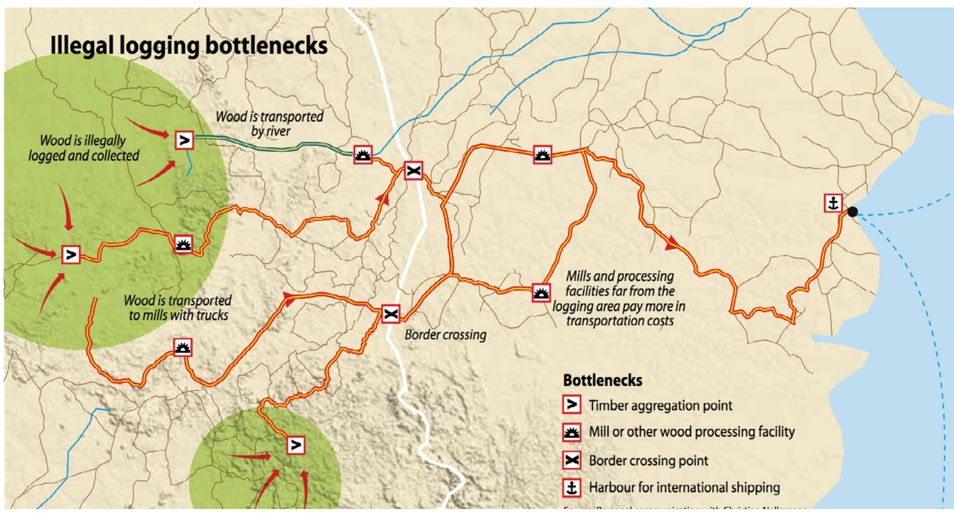
FISCAL MECHANISM	DESCRIPTION	EFFECT ON SFM INCENTIVES	OTHER FEATURES
Excise tax	Tax on timber and other forest-derived products Can be unit-, profit-, or resource rent–based	Mixed impact – Without additional measures can increase incentives for illegal or informal logging, selective harvesting, and land use change	Revenue-increasing High administrative costs (information, enforcement)
Area fee	Fee based on harvested area	Mixed impact – Without additional measures can encourage more intensive harvesting	Low administrative costs
Export tariff	Tax on exported timber and other forest products, levied by customs authority	Mixed impact – Without additional measures can generate distortions in consumption and marketing of forest products or encourage inefficiency and waste in domestic industry	Revenue-increasing Low administrative costs
Input tax	Charges on capital equipment, labor, or other inputs	Mixed impact – Can be mechanism to help control illegal logging	Revenue-increasing
Subsidy or tax expenditure	Fiscal incentives and tax discounts	Strong impact on incentives for SFM and land use change, if well targeted	Revenue-decreasing High administrative cost
Combination of taxation and subsidy/rebate (feebate)	Taxation and rebate combination based on firm adoption of SFM or another environmental indicator	Strong impact on incentives for SFM, if well targeted	Potentially revenue neutral Medium administrative cost, if used in combination with information instruments
Ecological fiscal transfer	Portion of central government fiscal transfers allocated based on environmental indicators	Strong impact on public incentives for SFM and forest conservation	Revenue neutral Low administrative cost

Source: Adapted and expanded from Gray 2002.
Note: This is a noncomprehensive list of forestry fiscal mechanisms. The country-level context will determine which instruments are most appropriate in a given circumstance. See chapters 3–8 and 11–13 for more details on individual instruments. SFM = sustainable forest management.

5. Fiscal mechanisms should be located at chokepoints to minimize enforcement and collection challenges and incentivize SFM along the supply chain.

Locating environmental forestry taxes at chokepoints can minimize certain challenges to fiscal administration.[19] The large number of forestry operators and the often large portion of informal or illegal forest production complicate the enforcement and collection of fiscal forestry policies, especially in countries with low governance capacity. However, there are certain chokepoints—bottlenecks where illegally and informally sourced (or otherwise difficult-to-tax) goods enter a formal market structure—through which forest products must flow (especially products intended for export). Key chokepoints for the forest sector include timber aggregation points such as timber depots, sawmills or other processing facilities, border crossings, or international shipping ports (figure ES.7).

FIGURE ES.7
USE OF ILLEGAL LOGGING BOTTLENECKS (CHOKEPOINTS) FOR POLICY ENFORCEMENT, INCLUDING FOR TAXES



Source: Nelleman and INTERPOL 2012.

Locating environmental taxation at chokepoints can minimize corruption opportunities in the forest sector. Corruption in the forest sector includes activities such as the falsification of documents, fraudulent interactions, bribery, money laundering, and tax evasion (Maguire 2013). Problems of forest sector corruption are exacerbated by insecure tenure arrangements and weak governance and monitoring capabilities. Corruption, fraud, and tax evasion are particularly pervasive in the forest sector; for example, the revenue and tax income lost due to illegal logging alone is estimated to be at least $10 billion per year (Nelleman and INTERPOL 2012). Initiatives like FLEGT have sprouted to address these challenges by increasing transparency, but fiscal policy design also has a key role to play here. FLEGT and other such initiatives can be complemented by locating environmental taxes at chokepoints. By locating taxes at chokepoints, the number of taxable agents is fewer and fiscal capacity and MRV systems may be more developed, thereby minimizing opportunities for corruption, fraud, and tax evasion.

19 However, there are certain types of deforestation for which there are no chokepoints, like deforestation caused by internal demand for charcoal. In these cases, environmental tax policy may not be the right instrument.

Locating environmental forestry taxes at the level of upstream processors or other chokepoints can incentivize sustainable supply chains. Taxes may fail when they are imposed at the wrong segment of a supply chain. An environmental tax on timber harvesters based on the sustainability of timber might not incentivize many operators to improve their production methods. Instead, they might choose to evade taxes (whether through informal or illegal production, or bribery of forest tax collectors). However, if an upstream processor or depot faces a taxation mechanism that varies based on whether their inputs were sourced sustainably, these actors face an incentive to purchase timber from legal and sustainable harvesters and lower their tax bill. Locating taxes at chokepoints is especially effective for forest products, as in many cases illegal product is mixed with legal product at depots. This is not to say that fiscal policy can replace enforcement or regulatory policies, but that fiscal policy can be designed to minimize these barriers.

Export facilities are a primary example of a chokepoint that exists in virtually every country. Where deforestation in a country is driven by the export of a commodity, export taxes can be implemented in combination with tax discounts for certified sustainable production methods. Using chokepoints reduces opportunities for fraud, and export taxes can be used to encourage sustainability as well as value added for domestic industry, if used in combination with other mechanisms. However, standard export taxes can be seen critically from a perspective of international trade facilitation, although they align with World Trade Organization (WTO) law. Nevertheless, well-designed export taxes addressing market failures facilitate the conduct of trade along true comparative advantages.[20] Despite important drawbacks, exports represent a simple and effective point at which to implement environmental taxes in countries where the enforcement of environmental policies through internal taxes is not feasible because of evasion and informality problems.

Producer countries with sufficient fiscal space should consider selectively reducing export taxes for certified sustainable products, to participate in global value chains while safeguarding sustainability. Combining export taxation with reduced tax rates (or waivers) for products with third-party certification creates the incentive for sustainable production and encourages integration into international markets. Using third-party certification in fiscal policy efficiently puts the burden of proof for determining the level of sustainability on firms, reducing tax administration costs.

6. International donor funding could help overcome political challenges to the implementation of certain environmental fiscal instruments.

The right fiscal policy mix can help close the gap between financing needs for sustainable forests and available funds during a time of globally worsening fiscal space. Existing fiscal policy for forest protection relies mostly on direct expenditures. Achieving sustainability objectives exclusively through these expenditure policies would require unprecedented increases in funding. Given fiscal pressures in developing countries, raising these large increases in funding from domestic sources is unlikely. Funding has come instead from

20 Failures to internalize environmental costs distort international trade (Chichilnisky 1994; Stiglitz 2006) away from allocative efficiency, which is given when goods are produced in the location where the opportunity costs to society are the lowest. Trade should be conducted according to genuine comparative advantage, that is, comparative advantage on the basis of true production costs. It is essential, therefore, that countries implement policies to internalize external costs from traded commodities (World Bank 2020). In countries where the enforcement of environmental policies through first-best policy instruments is not feasible, export taxes can play an important second-best role because they use a chokepoint (ports) that is difficult to evade.

international donors through REDD+, but it is estimated to be far less than needed to achieve forest sustainability objectives. The vast financing gap may become worse in the context of the current dramatic worsening of fiscal space in both developing forest nations and donor countries. As, despite the COVID-19 recession, solutions for sustainable forests must be found, there is a need to find a new policy package that can provide the needed boost to forest sustainability with fewer revenue needs. Above we have discussed several options, notably the alignment of contradictory fiscal policies for competing land uses such as agricultural subsidies and property taxes that increase land clearance, revenue-raising environmental taxes, and revenue-neutral approaches like feebates and ecological fiscal transfers. These policies enable the scaling up of fiscal policies for sustainable forests without requiring much additional funding.

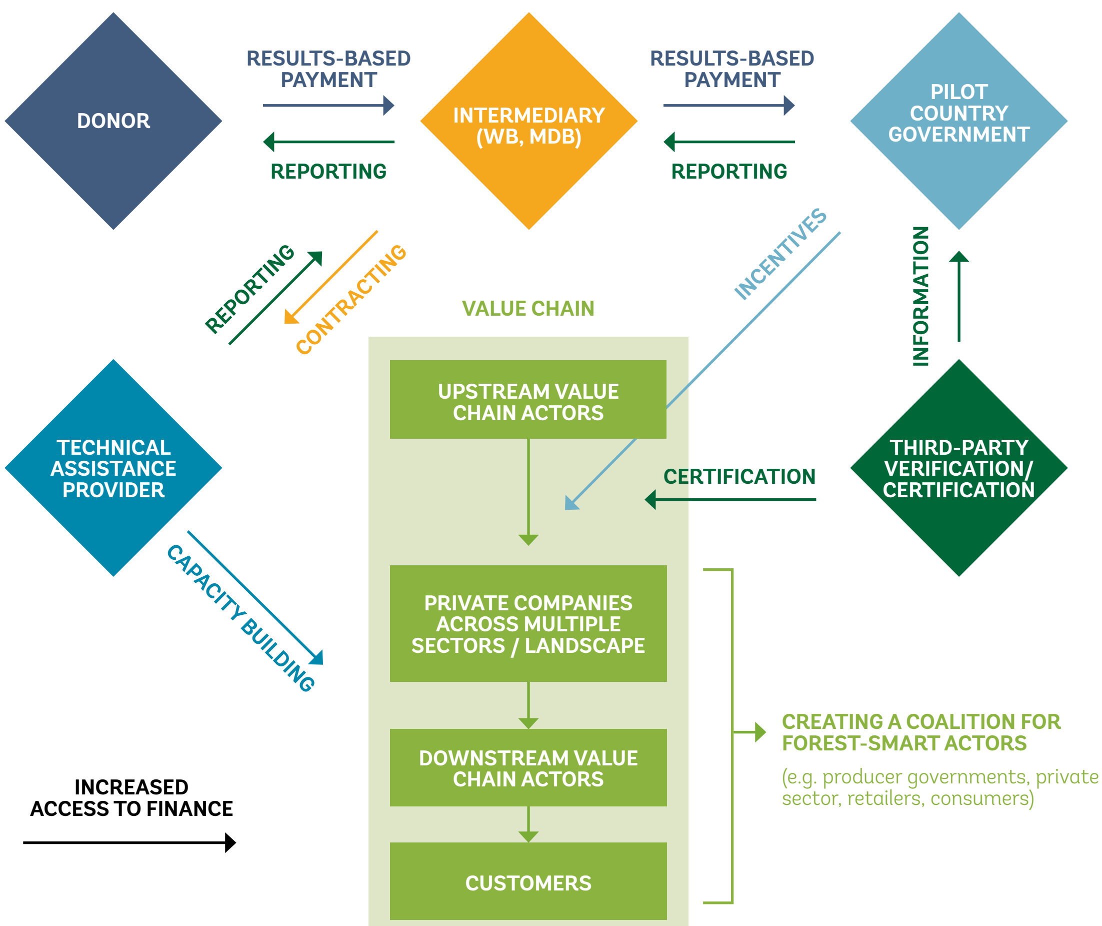
Nevertheless, there remains a large financing gap for meeting global forest targets—and a justified need for continued international burden sharing. Fiscal reforms may be limited by fiscal capacity, particularly in the short term. The mentioned revenue-raising or revenue-neutral instruments enable the scaling up of forest protection in a time of fiscal scarcity, but they do not substitute for the continued need to use expenditure policies like PES and REDD+. These are complementary policies as they address separate market failures. And irrespective of the combination of policy instruments, the prevention of deforestation and forest degradation in developing countries continues to generate large, globally shared external benefits, which justify large, global burden sharing in any conservation cost. The policy mix affects what the size of that conservation cost is, not how it should be split. The policy instruments proposed in this compendium would imply a step-up in domestic policy action by forest nations, but that should not come at the expense of international solidarity. Instead, countries should continue to be rewarded for such reforms—for example, through results-based payments such as policy crediting. In this way, the gap between the overall financing needs to meet global forestry objectives and the financing available could be shrunk in a way that benefits recipient and donor countries alike.

Phasing in the new fiscal policy instruments may require additional donor funding to support structural change, overcome political economy problems, and compensate initial revenue losses. Ecological fiscal transfers can be introduced as a revenue-neutral change to the existing intergovernmental fiscal transfer systems. In this case, the formula for the distribution of transfers between subnational governments changes without altering the total amount of the transfers. While this is possible, it can also be politically challenging. Here donor countries may be interested in supporting the phase-in of EFT financially. Sharing in the cost for an "almost revenue-neutral" EFT may still be better than many alternative forest sector interventions where a much greater share of the cost is borne internationally. Another core concern for donors is the likelihood of an intervention to be reversed when international funding ends. Here it is important that an EFT would imply changes in central government fiscal laws and create strong vested interests among subnational governments, which should both support its persistence and local ownership. A similar case for international co-financing exists for reforms that let taxes on deforestation-related commodities vary according to the certified sustainability/legality of production. Again, these reforms can be designed to be revenue neutral, but politically it is easier if the reform starts with just a decrease in taxes for certified sustainable commodities without an immediate matching rise in the default tax rate for commodities without the certification.

Donors could help cofinance the initial shortfall in commodity taxes. Given the argument on relative costs in comparison with alternative interventions, domestic co-financing and legal change, structural change of market incentives, and creation of vested interests for persistent change, the suggested policy reforms seem an effective investment for donors. This co-financing may also be in the interest of donors who would like developing countries both to reduce their use of export taxes on commodities and to raise the sustainability of these commodities. In this case, a forest nation could start reducing the export taxes for certified sustainable commodities, and a donor country could share in the revenue shortfall.

Such international co-financing in the introduction of environmental fiscal policies could function within existing results-based payment systems. A type of results-based payment called policy crediting already supports environmental tax policies by providing payments per unit of environmental improvements that were achieved as a direct outcome of the policy change. Thus, there already exist frameworks for facilitating such international collaboration. However, a more structured approach to potentially expand such collaborations is shown in figure ES.8.

FIGURE ES.8
ITTO PROPOSITION FOR AN INTERNATIONAL TRANSFER SCHEME TO INCENTIVIZE HARVESTED WOOD PRODUCT VALUE CHAINS



Source: Dieterle 2017.
Note: ITTO = International Tropical Timber Organization.

These international transfers could be transitory. As the recommended policy would provide strong incentives for firms in the informal sector to join the regular economy, the government's ability to raise revenue would improve. The abovementioned additional fiscal incentives for domestic industry would equally raise that revenue potential against business-as-usual trajectories. Most important perhaps, transitory international support of a pilot scheme could reduce the risk and cost for governments in testing such schemes. After it is established that such mechanisms work, international support should be scaled back, and that exit plan should be transparently communicated from the beginning. This will minimize the reliance on the generosity and political winds of donor countries, which can be variable.

Conclusion

This publication presents a first look into how governments can better design fiscal policies to reduce deforestation and forest degradation while promoting sustainable growth. Significant knowledge gaps remain for the topic, including information at the country level on how fiscal instruments are currently applied, the impact on incentives from these policies, and other sectoral data. Additionally, the principles and recommendations of this publication have not been systematically piloted in a national forestry context. Future work should incorporate further case studies of existing fiscal systems, results of fiscal reforms, and further country-level operational studies. The guidance provided by this publication should hence be viewed as a starting point to provide policy makers with a range of options to help design a context-appropriate fiscal regime for forest conservation and sustainable management. The major findings are summarized below.

Environmental fiscal policy interventions can help meet important national objectives. Environmental fiscal policy is one important tool to help countries meet the objectives of both the Paris Agreement and SDGs, as well as other national development priorities. Fiscal policies that help reduce deforestation and forest degradation support climate change mitigation and adaptation, water and food security, and the reduction of poverty. They contribute to green growth through the advancement of sustainable supply and value chains, and the formalization of a sector often plagued by informality and illegality. Additionally, environmental fiscal reforms can contribute toward domestic resource mobilization, or at least reduce the large financing gap for meeting forest sustainability targets. Addressing a subset of forestry issues with environmental tax policy can free up resources that then can be used to more effectively address those subsets for which tax policy is not a solution.

Environmental fiscal policy to incentivize sustainable forests includes a variety of reforms and new policy instruments. Key fiscal reforms include a reduction in fiscal incentives that (indirectly or directly) support deforestation, thus balancing incentives for land use change. In many countries, existing fiscal sectoral policies provide contradictory incentives for forest conservation and management; for example, forested land in some countries is taxed higher than agricultural land, directly providing an incentive for land clearing. Reforming such fiscal incentives to prioritize agroforestry or afforestation could help reduce deforestation as well as free up additional revenues. Reforms to existing regimes and new environmental tax mechanisms can also better align the incentives of private actors to engage in sustainable forest management, production, and conservation. Some relatively simple reforms to existing forestry-fiscal regimes could improve incentives, for example by relying relatively more on output-based charges. The feebate mechanism also has the potential to overcome challenges to environmental taxation in forestry and other land use sectors, especially when used in combination with information instruments. Additionally, certain fiscal mechanisms (such as EFT) can help align the incentives of public actors to engage in SFM and conservation.

Subsidy reforms: Policies should be evaluated in terms of their respective impacts on the incentives for deforestation and forest degradation. Where policies are found to provide contradictory incentives, the fiscal regime should be reformed and reconciled. Policy makers should replace certain agricultural support policies, including subsidies, that incentivize deforestation with those that promote deforestation-free production. Especially, support tied to output or market prices (coupled support) should be replaced with decoupled, direct payments to farmers (potentially tied to ecological outcomes—for example, PES) to reduce the distortion of production decisions and improve environmental sustainability.

Ecological fiscal transfers: Policy makers in countries that use intergovernmental fiscal transfers between central and local governments should improve the incentives of local governments to attain forestry objectives by including environmental criteria in the formula used for calculating the size of transfers. Several forest-related conservation criteria are possible, including forest cover, quality of area designated as protected area, forest carbon stocks (for example, aboveground biomass), percent of area under forest management plan, or area certified under third-party sustainability certification. The environmental indicator(s) chosen should be determined based on governance capacity, as some indicators are relatively more complicated to use.

Forest sector fiscal reforms: Forest sector fiscal frameworks should conform to a set of best practices, dependent on country-specific contexts, such as economic, political, and social factors. Output-based taxes, recurrent annual charges, and other charges can be reformed to better align with environmental objectives.

Feebates: Policy makers seeking to improve incentives for sustainable forestry in a revenue-neutral manner should consider the carbon sequestration–based feebate mechanism or the sustainability certification–based feebate mechanism, depending on the governance capabilities in the country in question. Where robust monitoring and land tenure systems may be lacking, third-party sustainability certification–based feebate mechanisms provide a “widely applicable” alternative to the carbon sequestration–based feebate. This mechanism can be extended beyond the forest sector to other land use sectors like agriculture and extractive industries.

Export taxes: Policy makers should carefully weigh any plans to phase out existing forest-related export taxes with the need for a robust environmental fiscal policy that is resistant against informality and other types of evasion. Although they have important drawbacks, export taxes use a strong chokepoint, and authorities can thus better enforce environmental export taxes than tax policy in the interior of some countries. Ideally, policy makers should use variable export tax rates based on the sustainability of production methods to reduce deforestation from internationally traded commodities and their value chains. One way to implement variable tax rates is through the feebate mechanism. This instrument can also be used for land use sectors beyond forestry.

Implementation challenges can be overcome through careful policy design and complementary policy interventions. One challenge to environmental fiscal policy implementation is the projected impact on government revenues; many governments may not have the capability to invest in reforms with high administrative costs or technical capacity needs, or those that entail large expenditures from the national budget. Accordingly, certain fiscal instruments can be designed to be revenue neutral or revenue raising, such as environmental taxation, feebates, subsidy reform, and EFT reforms. Additionally, forest sector taxation enforcement is often complicated by the large number of actors in the sector, institutional and governance weaknesses such as corruption, and the inability of fiscal administrators to target the often-large informal sector. Fiscal administrators can alleviate these issues if environmental taxation is targeted at chokepoints, such as at the customs gate.

Other, complementary policies will be necessary to comprehensively address all sources of deforestation. Given the complexity associated with deforestation, there is a need for additional reforms and investments beyond fiscal policy. Such investments include improvements in forest law enforcement, MRV systems, and administrative and other capacities. Regulatory measures such as environmental standards, protected area designation, and bans on the harvesting of certain species are also key to the protection and sustainable growth of the forest sector. Expenditure policies, such as PES and REDD+, are also especially important for providing landowners with the incentives to enhance ecosystem services from forests (for example, carbon sequestration and watershed services). Transparency initiatives and demand-side measures, along with other policies, will also be key components in the forest policy mix. Additionally, stakeholder consultation is key: Many vulnerable groups directly rely on forests for their livelihoods and indigenous, forest-dwelling communities should be involved in the fiscal reform process; the involvement of civil society groups and certification companies can importantly improve the enforcement of policies.

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Environmental Taxation and Sustainable Forest Management

DIRK HEINE & ERIN HAYDE

Forest Policy Landscape

Many policy measures have been implemented to encourage sustainable management of forest resources and forest conservation (table 1.1). The main policy instruments applied in the timber sector include regulatory approaches (bans, management plans, and sustainability standards), information and voluntary instruments (disclosure requirements and sustainability certifications), and economic instruments like results-based expenditures and environmental taxation.

TABLE 1.1
SELECT POLICY INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE USE OF FORESTS

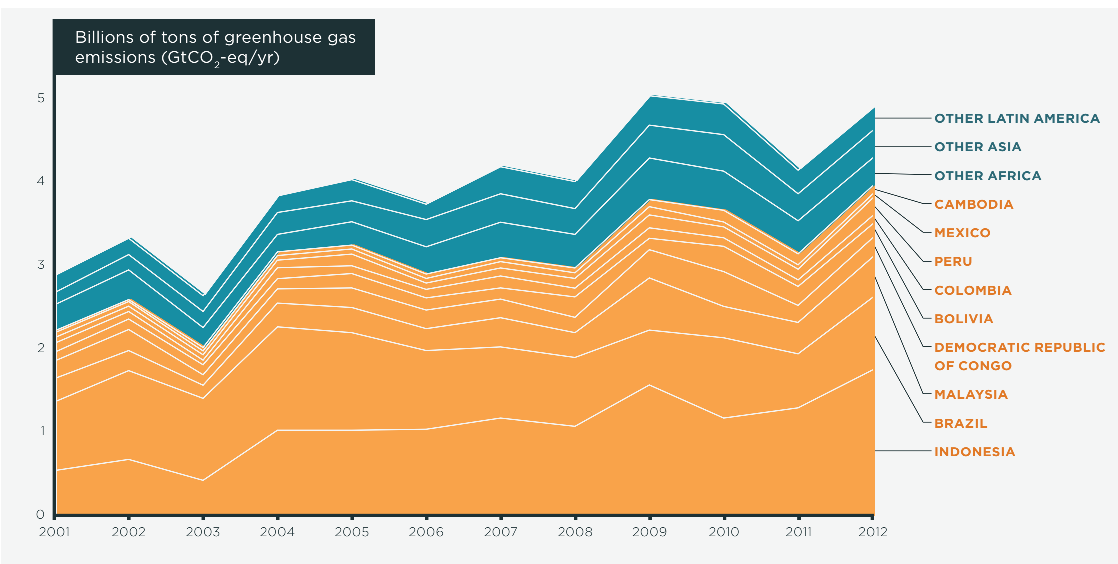
REGULATORY APPROACHES	INFORMATION & VOLUNTARY INSTRUMENTS	ECONOMIC INSTRUMENTS
▪ Restrictions or prohibitions on use (e.g., restrictions on trade in illegal timber) ▪ Restrictions or prohibitions on access and use (e.g., designation of protected area) ▪ Permits and quotas ▪ Quality, quantity, and design standards (e.g., minimum harvesting diameters) ▪ Spatial planning (e.g., ecological corridors) ▪ Planning tools and requirements (e.g., environmental impact assessments, strategic environmental assessments)	▪ Ecolabeling and certification (e.g., sustainability certification) ▪ Green public procurement ▪ Voluntary approaches (e.g., negotiated agreements between firms and governments) ▪ Corporate environmental accounting ▪ Conditional credit	▪ Results-based expenditure policy (payments for ecosystem services, REDD+) ▪ Subsidies ▪ Environmental taxation (taxes, charges and fees, e.g., royalties) ▪ Tradable permits ▪ Biodiversity offsets/biobanking ▪ Liability instruments (noncompliance fines) ▪ Performance bonds

Source: Adapted from OECD 2013.

Despite the variety of available policies, deforestation and forest degradation continue around the world. Global forest area declined from 31.6 percent to 30.6 percent between 1990 and 2015 (FAO 2018). Tropical deforestation is of particular concern as deforestation rates are much higher for this region. Overall, tropical deforestation increased by 53 percent between 2001 and 2012, from an average of 6 to 9.2 million hectares per year (Austin et al. 2017). This pace has not slowed: 2016 and 2017 set records for tropical tree cover loss (Weisse and Goldman 2018). Tropical deforestation is most extensive in Latin America and Sub-Saharan Africa, with forest area losses of 7 percent and 9 percent, respectively, between 1995 and 2014 (Lange et al. 2018).

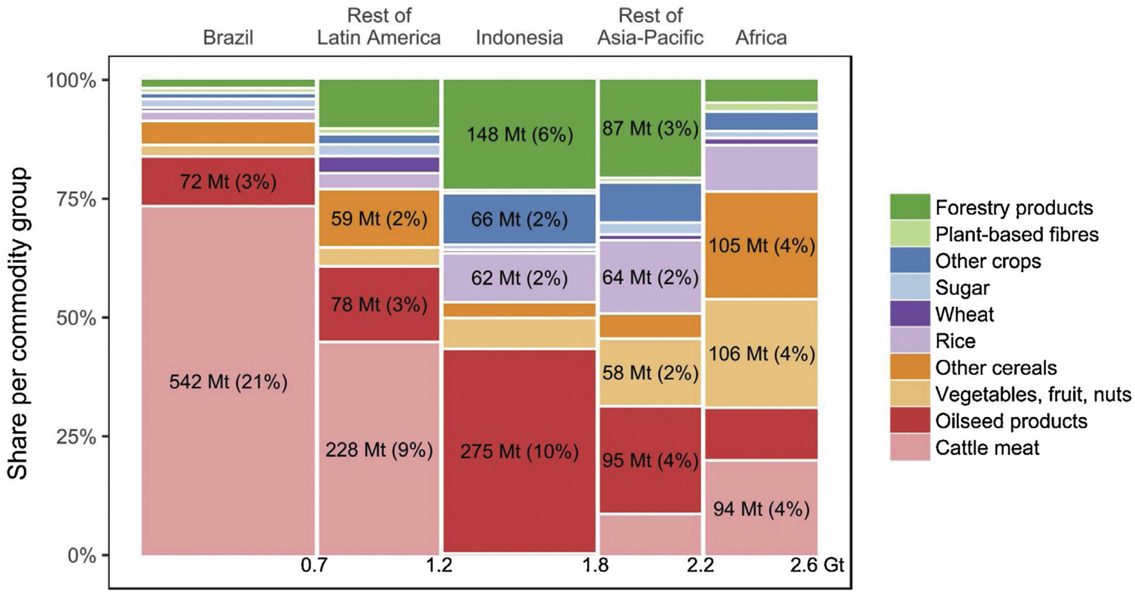
The loss of global forestland coincides with and contributes to other major depletions of environmental resource stocks. Emissions from deforestation have grown and contributed to the rising levels of overall atmospheric carbon dioxide (CO_2) concentrations (figures 1.1 and 1.2). In addition, deforestation has contributed to significant total biodiversity losses over the last several decades through habitat loss and other factors (Giam 2017) (figure 1.3). This depletion of key environmental resource stocks has important implications for environmental carrying capacities (Dryzek 2013; Keohane and Olmstead 2016; Rockstrom et al. 2009; Steffen et al. 2015; Wenpeng et al. 2018; Arrow et al. 1995).

FIGURE 1.1
ANNUAL CO_2-EQ EMISSIONS FROM TROPICAL DEFORESTATION, 2001–2012



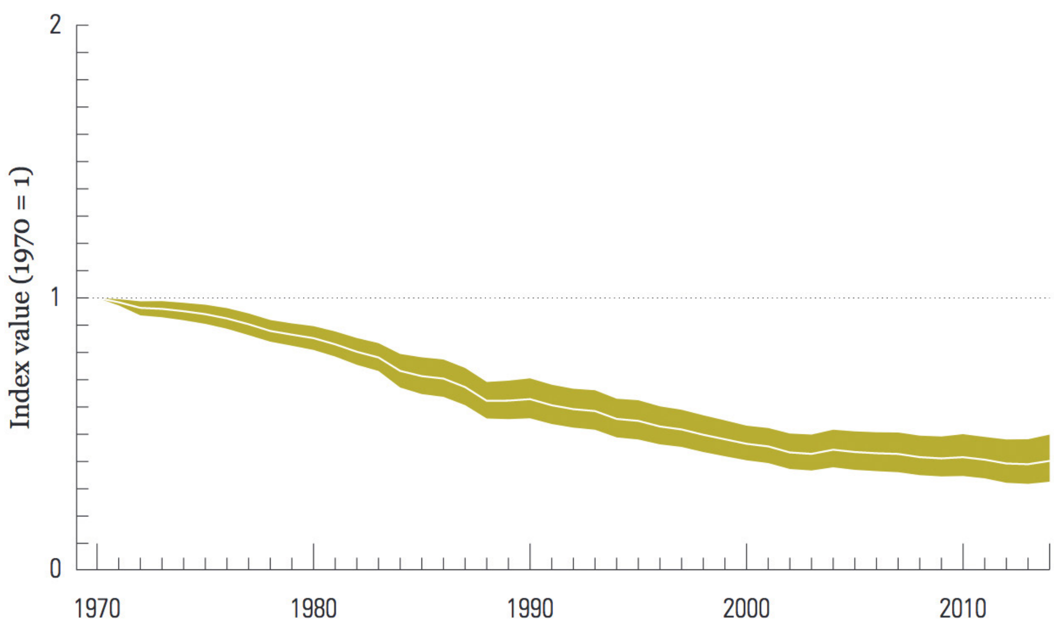
Source: Seymour and Busch 2016.
Note: The countries listed in orange represent 77 percent of the emissions from tropical deforestation.

FIGURE 1.2
CO_2-EQ EMISSIONS FROM TROPICAL DEFORESTATION BY DRIVING COMMODITY GROUP (EXCLUDING TIMBER CLEARING FOR LAND USE CHANGE), 2010–2014



Source: Pendrill et al. 2019.

FIGURE 1.3
GLOBAL BIOLOGICAL DIVERSITY INDEX, 1970–2014



Source: WWF 2018.
Note: The vertical axis represents indexed values, where 1970=1.

Deforestation, and therefore the need for policy action, is often greatest in low-income countries with low governance capacities. As such, policies are needed that are feasible and effective to implement even in low-capacity environments, especially for tropical forest-producing countries where past policy approaches have not succeeded at bringing down deforestation and forest degradation rates.

The increasing global demand for forest products exacerbates this challenge. Future demand for forest products will come from two main dimensions in addition to population growth: decarbonization trends and shifts in demand. Current trends in decarbonization indicate pressures to substitute forest-based products for carbon-intensive goods. Developing countries will also experience a shift in demand; as incomes increase, consumption patterns will likely shift to more closely match those of developed countries. By 2050, the total demand for industrial roundwood is projected to quadruple, increasing the annual supply deficit to over 4.5 billion cubic meters, compared with the current 1 billion (World Bank 2016). Low-cost and scalable policy interventions are needed to guide private investment and green growth in the forest sector to meet future demand and to stop and reverse the dramatic decay in global forests.

Environmental tax policy may have a special role to play in addressing both resource and land use management, particularly in low-income countries. Environmental taxation has so far been underutilized in the context of forest management and conservation. However, it may be particularly suited to address gaps in the climate and forest policy landscape, especially for countries under governance, budgetary, and other constraints. Environmental taxation has various benefits over the other main policy instruments for forest conservation that make it appealing in low-income countries. Environmental taxation is a low-cost option that provides dynamic incentives for sustainable forest management (SFM) and can help address funding gaps left by other policies.[1] We will now turn to each of the alternative policy approaches to forest conservation and discuss their relative advantages and disadvantages in comparison to environmental taxation.

Regulatory approaches

Regulatory policies are an important component of the forest conservation policy mix. Regulations determine minimum required standards for forest management and conservation, and—when enforced[2]—are closely correlated with decreased deforestation.[3] Such policies are key to influencing decisions made by the least sustainable or least efficient producers by, for example, restricting the most harmful practices. Key regulatory policies include protected areas and other forest reserves, environmental standards, and market bans. Bans and similar regulations do not directly change production standards but provide indirect incentives by regulating the terms under which forest products can be grown, harvested, and sold in the market. For example, the European Timber Regulation bans illegally logged timber from the EU's common market as part of the Forest Law Enforcement, Governance, and Trade (FLEGT) initiative. In some situations, these regulatory policies may be more suitable than fiscal or other market-based policies (Karsenty 2000).[4]

1 In addition to environmental tax reforms, reforms to existing fiscal regimes can help correct contradictory incentives for forest conversion while freeing up additional revenues.

2 For an in-depth discussion on forest sector regulatory policy, see World Bank (2019a) and World Bank (2019b).

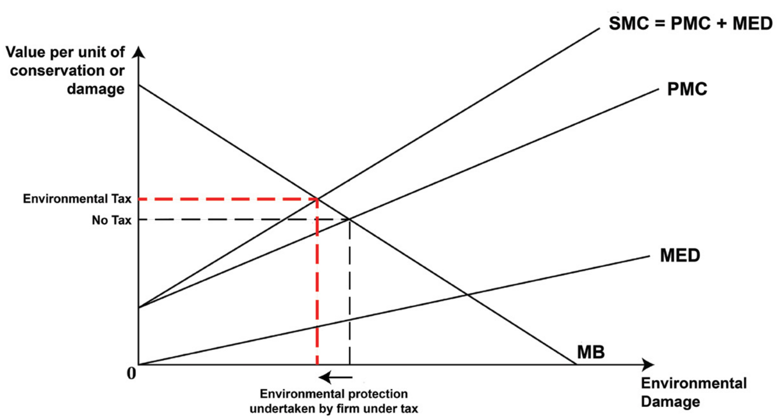
3 Protected areas, in particular, are highly correlated with low deforestation rates (Busch and Ferretti-Gallon 2017).

4 See chapter 4 for more details on the limitations of fiscal policy in fragile states.

Regulatory policies can be very effective at ensuring a chosen standard is met. However, they may be less cost-efficient than market-based policies. In the absence of trading markets for permits (which give firms some cost flexibility),[5] regulatory policies impose a uniform standard on all producers and are not cost-efficient if firms experience different costs for achieving the same level of sustainability (figure 1.4). In other words, if some firms can more efficiently implement sustainable practices, a regulatory policy that applies the same requirements to all firms fails to use the efficient firms' comparative advantage for driving down the overall cost of reaching a given environmental objective. The outcome is different with environmental tax policy because firms can choose to invest in sustainability investments until the costs outweigh the benefits,[6] so the marginal costs of abating environmental damages are equalized between firms instead of the total amount of abatement per firm. A recent study confirmed this by showing that fiscal mechanisms carbon taxes on land use emissions were eight times less costly compared with command-and-control policies (Souza-Rodrigues 2018).

FIGURE 1.4
COSTS OF ENVIRONMENTAL PROTECTION

A. ENVIRONMENTAL TAXES EQUALIZE MARGINAL COSTS

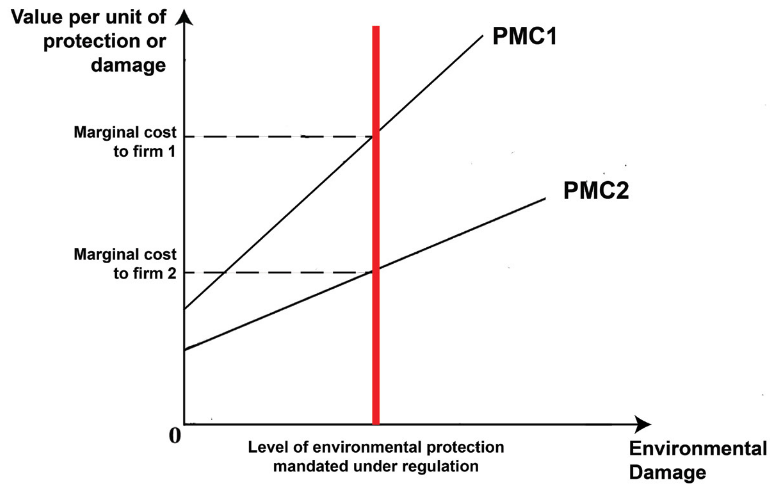


Note: Where there are negative externalities—or marginal external damages (MED)—the social marginal cost is higher than the private marginal cost. An environmental tax set equal to the MED increases the firm's private marginal cost curve to coincide with the social marginal cost curve. The quantity of output then falls to the socially optimal level of production. The environmental tax then internalizes the externality and removes the market inefficiency. MB = marginal benefit per unit of output; MED = marginal external damage per unit of output; PMC = private marginal cost per unit of output; SMC = social marginal cost per unit of output.

5 For more details on carbon markets, see "State and Trends of Carbon Pricing 2020" (World Bank 2020b), "Carbon Markets for Greenhouse Gas Emission Reduction in a Warming World" (World Bank 2018), and "Networked Carbon Markets" (World Bank 2020a).

6 Under a Pigouvian taxation framework, this point of optimal allocation is reached when the marginal mitigation costs are equal to the Pigouvian tax rate.

B. LEVEL OF MANDATED ENVIRONMENTAL PROTECTION COSTLIER COMPARED TO TAXATION



Note: Where firms have different environmental protection costs (PMC1 and PMC2), an equal reduction in environmental damage is inefficient since the marginal costs of firm 1 are higher than the marginal costs of firm 2. The optimal division of environmental damage reduction is instead where each firm's marginal cost is equal to the social marginal benefit, as in figure 1.2. PMC1 = private marginal cost curve for firm 1; PMC2 = private marginal cost curve for firm 2.

Regulatory enforcement may also be difficult in countries with low governance capabilities. The requirement that all firms conform to the same standard can be difficult to enforce,[7] especially in countries with governance constraints or corruption risks. In these cases, monitoring estimates on conservation may be unreliable and enforcement efforts insufficient (Hayes and Ostrom 2005; Nolte 2016). For example, while the FLEGT initiative has helped improve governance capacities and reduced the end-use market for illegal timber, it may not have performed as desired in terms of reducing illegal logging and related trade (EC 2016).

Information and voluntary instruments

Information instruments are another important forest management and conservation policy. Information instruments attempt to influence actors using transparency; policies include public disclosure requirements, information campaigns, audits, and certification systems. Information instruments are particularly useful in addressing decisions made in the first domain of economic decision-making (see box ES.1). Sustainability certification (or "eco-labels") may be particularly effective in promoting SFM. Certificates, like bans, modify the terms of market access, thereby providing indirect incentives for timber producers to improve their production standards.

7 In particular, it may be difficult to mandate certain behavioral responses. Additionally, dynamic incentives to encourage action above regulated standards are needed to address deforestation and forest degradation.

Sustainability certification is readily available for the timber industry. The Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) set standards for sustainable forest products, certify forest management, and label products as "eco-friendly," often using accredited subsidiary implementing agencies. Timber certification has the potential to improve yields and quality of output, improve conditions for workers, reduce operational risk, and increase access to markets and customers.

Sustainability certification coverage is growing in the soy, palm oil, and biofuels industries, largely as a result of major international roundtables established to convene stakeholder support for shared production principles.[8] Outside of the forestry and agriculture sectors, sustainability certification is more recent but also growing for extractive industries (including gold, aluminum, and oil and gas) as well as for electronics and tourism.[9]

While certification provides critical incentives for voluntary private sector investments, it also has important limitations, which include information problems, accreditation costs, free ridership, fraud, and a limited scope for competing certification schemes (see box 6.1). Additionally, sustainability certifications are voluntary instruments, intended to improve market access and influence demand—there is no guarantee of mass adoption. While the coverage and availability of information instruments, like sustainability certifications, are increasing, they need to be further scaled up to increase their effectiveness. These limitations can be improved upon when certificates are used in combination with environmental fiscal policies.[10]

Economic instruments: Results-based expenditure policy

Results-based expenditure policies are another important mechanism to encourage forest management and conservation. These policies, which include payments for ecosystem services, are flexible and can provide incentives for private investment in SFM. Results-based expenditure policies impact the decision-making of both inefficient and optimally producing firms and individuals by modifying relative prices.[11] Such policies also directly compensate instead of regulating or taxing low-income and vulnerable populations and can improve incentives for actors to join the formal economy. These market-based expenditure policies are complementary to regulations, as land use changes and deforestation drivers are dependent on market factors (Busch and Ferretti-Gallon 2017), and generally enjoy wide support from policy makers (Wunder 2006).[12]

When carefully designed, PES can be effective at reducing both deforestation and poverty. The theoretical underpinning of PES is that actors who benefit from environmental services should pay for their provision, while those who support the provision of (or enhance) environmental services should be compensated for doing so. Additionally, PES programs can compensate for *avoided* destruction of an ecosystem service, paid to those most likely to prevent such activities.

8 For example, see the Roundtable on Sustainable Palm Oil, https://rspo.org/.

9 For example, for gold, SCS Global Services, https://www.scsglobalservices.com/services/fairmined-gold-certification; for aluminum, Aluminum Stewardship Initiative, https://aluminium-stewardship.org/about-asi/; for oil and gas, Equitable Origin, https://www.equitableorigin.org/; and for electronics, Sustainable Electronics Recycling Institute, https://sustainableelectronics.org/.

10 See chapters 6 and 7 for more details.

11 See box ES.1 for more details on how relative prices impact the decisions of firms and individuals.

12 An in-depth review of results-based expenditure policies is not included here. For more details on PES policies, see, for example, Cadman et al. (2016); Cavelier and Gray (2012); Cavelier and Gray (2014); Lee et al. (2018); Pagiola (2011); Vincent (2012); Wunder (2015); Pagiola and Platais (2002); and Pagiola et al. (2005). For more details on REDD+, see, for example, Chandrasekharan Behr et al. (2012); International Forestry Resources and Institutions Research Network (2014); Jagger (2010); and World Bank (2014).

Common ecosystem services targeted under PES programs are carbon sequestration, watershed services, biodiversity maintenance, and landscape amenity, although the latter is rarely the primary goal.[13]

PES schemes can provide strong incentives for forest smallholders, the very poor, and community-based groups to invest in sustainable land management. PES projects are generally designed to reduce poverty through their contributions to building alternative livelihoods that replace deforesting activities. By improving the economic situation of participants, either directly or through benefit-sharing arrangements, PES provide an incentive to fully commit to the program. If local users actively participate in the program, this has the added benefit of reducing the need for extensive monitoring, which reduces associated transaction costs and improves environmental outcomes (Velde 2014). Increases in income may also mean that individuals experience higher returns to labor, which reduces pressures to increase resource extraction (Anthon, Lund, and Helles 2008; Hansen and Lund 2018).

Without complementary PES schemes, landowners or users may search for solely extractive income-generating opportunities. Direct payments to landowners provide a market incentive to conserve ecosystem services or counter strong market incentives to exploit these lands. Considerable incentives for land conversion exist. For example, an increase in agricultural prices increases the incentive to convert forests to monocultural plantations or pastureland (Busch and Ferretti-Gallon 2017). Whether a PES program is sufficient to overcome these incentives for land conversion depends on many factors. Without effective PES schemes, however, landowners may not have a way otherwise to realize monetary gains from forest management and therefore face no incentives to preserve forests or enhance ecosystem services (Kroeger and Casey 2007).

REDD+ is an important international results-based expenditure policy for the forest sector. REDD+ is a policy instrument that forms part of the 2015 Paris Agreement. Developing countries receive payments for reducing emissions from forested lands and investing in low-carbon paths to green growth.[14] The REDD+ framework lays out a set of relevant practices, including the use of private carbon offset purchases and governmental transfer payments. There has been a learning process throughout the development and implementation of REDD+ and some programs have been more successful than others; one notable success was Brazil's reduction in deforestation rates until 2018 (Birdsall, Savedoff, and Seymour 2014; Boucher, Roquemore, and Fitzhugh 2013; Boucher et al. 2011; Carrington 2017; Ruiz 2017).[15]

Results-based expenditure policies using international transfers distribute and reduce the costs of forest conservation and management (Luttrell et al. 2018; Zhang et al. 2017). The environmental imperatives of climate change and resource constraints create the need for global actions that support management efforts.[16] The need to address these imperatives is complicated by the fact that SFM efforts urgently needed in developing countries may not have the necessary

13 One exception is the United Kingdom's Countryside Stewardship Scheme.

14 Both donor and offset funding mechanisms use results-based compensation; however, the use of offset credits to fund the program implies a redistribution of emissions rather than a net reduction.

15 However, the success of the program is highly dependent on both domestic and international support. Recently, the Brazilian program has been at the center of political conflict between the Brazilian president Jair Bolsonaro and major donors to the Amazon Fund (the major source of funding for REDD+ in Brazil), in particular Norway. In reaction to the Bolsonaro government's unilateral action to drastically change the rules for administering the fund combined with sharp increases in domestic deforestation rates, Norway has frozen more than $33 million in future funding for the program.

16 For developed countries with relatively secure fiscal positions, payments for conservation in other countries has the potential to supplement or fulfill requirements for Nationally Determined Contributions (Lee and Sanz 2017).

funds. International transfers between developed and developing countries help distribute conservation costs, which makes conservation efforts relatively cheaper for both those paying for and the recipients of REDD+ funding (Wara and Victor 2008). International transfer policies can also have knock-on effects by mobilizing developing countries to make additional investments in conservation (Mathiesen 2018). If all countries contribute, it is more equitable than mandates or other regulatory measures that enforce compliance on low-income nations (Nordhaus 2015; Samii et al. 2014; Trenberth 2017).

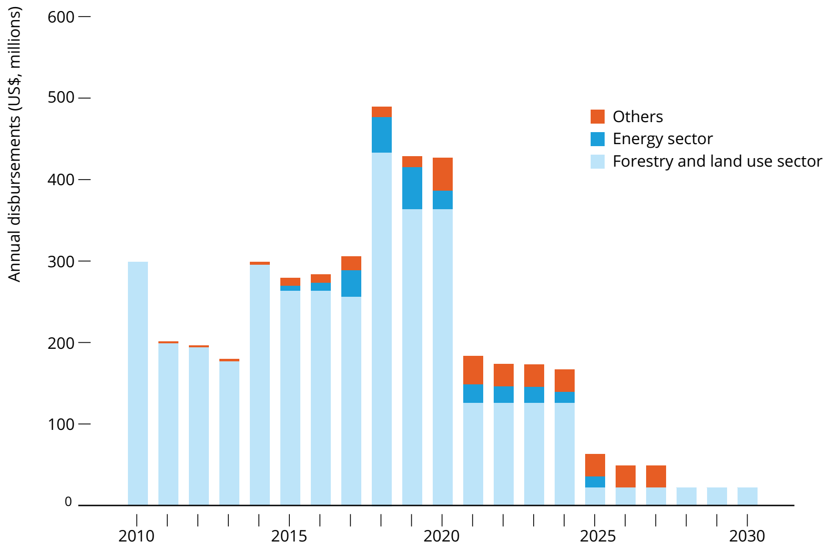
However, securing adequate and reliable funding is a major concern for results-based expenditure policies. REDD+ "will require unprecedented levels of funding" (Angelsen 2008) from developed countries. REDD+ funding must cover the opportunity and transaction costs of land users to ensure participation (Alston, Andersson, and Smith 2013; Coomes et al. 2008; Groom and Palmer 2012; Stickler et al. 2009).[17] If these costs are not covered, it can create a disincentive for smallholders and the very poor to participate; indeed, some evidence of selection bias among PES participants supports this concern (Alston, Andersson, and Smith 2013). The 12 largest programs[18] providing results-based climate finance[19] reached their estimated peak capitalization in 2015, which is expected to rapidly decline without new funding (World Bank 2017). Unless replenishment of funds can be achieved, disbursement from these programs is expected to peak between 2018 and 2020, declining thereafter (figure 1.5). The potential for funding to decline or cease is a problem for policy sustainability, as some developing countries can or will not be able to take over the needed investment (Kim 2017). Indeed, some projects have already suffered as a result of funding shortfalls (Alston, Andersson, and Smith 2013; Fletcher et al. 2016; Sunderlin et al. 2015).

17 Even if opportunity costs are covered, landowner access to credit and capital markets can impact the effectiveness of the program. The up-front costs of reforestation, timing of payouts, and up-front benefits from degradation may distort incentives to participate. For example, in the Ipeti-Embera REDD+ project in Panama, locals could allocate land to forest plantations or cattle grazing. Even though it was more profitable to reforest the land, lack of access to cash made it difficult for poor farmers to participate. The relative liquidity and lower transaction costs of cattle compared to REDD+ tree plantations made grazing initiatives more attractive than reforestation (Coomes et al. 2008). Additionally, the conditionality requirement of payments complicate payment calculations; there is a trade-off between the monitoring and enforcement costs of conditional payments and the lack of incentives provided by unconditional payments.

18 The Forest Carbon Partnership Facility (FCPF), the BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL), the Carbon Initiative for Development (Ci-Dev), the Pilot Auction Facility (PAF), the Transformative Carbon Asset Facility (TCAF), the Carbon Partnership Facility (CPF), REDD Early Movers (REM), Norway's International Climate and Forest Initiative (NICFI), Energizing Development (EnDev), the Global Energy Transfer Feed-in Tariffs (GET FIT) Program, the N2O Initiative by the German government, and the Nordic Climate Facility (NCF).

19 Ninety percent of which is dedicated to the forestry and land use sector.

FIGURE 1.5
ESTIMATED DISBURSEMENTS FROM THE 12 LARGEST RESULTS-BASED CLIMATE FINANCE FUNDS



Source: World Bank, Ecofys, and Vivid Economics 2017.

REDD+ remains costly even if the program is funded through the sale of offsets. Some have suggested lowering the need for public expenditures by funding the program through the sale of "offsets" in emissions trading schemes (Angelsen 2006; California Air Resources Board 2015; Neeff and Ascui 2009). Similar to the former Clean Development Mechanism, forest owners in developing countries or their governments would market their emission reductions in the form of tradable certificates. In case such markets could be re-created, companies in developed countries could then buy these certificates as substitutes for complying with domestic climate change obligations.[20] On a closer look, however, REDD+ requires public funding even when offsets are used at full potential (Heine, Faure, and Lan 2017).[21] For example, if—as for the Mexican national carbon market[22]—a firm is covered by a carbon tax for its energy-related emissions and can buy a forest offset to substitute for this tax payment, the forest offset costs public revenues. **The cost is still financed by the state—now through a tax expenditure instead of a direct expenditure.** The revenue loss may be felt in another country if the forestry offset from a developing country can be used by firms in developed countries to forgo carbon tax or emissions trading system auction payments. In either case, there is a loss of public revenue that could have been raised but was forgone because of the offset. Carbon markets thus do not resolve the fundamental problem that expenditure policies for forest conservation require significant public funding.

20 Although the policy debate on "market-based REDD+" is focused on emissions trading schemes as a source of funding (Anger, Dixon, and Livengood 2012; Nimz et al. 2013; Peters-Stanley et al. 2013), these offsets could also work without emissions trading schemes, as corporations could equally be allowed to deduct their payments for overseas mitigation activities from domestic carbon taxes or from renewable portfolio standards. See Metcalf and Weisbach (2012).

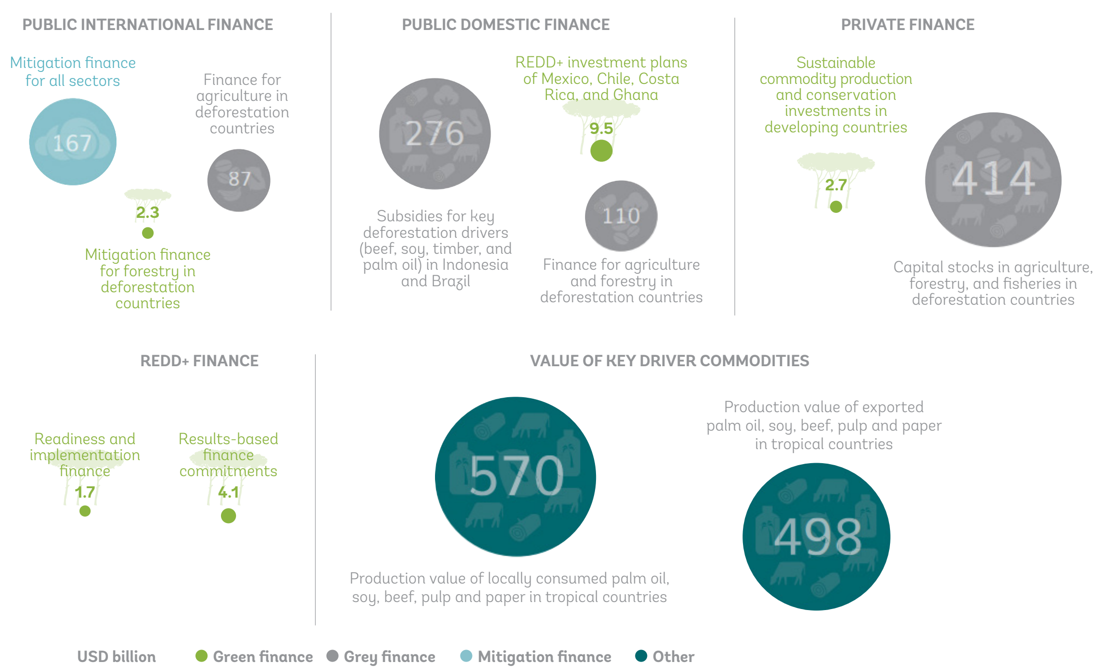
21 At present, this is not the case. Angelsen et al. (2017) argue that "a global carbon market has not materialized and is unlikely to emerge [as] the Paris agreement failed to create the binding national caps needed to boost demand for global carbon trading." However, there is recent progress in the creation of carbon markets as a result of negotiations on Paris Agreement Article 6.

22 See World Bank, Ecofys, and Vivid Economics (2017) for more details on Mexico's carbon market.

Another significant barrier to the effectiveness of results-based payment programs is the global imbalance between funding provided to such programs and that provided to deforestation drivers. Results-based payments compete with existing government policies in their influence on land use incentives. For example, REDD+ payments are competing with expenditures from the central state, like subsidies for agriculture or other deforestation-driving commodities and sectors. Domestic expenditure policies indirectly supporting deforestation outweigh the funding available through REDD+ or other projects seeking to prevent deforestation. For example, estimates from five countries show that agricultural and biofuel subsidies exceeded REDD+ finance by 600 and 9 times, respectively (McFarland, Whitley, and Kissinger 2015). As public expenditure policies reward land conversions, it can be difficult to enroll stakeholders in conservation-related expenditure programs (Dobbs and Pretty 2008).

This imbalance is also reflected in international climate and development finance flows. For example, in countries with high deforestation, forest conservation-related finance accounts for only 1 percent of global climate change mitigation development funding (Climate Focus 2017).[23] In total, the $20 billion that has been provided to support forest-based mitigation programs is trivial compared with the $777 billion in "gray finance" that has been provided to support land use sectors without clear alignment with forest and climate goals (figure 1.6). Furthermore, the forestry sector itself is under-funded; the amount of private sector investment falls short of that needed both to meet international demand and to fund SFM (figure 1.7). Environmental fiscal policy, both through reforms of existing fiscal regimes and through environmental taxation mechanisms, can help address these imbalances and channel investment toward SFM.

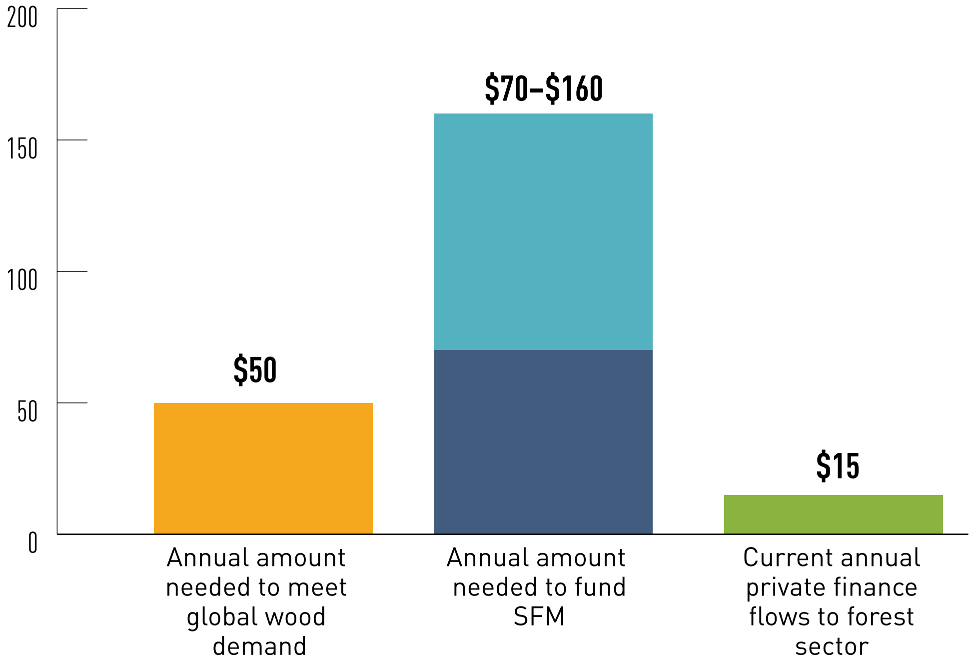
FIGURE 1.6
TOTAL GREEN AND GRAY FINANCE FLOWS, SINCE 2010



Source: Climate Focus 2017.

23 This figure is starker when one considers that forests represent up to 30 percent of the mitigation required to meet the goals under the Paris Agreement.

FIGURE 1.7
FUNDING GAPS IN THE FOREST SECTOR (US$, BILLIONS)



Source: World Bank 2016.
Note: SFM = sustainable forest management.

ENVIRONMENTAL TAXATION

STEFAN SPECK

Fundamentals of environmental taxation

Environmental taxation tackles one "market failure" by internalizing external costs. Markets provide the most economically efficient means of allocating scarce resources. However, this allocation is not always a fair one as markets can also be subject to failures, like the fact that external costs and benefits are not reflected in prices of goods and services. This market failure provides the rationale for governmental intervention and relies on the "polluter-pays" principle as an economic principle for allocating the costs of environmental damage control so that "a polluter has to bear all the costs of preventing and controlling pollution that [they] originate" (OECD 1992).[24] Government can intervene by creating new markets, such as for tradable emission permits, or by building on existing structures to correct market failures by using environmental taxes.

The main role of environmental tax policy is to influence marginal incentives by sending price signals.[25] By incorporating the environmental costs of productive activity, market prices will reflect their true costs and firms can make better-informed decisions about SFM investments. Environmental tax policy can also affect the incentives of government; implementing an environmental tax raises the profile and attention paid to SFM so the government might sustain future revenues (World Bank 2005).

24 For more details on the polluter-pays principle, Coasian bargaining, and Pigouvian taxes, see Heine et al. (2020).
25 See Hanson and Sandalow (2006); GTZ (2005); Parry et al. (2014); and Parry et al. (2012).

Environmental taxes can be designed to achieve quantity policy targets. The prevailing economic concept of designing environmental taxes is based on Pigou's (1920) seminal work of setting the tax rate equal to the marginal external damage, thereby controlling an unregulated free market by integrating the external costs into the price. However, the calculation of the marginal external damage is quite complicated in practice as the value of damages can vary significantly across the landscape (see box 1.1 for the Amazon case), though it is feasible to set the tax rate close to the optimal level. A more pragmatic approach is to set the tax rate at a level that is estimated to be sufficient to achieve a given environmental target. This is known in economic literature as the "standard-price approach" (Baumol and Oates 1971). It is a good solution in environmental policy areas for which quantifiable reduction targets are more established than the shadow prices for valuing an externality. For example, Coady, Parry, and Shang (2018) state that "concerning the valuation of carbon damages, the standard approach in the economics literature has been to use the social cost of carbon (SCC).… However, countries may instead prefer to use CO_2 values that are in line with their mitigation pledges under the 2015 Paris Agreement, which can differ substantially from the SCC."

BOX 1.1 VALUING ECONOMIC LOSSES RESULTING FROM AMAZON FOREST LOSSES

JON STRAND

Changes in the Amazon rain forest cover are associated with a wide range of impacts, locally, regionally, and globally.[a] A rational land use policy for the Amazon region dictates that deforestation not take place as long as the total economic value of the protected forest, properly defined and measured, exceeds the value of deforested land in its best alternative use (such as for agriculture or urban development). The opportunity values—for example, in timber or agricultural values of converted forest—are relatively easy to observe, and private parties have high incentives to exploit them. The protection values are more difficult to both observe and measure.[b]

A useful concept of rain forest value is the loss to the region when a small section is lost, corresponding to the *marginal value* of the rain forest. *Negative* externalities can occur when losing a small forest area induces further losses due to fragmentation (increasing forest fire risks) and increased forest dryness. These knock-on effects increase marginal forest values because losing a small part of the forest also imposes losses on the remaining forest. Positive externalities can occur when endemic or otherwise threatened species migrate from deforested to remaining forest areas, or when tourism and recreation activity moves similarly. Such effects reduce marginal values. A marginal valuation approach, while theoretically appropriate, is highly demanding in terms of data needs. For practical purposes, the figures described below largely reflect average values.[c]

HYDROLOGICAL IMPACTS OF AMAZON DEFORESTATION

Amazon deforestation leads to changes in the amounts and variability of rainfall, both within and outside of the Amazon. Such impacts can be felt for economic activities including agriculture, river navigation, public water supply, and hydropower production.[d] The maximum impacts of these rainfall changes on soy-growing areas exceed \$200/ha/year; the average loss impact calculations indicate losses up to only about \$10 ha^{-1} $year^{-1}$ of lost Amazon forest, with similar figures for beef.

REDUCED-IMPACT LOGGING

The marginal value from reduced-impact logging (RIL)[e] could be low in most of the region, for two main reasons. First, a large part of the Amazon is now either protected or administered as indigenous zones, and commercial timber extraction is not permitted in these areas. Second, extraction costs are high for much of the remaining forest area, in particular in the western Amazon where roads are virtually nonexistent.[f] Net values can, in smaller selected areas, reach up to \$320/ha/year but are mostly less than \$20/ha/year.

MAPPING OF FOREST FIRE ACTIVITY IN THE AMAZON

Forest fire activity has two contradictory value impacts. Forest fires *reduce average forest values* as burnt forest is lost or has a lower market value. Forest fire occurrence, conversely, tends to *increase marginal forest values* in many parts of the Amazon. Forest fires are more prevalent in remaining parts of the forest that have been fragmented by fire or logging, leading to externality effects whereby initial forest losses increase fire frequency and severity, consuming more of the forest, serving as a multiplier on the initial loss. This factor has implications for the value of preventing deforestation, which is magnified by reductions in forest fire risk. Impacts on (average) values for standing forests as a result of forest fires are relatively modest; they are highest in the southernmost and southeastern Amazon but exceed \$1 ha^{-1} $year^{1}$ only in small parts of the region (and go up to a maximum of around \$5 ha^{-1} $year^{1}$).

BIOLOGICAL RESOURCES INCLUDING BIODIVERSITY

The Amazon's biological resource base has various values and aspects that render its economic valuation a challenge. One set of such values is the direct (actual and potential) tangible values through services rendered such as pollination and through bioprospecting (the possibility of commercial utilization of the relevant biological resources, for instance, through new pharmaceutical products). But the biological resource base of the Amazon has nonuse (existence and preservation) values to all of humanity, including for the populations of the region for generations to come. Since there are generally no markets for most of these resources, their values depend largely on subjective preferences by the present generation of humans, and values ascribed by these to future generations. A further challenge is to distinguish fruitfully between "marginal" and "average" biodiversity impacts and values. One issue here is that the number of species extinctions that will follow from moderate deforestation of the Amazon (say, 10–20 percent) could be limited, while species losses from total deforestation would likely be very large (possibly, in the million range or more).[g]

a. Strand et al. (2018) provide more details.
b. Strand et al. (2018) have measured some of these values with relatively high integrity and precision but captured far from all forest ecosystem values.
c. Many potential value elements, including bioprospecting, tourism, nutrient retention, and protection against flooding and droughts, which are important for the overall value of the Amazon and play a large role in much of the related literature, are not included because of our inability (at this time) to map their economic values in a solid and meaningful way.
d. The model calculations of rainfall impact from Amazon deforestation alternatives are highly uncertain and more uncertain for larger assumed future forest losses. While in most parts of the region rainfall will be reduced in response to deforestation, in some smaller parts of the region the prediction is even *increased* rainfall.
e. RIL implies a delicate balance between timber extraction and quality of remaining forest in the Amazon. Extracting all high-value timber may be economically attractive in the short run, but it could reduce the value of the remaining forest, including its biodiversity, in the longer run.
f. The highest net values are found in areas west of Belém and in certain selected areas in western Amazonia with good road or flotation access.
g. See *The Economist* (2013) special report on biodiversity.

The efficiency objective of environmental taxation consists of providing the right incentives to market participants to consider the costs that their actions impose on third parties.[26] For example, a forester harvesting trees causes the release of greenhouse gases, which cause global damages, reduce soil fertility, increase sedimentation in waterways that impose a harm on people in the vicinity, and so on. By incorporating these costs into the price of timber, an environmental tax reform gives the forester the incentive to cause environmental damage only when his personal gain exceeds the cost imposed to society.

26 See Pigato (2019) for more details on the efficiency and effectiveness objectives of environmental taxation.

The effectiveness objective of environmental taxation consists of reducing the environmental damage in physical terms. In most situations, there is no conflict between the efficiency objective and the objective to minimize environmental damages. Well-designed environmental taxation simultaneously provides the incentives to internalize costs that market participants impose on others and achieves significant reduction in those damages (see, for example, Li, Linn, and Muehlegger 2014; Miller and Vela 2013; Mukherjee and Chakraborty 2015).

Environmental taxation, unlike many other policies, can also generate revenue. While some of this revenue will go toward the implementation costs of the new policy, the remainder could be used for various purposes. For example, governments can use tax revenue toward expenditures that enhance forest sustainability, to compensate impacted groups, or toward a reduction in other taxes.

Environmental taxation may, however, be better suited to address particular resources. Environmental taxation can be used where the sustainability of the resource or the environmental impact from industry activities is not reflected in current prices. Environmental taxation can also be used to reduce dependency on specific resources, including those "with high economic importance or increasing demand, import dependency, geological scarcity or geopolitical risk of supply" (Eckermann et al. 2015).

Environmental tax policy is appropriate in the following circumstances:

a. Where environmental degradation is caused by many different sources
b. Where mitigation costs differ significantly among actors
c. Where there is not just one technological fix for a government to mandate
d. Where environmental damages or the products associated with environmental damages are relatively easy to measure and monitor[27]

While these conditions might not be perfectly met in all situations, diversions can be taken into consideration and fiscal policy can be adjusted accordingly. For example, the measurement of damages can be quite costly and much technical capacity would be needed to identify all sources of environmental degradation. Instead, calculations based on an average marginal external damage or the standard-price approach can be used as an estimate and need only be revised periodically. Furthermore, costly monitoring could be alleviated using third-party monitoring or certification agencies, as recommended in chapter 6.

27 Adapted from Hanson and Sandalow (2006).

Role for environmental taxation in the forest policy landscape

Environmental fiscal policy can fill gaps left by other policies. Insufficiencies in both regulatory and results-based expenditure policies create the need for supplementary price-based instruments with lower costs or potential contributions toward domestic resource mobilization. In regulatory policy, these gaps are largely to do with marginal incentives and enforcement capacities, while expenditure policies fall short mainly because of their funding needs, ability to meet future demand, and global imbalances in support provided for forests versus deforestation drivers.

Revenue-neutral or revenue-raising environmental fiscal policy mechanisms can fill these gaps in certain situations. Environmental tax policy can create a system of domestic incentives that promote growth and formalization of the industry, thereby channeling private investment toward sustainable production practices and helping to overcome limited public sector and international donor funding.[28] Reforming existing fiscal regimes can help address the imbalance between funding provided for forest conservation and for deforestation-driving sectors and commodities.

Environmental taxation is generally the most growth-friendly policy instrument for reducing environmental damages, particularly in countries with limited administrative capacity.[29] The typical alternative to environmental taxation has been regulations such as prohibitions against damaging activities or rules mandating the adoption of certain technologies. Instead of the "red tape" approach, environmental taxation is an incentive-based instrument; rather than prohibiting an activity, its external costs are incorporated into the price. A uniform price for environmental damage equates abatement costs across firms, households, and sectors (Parry et al. 2012). This approach enables environmentally damaging businesses to continue their activity if it is economically efficient to do so, in the sense that the private gain from continuing the activity (that is, producer and consumer marginal surplus) exceeds the social cost of the activity (in other words, the tax rate). In this way, environmental taxation reduces economic activities that cause more harm than benefit. A profit-maximizing firm will reduce its environmental damage to the level at which its private marginal cost for achieving these damage reductions equals the environmental tax. Through this private optimization, environmental damage continues when the continuation of the activities increases overall economic value in society at large—and ceases otherwise.

Another cost advantage of environmental taxation over regulatory policy is the scope of environmental damage reduction opportunities.[30] For example, an environmental forestry tax can provide firms with an incentive to switch to more efficient production techniques. Firms can then choose which techniques are most cost-effective, allowing for a wide range of possibilities. The damage reductions occur where they are least expensive, minimizing economy-wide costs (Ackerman and Stewart 1985; Buchanan and Tullock 1975). Environmental taxes can provide firms with an incentive to source more sustainable inputs (input substitution effect) and reduce degradation (abatement effect) while simultaneously providing an incentive to consumers to purchase goods with lower associated environmental damages.[31] By contrast, a regulation mandating that foresters adopt a specific production method (for instance, RIL) uses a much

28 See Kim (2017) for more details.

29 See Chiroleu-Assouline and Fodha (2011); Fullerton (2001); Goulder et al. (1999); Kaplow and Shavell (2002); Krupnick et al. (2010); Sterner and Coria (2013).

30 For example, Aldy et al. (2010) and Krupnick et al. (2010).

31 Output substitution effect; for example, Sterner and Coria (2013).

narrower set of options for reducing environmental impacts. In this case, some of the cost advantages of firms with cheaper damage mitigation opportunities than their competitors remain unused, and the overall environmental target is reached at greater cost.

These cost advantages tend to hold over time. A regulatory standard would require forest operators to adopt a certain production technique or processing efficiency. After achieving this mandate, there is no incentive for the logging firm to continue improving SFM. However, with environmental taxation, firms face dynamic incentives to continue reducing costs (Sterner and Coria 2013).

Environmental fiscal policies may also help improve regulatory enforcement. While such policies will not directly improve enforcement capabilities themselves, they can help reinforce compliance by aligning fiscal incentives with environmental objectives. Environmental tax policy creates additional incentives to comply with and even go beyond regulatory standards. Where enforcement issues stem from contradictory incentives faced by public actors, environmental fiscal reforms (such as ecological fiscal transfers) may also help improve regulatory enforcement.[32]

Environmental taxation may also be lower-cost than results-based expenditure policies. Environmental taxation, including the introduction of new mechanisms and the reform of existing regimes, can be done at low cost by reusing existing systems. Environmental considerations can easily be built into existing fiscal incentive structures. Compared with policies like REDD+, environmental taxation substantially decreases funding requirements. In some cases, environmental fiscal policies may even contribute to domestic resource mobilization. In other cases, environmental fiscal policies are best combined with a particular type of temporary results-based expenditure policies: policy crediting, that is, to reward a country for environmental improvements that are directly attributable to the adoption of the fiscal policy.

BOX 1.2 GLOBAL EXTERNALITIES FROM FOREST ECOSYSTEM SERVICES

Benefits from forest protection are shared across countries, justifying an interest of countries in protecting forests outside their borders. Also, countries that do not have significant forests themselves have an interest in supporting the protection of global forests because the benefits of these forests are globally shared. Global forest services can be classified as *resources* (industrial wood, fuelwood, non-wood forest products), *amenities* (spiritual, cultural, historical), *biospheric reservoirs* (biodiversity, climate stabilization), *social* (sports fishing/hunting, recreation, ecotourism) and *ecological services* (water, health and soil protection) (Shvidenko et al. 2005). As a result of these nonmarket services, "forest degradation through over-exploitation generally implies an economic cost far beyond the loss of timber production potential" (Leruth, Paris, and Ruzicka 2001). Part of these forest services are global externalities that accrue to countries other than those hosting the forest, thereby justifying a sharing of costs for the maintenance of the forests. Here we list the two most important sources of these external benefits.

CLIMATE

Globally, forest biomass stores over 1 trillion tonnes of CO_2 (Nabuurs et al. 2007), so there is a large stock even compared to the current total flow of greenhouse gas emissions of about 40 billion tonnes of CO_2 annually (IPCC 2014). All countries have an interest in avoiding the release of this stock of carbon into the atmosphere, which is happening at a rate of 6 billion tonnes per year (Mendelsohn et al. 2012).

Besides forests as sources of emissions, their cross-border importance arises from their role as emission sinks. Forests sequester one-quarter of anthropogenic carbon emissions and

32 See chapter 11 for more details on ecological fiscal transfers.

do so much more cheaply than other mitigation technologies (Eliasch Review 2008; Golub et al. 2009; Kartha and Dooley 2015; Nabuurs et al. 2007; Rose et al. 2012; Stern 2006).

BIODIVERSITY

Forests are the world's largest repository of terrestrial biodiversity; tropical rain forests account for between 50 percent and 90 percent of land species (CBD 2010; WRI 1992). Contingent valuation studies suggest that these species have large intrinsic and nonuse values to humans in general (OECD 2001), including in developed countries for faraway forests (Navrud and Strand 2013). Besides these nonpecuniary externalities, all countries share in the consumer benefit from commercial uses of forests, which include biotechnology (Alho 2008). For example, 25–50 percent of new medical products and pharmaceuticals are derived from genetic resources that are largely dependent on biodiversity (Barthlott et al. 2005).

Environmental fiscal policy can be implemented unilaterally, which results in more control by individual states over their domestic policies. This is true especially when environmental fiscal policy is compared with international results-based expenditure policies such as REDD+, which are exposed to the variability of international politics and allow for less control by sovereign recipient states. The existence of positive global externalities provided by forests (box 1.2) justifies international financing to compensate low-income countries for protecting these resources. However, developing countries do not need to wait for such funding to become available to implement domestic forest conservation and management policy; indeed, there are many rationales for forest-producing countries to act unilaterally through domestic environmental fiscal policy (for example, see box 1.3).

BOX 1.3 POPULAR SUPPORT FOR FINANCING INTERNATIONAL AND DOMESTIC FOREST CONSERVATION POLICIES

JON STRAND

Both in developed and in developing countries, political debates recur if the public attributes high-enough values to tropical forests in developing countries to justify forest conservation.[a] For politicians in developed countries, it is important to know if their electorate values overseas forests like the Amazon strongly enough to justify the provision of international financing such as REDD+. And if this international funding remains limited, it is important to know for politicians in developing countries if their electorate values their domestic forests enough to justify bridging the gap in international support with national domestic policy action. The empirical economic literature on the willingness to pay (WTP) for forest protection provides answers by estimating the value that laypersons or experts ascribe to international forest protection.

The value prescribed to rain forest protection may be proportional to GDP. According to recent valuation surveys that examined the WTP to support Amazon rain forest protection in North America, Norway, and Brazil, the average national valuation per household was close to proportional to countries' average (PPP-adjusted) GDP per capita (Strand et al. 2018). The results are given in table B1.3.1.

TABLE B1.3.1
TOTAL AND PER HECTARE VALUES ASSIGNED TO BIODIVERSITY PROTECTION IN THE AMAZON (IN PPP US$)

SURVEY	ANNUAL VALUE PER HECTARE OF AMAZON RAIN FOREST PROTECTED	ANNUAL VALUE PER HECTARE OF AMAZON RAIN FOREST ASSIGNED TO BIODIVERSITY PROTECTION	TOTAL VALUATION PER YEAR OF PROGRAM TO PROTECT 10% OF AMAZON BIODIVERSITY
U.S./Canada (SP survey)	$92	$86	$5.2 billion
Delphi survey of experts (NA experts only)	$70–$100	$42	$2.5 billion
Brazil (SP survey)	$120	$18	$1.1 billion

Source: Strand et al. 2018.
Note: NA = North America; SP = stated preference.

Some countries may value *biodiversity* protection differently. A significant difference between the Brazilian figures and those from North America and Norway is that while the latter samples' values of protecting 10 percent of the *biodiversity* in the Amazon was about 40 percent of the total protection value for the entire program (about $37), this share in Brazil was only 15 percent (about $18 on a PPP basis; $10 on a nominal basis). Thus, while the population in North America is willing to pay $5.2 billion ($37 times 140 million households) annually to eliminate a "high risk of extinction" among 10 percent of the Amazon's species up to 2050, the population of Brazil is willing to pay $1.1 billion ($18 times 60 million) for the same program. The latter is smaller but still considerable. Per capita WTP to protect Amazon biodiversity among Brazilians is then found to be about 37 percent of per capita WTP in North America (on a PPP-adjusted basis; 23 percent on a nominal basis). This share is not much lower than Brazil's per capita GDP relative to that of the United States, which is 43 percent (on a PPP-adjusted basis; 27 percent on a nominal basis).

These are lower-bound estimates because they only quantify part of the benefits provided by forests. The results reflect only a fraction of the total global values related to protecting the Amazon rain forest against probable or possible forest losses over the next half-century. The social value of the forests may significantly exceed their perception in stated valuation surveys (see box 1.1). Many ecosystem values are not accounted for, and more research on WTP from additional regions is needed as well.[b] Foresighted policy makers should then take additional values into consideration, even though stated values are informative for political support of conservation actions.

The reported valuations nevertheless show that in both developed and developing countries, populations do value the protection of tropical forests, which justifies governments in both to finance forest conservation. For developed countries, international financing of overseas conservation efforts like REDD+ are justified by the populace's stated willingness to pay. For developing countries, the WTP of their own populace justifies that countries should put in place domestic conservation policies even in cases where those have to be domestically funded. The finding of a domestic WTP for policies in developing countries is essential for this publication, which is focused on domestic policy action that can be implemented even when external funding is not forthcoming. Not only is it possible to act through domestic fiscal policy, as shown in the rest of this volume, but such action is also politically justified—even when it costs. Failing to act would destroy value also to the domestic population.

The results also show that in poorer countries, more international financing and/or cheaper conservation policies are needed. The relation between GDP and the willingness to pay for conservation justifies preferential access to international financing for poorer countries. It also justifies that domestic policies for forest protection in developing countries should be of the cheapest possible type, such as fiscal policies that may even raise funding like forest taxes.

a. More details provided in Strand et al. (2018).
b. Some of these are already valued in spatial detail for the Brazilian Amazon by Strand et al. (2018).

Environmental fiscal policy is well suited to foster the industry investment necessary to meet future demand for forest products. Environmental tax policy can channel private investment toward more sustainable pathways. Not only will this help meet and tame the dramatically growing demand for forest products while avoiding excessive environmental damages, but it will also situate forest-producing countries to meet the levels of sustainable production increasingly demanded by international consumer markets. Compared with results-based expenditure programs for abstaining from forest exploitation that can restrict the supply of forest products, environmental taxation supports private investment in SFM and green industry growth. Results-based expenditure programs also may be better suited to target smallholders or subsistence farmers,[33] whereas an environmental tax can better target commercial producers. When environmental tax policy is used in conjunction with information instruments, it can target both the supply of and demand for forest products.[34]

Environmental fiscal policy can also address the large imbalances between funding provided to forests and that provided to deforestation-driving sectors and commodities. Reforms to existing fiscal regimes, including subsidy and other incentive reforms, budget tagging, and ecological fiscal transfers, can help reduce funding provided to deforestation drivers. If funding can be better balanced, it will reduce contradictory incentives for forestland conversion. In addition, these reforms can be designed to be revenue neutral or even revenue raising.

Despite these advantages, environmental fiscal policy in forestry has lagged other sectors. For example, environmental taxation is much more widespread for fuels for several reasons, often related to access of information. The calculation of the emissions and other environmental damages from fuels is much more straightforward and easier to tax (Parry et al. 2014) than those from forestry activities and deforestation, which can significantly vary across landscapes. Furthermore, the high levels of informality that characterize the forest sector present specific problems—like information access—which do not exist for highly regulated commodities like fuels (see chapter 2 for more details). However, these constraints to using environmental taxation in the forest sector can be overcome through careful instrument design (see chapter 3 for more details) and new policy combinations (see chapters 5, 6, and 7 for more details).

33 Environmental taxation may be less appropriate in these cases because of the distributional issues of taxing vulnerable populations as well as because of the risk that these actors will enter informal markets in response to higher costs.

34 See chapters 6 and 7 for more details.

Environmental Taxation in the Forest Sector

Environmental taxation for the forestry sector can help reduce the incentives for deforestation and forest degradation. Environmental tax policies for the forest sector include both reforms to existing fiscal regimes and subsidies as well as new mechanisms and policy combinations.

Reforming the fiscal framework for the forest sector can reduce competitive advantages between land uses. Current fiscal regimes may be "blind" to how they impact the incentives for different land uses. Fiscal incentives can be heavily biased toward agricultural or other commodities. Reforming such policies may reduce the incentive to convert forestland to other uses. For example, in Brazil the fiscal system was changed in the 1990s and forests were classified as a "productive land use" and were thereby given an exemption from the Rural Property Tax. This reform reduced the incentive for farmers to remove trees from their land because they no longer needed to pay higher land taxes on these plots.[35] However, Brazilian land taxes still provide an incentive for land clearing: The tax rate decreases as greater portions of the property in question are used for agriculture, encouraging landowners to convert forested land to agricultural use.[36] A reduction of subsidies to other land use sectors combined with other fiscal policy reforms may "level the playing field" by reducing the opportunity costs of maintaining forest stands.[37]

Traditional timber sector taxes can also be adjusted or reformed to optimize the incentives sent to private actors.[38] Traditional sectoral taxes include excise taxes, royalty charges including area fees, corporate income taxes, and export taxes, among others.[39] Forestry taxation can make up a significant portion of government revenues (including export earnings) in a variety of countries (table 1.3). If environmental taxation were implemented, it could be a significant new source of revenue in some countries.

35 See box 3.1 for a discussion of the impact of land taxation on land conversion.
36 Furthermore, many properties have less than the legal minimum level of forest cover, which suggests that the problems are much deeper than just a poorly designed property tax.
37 See chapter 12 for more details on fiscal reforms for the agriculture sector and chapters 13 and 14 for more details on fiscal reforms for nonrenewable extractive industry to reduce deforestation associated with these sectors.
38 See chapters 3 through 7 for more details.
39 Discussed in more detail in chapters 3 and 4.

TABLE 1.3
FOREST-RELATED EXPORT EARNINGS AND GOVERNMENT REVENUE FOR SELECT FOREST-PRODUCING COUNTRIES

	BENIN	CENTRAL AFRICAN REPUBLIC	CONGO, DEM. REP.	CONGO, REP.	MALI	MALAYSIA	ECUADOR	NICARAGUA
% OF EXPORT EARNINGS	0.2	48.7	0.4	11	25	4.2	0.83	
FOREST-RELATED GOVT. REVENUE (% OF TOTAL GOVT. REVENUE)	0.03	9	0.4	0.9	0.7	1.54	0.0003	0.13

Source: GTZ 2005.
Note: Benin: export 2002, revenue 2000; Central African Republic: export 2003, revenue 2003; Congo, Dem. Rep.: export 2002, revenue 2002; Congo, Rep.: export 2003, revenue 2002; Mali: export no year given, revenue 1999/2000; Malaysia: export 2002, revenue 2002; Ecuador: export 2002, revenue 2004 (est.); and Nicaragua: revenue 2003.

Furthermore, new environmental tax and fiscal policy combinations can also be implemented. For example, for countries struggling with deforestation related to internationally traded goods, implementing environmental taxation through export taxes is one option that is relatively easy to implement even in countries with low governance capacities. Other revenue-neutral and revenue-raising environmental fiscal instruments that are relatively simple to implement even under various constraints include fee-and-rebate (feebate) mechanisms and ecological fiscal transfers, along with reducing subsidies in other land use sectors that might be encouraging deforestation.

The effectiveness of forest taxes depends on the ability of administrators to target the right tax base. A tax on timber products effectively penalizes timber output. The amount of timber produced can have relatively high or low associated damage to the forest in question, depending on the type of production process used. Environmental forestry taxes should, therefore, ideally target the production methods themselves, instead of timber output, to influence incentives to invest in SFM. The effectiveness of a given policy will also depend on a functional governance system including the tax administration's capacity for developing a coherent overall tax policy[40] to achieve the Sustainable Development Goals, the objectives of the Paris Agreement, and other national objectives.

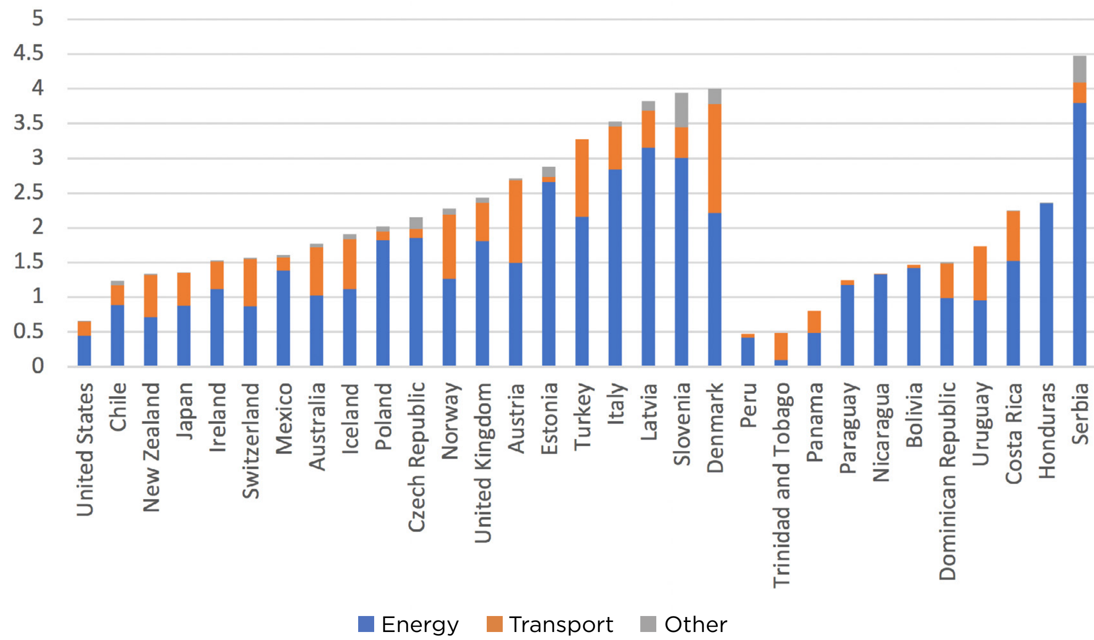
Environmental taxes in practice

Environmental taxes have been used by some nations as a significant source of government revenue. Beginning in the 1990s, there was a push from Nordic countries to "green" their tax code (Parry et al. 2012; Speck et al. 2006). From there, environmental fiscal reform spread to Western Europe and then to emerging and developing economies (Speck and Gee 2011). In typical OECD countries, environmentally justified taxes make up 3–10 percent of total tax revenues (figure 1.8), and there is ample room to scale this up. Among OECD countries, environmental tax revenues grew between 1994 and 2016 (from $423.3 to $742.5 billion, with a peak of $795.4 billion in 2014)

40 Including investing in institutional improvements relating to the supervision, implementation, and governance of forest taxation schemes.

but declined slightly as a share of tax revenues (6.2 percent to 5.2 percent) and GDP (1.9 percent to 1.6 percent; figure 1.9).

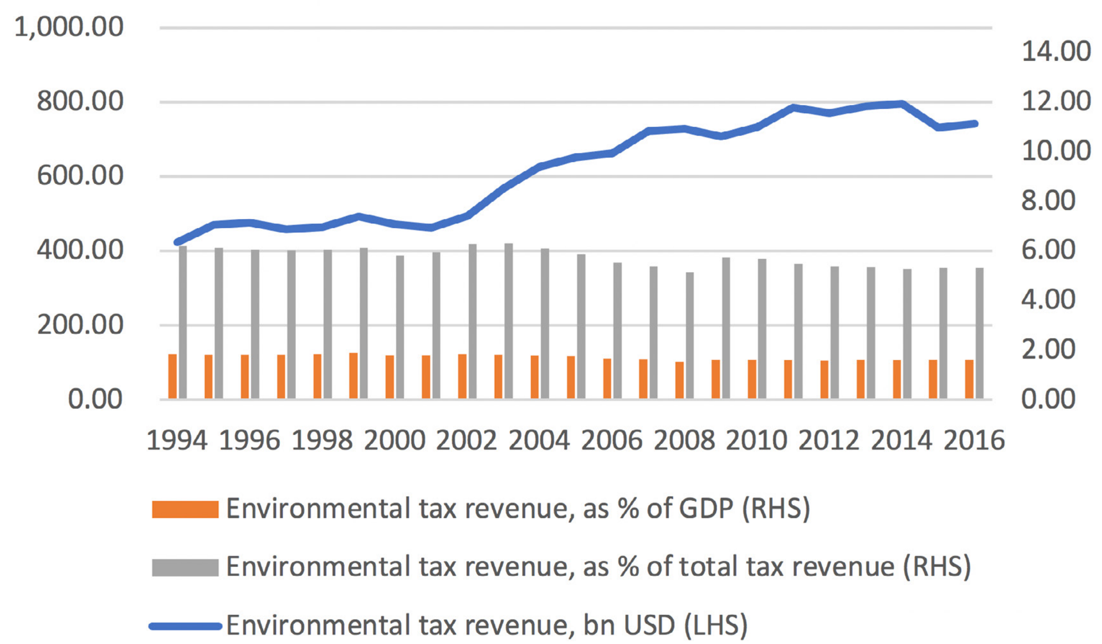
FIGURE 1.8
REVENUES FROM ENVIRONMENTALLY RELATED TAXES (% OF GDP), 2016



Source: OECD.stats (database), OECD, Paris, https://stats.oecd.org/Index.aspx?DataSetCode=ENV_ENVPOLICY.

The share of environmental damage and resource taxes in total environmental tax revenues is rather negligible to date since environmental taxation so far has focused on the energy and transport sectors (figure 1.8). However, given the land use and forestry sector's contribution to global GHG emissions, environmental taxation of the sector could contribute significantly to domestic resource mobilization and climate change mitigation.

FIGURE 1.9
ENVIRONMENTAL TAX REVENUES IN OECD COUNTRIES, 1994–2016



Source: OECD.stats (database), OECD, Paris, https://stats.oecd.org/Index.aspx?DataSetCode=ENV_ENVPOLICY.
Note: The line (left axis) shows gross tax revenue in OECD countries increased 1994–2014, but the bars (right axis) show revenues declined as a proportion of GDP and total tax revenues. GDP = gross domestic product.

Conclusion

There are many forest conservation policy approaches that can be taken; however, some may be more effective for low-income countries. While regulatory approaches (like standards or bans) can be quite effective at achieving policy objectives, they require adequate administrative and enforcement capacity and can be less efficient than economic instruments. However, economic instruments like results-based expenditure policies also require higher levels of governance capacity and are much costlier to implement (because of the introduction of new institutions and administrative arrangements), and some (like REDD+) rely on external donor funding. Environmental taxation, by contrast, is a low-cost policy that can be implemented unilaterally and, if well designed, can be effective even in countries characterized by low governance or administrative capabilities.

Environmental fiscal policy remains complementary to other forest conservation and management policies. Although environmental tax policy should be utilized much more than it currently is to incentivize forest conservation and sustainable management, it is not a silver bullet. Regulations, information instruments, and economic instruments like results-based expenditure policies, among others, are key components in a forest-smart policy mix.[41] Indeed, environmental taxation can improve the outcomes from other policies, helping policy makers achieve environmental and climate objectives at lower overall cost.

41 More details regarding complementary policy reforms for sustainable forest management can be found in World Bank (2019b, 2019a).

The remainder of this publication discusses various environmental taxation policies as well as other revenue-neutral or revenue-raising fiscal instruments that are well suited for low-capacity environments. A variety of environmental fiscal measures are available and, when well designed, can be implemented under a wide variety of governance arrangements. Key environmental tax instruments include reforms to existing forestry fiscal regimes, fee-and-rebate mechanisms, and environmental export taxes. Other revenue-neutral and revenue-raising environmental fiscal instruments include ecological fiscal transfers and the reduction of subsidies in other land use sectors that might be encouraging deforestation. Subsidy reform will also be a key policy strategy, especially for countries under budgetary constraints. If subsidies that currently promote deforestation and degradation can be reformed in accordance with climate-smart guidelines, this could free up additional revenues for countries to use toward accomplishing environmental, climate, or other national objectives. This publication does not present a comprehensive list of fiscal instruments that can help promote sustainable forests, but rather it represents a starting point for policy makers in low-capacity environments who are looking for manageable instruments that can also contribute toward domestic resource mobilization.

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2

Forestry Fiscal Reforms and the Informal Sector

ANIL MARKANDYA, ERIN HAYDE & RATNIKA PRASAD

Introduction

Environmental fiscal policy is currently underused in the forest sector. This is partly due to the difficulty in taxing forest-dependent activities and peoples. Of the utmost concern is the impact of environmental taxation on poverty and distribution, but feasibility is also a concern, as a large share of forest production is informal in many countries. While informal production delivers many key benefits to local economies and in particular to vulnerable communities (Loayza and Rigolini 2011; Alatas and Newhouse 2010), it is also seen as a significant barrier to the achievement of sustainable management of tropical forests (Kishor 2012).

Environmental fiscal policies to reduce deforestation and forest degradation will interact with informal sector operations in various ways. Higher taxes or more stringent environmental regulations are usually associated with formal sector exit, as operators avoid higher costs. However, through careful design of specific fiscal instruments (and the use of complementary policies), this impact can be minimized and the incentives to improve environmentally friendly practices can be provided along with other benefits. Given data limitations and the dependence of policy recommendations on the individual characteristics of a given jurisdiction (including the structural reasons for informality and barriers to formalization), more research is needed on this topic before specific policy recommendations can be developed.

Environmental fiscal policy should thus be implemented within a comprehensive policy approach. Environmental fiscal policy is not a silver bullet, especially when considering the mobilization of resources needed for national sustainability objectives. A comprehensive policy package that encourages poverty reduction, industry formalization, and sustainable forest management will be needed to ensure economically, socially, and environmentally sustainable forests.

The Informal Forest Sector

The informal sector includes various kinds of economic activity (like home-based work, self-employment, and casual or seasonal work, among others) that is neither taxed nor monitored by the government.[1] In the forest sector, informal production is largely undertaken by small-scale chainsaw

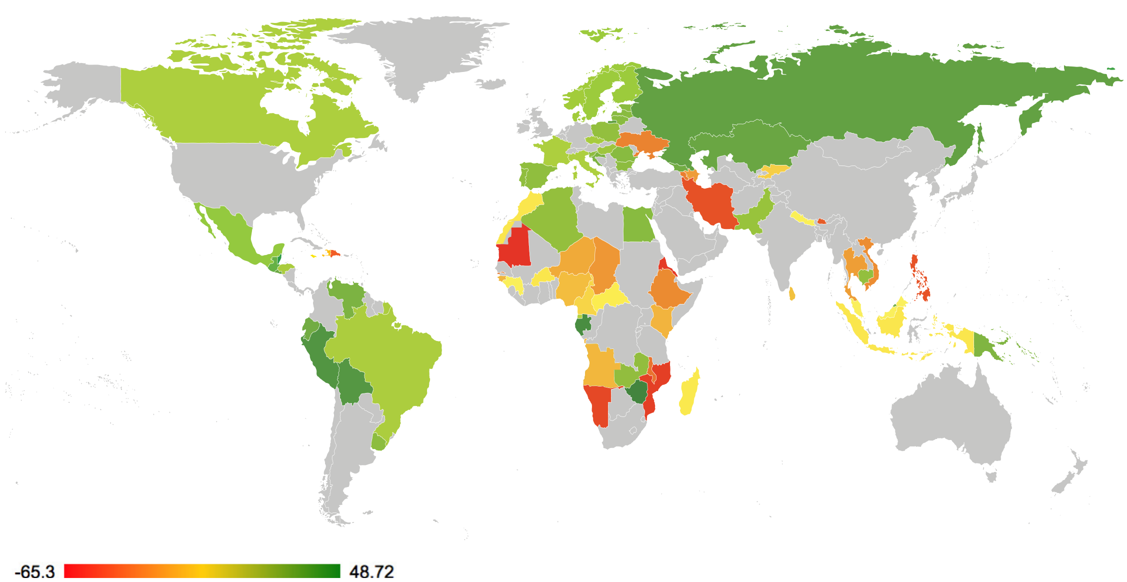
1 Here, we do not address the various approaches to defining informality, and instead refer the reader to Henley, Arabsheibani, and Carneiro (2009) and Perry et al. (2007). It is also important to note that formal sector operations are necessarily always legal.

millers.[2] Informal forest producers may also participate in illegal practices, like illegal logging or harvesting. While informal operations are not always "illegal," in some countries the informal sector is also the biggest driver of illegal logging, as in Cameroon (Alemagi and Kozak 2010).

Informal sector activity is undertaken for various reasons. Often it is linked to forest dependency (Benson et al. 2014; FAO 2018), and it is a survival strategy for people with limited human capital or various other constraints. However, informal production is also a way for individuals and firms to avoid regulations, taxes, and other costs associated with formal production (Bacchetta, Ernst, and Bustamante 2009).

Large informal forest sectors are prevalent around the world, especially in developing countries (Whiteman, Wickramasinghe, and Piña 2015). The informal share of the forest sector tends to decline with a country's level of development, with some outliers. Figure 2.1 compares the share of informality in the economy overall with that of the forestry sector. In general, developed countries with large forest sectors have a smaller informal share within that sector than in the wider economy.[3] On the other hand, many developing countries have larger informal forest sectors than their overall economy's level of informal activity. Particularly large differences are found in Eritrea, Iran, Mauritania, Mozambique, Namibia, and the Philippines.

FIGURE 2.1
COUNTRIES WHERE THE FORMAL FOREST SECTOR IS MUCH SMALLER OR MUCH LARGER THAN THE FORMAL SECTOR OF THE ECONOMY AS A WHOLE



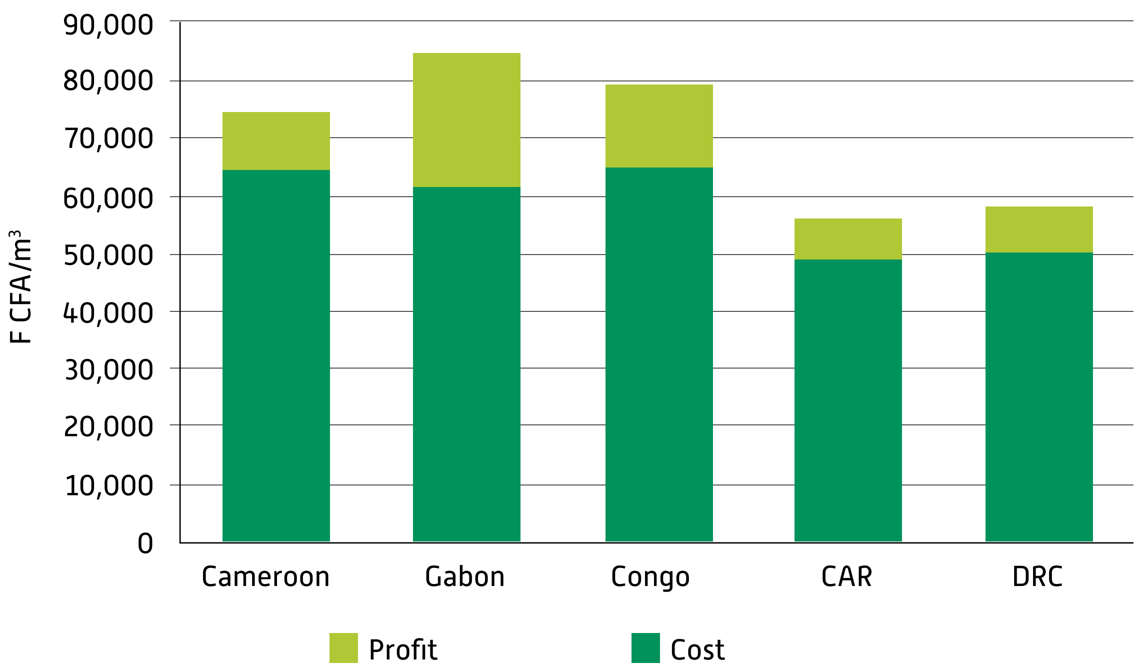
Sources: FAO 2014; Medina and Schneider 2018.
Note: The numbered scale indicates the differences between the shares of the informal sector of the whole economy minus the shares of the informal sector as part of gross value added in the forest sector. Dark green (positive numbers) indicates countries where the informal forest sector is smaller than the informal sector of the wider economy. Dark red (negative numbers) indicates countries where the informal forest sector is larger than the informal sector of the wider economy. Countries range from -65.3 (dark red) to 48.72 (dark green); see annex 2A for details.

2 Despite the fact that chainsaw milling is a legal and regulated activity in most tropical countries, enforcement of chainsaw milling regulations is usually low (Kishor 2012).

3 There are some emerging economies and developing countries in that group as well, such as Brazil, Honduras, Papua New Guinea, Guatemala, Ecuador, and the Republic of Congo. See annex 2A for individual country details. This is consistent with the findings from the wider literature, for example, Loayza and Rigolini (2006).

The informal forest is an important source of employment and income globally, in particular for rural and vulnerable communities (Cerutti and Tacconi 2006). For each chainsaw miller in the formal sector, it is thought that there are more than three in the informal sector (FAO 2018). As the government does not monitor informal sector activity, it is difficult to provide precise figures on the size of the informal forest sector. However, one estimate places the number of people involved in the worldwide informal forest sector at 40–60 million (FAO 2018). This figure is in addition to the numerous forest-dwelling indigenous peoples and local communities who primarily depend on forests for their livelihoods (Arce 2019). Furthermore, informal chainsaw milling is a profitable activity, with profits exceeding costs in all countries examined (figure 2.2). In some countries, the informal sector thus accounts for a significant share of employment and income opportunities (Kishor 2012). However, whereas the contribution of formal forest sector output to world GDP is estimated at 0.9 percent of global GDP, including also the informal forest sector just adds 0.2 percent (FAO 2014).

FIGURE 2.2
PROFITS AND COSTS ASSOCIATED WITH INFORMAL CHAINSAW MILLING



Source: Adapted from Lescuyer and Cerutti 2013.
Note: Cost includes all the costs of chainsaw-harvested products, such as wages, tree purchases, and transport. CAR = Central African Republic; DRC = Democratic Republic of Congo.

TABLE 2.1
SHARE OF INFORMAL ACTIVITIES IN GROSS VALUE ADDED OF THE FOREST SECTOR

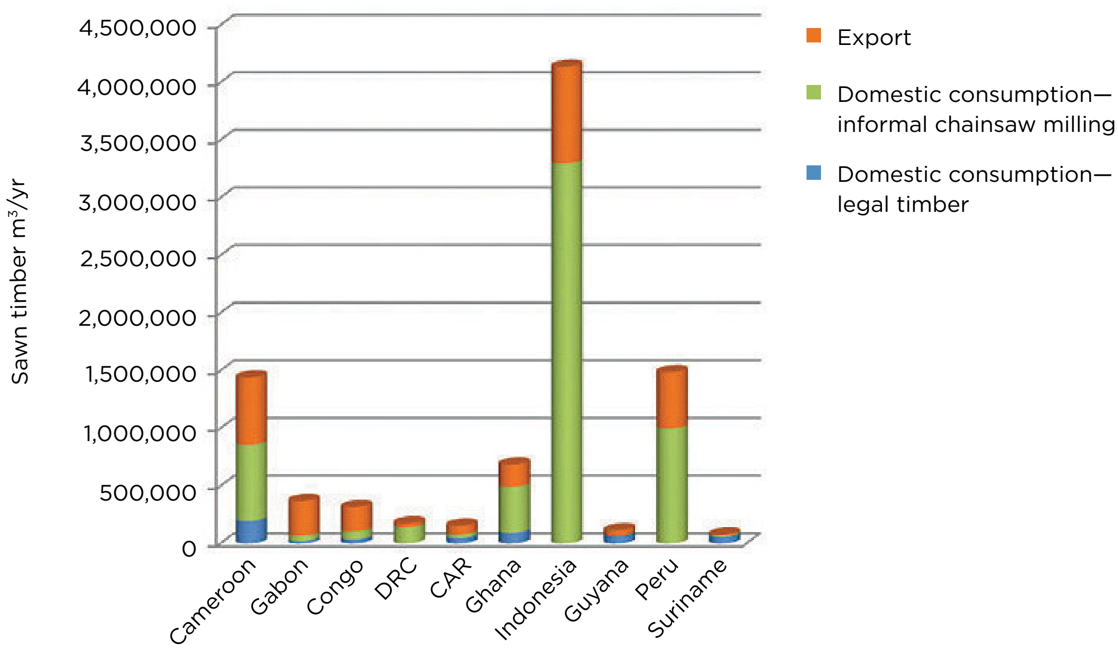
WORLD BANK INCOME GROUP	SHARE OF INFORMAL FOREST SECTOR IN GVA (%)	STANDARD DEVIATION (SD)	COUNTRIES WITH INFORMAL SECTOR SHARE MORE THAN ONE SD HIGHER THAN THE AVERAGE	COUNTRIES WITH INFORMAL SECTOR SHARE LESS THAN ONE SD HIGHER THAN THE AVERAGE
Low income	57.6	23.7	Democratic Republic of Congo, Eritrea, The Gambia, Somalia	Cambodia, Republic of Congo, Republic of Korea, Zimbabwe
Lower middle income	46.9	27.9	Armenia, Bhutan, Côte d'Ivoire, Djibouti, Mauritania, Moldova, Nigeria, Philippines	Egypt, El Salvador, India, Pakistan, Solomon Islands, Uzbekistan
Upper middle income	31.3	26.6	Angola, Azerbaijan, Dominican Republic, Mongolia, Namibia, Thailand, Turkmenistan	Dominica, Iraq, Jordan
High income	6.0	6.9	Argentina, Cyprus, Equatorial Guinea, French Guinea, Ireland, Italy, Trinidad and Tobago, Uruguay	

Source: FAO 2014.
Note: GVA = gross value added.

Informal forest sector activity can be divided into three main subsectors: timber, fuelwood (for example, charcoal), and non-wood forest products (NWFPs).[4] Informal operators in these subsectors may engage in a range of activities, including subsistence agriculture, small-scale trading, and artisanal crafts and services. The extent of informal production for each subsector depends on a number of different factors and varies between countries.

4 NWFPs are distinct from non-timber forest products (NTFPs). NWFPs include such forest products as mushrooms, resins, and animal products like game or honey. The NTFP category, on the other hand, includes fuelwood, wood chips, and other wood-based fiber products (for example, from bamboo or cork). See FAO (1999) for more details.

FIGURE 2.3
TIMBER VOLUMES ON DOMESTIC AND FOREIGN MARKETS FOR SELECT TROPICAL COUNTRIES



Source: Kishor 2012.
Note: CAR = Central African Republic; DRC = Democratic Republic of Congo.

In general, informal sectors are larger for products destined for domestic and regional markets. For timber, exported products are usually associated with large-scale, formal sector production, while domestic and regional consumption is largely supplied through informal chainsaw milling (figure 2.3).[5] Fuelwood (for example, charcoal) is largely produced for domestic and regional consumption: Informal sectors can be quite substantial and informal operators often participate in illegal harvesting, as in the Congo Basin (Behrendt, Megevand, and Sander 2013). Equally for NWFPs, much of the production is informal, is often subsistence-related, and is dominated by a mostly female labor force (FAO 2018).[6]

Both domestic and international timber markets in tropical countries are supplied by the informal sector. Most of the timber produced for domestic consumption in tropical countries is supplied through informal chainsaw milling rather than formal production (figure 2.2). Even timber exports (which tend to be supplied by large-scale formal operators) can include informal sector products, as domestic timber can be mixed into international shipments, whether by legal means or by counterfeit paperwork (Kishor 2012). In many countries, informal timber production is overtaking formal production; for example, in the Congo Basin, the informal sector accounts for

5 Timber products can usually fetch higher prices on international markets (especially Western markets) than on domestic markets. As such, large formal operators tend to sell on the international markets, leaving a domestic demand gap that is usually filled with low-quality products through informal supply networks. However, this is not always the case; in particular, the problem of international trade in illegal timber has drawn considerable attention in recent years as illegally produced logs can be mixed in with legally certified logs destined for international markets (Kishor 2012).

6 However, more information is needed particularly for the NWFP sector: Because of high levels of informality as well as other factors, not enough information is available on the true value and extent of NWFPs and services (Forestry Department 2016). Therefore, this chapter largely focuses on the informal sectors for timber and fuelwood.

as much as 87 percent of total production (table 2.2). This expansion of informal production is due in part to an increase in illegal logging (Arce 2019).

TABLE 2.2
INFORMAL TIMBER PRODUCTION IN CENTRAL AFRICA

Volumes of timber (m^3) in 2009	Cameroon (Yaoundé, Douala, Bertoua)	Gabon (Libreville)	Congo (Pointe-Noire, Brazzaville)	DRC (Kinshasa, daily flow only)	CAR (Bangui)
Informal timber production for domestic markets	662 000	50 000	99 000	146 000	33 000
Informal timber production for unofficial export to nearby countries	60 000	0	0	> 50 000	6 000
Total informal timber production	722 000	50 000	99 000	196 000	39 000
Formal timber production (from industrial waste or small-scale permits) for domestic markets	198 000	20 000	10 500	Not estimated	34 000
Official exports of industrial timber	343 000	150 000	93 000	29 000	41 000
Total legal timber production (domestic consumption + official exports)	541 000	170 000	104 500	29 000	75 000
Informal production / total production (%)	57	23	49	87	34

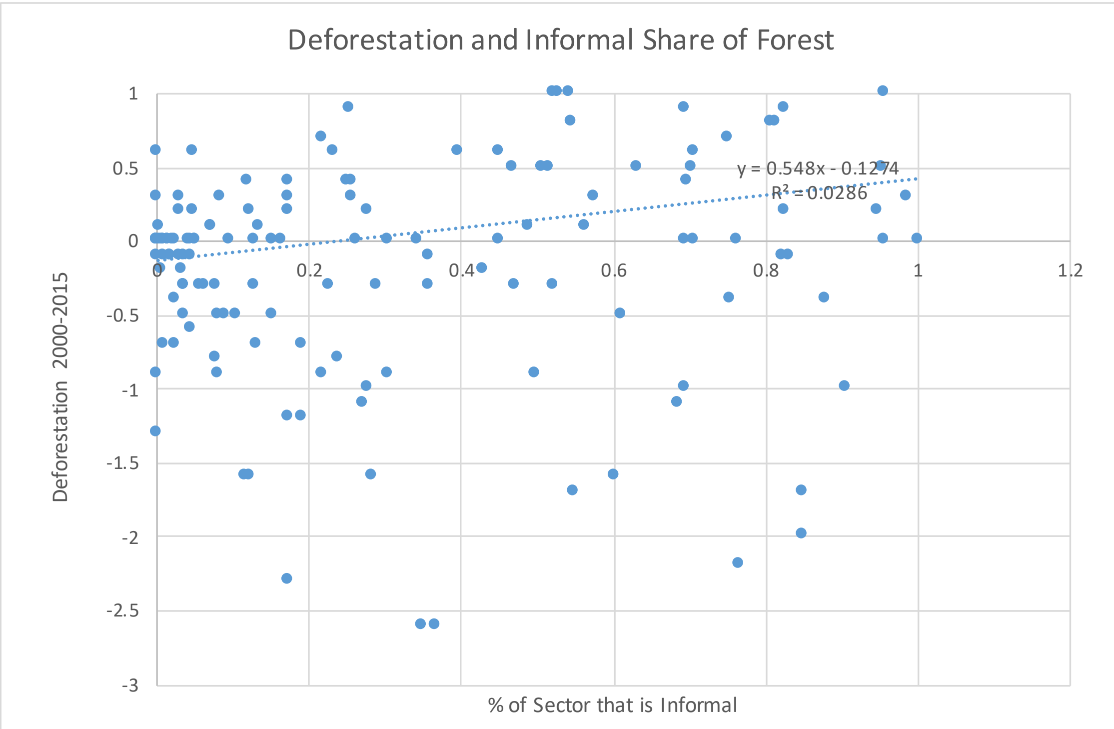
Source: Lescuyer and Cerutti 2013.
Note: CAR = Central African Republic; DRC = Democratic Republic of Congo.

Most of the growing domestic fuelwood needs are met by the informal sector. In tropical countries, most of the locally traded wood is used for fuel or made into charcoal (Kishor 2012). Charcoal consumption has increased by 20 percent in the past 10 years and almost doubled in the last 20 years, putting pressure on forest resources in Sub-Saharan Africa, Southeast Asia, and South America (FAO 2018). For example, in Tanzania charcoal makes up 95 percent of the energy supply, but there is no comprehensive policy framework governing this sector, which has led to a highly informal and unregulated sector with direct environmental impacts (FAO 2018). The fuelwood sector is one of the major threats to forests, especially as energy demands are predicted to increase (Megevand et al. 2013).

The informal forest sector and sustainability

The informal forest sector has numerous impacts on environmental sustainability, including both deforestation and forest degradation. Available data indicate a positive (but very weak) relationship between the informal share of the forest sector and the rate of deforestation in each country. Figure 2.4 shows the plot for the average deforestation rates between 2000 and 2015 against the informal share of the forest sector. Despite the positive relationship, there are many outliers and only about 3 percent of the variation in deforestation can be explained by the share of the informal sector. Informality, on its own, does not appear to be a decisive deforestation driver as deforestation rates are determined by many interdimensional factors (see Busch and Ferretti-Gallon 2017).

FIGURE 2.4
DEFORESTATION RATES AND THE SHARE OF THE INFORMAL FOREST SECTOR



Sources: World Bank 2018; FAO 2014.

Negative environmental impacts stem from the fact that informal operators do not tend to comply with environmental and other regulations, and (as they often operate outside regulatory frameworks) they cannot easily be sanctioned for their activity.[7] Informal operators may not use or respect land use management plans that would otherwise function to protect vulnerable forests. For example, most of Kinshasa's fuelwood needs are met through informal harvesting from degraded and mostly cleared forests within 200 kilometers of the city (Behrendt, Megevand, and Sander 2013). In addition, Durst and Enters (2001) point out that the presence of informality makes the introduction of reduced-impact logging—a component of SFM—more difficult, even with subsidies; informal timber can be sold at lower cost, which depreciates the entire market and undermines efforts to promote RIL.

Negative environmental impacts also stem from the fact that the informal sector tends to have low productivity levels (Arce 2019). Small-scale chainsaw millers carry out the majority of informal forest sector production (for timber and charcoal). Beyond harvesting methods, charcoal production itself is inefficient: Most charcoal production in developing countries uses simple technologies with conversion efficiencies of between 10 percent and 22 percent, compared with more than 30 percent with more advanced technologies (FAO 2018). The low level of mechanization and productivity levels of the sector result in greater inefficiency and stress on forest resources and excessive logging.

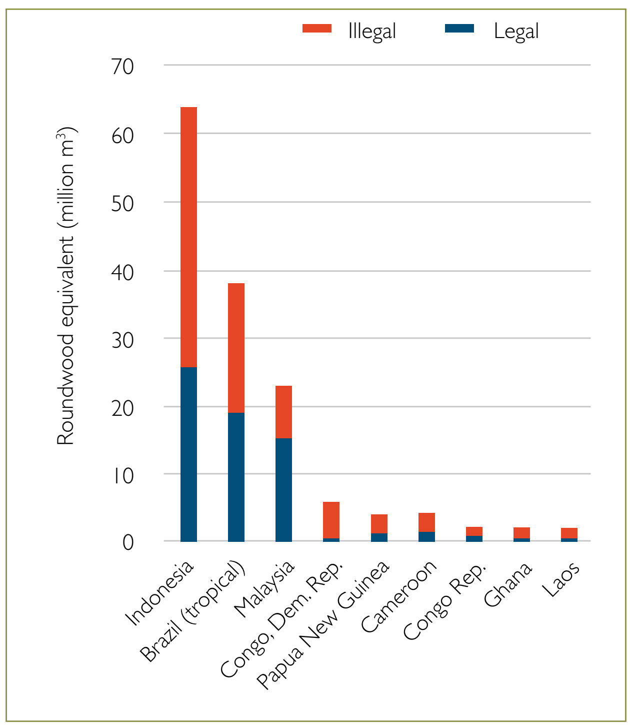
7 If informal forestry operators also engage in illegal logging, harvesting can be especially damaging when done in protected areas or when protected species are removed.

Beyond environmental impacts, the informal forest sector can contribute to unsustainable governance-related outcomes. Large informal forest sectors can put pressure on formal operators, which reduces their incentives to follow the law. For example, formal operators may face significant pressure to launder products by combining informal (or illegal) logs with formal ones. In this way, the informal sector can facilitate the creation and maintenance of corruption networks and money laundering, increasing risky speculative investments, crime, and trafficking (Kishor 2012). The informal sector also hampers fiscal sustainability because informal operators do not pay taxes or other fiscal charges; this represents lost revenue that otherwise would have been available to invest in SFM or other public goods like electrification. Furthermore, in the presence of large informal markets, the true contributions of the forest sector are underestimated in national account statistics like GDP and value added (FAO 2018);[8] this—combined with suboptimal tax revenues collected from the sector—may lead governments to underinvest in the sustainable development of the sector.[9]

Informal forest sectors can also hamper efforts toward social and economic sustainability, as both informal sector products and livelihoods supported tend to be of lower quality than in the formal sector (Arce 2019). The informal forest sector is often characterized by low wages and productivity, gender equality gaps, highly hazardous work, lack of job security, and inadequate safety and health conditions (Arce 2019; Briassoulis 1999). Informal sector production may be largely undertaken by women, who are also paid less than men on average. For example, in Sub-Saharan Africa, women earn about 32 percent less than men (FAO 2018).

Another key determinant of the informal forest sector's impact on sustainability is the level of illegal logging.[10] Illegal logging accounts for 15–30 percent of global forestry production and up to 90 percent in tropical primary producer countries (INTERPOL 2016) (see table 2.3 and figure 2.5). The expansion of illegal logging also tends to reinforce the weight of informal work in the sector (ILO 2019), further

FIGURE 2.5
ESTIMATED PRODUCTION OF LEGAL AND ILLEGAL TIMBER BY SELECTED TROPICAL COUNTRIES, 2013



Source: Jianbang et al. 2016.

8 For instance, the Zambian government estimates that including the informal economy in the calculation would increase the forest sector's total annual contribution from 5.5 percent to 23 percent of GDP (Forestry Department 2016).

9 Developing countries tend to spend less on their forest sectors compared with other countries despite the fact that the sector delivers significant returns (Whiteman, Wickramasinghe, and Piña 2015).

10 While the informal sector engages in illegal logging and harvesting in many countries, the available data show little statistical relationship between illegal logging and informality. Estimates for illegal logging have a large degree of uncertainty, but CIFOR estimates for 19 countries (Jianbang et al. 2016) do not show a strong association between the estimated mean percent of illegal logging and the share of informality in the forestry sector (see annex 2A for more details).

impacting sustainability. Illegal logging impacts not only environmental sustainability but also fiscal sustainability, costing billions in government revenues every year. Revenue loss estimates range from $30 billion to over $157 billion per year (Montero et al. 2019).[11] Not only does illegal logging and its trade directly cost government revenues, it also is a drain on resources with little gain for domestic operators (Kishor 2012).[12]

TABLE 2.3
SHARE OF ILLEGAL LOGGING IN TIMBER HARVESTED, SELECTED COUNTRIES

	% ILLEGAL	RANGE FOR ILLEGAL SHARE	
COUNTRY	**WB (*)**	**PERCENTAGES**	
Bolivia	80.0%	80	80
Brazil	33.5%	20	50+
Cambodia	90.0%	90	90
Cameroon	50.0%	50	65
Colombia	42.0%	42	42
Congo, Dem. Rep.	90.0%	90	90
Congo, Rep.	70.0%	70	70
Ecuador	70.0%	70	70
Gabon	70.0%	50	70
Ghana	52.0%	34	70
Indonesia	75.0%	60	80
Lao PDR	45.0%	45	80
Liberia	80.0%	80	80
Malaysia	35.0%	35	35
Papua New Guinea	70.0%	70	70
Peru	80.0%	80	90
Russian Federation	30.0%	10	50
Thailand	40.0%	40	40
Vietnam	30.0%	20	40

Sources: Jianbang et al. 2016; World Bank 2006.
Note: *Mean values are estimated from Jianbang et al. (2016). Jianbang et al. (2016) provide estimated percentages of illegal logging from four different sources; the percent illegal shown is an average calculated from these four sources. The range of illegal production share shows the minimum and maximum percent of illegal production estimated for a given country from these four sources.

11 Estimates are, however, uncertain because of the lack of consistent and reliable information on the extent of illegal logging.
12 For example, when illegal forest products are exported, they go through a complicated chain of operators who wield disproportionate market and political power. As a result, the majority of profits accrue to middlemen operating outside the country of origin. See Kishor (2012) for more details.

Fiscal Instruments and the Informal Forest Sector

Informal activity impacts the type of environmental fiscal instruments that can be used to target forest sector operations. Informality encumbers the collection of traditional forestry taxes, especially where governance capabilities are low.[13] Furthermore, when implementing environmental fiscal policy for the forest sector, policy makers should consider the equity impacts on vulnerable and forest-dependent populations. Given forests' strategic function for resource-dependent, rural, indigenous, and other vulnerable communities, any policy reforms should be designed to avoid regressive impacts on these populations (Boyd et al. 2005; Hanson and Sandalow 2006). However, this does not mean that the policy in question should not be implemented at all; rather, the policy should be complemented with a compensation mechanism or other targeted interventions. Implementing higher taxes on charcoal, for example, would most likely not have the desired effect: As the majority of charcoal is produced and consumed by poor households with few alternatives, the tax would either penalize poor populations (Anthon, Lund, and Helles 2008) or both.[14] Such a tax policy could then be complemented with targeted payments to low-income households to account for any regressive effects and adverse incentives.

Despite these challenges, environmental fiscal policy instruments can promote sustainable forests while impacting the informal sector itself. Fiscal reforms have several effects on both the extensive and intensive margins.[15] The impact from fiscal reforms on the informal sector through the extensive margin will depend on the magnitude of net revenues raised and on the design of fiscal mechanisms. An increase in overall taxation of forest-related activities may create an incentive to reduce the use of labor and/or capital, to shift out of formal production, or to cease production altogether. If undesirable, such motivation can be reduced if fiscal reforms involve tax rebates for some practices as well as provide support to firms to increase their profitability and productivity.

Adjustments on the intensive margin can also create incentives for producers to move either into or out of the informal sector, depending on how the feebates are structured. If they entail a large increase in costs, fiscal reforms can encourage more intensive and environmentally damaging production and may also encourage a move outside the formal sector where both taxes and regulations are avoided. Avoiding the creation of adverse effects requires inducements so that, at each stage of production, the taxation system gives a fiscal advantage to the more sustainable option. As noted in other chapters, a feebate scheme charged only to logging concessions most likely will still not be enough to bring the shadow economy into the light. If, however, the feebate scheme is applied where chokepoints (unavoidable control points) exist, pressure to formalize and certify can be created. If a processor faces the same feebate scheme, there is the incentive to ensure that inputs are purchased from certified logging companies to receive the tax rebate and lower costs. If this scheme is applied along the timber supply chain, it reinforces the pressure on actors to join the formal market.[16]

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13 In many cases, forest sector administration is characterized by high levels of corruption, manifested through para-fiscal levies like bribes, kickbacks, and protection money (Kishor and Oksanen 2006). On the one hand, these para-fiscal charges tend to increase the size of the informal sector, as the avoidance of costs is one of the main incentives to leave the formal sector. On the other hand, large informal sectors also reinforce the creation and maintenance of corruption networks (Kishor 2012), as discussed above.

14 If a tax increases the price of goods, certain consumers may not be able to afford the increase in costs and may substitute away from the higher-priced good. If there is no readily available substitute for forest products, consumers may turn to the informal market. This demand for informal market goods reinforces incentives for firms to join the informal sector. The regressive effect of taxes can lead to informal market entrance if no other policy instruments are used in combination to mitigate this impact.

15 The extensive margin refers to the overall use of different inputs in the production activities of the forest sector. The intensive margin of adjustment refers to changes in the labor and capital-output ratios.

16 See chapters 6 and 7 for more details on using fiscal mechanisms to target chokepoints along the commodity supply chain.

The ultimate impact on the informal forest sector from fiscal policy will depend on the structural reasons for informality within a given country. Several stylized models explain the presence of informality within an economy as a whole (La Porta and Shleifer 2008, 2014). The exclusion model states that informality may be caused by burdensome regulations that increase the costs of formalization (de Soto 1989, 2000). If this model holds in an economy, policies that reduce the compliance costs of formalization would lead to a reduction in the share of informal sector activity. The rational exit model states that the benefits of formalization may be outweighed by its costs, and firms (as rational actors) will exit the formal market if the costs outweigh the benefits (Levy 2008; Maloney 2004). In this case, policies that increase the benefits and reduce the costs of formalization may help reduce the size of the informal sector share of production (Perry et al. 2007). Finally, the dual economy model of informality states that informal firms serve different customers or are not competing with formal firms (La Porta and Shleifer 2014; Harris and Todaro 1970; Lewis 1954). Informality in this case may then fall autonomously, without policy intervention, as the economy grows (Rothenberg et al. 2016). These models of informality are not mutually exclusive, and informality may be caused by a combination of these factors.

Depending on which informality model (or combination) characterizes an economy, fiscal policies may be designed to reduce incentives to join the informal sector.[17] In the exclusion and rational exit models, tax rebates based on legal accreditation with the state and verification of SFM practices would be appropriate (see chapters 6 and 7 for more discussion). The same instruments may also have some effect if the dual economy paradigm is the dominant one; however, in that scenario demand-side initiatives that target vulnerable communities may have more impact.

However, data on the links between fiscal reforms and informal forest activity are very limited. Country-level research is thus needed to resolve the potential for fiscal reforms to promote SFM in general and on its impacts on the informal sector. Here, we briefly examine several of the environmental fiscal reforms described in this publication, which may be able to work despite large informal sectors or even to incentivize formalization of the forest sector.

1. **Changing tax types**

   Reforming the existing tax and fee structure in the forest sector can impact the informal sector in various ways. For example, imposing fixed costs (like area fees or property taxes) tends to drive marginal players out of the formal industry. This may professionalize the industry, making SFM more feasible. In general, if the environmental fiscal reforms reduce the costs or increase the benefits of formalization, they could help reduce the size of the informal forest sector. These reforms are most appropriate for the timber subsector, as its formal production tends to be more regulated than the fuelwood or NWFP subsectors.

2. **Substituting labor taxes with environmental taxes**

   Another promising fiscal policy approach is the revenue-neutral environmental fiscal reform, whereby taxes are shifted away from economic "goods" such as employment or labor and

17 Despite the potential of environmental fiscal instruments to produce positive policy outcomes, other policy instruments will also be necessary. Fiscal policy is not a silver bullet—other policies are needed to address all the issues related to informality and the sustainability of the forest sector.

toward environmental "bads" such as deforestation or forest degradation.[18] If environmental fiscal reform is implemented, policy makers can reduce some of the fiscal barriers to formal employment (for example, by lowering income taxes).

The effects of fiscal reforms will depend on the changes to overall tax revenues. One can consider the following cases: (i) overall forest taxes are increased, and (ii) they remain the same.[19] If taxes increase significantly, there is the possibility to use revenues to reduce other taxes and/or directly support vulnerable groups negatively affected by the reforms (for instance, via targeted income transfers). Using some revenue to reduce other taxes, especially payroll taxes for low-income labor, would be beneficial to the wider economy. Although there are tax interaction effects to consider, most modeling exercises in economies with significant unemployment show that imposing an environmentally desirable tax and reducing employment taxes does reduce unemployment as well as improve environmental indicators. Using revenues in this way would also reduce the incentive to exit the formal sector because of the employment tax (Markandya, González-Eguino, and Escapa 2013).[20]

The amount by which employment taxes could be decreased, however, will not be large unless the forest sector is a major part of the whole economy. If the reforms do not raise significant additional taxes, the scope for reducing other taxes will be small as will be the pathway for influencing the informal sector. The potential for fiscal reforms involving forest taxation combined with a reduction of employment taxes in the formal sector is better in countries where forests rents account for a large share of GDP, which is the case in Burundi, the Central African Republic, the Democratic Republic of Congo, Guinea-Bissau, Liberia, Mozambique, Niger, the Solomon Islands, Somalia, and Uganda (World Bank 2018).

3. **Variable environmental taxes**

Variable environmental taxes (that is, Pigouvian tax rates that vary according to the environmental impacts) can be implemented to target the sustainability of production of the forest sector. Previously, variable environmental tax rates were too complicated to put in practice in the forest sector (Leruth, Paris, and Ruzicka 2000); however, recent policy developments have made them accessible to a wide range of countries.

The taxation-and-rebate (feebate) instrument is a promising policy mechanism that could both reduce the share of informal sector production and promote SFM. The feebate (similar to a deposit-refund system) is a fiscal mechanism under which all formal timber harvesters, processors, and/or retailers are charged a high tax rate based on the worst-case assumption that their production was unsustainable.[21] When accredited producers can prove to fiscal administrators that their production has been more sustainable, they are offered a tax rebate. Proof can be in the form of third-party certification agencies (that is, FSC or PEFC for timber and Roundtable on Sustainable Palm Oil for palm oil), or government-sponsored certification (such as the Mexican Forest Certification System for timber in Mexico and Indonesia Sustainable Palm Oil for palm oil in Indonesia). In this way, the tax rate varies depending on

18 See Castellucci and Markandya (2012); Markandya (2012); Markandya, González-Eguino, and Escapa (2012, 2013); and Pigato (2019) for more details on environmental fiscal reform and tax shifting.

19 It is difficult to imagine forest tax reforms resulting in a decline in forest revenues. In particular, feebate mechanisms can be designed in a revenue-neutral manner; see chapters 5, 6, and 7 for more details.

20 See Pigato (2019) for more details on environmental fiscal reforms.

21 The (Pigouvian) tax rate in this case corresponds to the environmental damage caused by producing one unit of timber or other wood product. For more details on this mechanism and the choice of tax rates, see chapters 6 and 7.

production practice. Again, this reform may be most appropriate for the timber subsector, as individuals and firms in the fuelwood and NWFP subsectors often operate outside of formal tax systems.

Introducing a feebate system would impact the informal sector in various ways depending on how the existing fiscal regime is modified. If the reform involves a basic increase in the tax payable, an incentive is created for firms engaging in activities that are only marginally profitable in the formal system to consider moving out of it and continuing as an informal or illegal enterprise (Loayza 1999). If, however, the reform offers the possibility of reducing the level of tax payable upon the compliance with set conditions, then the incentive would work in the other direction—that is, to encourage enterprises in the informal sector to move to the formal sector.

The incentive to formalize and implement SFM practices would be strengthened if the tax structure involved rebates downstream in the supply chain. As there are significant challenges with taxing harvesters directly (owing to their large number, their isolated and dispersed location, informality, and risk of corruption), policy makers might decide to apply the feebate scheme to formal processors or retailers of forest products.[22] Under a downstream feebate, the pressure to formalize comes from both private and public agents. If downstream processors can reduce their tax bill by sourcing from accredited and sustainably certified suppliers, it helps reduce the market for uncertified (and informal) forest inputs. A downstream feebate would hence be more effective in reducing informality in countries with formal domestic wood processing and retail industries.

The magnitude of any impact will depend critically on the size of the tax rates applied and how they change the status quo, the feebates offered, and other taxes in the system. There is considerable theoretical discussion in the literature on the design of an ideal system but little empirical evidence so far as major packages of such reforms have not been tried. Yet there are some countries with modest fiscal reforms in the forest sector along the lines suggested that merit evaluation. This is a topic for further research.

4. **Public procurement**

Public procurement policies, while not usually included as a traditional fiscal instrument, can be easily implemented even in the case of large informal sectors. Public procurement policies are regulations that stipulate what kinds of and how purchases can be made with public funds. Many countries have already implemented this reform for sustainable forest products; for example, the United Kingdom implemented the Timber Procurement Policy, which stipulates that all timber and wood products must be from independently verifiable legal and sustainable sources (see chapter 6 for more details). By requiring all timber and wood products publicly purchased to be legal and sustainable, governments send a powerful signal regarding their commitment to a sustainable forest sector. Furthermore, public procurement policies are relatively simple to introduce, even in countries with low governance capacities and high levels of informality (Brack 2014).

22 The number of downstream processors and retailers tends to be fewer than the number of direct forest harvesters; therefore, it may be easier for governments to implement taxation at this segment of the forest value chain. Furthermore, using variable environmental export taxes may be the best policy option for countries with low governance capacities, and especially where deforestation is largely driven by international commodity export. See chapters 7 and 8 for more details.

5. **Ecological fiscal transfers**

   Ecological fiscal transfers are another fiscal policy mechanism that can be implemented under a wide variation of governance arrangements and that may have an impact on the informal forest sector. All governments distribute centrally generated revenues to subnational or regional and municipal governments for various reasons (see chapter 11 for more details). With EFT, a portion of central government revenues are distributed based on an environmental or ecological indicator. For example, India distributes a portion of revenues to states based on the forest cover in the jurisdiction. Brazil, France, Germany, and Portugal also use EFT (usually based on the amount of forested area designated as protected).

   EFT distribute central government revenues to compensate regions that forgo economic development in favor of forest conservation; thus, EFT can serve as an incentive for *public* actors to invest in SFM and forest conservation. This policy may help jurisdictions overcome local corruption networks in part by providing an alternative source of funding that can then also be used to invest in strengthening governance capacities. Furthermore, EFT can support better recordkeeping of the status of forests. Distributing revenues in this way sends a strong signal that the public sector is committed to investing in sustainable forests.

6. **Fiscal reforms in other sectors**

   Fiscal reforms in other sectors such as agriculture may be able to improve the sustainability of forests despite the presence of large informal sectors. Indeed, reforms in other sectors may be able to reduce informal operations if the reforms reduce the incentive to convert forests to other land uses. For example, reforming agricultural subsidies may reduce the incentives to (informally or illegally) clear-cut forests for cattle grazing or agricultural commodities (see chapter 12 for more details).

7. **Expenditure policies**

   Expenditure mechanisms are another key fiscal policy that can impact the informal sector by providing alternative livelihoods and employment opportunities, among other effects.[23] Results-based expenditure policies, notably payments for environmental services and REDD+, may be able to reduce informal forest sector activity. These policies create an incentive for parties to engage in the formal sector insofar as participating in these schemes generates some benefits to the providers of the services and requires some administrative recognition (Lipper and Neves 2011).[24] Such expenditure policies may be more effective in the fuelwood and NWFP subsectors, as many individuals participate in these sectors for subsistence; providing an alternative source of livelihoods and employment may be most effective where informality is the highest.

   By investing in programs to encourage sustainable use of resources (especially regarding increased efficiency), demand for forest products and therefore forest exploitation in general is reduced. An example where direct expenditure is more effective than taxation is charcoal production in countries with low enforcement capacity. In the Democratic Republic of Congo,

23 The focus of this publication, however, is on revenue-neutral or revenue-raising instruments that can be applied under a wide variety of governance arrangements and capacities. Therefore, we refer the reader to the executive summary and chapter 1 for more details and references on forest sector expenditure policies.

24 However, schemes such as REDD+ can also create a “leakage” if participating enterprises find their profits from logging reduced and undertake logging activities elsewhere, frequently in the informal or illegal sector (Enters et al. 2002; Kuik 2014).

charcoal is the main driver of deforestation, where 84 percent of harvested wood is used for charcoal and firewood, carried out through a very large number of individually small entities in the informal sector (World Bank 2018). In Kinshasa alone, the country's capital, the charcoal sector employs more than 300,000 people, and most charcoal producers earn less than $50 a month (Trefon 2016). Taxing them would not be feasible, and there is also evidence that such taxes would have the opposite effect of intensifying wood extraction (Anthon et al. 2008). In this case, expenditure policies that invest in increased efficiency cookstoves or plantations for biomass can reduce the demand for charcoal and therefore reduce pressure on forests.

More generally, there is an efficient role for direct public expenditures in increasing the supply of forest-derived or other agricultural products, through technological investments that encourage increased productivity on the land, to discourage expansion into forested, protected, or ecologically important lands. These effects on supply and demand (and therefore price signals) are more easily achieved through expenditure policy compared to tax policy and therefore expenditures should supplement environmental tax reforms.

Revenue gains from formalization

Government revenue would also increase if part of the informal sector was converted into the formal sector. While it is not practical to assume informal activity could be completely eliminated, some reduction of the informal sector should be possible given the evidence of the variation in its size across countries at similar levels of development. Table 2.4 estimates revenue increases from formalizing half the current informal sectors in countries with available data.

Forestry tax revenues vary greatly across countries. Accordingly, the potential for increasing them by reducing the informal share of the sector will also vary. GTZ (2005) reviewed the sector in 18 countries and managed to obtain information on tax revenues in 10 of them.[25] Tax instruments included in the estimates were (a) volume-based taxes such as stumpage fees, (b) area-based charges, (c) corporate taxes on forest enterprises, and (d) export taxes.[26] Forest tax revenue as a percent of government revenue ranges from around zero in Brazil,[27] Chile, and South Africa, to as much as 14 percent in the Central African Republic and 25 percent in Cameroon (table 2.4). Thus, there is a huge variation in the fiscal role of forest taxation across this sample of countries.

25 From a further survey of the literature, data from an additional two countries have been obtained.

26 Not all these instruments are used in all countries; the differences between the instruments are discussed in other chapters in this collection.

27 Brazil introduced a new forest code in 2012 that is not captured in the GTZ data. It also does not have any forest taxes, but there is on economic instrument called the Environmental Reserve Quota (CRA, per the Portuguese acronym). These quotas are tradable quotas based on the amount of protected forest area that every landowner should keep in her property, which varies depending on the forest type. This economic instrument is currently in the regulating process at the state level. Rajão and Soares-Filho (2015) estimate the price of the quotas under different scenarios. None of the revenue, however, appears to go to the government.

TABLE 2.4
TAX REVENUES FROM FOREST SECTOR AND POTENTIAL INCREASE IF INFORMAL SECTOR COULD BE HALVED

COUNTRY	FOREST REVENUE AS % OF GOVERNMENT REVENUE	ESTIMATED FOREST REVENUE (US$, MILLIONS) (2014)	SHARE OF INFORMAL SECTOR (%)	INCREASE IN REVENUE IF INFORMAL SECTOR WAS HALVED (US$, MILLIONS)	SOURCE
Benin	00.03	44.31	52.8	24.75	GTZ (2005)
Cameroon	25.00	1,191.23	52.1	647.03	Fernagut (2014)
Central African Republic	14.00	3,736.60	56.1	2,387.27	ITTO (2005)
Congo, Dem. Rep.	00.40	11.06	94.8	100.21	GTZ (2005)
Congo, Rep.	00.90	12.05	13.4	0.93	GTZ (2005)
Mali	00.70	10.59	35	2.85	GTZ (2005)
Malaysia	01.54	772.73	42.7	288.18	GTZ (2005)
Guyana	00.10	0.72	34.2	0.19	FAO (2010); OECD (2018)
Nicaragua	00.13	2.35	35.5	0.65	GTZ (2005)

Note: Estimates are based on forest revenues as a share of total government revenues estimated at different dates but recalculated based on actual government revenues in 2014.

As expected, the change in revenue depends on the original size of the informal sector and the level of taxation. In some cases, the increase in revenue could be very large. This increase in income could then be used to increase forest-related tax expenditures, such as rebates for producers who conform to specified environmental criteria, or investments into alternative livelihoods or afforestation programs (for example, payments for environmental services). If these new expenditures were allocated to vulnerable forest users, it is likely that those brought into the formal sector would benefit most, as these two groups often coincide. Another possibility is to use the increase in revenues to reduce the rate of taxation, thus making the tax burden smaller. This “tax shifting” could be done specific to the tax burdens in the forest sector or the tax burdens in the wider economy, depending on the amount of new revenues generated and diversification objectives.

A ‘Forest-Smart’ and Socially Sustainable Policy Mix

A forest-smart and socially sustainable strategy uses a comprehensive policy approach. Despite the fact that certain environmental fiscal policy reforms can work despite large informal sectors (and may even be able to impact formalization), other, nonfiscal policies are necessary to reinforce environmental and social sustainability. Improving governance alone (for example, banning informal activities or strengthening enforcement to eliminate informal operations) would miss addressing the key drivers of the problem—in particular, drivers related to economic necessity and a lack of alternative livelihoods, among others (Kishor 2012). The diversity that characterizes forest sector production suggests that a combination of various policies should be used: Regulations, information instruments, and fiscal policies should all be used to reduce poverty, encourage formalization, and increase SFM.[28]

28 Furthermore, different tools should be used when addressing forest-producing versus forest-consuming countries (see chapter 7 for more details). In particular, addressing illegal logging requires action and coordination at various stages (Kishor 2012).

A sustainable policy mix takes forest dependency into account. About 350 million people living within or adjacent to dense forests depend on them for their subsistence and income. Of those, about 60 million people (especially indigenous communities) are wholly dependent on forests. Forests are therefore a key safety net for rural populations and any policy reforms that impact the forest sector should be carefully considered in terms of their impact on poverty and forest dependency. In particular, environmental fiscal reforms should be evaluated for their impact on vulnerable and poor populations in order to avoid regressive impacts.

Sustainable forest sector policies can contribute toward poverty reduction. Policy makers who wish to reduce informal forest sector production should focus on poverty reduction policies. As jobs are key for economic and social development, policies should improve labor market conditions by increasing the informal sector share of production; improving the quality of formal jobs through gains in productivity, earnings, and access to social insurance; improving tenure rights and unionization rates; and connecting vulnerable groups to better jobs (Arce 2019; World Bank 2018). Significant gains could be achieved if policy makers focus on giving women equal access to land ownership and tenure as well as helping women access training and paid employment (FAO 2018; Whiteman, Wickramasinghe, and Piña 2015). Promoting community forest management can also provide significant benefits (FAO 2018); for example, a program in India that strengthened community forest management increased real cash incomes for forest users by 53 percent and increased household incomes by 40 percent (World Bank 2013). Investments in goods with strong public good components, such as electrification, will also be an important component (see chapter 8 for more details).

Sustainable forest sector policies help formalize the industry. Various policy instruments can help formalize the forest sector, such as the provision of credit and other sources of financing supplemented with technical assistance in production methods,[29] marketing, and management as well as investments in infrastructure (Arce 2019). Policy makers should strengthen governance capacities,[30] such as law enforcement, monitoring systems, and the ability to confront vested interests with tougher sanctions. A bonus system that rewards field agents for implementing legality might also help reduce corruption (Kishor 2012; Lescuyer and Cerutti 2013). Independent observers can also be used to accompany and support national forest monitoring systems, as is done in Cameroon, the Democratic Republic of Congo, and Indonesia (Kishor 2012). Developing producer organizations may also help transform the informal sector (FAO 2018). Reducing barriers to formality would help reduce the incentives to join the informal sector—for example, by reforming small-scale logging permits to simplify the accreditation procedure.[31] Other corrective measures to reduce the costs of formality include removing unduly strict restrictions, obsolete institutional arrangements, and centralized decision-making (Briassoulis 1999).

Sustainable forest sector policies promote SFM. Policy makers should ensure that incentives to offset the costs associated with sustainably produced charcoal are provided (Kishor 2012). Demand-side policies that reduce the pressure on forest resources, like investments in improved efficiency cookstoves, can also contribute to SFM. Additionally, policy makers could explore investments in alternative sources of energy for rural needs, like decentralized solar (Kishor 2012).

29 The policy mix should include technical measures that improve processing efficiency, in particular for charcoal (Kishor 2012).

30 Crucial forest sector governance and revenue management reforms are described in more detail in two complementary reports, World Bank (2019a) and World Bank (2019b).

31 Such reforms also represent an opportunity for policy makers to better integrate customary tenure on forestland, and to formalize local people's rights over forest resources (Lescuyer et al. 2012). However, such reforms will only be effective at reducing the informal sector if the costs are lower than the benefits legality might bring to operators (Kishor 2012).

Policy makers can strengthen community forestry (an important component of sustainable forest sectors) by improving forest management plans; in Mexico, such a program was found to have increased jobs by 27 percent and the net value of goods and services produced by 36 percent (World Bank 2013). Promoting forest certification can increase the supply of forest products from well-managed forests; however, complementary cost-sharing programs for smallholders might be necessary in conjunction with certification efforts. Policy makers should provide incentives that offset the costs of sustainable production. Education and outreach programs, including adequate formal and nonformal training on SFM (especially harvesting), can help increase productivity and wages, reduce accidents and high workforce turnover, and improve environmental outcomes (Arce 2019).

Policy approaches should be tailored to the forestry subsector in question. Different policies will be needed to address the timber, fuelwood, and NWFP sectors. In particular, environmental taxation instruments may be more appropriate where informal sectors are relatively small, such as the timber subsector. On the other hand, expenditure policies may be more appropriate where informal sectors are relatively large and therefore would complicate the efficient collection of environmental taxes, such as the fuelwood (that is, charcoal) and NWFP subsectors. Expenditure policies for the subsectors should focus on livelihood and employment, to provide rural and vulnerable communities with alternative and formal livelihoods.

Furthermore, policies should be tailored to the different types of firms or individuals operating in the informal sector (Benjamin et al. 2014).

Policy makers should ensure collaboration within governments and with civil society. Policy should be coherent across governmental departments, integrating forest strategies with those that deal with agriculture, food, land use, and rural and national development (Arce 2019). In addition, policy makers should consider providing opportunities for civil society to participate in the reform process and to ensure local communities have rights to consultation, access, and benefits from forest resource use (Kishor, Castillo, and Nguyen 2015).

Collaboration is also needed on an international scale. The barriers to achieving sustainable forest sectors are multifaceted and require wide-ranging policy solutions that operate on multiple levels. Beyond domestic coordination, international efforts will be needed to achieve economic, social, and environmental sustainability in the forest sector. International efforts to curb illegal logging in particular, like FLEGT and anti-money laundering laws, are a key component of these efforts. Other key international policies include collaboration to codify treaties, agreements, and international standards (Kishor 2012).

If situated within a comprehensive policy approach, environmental fiscal policy reforms can create positive incentives for economic, social, and environmental sustainability. Environmental fiscal policy instruments have been underutilized in the forest sector for various reasons, including the administrative difficulty and distributional implications of taxing informal production. Recent policy developments have opened opportunities to apply environmental fiscal mechanisms to the forest sector to achieve numerous goals, including improving environmental outcomes while reducing the incentives to exit the formal sector. However, policy makers should ensure that environmental fiscal policy reforms are supplemented with key interventions that promote equitable development including higher quality employment and livelihoods, increase productivity, and encourage SFM.

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ANNEX 2A

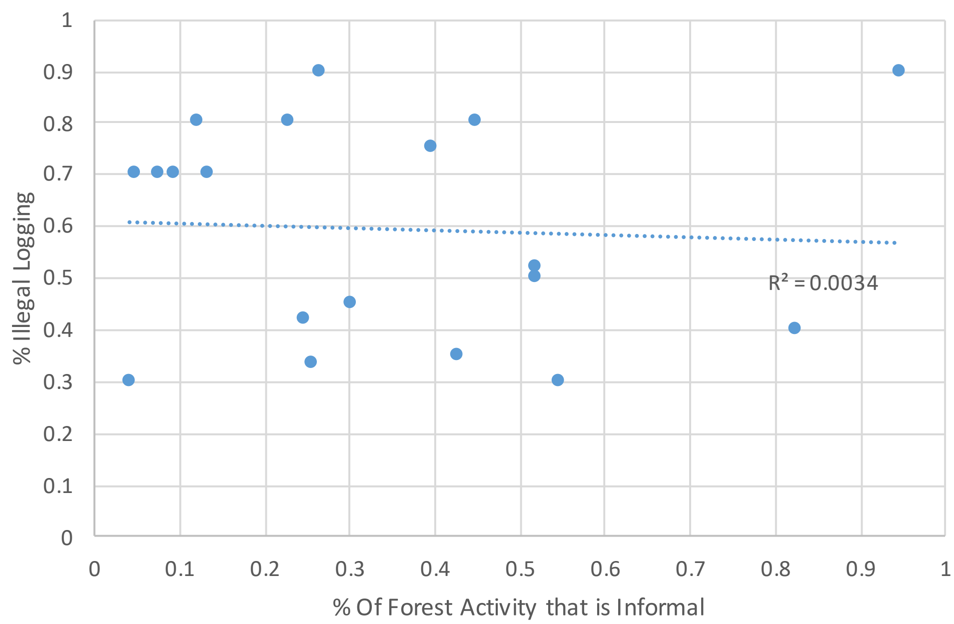
TABLE 2A.1
COUNTRIES WHERE THE INFORMAL FOREST SECTOR IS MUCH SMALLER OR MUCH LARGER THAN THE INFORMAL SECTOR AS A WHOLE

INFORMAL FOREST SECTOR MUCH SMALLER	COUNTRY	INFORMAL FOREST SECTOR MUCH LARGER	COUNTRY
10.10%	Equatorial Guinea	-65.30%	Mauritania
11.62%	Denmark	-59.34%	Eritrea
11.82%	France	-58.21%	Mozambique
11.91%	Canada	-54.39%	Namibia
11.93%	Italy	-51.35%	Iran, Islamic Rep.
11.98%	Brazil	-51.18%	Philippines
12.67%	Honduras	-48.53%	Bhutan
12.79%	Sweden	-48.35%	Congo, Dem. Rep.
13.13%	Czech Republic	-44.03%	Dominican Republic
13.13%	Norway	-42.15%	Malawi
13.24%	Finland	-40.92%	Gambia, The
14.49%	Mexico	-39.52%	Armenia
16.03%	Cyprus	-38.39%	Ukraine
16.26%	Hungary	-36.29%	Ethiopia
17.65%	Pakistan	-36.11%	Vietnam
19.07%	Portugal	-33.65%	Chad
19.28%	Algeria	-32.91%	Togo
19.49%	Cambodia	-32.72%	Azerbaijan
19.59%	Poland	-32.65%	Côte d’Ivoire
19.86%	Zambia	-31.90%	Thailand
20.10%	Spain	-29.64%	Niger
20.58%	Uruguay	-27.02%	Kenya
21.13%	Slovenia	-26.74%	Guinea-Bissau
21.15%	Bulgaria	-26.39%	Angola
21.75%	Latvia	-24.76%	Nigeria
21.77%	Lithuania	-23.99%	Sri Lanka
21.96%	Egypt, Arab Rep.	-21.72%	Haiti
22.24%	Romania	-21.17%	Kyrgyz Republic
22.98%	Estonia	-19.62%	Cameroon
24.41%	Papua New Guinea	-15.78%	Jamaica
25.35%	Croatia	-15.76%	Morocco
25.65%	Venezuela, RB	-15.70%	Burkina Faso

27.47%	Solomon Islands	-15.57%	Indonesia
27.96%	Guatemala	-14.73%	Madagascar
28.75%	Ecuador	-14.20%	Central African Republic
29.08%	Georgia	-12.97%	Nepal
29.76%	Brunei	-11.48%	Guinea
30.57%	El Salvador	-11.23%	Malaysia
31.73%	Congo, Rep.		
31.89%	Kazakhstan		
34.21%	Russian Federation		
35.07%	Belize		
39.24%	Bolivia		
40.31%	Peru		
44.77%	Gabon		
48.72%	Zimbabwe		

Note: Figures are differences between the shares of the informal sector of the whole economy minus the shares of the informal sector as part of gross value added in the forest sector. Countries are listed in order of size difference.

FIGURE 2A.1
PERCENT OF ILLEGAL LOGGING AND PERCENT OF FOREST SECTOR THAT IS INFORMAL



Source: Based on estimates from Jianbang et al. 2016.

Figure 2A.1 shows little correlation between the rates of illegal logging and the informal share of forest activity. The trend line is even slightly negative, with the share of illegal logging declining as the share of informal forestry increases. Not much can be read into this correlation. Various studies emphasize the importance of government policies, institutional factors, and especially the monitoring of exports as factors that influence the scale of illegal logging (Hoare 2015; Lawson et al. 2014; Gonçalves et al. 2012). The size of the informal sector, as such, does not seem to determine this phenomenon. This is surprising as the conventional view is that a large informal sector and illegal logging are highly correlated. However, disaggregated analyses that look at individual subsectors and local deforestation rates may show a higher correlation; as such, caution should be taken when examining aggregated data of this kind.

3

Designing Forestry Taxes to Promote Conservation

THORNTON MATHESON

Introduction

Generally, tax economists recommend that a uniform tax regime be applied to all economic activities to prevent distorting the allocation of productive resources across sectors. However, when certain activities have distinctive features, such as externalities or economic rents, there may be sound reason to introduce sector-specific taxes, subsidies, or tax expenditures. In forestry, positive externalities from forest conservation—carbon sequestration, biodiversity, watershed protection, and aesthetic and recreational benefits—justify subsidies to expand forestation. Since carbon sequestration has global benefits, it is appropriate for developed countries to compensate developing countries for preserving their forests. However, global transfers for this purpose are limited, and most developing countries lack the fiscal resources to provide adequate subsidies. Beyond expensive subsidies, countries should therefore also use the tax system to encourage conservation while still contributing a fair share of revenues to local and national treasuries.

Some extractive industries, such as petroleum and mining, generate economic rents from the exploitation of fixed natural resource endowments. Application of a rent tax, such as a cash flow tax, to these activities can generate revenues efficiently—that is, without discouraging investment. Some forms of forestry may also generate rents, particularly logging of old-growth forests (a fixed endowment). In managed forests, however, planted trees are an investment and their cultivation may therefore generate no rent. The major input into forestry—land—is generally in fixed supply and thus generates rents; however, the supply of *forested* land is generally not fixed, except in areas where land is unsuitable or too sparsely populated for agriculture or urban development. Legal and regulatory provisions, such as conservation set-asides, can also create a fixed supply of forested land that may generate rents for holders of logging rights.

Political and administrative considerations may also dictate a need for special forestry taxes, particularly where multinational enterprises are involved. The difficulty of enforcing the corporate income tax on multinational enterprises is well known.[1] Their ability to shift profits across borders may necessitate levying simpler taxes to collect a reasonable amount of revenue.[2] The ability to generate public revenue from forestry is likely to increase with the size of the

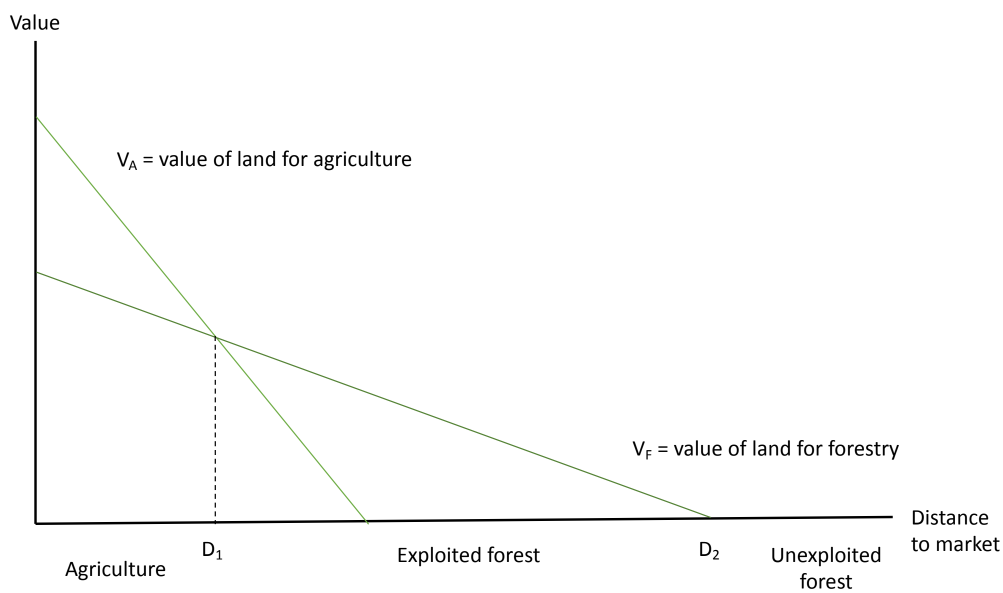
1 See, for example, the OECD Base Erosion and Profit Shifting project: http://www.oecd.org/tax/beps/.
2 Such as area fees on exploited acreage or stumpage taxes on the gross value of extracted logs.

(formal) forestry sector in the economy,[3] and political pressure is likely to be particularly high where foreign multinational enterprises are exploiting legacy forests.

Taxes and the Supply of Forested Land

As described above, the effect of taxes on forestry depends in part on the elasticity of the supply of forested land—that is, the ease with which forested land can be converted to other activities (and vice versa). The most common alternative activity for rural land is agriculture, although logging, extractive industries, and urbanization are also major drivers of land clearing. A simple Ricardian model of land use adapted from Hyde (2012) illustrates this matter (figure 3.1):[4] Land is differentiated by its distance to a market center, which is measured along the horizontal axis, while the vertical axis measures land value. Closer to the market center, the value of land for agriculture (V_A) exceeds that of land for forestry (V_F), but agricultural land value drops more quickly than that of forestry as a result of agriculture's more frequent market interactions for both inputs and outputs. Areas to the left of the intersection of the agricultural and forestry land value schedules (D_1, or the "extensive margin") are used for agriculture, while areas to the right of that intersection are forested. Areas to the right of the intersection of the V_F schedule with the horizontal axis (D_2) are too remote for exploitation and thus remain mature, natural forest.

FIGURE 3.1
LAND USE MODEL



Use of the exploitable forest between D_1 and D_2 depends on the cost of enforcing property rights over private land. This cost is assumed to rise with distance to market, as enforcing property rights in remote areas is more difficult (figure 3.2). The intersection between schedule C and either land value schedule determines the maximum amount of land that can be privately

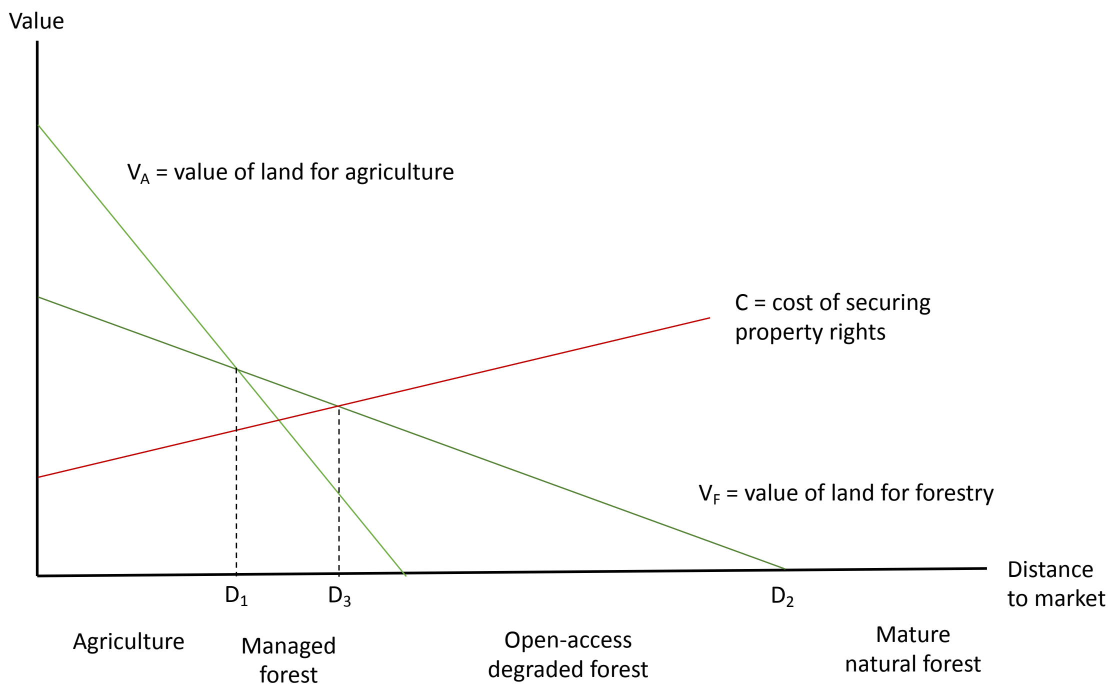
3 See chapter 2 for more details on the level of informal production and its impact on forestry revenue collection.
4 Ricardian models, which are based on the concept of "comparative advantage," allocate factors (such as land) among alternative activities (such as agriculture and forestry) depending on their relative productivity in those activities. In equilibrium, the marginal productivity of a factor is equalized across activities. The Hyde (2012) model derives from an early model by von Thünen (1826); see box 3.1 for more details.

exploited for either agriculture or forestry. To the right of these intersections, land and its products are nonexcludable; natural forests in this open-access range will be exploited by foragers and informal loggers, resulting in forest degradation.

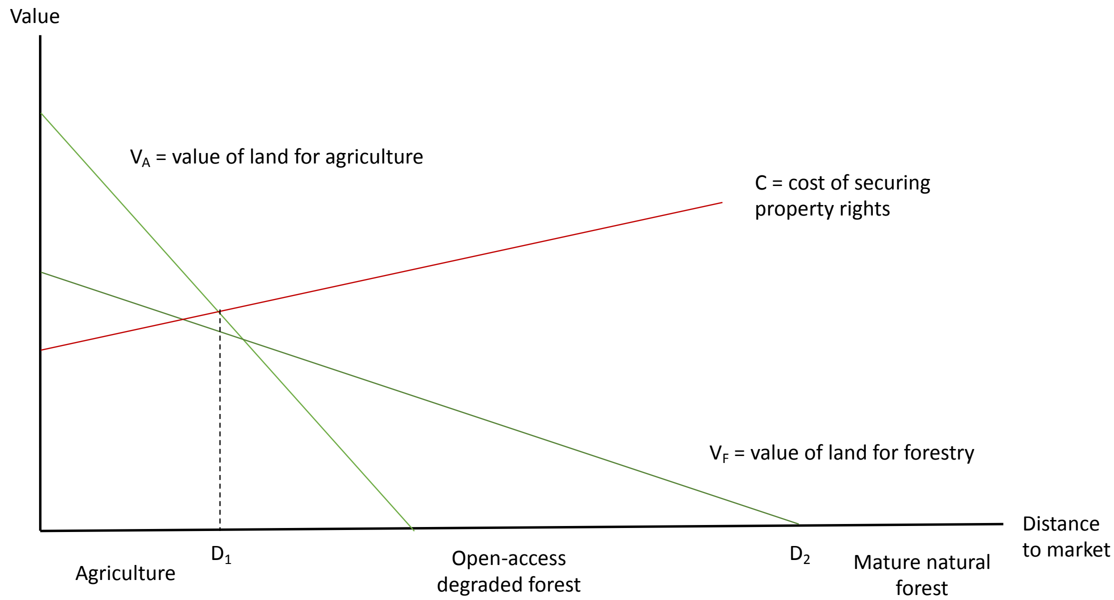
Consider two cases distinguished by strong (low-cost enforcement) versus weak (high-cost enforcement) property rights. In low-cost environments (for example, developed countries), schedule C intersects the V_F schedule to the right of its intersection with the V_A schedule (at D_3, or the "intensive margin") (figure 3.2, panel a). The area between D_1 and D_3, where the value of forestry exceeds that of agriculture and the cost of enforcing property rights is less than the forestry value, will therefore sustain private, managed forests. Where property rights enforcement is costlier, including in many developing countries, the C schedule intersects the V_F schedule to the left of its intersection with the V_A schedule (figure 3.2, panel b). In this case, the cost of enforcing property rights exceeds the value of forestry throughout the range in which forestry value exceeds agriculture value, so managed private forestry is not a viable option. This case therefore only allows for agricultural land, open-access degraded forest, and mature natural forest. One action government can thus take to promote managed forestry is to improve property rights (for example, by cadastral development) and facilitate their enforcement (for example, by legal and judicial reforms).

FIGURE 3.2
LAND USE MODEL WITH LOW AND HIGH ENFORCEMENT COSTS

A. LOW ENFORCEMENT COSTS



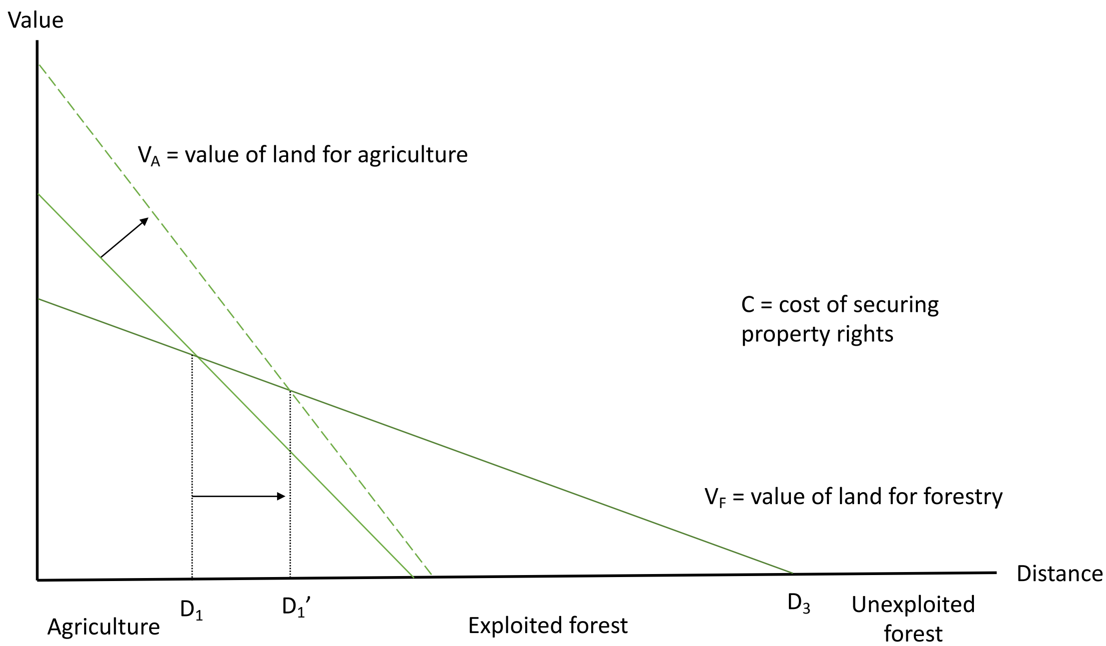
B. HIGH ENFORCEMENT COSTS



Fiscal policy plays a significant role in determining land use by affecting the location of the after-tax-and-subsidy V_A and V_F schedules, and thus the location of the extensive margin. In general, taxing (subsidizing) an activity shifts its net land value schedule downward (upward), thereby decreasing (increasing) the amount of land dedicated to that activity. An important example of this is fiscal subsidies to agriculture (figure 3.3); in many countries, agriculture receives significant tax breaks, including reduced (or zero) income and property tax rates and value added tax (VAT) exemptions on input and/or outputs, as well as outright subsidies.[5] Using a particular plot of land for agriculture may thus have a higher after-tax value than using it for forestry, even if forestry has a higher pretax value. Subsidizing agriculture encourages conversion of forested land, whether privately or communally exploited, into farmland, shifting the V_A schedule outward, moving the extensive margin from D_1 to D_1'. Determining an appropriate fiscal regime for forestry should therefore consider fiscal regimes for competing activities, and dismantling agricultural subsidies and tax breaks may be an important step toward encouraging reforestation (see also chapters 12 and 13).

5 These policies may be further complicated by market interventions, such as output price supports or ceilings.

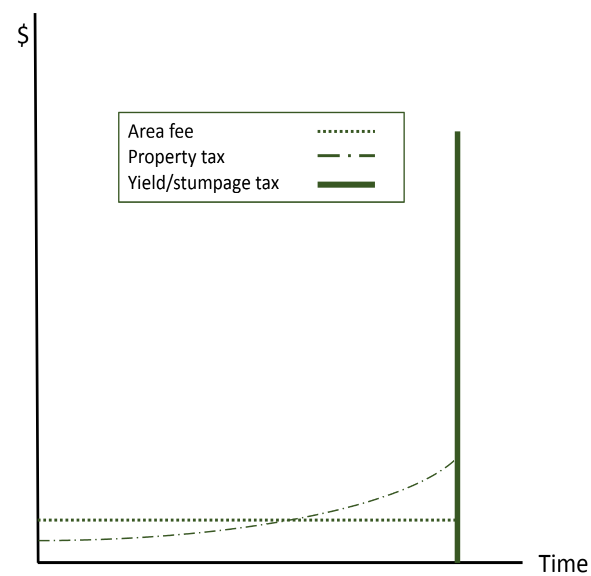
FIGURE 3.3
EFFECT OF AGRICULTURAL SUBSIDIES ON LAND USE



Forestry Taxes

In addition to standard income taxes, forestry companies are generally subject to two types of sector-specific taxes: (1) recurrent annual charges, such as property taxes and area fees, and (2) output-based taxes, such as stumpage fees and export taxes. These two types of taxes have distinct effects on the extensive and intensive margins as well as on the optimal "rotation period" of managed forests—that is, the maturity at which trees are harvested. They also have different risk profiles for forestry companies and government revenues. Whereas output taxes are deferred until harvest, area fees and property taxes generate revenue throughout the life of a forest concession (figure 3.4).

FIGURE 3.4
TIME PROFILE OF FORESTRY TAXES



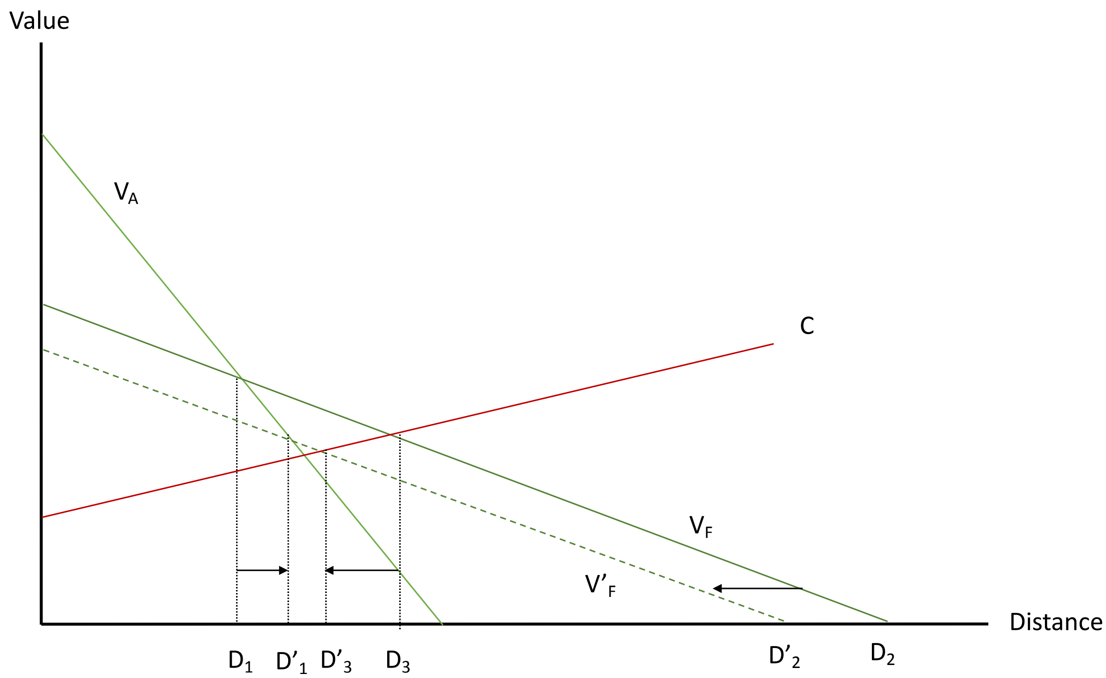
Recurrent annual charges

Recurrent annual charges can have various structures. Property taxes charge a percentage of the value of the property, either including or excluding the value of the trees. Area fees, by contrast, levy a fixed charge per acre or hectare. Clearly, levying a property tax on the value of land and/or trees requires that the property be regularly revalued. Area fees are therefore simpler to administer; nonetheless, they are generally set—possibly by competitive auction—based on some measure of the value of the forestry concession and need to be adjusted over time to preserve their real value.

Area taxes impose a fixed cost that forestry operators must pay regardless of how much timber they cut. All else being equal, imposing this cost shifts the V_F schedule downward, shrinking both the extensive and intensive margins for forestry (figure 3.5).[6] The total area of forested land shrinks from D_1–D_2 to D'_1–D_2, while the area of managed forest shrinks from D_1–D_3 to D'_1–D'_3, and the area of open-access, degraded forest expands from D_3–D_2 to D'_3–D_2. Several policies can counteract this effect: Conservation set-asides can fix the supply of forested land at D_1; however, this introduces a discontinuity in the value of land use at that margin. If there is little or no effective property tax on agricultural land (as is often the case in developing countries), then imposing the same property tax rate on agriculture shifts the V_A schedule downward by the same amount as the V_F schedule, restoring the extensive margin to D_1. Additionally, legal and institutional reforms could shift the cost schedule downward, shifting the intensive margin D_3 back to the right. Since open-access forest does not yield property taxes, this policy generates additional revenue.

6 Figure 3.4 assumes that no area fees are imposed on open-access forest and that the property tax rate on agriculture is independent of the area fee on forestry.

FIGURE 3.5
AREA-BASED TAXES AND LAND USE



The imposition of fixed costs tends to drive marginal players out of managed forestry, which may professionalize the industry, making sustainable harvesting more feasible (Karsenty 2010). However, the increase in informal activity may offset these effects. Area-based taxes, which must be paid irrespective of output, also tend to increase logging in low output-price states to cover fixed costs.

To determine the effect of area-based charges on the optimal rotation age, a different type of model is required. Following Faustmann (1995), the optimal rotation period is typically estimated by equating the marginal revenue increment from allowing trees to grow one more period with the marginal costs incurred by doing so.[7] The classic result in a no-tax scenario is to harvest timber when its growth rate, which generally declines with tree age, falls equal to the opportunity cost of holding land, as represented by the interest rate:

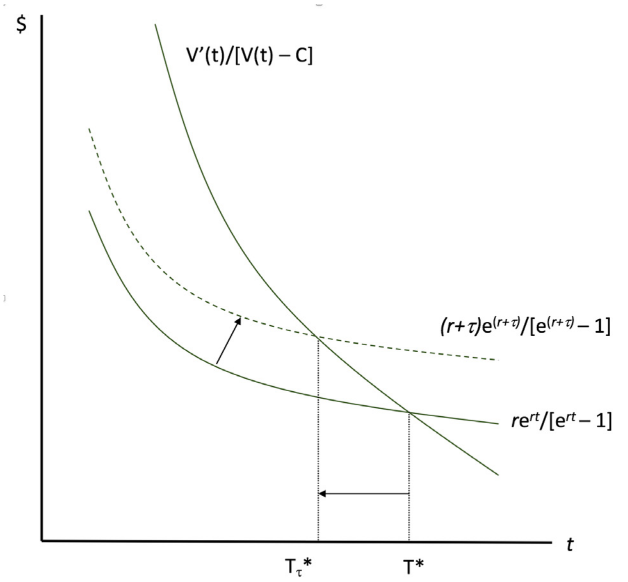
$$\frac{V'(t)}{V(t) - C} = \frac{re^{rt}}{e^{rt} - 1} \tag{3.1}$$

where $V(t)$ represents the value of timber as a function of time (maturity), C represents the cost of afforestation (in other words, planting), and r is the interest rate. Since $V'(t) > 0$ and $V''(t) < 0$ over the relevant range of tree growth,[8] the left-hand side of equation (3.1) goes to zero as t goes to infinity, while the right-hand side approaches 1. The marginal revenue curve thus intersects the marginal cost curve from above at T* (figure 3.6).

7 The major alternative to the Faustmann model of optimal forestry management is "maximum sustainable yield." Helmedag (2018) shows that the Faustmann model approaches maximum sustainable yield as the interest rate goes to zero.

8 The growth rate of saplings can be convex (both V' and $V'' > 0$), but as trees mature their growth rate tends to decline.

FIGURE 3.6
EFFECT OF PROPERTY TAX ON TIMBER VALUE ON OPTIMAL ROTATION PERIOD



Chang (1982) modifies the Faustmann model to incorporate the effects of various forestry tax regimes, including both area-based and output-based taxes.[9] Where the property tax is levied as a percentage of land value only and is fully capitalized into that value, it has no impact on the optimal rotation period, since the decline in land value (and hence the opportunity cost of holding land) just offsets the amount of the tax. However, a property tax levied on the value of the trees shortens the optimal rotation period by shifting the marginal cost curve upward (figure 3.6). The impacts from an alternative and more general land tax scheme on forest conservation is described in box 3.1.

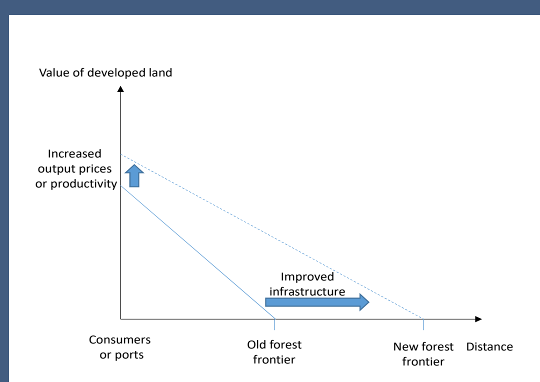
BOX 3.1 DEFORESTATION, FOREST PROTECTION, AND LAND RENTS: THE POTENTIAL OF LAND TAXES

MATTHIAS KALKUHL

There are two basic approaches to forest protection: regulation (like protected areas) and price-based instruments (like payments, taxes or subsidies to specific activities on land use). Land taxes, as a fiscal policy instrument, are related to both approaches: (i) They can absorb the land rent increase that is associated with forest protection and thus reduce public costs of protection; and (ii) differential taxes on developed or non-forest land can by themselves provide incentives to conserve land and reduce deforestation.

The analysis on policies to reduce deforestation has to start with understanding the key drivers of land use change, which builds on the framework developed in Kalkuhl and Edenhofer (2017) and Miranda et al. (2019). We denote all land that is not under agricultural use as undeveloped land, or forestland, ignoring here the possibility that forestland may also be used economically.[a] We consider the land rent as the rental value of a specific plot of land, independent of its use. The starting point for understanding deforestation is the hedonic pricing model, which dates back to von Thünen's (1826) model of circular spheres of land use. Land is only developed and cultivated if it is associated to a positive land rent. Land rents are primarily determined by (i) transportation costs to consumers (for instance, cities or international ports), (ii) the value of agricultural output, and (iii) the agricultural productivity.[b] As commercial agricultural products

FIGURE B3.1.1 NO POLICY



9 The Chang model also allows for partial pass-through of forestry taxes into product price. However, this analysis assumes forestry producers are price-takers on the global market.

FIGURE B3.1.2 PROTECTED AREA

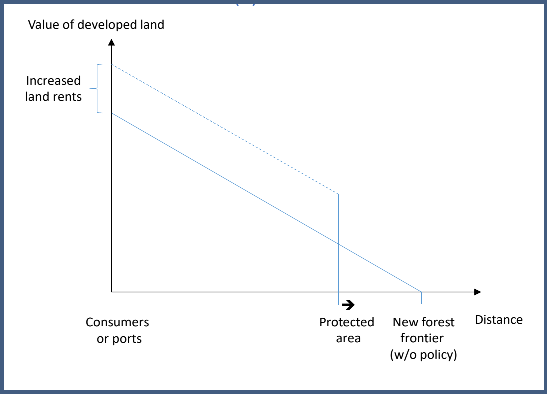
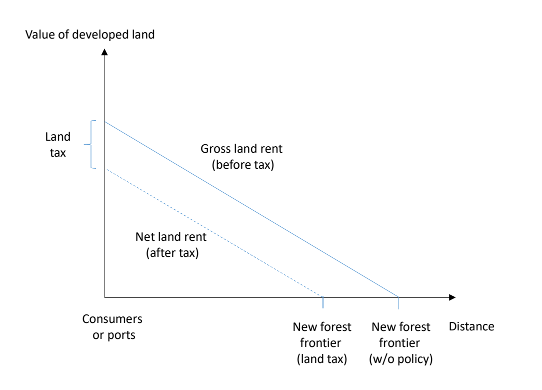


FIGURE B3.1.3 LAND TAX POLICY



need to be transported to consumers, transportation costs increase in distance to consumers and land rents decrease accordingly (figure B3.1.1). Without any policies, all land with positive rent is cultivated; primary forestland prevails where the land rent drops to below zero. The intersection with zero is the forest frontier. Any reduction in transportation costs, for example, through improved infrastructure, shifts outward and flattens this downward sloping curve. Besides transportation costs, prices of agricultural goods and productivity levels lead to an upward shift of the land rent curve. The forest frontier shifts further and forest area decreases.

Regulatory approaches like the establishment of protected areas can prevent the expansion of the forest frontier. In figure B3.1.2, the protected area leads to a lower amount of developed land compared to the no-policy case. Lower land supply, however, leads to lower agricultural production, which drives up output prices and thus land rents. Owners of developed land thus receive a windfall profit from forest protection—see, for example, Chamblee et al. (2011), Kiker and Hodges (2002), Lynch and Duke (2007), Nunes et al. (2012), Phillips (2000), and Wu and Lin (2010). A tax on developed land that equals this land rent increase can capture this windfall profit without distorting agricultural production and conservation decisions. The land tax is therefore a policy that can be highly beneficial in countries where the fiscal system is very expensive—for instance, because of large informal sectors or tax evasion.[c]

While a land tax can complement regulatory approaches to capture increased land rents, land taxes can provide by themselves incentives to reduce land conversion. This is depicted in figure B3.1.3. A unit tax on developed land reduces land rents uniformly and therefore shifts the forest frontier closer to the consumers—less agricultural land is used. Contrary to regulatory approaches, land taxes conserve land and generate public revenues. They can therefore create a double dividend if other distortionary taxes are reduced.

If specific land use types, like forests, create positive externalities as a result of carbon storage, biodiversity conservation, and other ecosystem services, a Pigouvian subsidy that equals marginal social benefits would be an efficient instrument to incentivize an optimal allocation of such land use types.[d]

However, because total land is fixed in its supply, neither a land use–specific tax nor a subsidy affects the total supply of land—just the allocation between different land use types. For example, a tax on developed land affects only the allocation between developed land versus non-developed land, not the total amount of land. A subsidy on non-developed land works the same way and could achieve the same allocation. Taxes and subsidies on land are therefore equivalent. This equivalence does not hold for most other environmental problems, where a subsidy on a clean substitute is less efficient than a tax on pollution as the subsidy increases total demand above the efficient level. While a pure tax on developed land can achieve the same allocation as a pure subsidy on non-developed land, any combination of taxes and subsidies that has the same price differential between developed and non-developed land will do so as well—with different fiscal implications. This creates an additional degree of freedom to shift the costs of conserving non-developed land between landowners and taxpayers without affecting the total land allocation. Taxes on agricultural land have therefore been suggested as an instrument to generally reduce economic incentives for deforestation (Angelsen 2007; Binswanger 1991; Kalkuhl and Edenhofer 2017).

Lastly, an important caveat of taxes is that they are rather unspecific with respect to preventing conversion of highly valuable ecosystems or biodiversity hotspots. While land taxes on agricultural or non-forest land can generally reduce pressure on such systems, protected areas or additional subsidies or payments for ecosystem services can better target specific locations. A combination of location-specific policies and land taxes can be a way to conserve high-value ecosystems, to reduce land consumption in general and to capture some of the windfall profit for land-owners resulting from increased land rents.

a. This perspective is most appropriate for biodiversity and carbon-rich primary forests. Our framework and model can easily be extended to also consider economic rents in forest areas.
b. Idiosyncratic plot-specific characteristics are ignored here as they average out in the aggregate.
c. Land taxes are relatively simple to enforce and collect and therefore are associated with lower administrative costs compared with other fiscal instruments applied in the forest sector, such as excise taxes, which may be easier to evade (Norregaard 2013). However, the effectiveness of land taxes depends on the ability of administrators to enforce the policy, which may require improvements in governance and the rule of law, including strengthening of the tenure system and rights.
d. Pigouvian taxes and subsidies correct for externalities, such as environmental damages and benefits. Without the tax, these externalities are not included in market prices or cost calculations of private firms. By incorporating these costs into the price of goods and services, Pigouvian taxes (subsidies) reduce over- or underconsumption caused in part by distorted market prices. Pigouvian taxes (subsidies) should be set equal to the marginal environmental damage (benefits) from producing an additional unit of a good or service with negative (positive) externalities at the optimal provision level, where its marginal social benefits equal its marginal social costs.

Recurrent taxes on timber value shorten the harvest rotation period and should therefore generally be avoided. Environmental services, particularly biodiversity, tend to increase with forest age, so internalizing the positive externalities from carbon sequestration calls for lengthening the rotation period (Kula and Gunalay 2012). Recurrent taxes on timber value provide the opposite incentive. Forestry companies are particularly sensitive to such taxes since they cascade on the value of previous years' growth (Chang 1982). Imposition of such taxes is often associated with "cut and run" behavior, discouraging replanting. Adjusting the property tax annually for growth of the timber stock also adds to administrative complexity and is thus particularly ill-suited to developing countries.

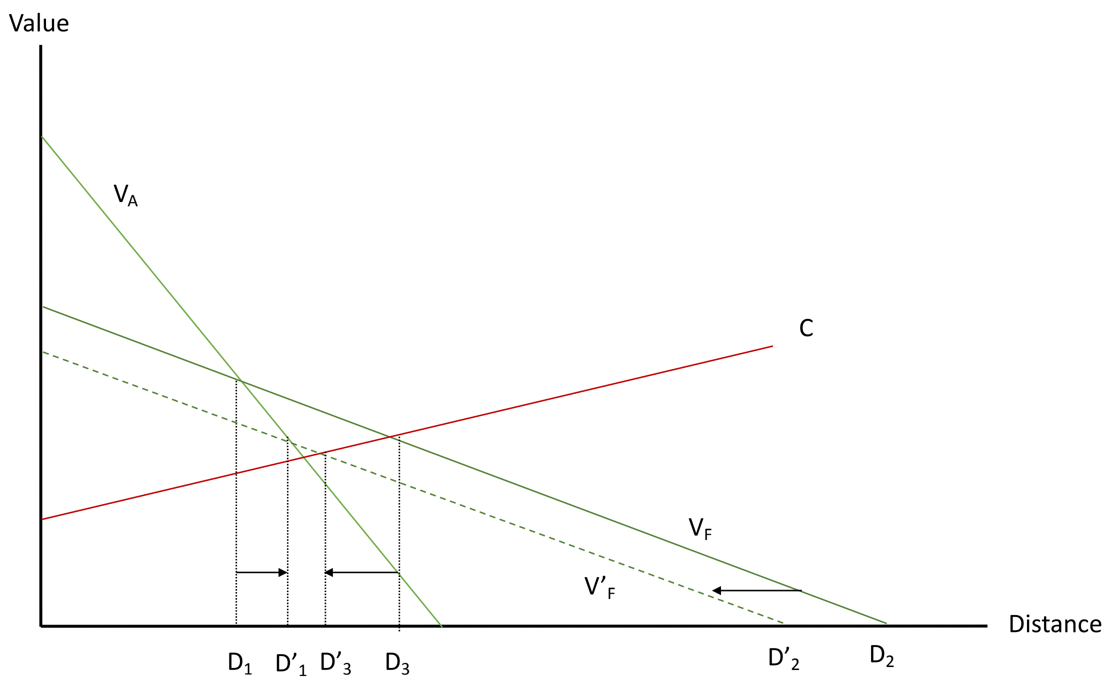
Logging licenses may be allocated by competitive auction, in which case the resulting license fees will ex-ante have the character of a tax on logging rents. Forestry companies will be willing to bid up to the amount of rents (economic profits in excess of companies' discount rates) for the concession. With a small number of bidders, however, the risk of collusion to underbid will be high. Ex-post, the license fee will have the character and effect of an area fee as described above.

Output taxes

Various types of output-based taxes are levied on forestry. Royalties or yield taxes take a percentage of the market value of harvested wood. Stumpage fees approximate a yield tax by levying a fixed charge on the volume of wood extracted, which often varies by species in accordance with the value of wood. Stumpage fees are thus less vulnerable to under-declaration of timber value. However, their rates must be regularly adjusted to maintain real value as well as their alignment with market values. The relative administrative burden of the two types of output taxes is therefore unclear. An export tax is a yield or stumpage tax levied only on exported timber.

Like property taxes, output taxes shift the V_F schedule downward, impacting both extensive and intensive margins and reducing total forestation (figure 3.7). In contrast to property taxes, however, output taxes expand the area of unexploited forest (D_2 to D'_2), provided that they can be levied on informal logging. This may be difficult, although imposing output taxes at chokepoints such as sawmills may facilitate this.

FIGURE 3.7
OUTPUT TAXES AND LAND USE



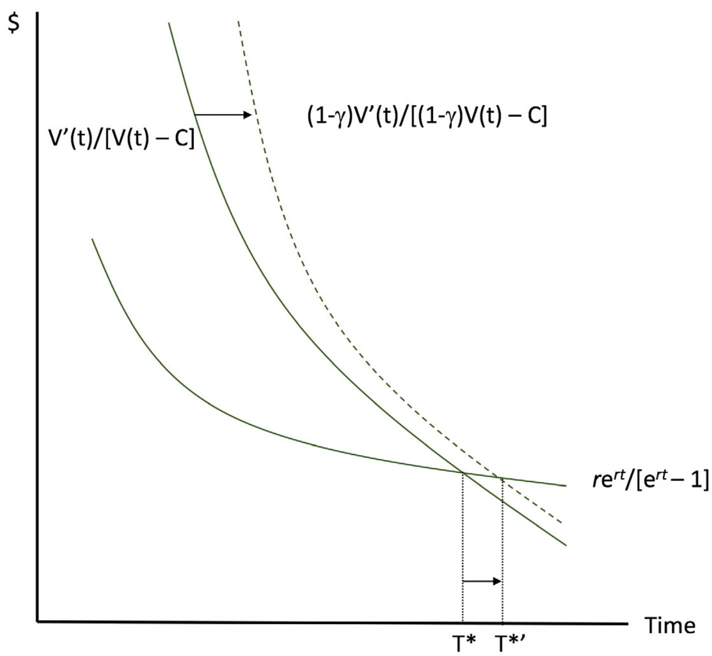
In further contrast to property taxes, output taxes extend the optimal rotation period by shifting the marginal forestry revenue curve outward (figure 3.8). Imposing an output tax at rate γ reduces net proceeds from timber sales to $(1-\gamma)V(t)$ without reducing costs (C) accordingly, such that

$$\frac{(1-\gamma)V'(t)}{(1-\gamma)V(t) - C} > \frac{V'(t)}{V(t) - C} \tag{3.2}$$

while output taxes have no effect on the opportunity cost of holding forested land. The optimal rotation period thus increases from T* to T*', which as previously noted benefits the environment. This analysis suggests that a policy of charging lower output tax rates on sustainably harvested timber should only be undertaken if the benefits of SFM outweigh those of the longer rotation period incurred by charging higher rates.

From a conservationist viewpoint—as well as that of forestry operators—output-based taxes are thus preferable to property taxes or area fees. Governments, however, are likely to prefer the latter insofar as recurrent charges generate revenue earlier in the production cycle and, since they fluctuate much less with output and market prices, are less volatile.

FIGURE 3.8
OUTPUT TAXES AND OPTIMAL ROTATION PERIOD



Under an export tax, output taxes are limited to wood delivered to customs for export, leaving domestic consumption exempt. In very low capacity environments, this is often the only administratively feasible way to tax timber extractions. The goal of this policy is often to encourage domestic value added by imposing a higher export tax rate on unprocessed logs or even exempting processed wood exports altogether. Since wood is exported only if the world market price exceeds the domestic price that would prevail under autarky, export taxes have the effect of lowering the domestic price of wood products below the world price. This can stimulate the domestic wood processing industry; however, export taxes frequently cause distortions that lead to waste and even negative value added. Sawmills in low-income countries tend to have high wastage rates, so more wood is lost in processing than would be the case for exported logs. If the export tax rate on unprocessed wood is sufficiently high, however, it may be more profitable for forestry companies to process the wood domestically in order to avoid the export tax, even if the resulting wastage generates less total income (private profits plus government revenue) for the country in question.[10] Wherever feasible, output taxes should thus be levied on all timber, whether exported or domestically consumed.

Income tax

In addition to sector-specific taxes discussed above, forestry operators are usually subject to business income taxes. The distinctive features of managed forestry—notably the great length of the investment cycle from planting to harvest, which can span multiple decades—create special income tax design considerations. Unless sold as standing trees, timber proceeds are generally taxed on a realization (rather than an accrual) basis, meaning that income is not recognized until the trees are harvested. These proceeds, net of costs, may be taxed either as ordinary income or as capital gains. Where the (long-term) capital gains tax is lower than the ordinary income tax rate, capital gains treatment generally confers a tax benefit. The U.S. federal individual income tax, for example, accords capital gains treatment to timber income as an investment incentive to promote afforestation (Pierce 2003).

10 For example, see Krelove and Melhado (2010).

Subjecting timber income to a reduced capital gains tax generally implies that capital investment incurred in creating the timber asset is also deducted at that lower rate. The very long investment cycle may greatly erode the tax value of capitalized costs if they are not carried forward with interest. However, operators managing timber stands of staggered maturities should be able to realize the tax value of capital depreciation on an ongoing basis. Nonetheless, operators with ordinary income as well as capital gains will prefer to maximize the value of their current deductions taken at the (higher) ordinary income tax rate rather than capitalize and carry them forward against future timber proceeds. Careful policing of operating and capital expenditures will therefore be necessary.

Conclusion

The preceding analysis suggests several ways in which tax policy can be used to promote forest conservation under conditions that do not allow for adequate subsidies for forest management, such as payments for ecosystem services.

Governments need to eliminate direct and indirect subsidies that encourage the conversion of forestland. First, tax expenditures for agriculture, the dominant force driving deforestation in most countries, should be sharply reduced. Farmers should be subject to normal levels of property and income taxes, and VAT exemptions for farm inputs should be eliminated. Where other activities such as urban development spur deforestation, any tax expenditures for those activities should also be reduced. If tax expenditures for competing activities cannot be eliminated for political or administrative reasons, an alternative policy to level the playing field is to extend them to the forestry sector as well, although this has obvious fiscal costs.

Output-based taxes generally provide better environmental incentives than recurrent charges. Two major types of sector-specific tax apply to forestry: recurrent charges (property tax, area fees) and output-based taxes (yield or stumpage taxes, export tax). Of these, output-based taxes impose less risk on forestry operators since they do not apply until the time of harvest and vary directly with output price. Both types of tax reduce the amount of land allocated to forestry at both the extensive and intensive margins. However, by reducing the return to logging, output-based taxes can also expand the area of unexploited natural forest.[11] Output-based taxes also have the beneficial effect of extending optimal rotation period, enhancing positive environmental externalities. Assuming full tax capitalization, area fees and property taxes on land value do not affect rotation period. However, property taxes on timber value reduce the optimal rotation period and should therefore be avoided; timber taxes cascade on the value of old growth and have been known to encourage cut-and-run behavior. Setting area fees via competitive auction will restrict them to the amount of rents available in the forestry sector; however, where administrative capacity is limited, or the number of bidders is small, collusion to underbid is a risk.

Also, general business taxation can be designed to improve conservation incentives. Forestry companies are typically subject to income taxation, where sector-specific considerations also apply. Where the (long-term) capital gains tax rate is lower than the income tax rate on ordinary income, classifying timber as a capital asset may provide an incentive for forest management (as in the United States). This will also, however, reduce the tax value of capital depreciation, particularly if forestry companies have insufficient annual capital gains to realize

11 This may require that output taxes be applied to informal logging, which may be difficult. Chapters 2, 6, and 7 describe potential fiscal policy instruments that may be able to reach the informal sector.

those deductions immediately. Another means of alleviating the burden of income taxation on forestry concerns is to transform the income tax into a rent tax: by expensing capital investment and carrying any (capital) losses forward with interest while denying a deduction for interest payments. This policy could be tricky to apply to multinational enterprises, however, since it creates discontinuities between domestic and foreign affiliates whenever the latter are subject to income taxation.

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4

Using Fiscal Incentives in Fragile States

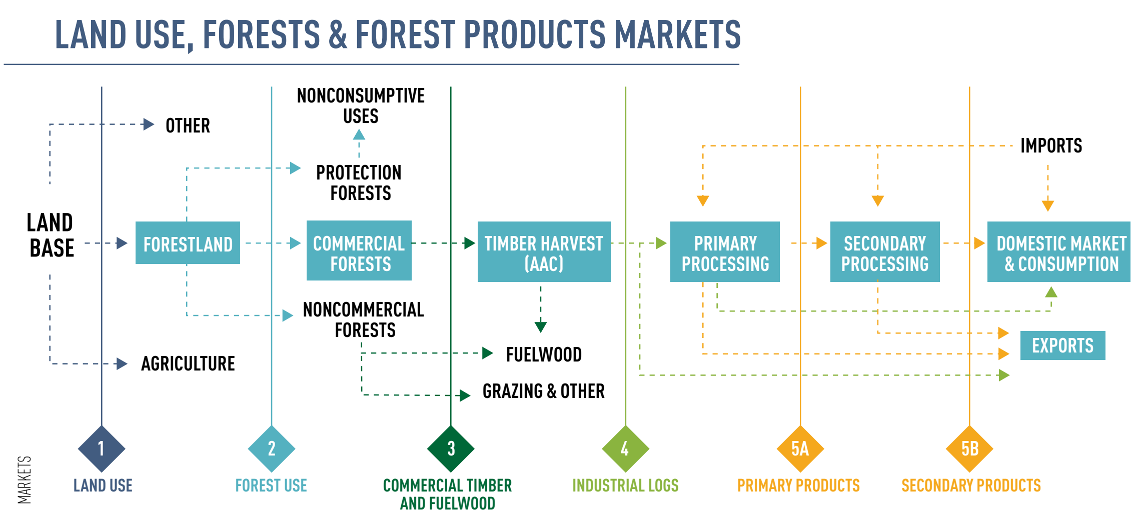
ALAIN KARSENTY

Introduction

It is possible to improve tax policy to raise incentives for the sustainable use of ecosystem resources and services, corresponding, among others, to the SDG 12 objective ("Responsible consumption and production"). In most developing countries, forest taxes are set either on forest area granted, on potential commercial volume, on effectively felled volume, on volume entering the mill (or on the output), or on volume sold on national or international markets. And as explained in chapter 3, alternative tax designs can produce stronger incentives for sustainable forestry.

However, fragile institutions and weak governmental capacity impact the effectiveness of such systems. Therefore, the design of tax policies and ambition levels need to be adapted to the governance capacity of countries. This chapter investigates options for the use of environmental tax policy in fragile states, focusing on specific stages of the forest value chain (shaded boxes in figure 4.1).

FIGURE 4.1
MAIN ELEMENTS OF THE FOREST VALUE CHAIN



Source: Adapted from Day 1998.

Second-Best Institutions Rather Than 'Best Practices'

Fiscal instruments should be tailored to the governance context prevailing in different countries. As noticed by Rodrik (2008), "second-best institutions" are often better adapted for developing countries than "best practices" inspired by most developed countries. In this chapter, a comparison is made among what are generally featured as best practices in forest taxation and how these face serious hurdles in fragile states. Box 4.1 gives an example of the complexity of forest sector fiscal policy and its reform as well as notes some policy requisites and synergies for the Democratic Republic of Congo.

BOX 4.1 FISCAL PATHWAYS TO IMPROVED FOREST GOVERNANCE IN THE DEMOCRATIC REPUBLIC OF CONGO

THEODORE TREFON

The Democratic Republic of Congo's forests offer tremendous potential for economic development and social well-being. They already provide subsistence and well-being to millions of ordinary Congolese—unlike industrial mining or oil resources, which mainly benefit national elites and foreign multinationals (Edmond and Titeca 2018; Garrett 2016). The IMF (2013) Congolese Poverty Reduction Strategy Paper emphasizes the economic contribution of forests for obvious reasons. But the country's forests are vulnerable too and their longer-term sustainability is uncertain; some estimates suggest that these forests will be gone by 2100 (Tyukavina et al. 2018).

The Ministry of the Environment does not have the means to manage this natural heritage and consequently depends to a large extent on international partnerships. The potential of the Democratic Republic of Congo's forest resources could be a catalyst for national development. This potential includes industrial harvesting of timber, payments for ecosystem services, and, most important, livelihoods for local populations (IMF 2013). The logical steps to take to capitalize on this potential are known and have been tested in the country and elsewhere, but the Democratic Republic of Congo's long-awaited rendezvous with forest sector–led development has not been met. This can be explained by unrealistic policy design, governance challenges, and the role of the forestry sector within the broader political economy landscape.

The 2002 forest code and the October 2005 presidential decree laid the legal foundations for sustainable, socially and environmentally responsible management. These foundations include substantial requirements for public consultation and integration of social and environmental factors into the forest concession allocation process. In theory, this represents a significant improvement on past laws and practices. However, in practice, the probably too ambitious terms of the forest code are squeezing out of the sector those loggers who pay taxes or try to respect social clauses. The German Danzer group, formerly one of the big actors on Congo's industrial logging landscape, shut down its Democratic Republic of Congo operations in 2013 for this reason. Moreover, there is space to reform certain contradictory policies, for example, the forest code and the 2006 constitution concerning fiscal rights and responsibilities of the central government and the provinces (Global Witness 2012).

However, improved management of the forestry sector is at a standstill. This can be explained by the formal sector being overrun by artisanal timber harvesting for domestic use (building materials and fuelwood), challenges with law enforcement (and legality measures such as FLEGT), difficult relations with local populations who have unrealistic expectations (sometimes supported by foreign social and environmental watchdogs), and the expanding involvement of foreign companies.

The country's cultural context helps account for why forest sector reform initiatives

have not achieved expected results. Integrating this cultural dimension into the forest management agenda is a useful step in empowering communities so they can engage in the process. It is also useful because Congolese political actors sometimes operate in a world that is difficult for international experts to understand. The expectations of ordinary people are rarely considered because they are disassociated from debates about institutional reform. This disassociation results from the breach between foreign experts who interact with local elites and voiceless ordinary people.

As the Democratic Republic of Congo gradually starts to reinvent its governance performance (notably the application of the rule of law), fiscal policy design can be improved. Other countries in the region have adopted successful policies to reduce deforestation that can serve as examples. Fiscal policies can help reduce deforestation in fragile low-income countries, but in the Democratic Republic of Congo concomitant progress in the democratic process needs to be made. The problem is the state's inability to collect taxes and, if they are collected, its inability to transfer the money into the appropriate government channels—not necessarily the absence of taxable revenues themselves. Tax legislation and regulations are inadequate with poor coordination by different collection agencies. Payment methods that are not transparent have prevented reliable disclosure of real tax amounts. Fiscal policies are necessary but insufficient to lead to change alone. The slogan "No taxation without representation" can be extended to "No representation without taxation"; this will require significant behavior change in rentier economies like that of the Democratic Republic of Congo.

Pathways to improved fiscal policy to avoid forest degradation and deforestation include the following means:

- Training civil society organizations to monitor resource extraction along the lines of community policing
- Drawing lessons from the VAT put into place in 2011 and analyzing how mining and petroleum resources contributed
- Reinforcing the central government's revenue collection structures, mainly OFIDA (customs and excise tax), DGRAD (fees and commissions), DGI, and DGE (income tax)
- Respecting the requirements stipulated in the decentralization laws, notably the one regarding fiscal retrocession (Art. 175) to provinces from the central government

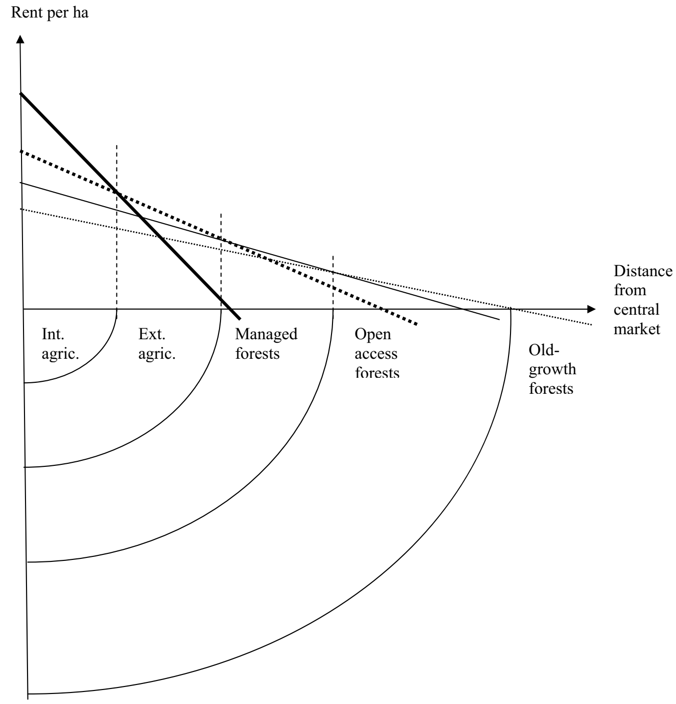
An integrated natural resource approach in the Democratic Republic of Congo is necessary to regain sovereignty and to better manage the natural resource base. Fiscal mechanisms are prerequisites for the implementation of this process. The concluding message of this contribution is, therefore, a call for the inclusion of appropriate fiscal policies within broader governance and state-building initiatives.

Fiscal Rationale of Forest Taxation: Capturing Economic Rent in Context of Limited Information

Forest taxes are used by governments in addition to corporate taxation to capture a greater share of revenues. Theoretically, the aim of forest taxes is to capture the "stumpage value" of a production forest, which can be assimilated to an economic rent (Gillis 1992). The stumpage value corresponds to the market price of the wood production (that is, a mix of logs, sawn wood, by-products, and finished products) minus the cost associated with logging, forest management, transport, processing, marketing, and a "normal" profit. Corporate taxation should also be deducted to get the stumpage value of a forest management unit. Forest taxation, therefore, can be viewed as a way of capturing the forest economic rent not collected by corporate taxation, in a context of asymmetrical information between companies and governments about the prices and costs of timber operations.

Such information asymmetry is often specifically associated with tropical timber and fragile states. Species are often traded in small quantities on few markets, making the information on sales prices difficult to know. Relative prices are constantly evolving, not only among species but also between logs and processed products. In addition, companies can reduce their tax base, often through transfer pricing, but not only, and understaffed tax authorities frequently lag behind. Therefore, forest taxes play a critical role by collecting minimum revenues for the state, whether they capture some share of the economic rent (that is, profit in excess of "normal" return).

FIGURE 4.2
THE VON THÜNEN MODEL WITH FIVE ALTERNATIVE LAND USES



Source: Angelsen 2007.

Collecting revenues from productive forests is the first incentive for public authorities to keep the forest under its current use rather than encourage land conversion to agriculture. Adopting a von Thünen perspective (which explains the localization of economic activities by the increasing transport costs to bring productions to markets), such a fiscal incentive can work around the "agricultural frontier" (see box 3.1). This frontier is the geographical point where potential net returns from agriculture or cattle (factoring in the cost of securing property rights) can compare with timber revenues (Hyde 2012). Figure 4.2 shows the agricultural frontier (solid line crossing the x-axis) proposed by Angelsen (2007). If one considers that the revenue of the state can be proportional to the revenue enjoyed by economic agents (through taxes on profits and/or land values), one can understand that, all other things being equal, a drop in fiscal receipts from forestry will encourage governments to allocate more forestland to agriculture, reducing its expenses for forest control and supervision.

The Uncertain Pigouvian Potential of Forest Taxes

What is the potential of forest taxes to internalize the negative external effects of timber production? This issue has been widely discussed in the last decades (Gillis 1992; Hyde and Sedjo 1992; Karsenty 2000, 2010; Leruth, Paris, and Ruzicka 2001; Vincent 1990) without a straightforward conclusion. As recalled by Leruth, Paris, and Ruzicka (2001), **traditional forest taxes cannot act as Pigouvian taxes since they are set not on negative externalities (for example, damages, wastes, and so on) but on area exploited or volume** (whether they are priced or not, that is, expressed in cubic meters only or in cubic meters and FOB prices) along the value chain.

It is theoretically possible to foresee taxes set on damages, but this could entail high costs. For instance, one can imagine that, instead of taxing volume felled, taxes could be set on destroyed trees or area disturbed by logging and hauling operations. However, difficulties with such a scheme can be easily foreseen in the context of selective logging in tropical areas. Since satellite imagery is only gradually becoming precise enough (to distinguish what is attributable to logging and roads, and what is attributable to, say, shifting cultivation or fires) and not yet available in real time, such a survey would still require expensive field surveys, with corruption risks if such surveys are made by forest officers.

Yet forest services in fragile states lack financial means to monitor forest operations and estimate the level of damages on an objective basis. The same would apply for, say, carbon emissions or biodiversity losses. In addition, damages are not the same for each negative externality: For instance, damage from road compaction might be more critical than damage to forest regeneration. Damages to canopy cover can be also critical, but the right thresholds are difficult to set: Light-demanding species need more opening than shade-tolerant ones, and it also depends on the dynamics of pioneering species.

Area taxation is a good example of the uncertain Pigouvian effect of forest taxes. Area taxes are easy to collect (as area information is readily available); however, the effect of the level of area fee on loggers' behavior will depend on many other contextual factors. On the one hand, one can expect that an increase of area fees will encourage logging intensification (that is, more volume harvested per surface unit, less abandoned). Logging intensification can be a desirable outcome in certain conditions (for example, when regeneration of light-demanding commercial species requires more canopy opening), but it can also have adverse effects, especially if management plans are not strictly enforced. In addition, positive outcomes (for example, using more volume per hectare in order to "consume" less space) depend on the capacity to find profitable enough outputs for lesser-known timber species and industrial capacity (and outlets) to valorize timber with defaults.

Some researchers have even pointed out the risk of short-term-oriented behavior associated with higher area fees ("rush throughout the concession"), suggesting loggers would not respect the felling cycles and would seek to abandon the concession as early as they can, to stop paying high area fees (Vincent, Gibson, and Boscolo 2003). Admittedly, this depends on the degree of enforcement of forest regulations, and it is a mono-causal explanation of loggers' behavior that does not explain why loggers in Southeast Asia exploited their forests so rapidly, sometimes conducting their operations at night. However, in countries with limited enforcement of the regulatory framework, this effect is not unlikely.

Felling taxes can modify incentives as there is room to modulate tax rates according to the promotion objective of some species (for example, diminution of high-grading or hyper-selective harvests). However, not all lesser-known timber species are resilient to an increasing harvest pressure, and such incentives should be granted after careful analysis of forest inventories and scientific studies related to regeneration capacity. In any case, the Pigouvian potential of different felling tax rates is quite limited when transport costs are high and market prices of targeted lesser-known timber species are not high enough to ensure profitability.

In general, it is considered that moving forest taxes from downstream to upstream stages of the value chain favors efficiency. Following such a principle, in 2000, World Bank consultants proposed that the government of Cameroon move the tax on processed products from the output to the volume of logs entering the mills, with the objective to encourage an optimal use of the raw material. This change was implemented for almost a decade, but tax collection rapidly declined as the controllers posted at the entry of the (numerous) mills became "captured" by companies and neglected to report certain volumes (or did not declare the right species). Eventually, this solution was abandoned, and taxes are mainly collected at the export chokepoint. This example illustrates the difficulties of implementing theoretically satisfying solutions in fragile states.

One way to move taxes upstream is by using a bidding procedure (that is, auctions) for allocating forest permits. Such a procedure has been suggested to fulfill two other policy objectives: (i) Increase tax collection through better economic rent capture using competition between companies for securing their access to the resource; and (ii) counter discretionary allocation of permits through the comparison of proposals and, possibly, the publicity of the allocation procedure.

However, forestry ministries tend to favor "technical criteria" over financial ones, overestimating their capacity to monitor the fulfillment of commitments once the permit has been attributed (thus making eventual sanctions unlikely). In Cameroon, where an auction system jointly designed and revised with the World Bank has been implemented since 1997, the coexistence of technical and financial offers has favored corruption (Topa et al. 2009). Even though the financial offer was given the most weight (at 70 percent) in the result, the eliminatory threshold associated with the technical offer sometimes led to suspect elimination of certain competitors, which benefited other competitors. Up-front transmission of information on the bids to some competitors (sent in advance by bidders to the commission under sealed envelopes) has also been suspected to have distorted competitive conditions on some occasions (Karsenty and Fournier 2008). Real-time auctions would mitigate such risk of information leakage, but it has not been attempted for concession allocation in the forestry sector.

The auctioning of forest permits is generally strongly opposed by insiders from the private sector. In Cameroon, the auction system has demonstrated the potential to collect a greater part of the economic rent and revealed in several circumstances the true willingness to pay (Topa et al. 2009), but duplication of the mechanism in other countries did not happen. Insiders prefer discretionary allocation. Companies equally fear that competition leads to overbidding and the "winner's curse."

An annual area fee set through auctioning is a fixed cost, while timber prices (and other costs) vary over time. This potentially creates a risk for the forestry industry, which is a long-term activity. The risk of price variation can be mitigated if the annual fee set through the auction process is indexed to a composite price index reflecting the variation of the market price of various timber species, and products (logs, sawn wood, plywood, and so on). The International Tropical Timber Organization (ITTO) publishes a bimonthly list of prices; however, the list is not exhaustive and the accuracy is disputed. Nevertheless, it reflects FOB price change trends for various regions. Reinforcing this information service would perhaps convince new governments to experiment with auction mechanisms for allocating forest permits without placing all the risk on the industry.

In Africa, where foreign companies tend to dominate the industrial value chain, national loggers fiercely oppose the auction system, which was considered to favor powerful economic actors. In Cameroon, for some years, certain allocation rounds have been reserved for nationals. However, it turned out that some local concessionaires winning the auction were simply straw men of hidden foreign operators.

From Performance Bonds to 'Feebates' Associated with Certification

Acknowledging the limited potential for using traditional forest taxes as incentives, analysts in the 1990s proposed a "performance bond" mechanism. The idea was to force loggers to make, before starting operations, a cash deposit that would be refunded according to the quality of work assessed ex-post on the degraded areas (Blakeney 1993). Karsenty (2000) proposed to accentuate the incentive dimension of the mechanism through the setting of national funds supplemented by international transfers, allowing reimbursements of the deposits with subsidized interest payments for good performances. However, such ideas stumbled over the obstacle of institutional arrangements needed to combine government involvement and independent monitoring of forest performance. In addition, to become an incentive, the deposit should be substantial, which would tend to favor large-scale companies at the expense of national companies and small and medium enterprises. In Cameroon, a financial deposit (guarantee) has been in force for years (Topa et al. 2009), but concessionaires do not trust the government to refund them at the end of the contract and have simply factored in this cost in their up-front expenses.

The rise of independent forest certification schemes, in particular the Forest Stewardship Council, has led to a reframing of the performance bond idea through combining three economic instruments: taxes, certification, and performance-based incentives. The new approach relies on private governance (forest management certification) to assess the performance of forestry companies against ecological and social production standards. In situations where the public sector is not able to raise information or adequately control production methods, goods can be taxed on the assumption that they are not sustainable unless it is shown that sustainable production methods have been followed (Heine et al. 2014), for example, using international sustainability certification companies. Karsenty (2010, 2016) suggested a mechanism of forest tax reductions for certified concessions with full compensation of foregone revenues to public treasuries through bilateral agreements—for a bounded period to be negotiated between donors and national governments. If achieving this transition in fragile producer states is too difficult, the producers can nevertheless be made to face price incentives for sustainability if consumer countries reduce the rates of their consumption taxes for certified imported timber commodities (Heine, Faure, and Lan 2017). Relatedly, Trachtman (2017) suggested that taxing the consumption of goods for their environmental damages and providing exemptions for sustainably produced goods is likely compatible with trade law. And Böhringer, Rosendahl, and Storrøsten (2017) provided a general equilibrium model showing strong effectiveness of a combination of taxes with output-based rebate for sustainable production. These proposals are taken up in chapters 6 and 7 of this volume.

The issues of transparency and a level playing field in fragile states are significant obstacles to implementing such a mechanism beyond the issue of willingness to pay from donors' side. Some FSC-certified companies operating in Africa, for instance, have been reluctant toward such a scheme inasmuch as they do not pay the nominal taxes even in the absence of any rule-based tax discount schemes, thanks to tax concessions they receive in return for various services they provide to public institutions (road maintenance, industrial investment in some places, and so on). Most of the time, such arrangements are not illegal, but they derogate from the common fiscal regulations. Significantly, these companies are opposed to disclosing the amount of taxes they annually pay. Officially, it is to avoid communicating strategic business information to competitors; another motivation may be to avoid making public discreet bilateral arrangements with various authorities.

The potential mandating of forest management certification in some countries could also be an obstacle to using feebates. The 2018 announcement in Gabon of mandatory FSC certification by 2020 of all concessions will possibly be followed by a similar provision in the forestry law under preparation in the Republic of Congo. If the obligation to certify is enforced, and all products carry the same certificate, feebates will no longer be able to affect the relative prices of products produced with more stringent production standards. In this case, fragile countries will effectively just outsource certain law enforcement functions to certification companies, which could be a solution to overcome public governance with private governance. Certification companies are accountable to international oversight because they face a strong disincentive to shirk in one market and risk negative spillovers to their business in another market. Furthermore, their global brands provide an easy target for consumers and nongovernmental organizations in case of any wrongdoing. However, notwithstanding these advantages of using certification companies to supplement weak public governance, there are also problems in the delegation of government tasks to unelected private bodies. Even where the government uses private governance as an enforcement mechanism, it needs to retain its role in public oversight, and this can be difficult in fragile states.

Measures to assure the independence of the certification process may be needed in fragile states. Governance problems do not arise for states only—the fragility of the host state can also affect effective governance of the certification systems themselves. One of the main criticisms leveled at certification is the selection and the remuneration of the certifying body by the audited company itself, which can lead to "biased selection" and potential complacence of the for-profit certifying body. Earmarking a fraction of the forest taxes for a fund (that would directly remunerate the certifying body in lieu of the company itself) can diminish the commercial dependence of the former vis-à-vis its client. In addition, it would organize a financial transfer from noncertified companies to certified ones, since all of them could contribute to the funding through taxation (pooling). If governments were reluctant to "sacrifice" or to earmark fiscal receipts, donors could directly finance and manage such a fund. This financing structure would not, however, resolve the issue of selection of certifying bodies by the companies. Feebates may be able to address this concern by granting different sizes of tax discounts for certificates of different stringency (see chapters 6 and 7), but this solution also complicates tax policy.

Conclusion

In fragile states with weak institutions and rampant corruption, the potential to use traditional forest taxes as Pigouvian taxes should not be overestimated. First, governments perceive natural resources taxation, including forestry, for the primary objective of collecting revenues (and economic rents if there are some to be had) in a context of asymmetry of information regarding the real profits enjoyed by companies, limiting the potential of corporate taxation. Unless governments of fragile states receive additional international financing for change, it is politically unlikely that they would change their priorities and give a prominent place to Pigouvian taxes in their forest fiscal system. This constraint raises the question of whether donors, perceiving the opportunities of improving the conservation incentives from forestry taxes, will be prepared to financially support such reforms in developing countries, similar to how they are already providing such financing for expenditure policies like REDD+. Second, administering the taxation of negative externalities (notably ecological damages) could be costly unless fragile states have access to the needed systems for raising this information, which would necessitate precise field surveys, probably in combination with remote sensing systems, or the information from private forest certification systems.

The extension of independent forest certification, however, provides an opportunity to revisit the principle of "performance bonds" conceived in the 1990s but never implemented because of the difficulty of agreeing upon criteria of performances and the limited capacity of forest services in developing countries to implement such a scheme. If donors join forces, using tax rebates as an incentive for becoming and remaining certified (if certification remains a voluntary scheme), and pooling the costs of audits, seems to be a promising avenue. Such a mechanism could provide transparency, and a much-leveled playing field among companies vis-à-vis tax exemptions will help progress toward the rule of law. In that way, such a scheme would also be an instrument for better governance, as auctioning area fees has been used (for example, in Cameroon) for publicizing the allocation process and to contain opportunities for corruption.

However, tax instruments are not silver bullets for promoting SFM or avoiding deforestation, especially if other sectoral policies, including fiscal ones, favor forest conversion. In particular, in countries where illegal logging activities, often associated with informal small-scale producers, are widespread, increases in taxation levels (which could be a prerequisite for using feebates unless there is international co-financing) are likely to lead to more illegality if there is no complementary policy implemented to tackle this issue.

Well-designed fiscal policies can be good auxiliaries for implementing coherent public policies aiming at containing deforestation, provided they are embedded in an appropriate mix of economic and regulatory instruments.

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5

Rationale for, and Design of, a Feebate for Forest Carbon Sequestration

IAN PARRY

Introduction

Deforestation from (human-induced) activity, net of afforestation, currently accounts for about 12 percent of global carbon dioxide emissions (figure 5.1, panel a), though this share is projected to decline over time. Afforestation offsets roughly half of the current global emissions from deforestation,[1] leaving net emissions of approximately 5 billion tonnes in 2016, compared with industrial CO_2 emissions of about 36 billion tonnes.[2] Under business-as-usual (BAU) conditions (that is, with no mitigating measures), net human-induced emissions from forestry are—albeit with much uncertainty—projected to steadily decline (as deforestation opportunities are progressively exploited) by around 50 percent by 2050 and by 100 percent by 2100, while industrial emissions are projected to roughly double over the century.[3]

FIGURE 5.1
CONTRIBUTION OF FORESTRY TO EMISSIONS AND CLIMATE STABILIZATION

A. GLOBAL CO_2 EMISSIONS SHARE, 2016 B. GLOBAL MITIGATION SHARE, 2015–2100

1 For simplicity, here afforestation is taken to include both the establishment of forests or tree stands in areas with no previous tree cover and replanting of trees in a previously deforested area (normally the latter is referred to as reforestation); deforestation is taken to include both clear-cutting of forestland for agricultural uses/timber harvesting and selective harvesting/household use of woody residue (normally the latter is referred to as degradation).

2 There are significant discrepancies in how forestry emissions are currently measured, in part reflecting the difficulty of disentangling human-induced from natural emission releases and sequestration. Global models (like those cited below) suggest significantly higher emissions than the aggregation of inventories reported by individual countries (for example, Grassi et al. 2018). On net, forests act as a carbon sink (capturing some of the industrial CO_2 emissions before they accumulate in the atmosphere) when account is taken of natural (nonhuman-induced) growth, sequestering on net (that is, with human and natural impacts) around 10 billion tonnes of CO_2 a year (Mendelsohn, Sedjo, and Sohngen 2012).

3 See IPCC (2014) and Kriegler et al. (2015), figure 5.1.

In a globally efficient policy to meet climate stabilization goals, studies suggest forestry would account for roughly a quarter of the cumulative CO_2 emission *reductions* out to 2100 (figure 5.1, panel b). Forestry emissions are relatively more responsive to pricing than emissions from energy—that is, there is a relatively greater preponderance of low-cost mitigation opportunities.[4]

However, it is important to promote all the main behavioral responses for reducing emissions. Reducing deforestation, increasing afforestation, and enhanced forest management account for an estimated 42 percent, 27 percent, and 31 percent, respectively, of the efficient accumulation of forest carbon storage over the century under alternative climate stabilization scenarios, with about 70 percent of the combined emission reductions occurring in tropical regions.[5] Enhanced forest management encompasses postponing timber harvesting, planting of larger trees, thinning to increase forest growth, fighting forest fires and other disturbances, and fertilizing.[6] Forests are also a potentially important source (especially for aggressive climate stabilization scenarios) of biomass for burning in power plants with carbon capture and storage to remove CO_2 emissions from the atmosphere—this is a longer-term possibility, however (and is not discussed below), as these technologies are presently unproven at scale and would require high carbon prices.

Nationally Determined Contributions submitted for the 2015 Paris Accord by large forestry emitters often contain nationwide emissions targets but are vague about targets and instruments for the forestry sector. Most of the major, recent contributors to CO_2 emissions from tropical deforestation have made pledges to reduce economy-wide greenhouse gases—typically in the order of 20–40 percent by 2030 relative to GHGs in a baseline year (table 5.1)—though often the more ambitious targets are contingent on external finance. However, NDCs generally lack quantitative emissions targets for the forestry sector, and countries have not specified policy instruments to be used to reduce forestry emissions.

4 See, for example, Gregersen et al. (2010); Houghton et al. (2015); Kindermann et al. (2008); Moulton and Richards (1990); Plantinga Mauldin, and Miller (1999); Richards and Stokes (2004); and Stavins (1999).

5 Figures from Mendelsohn, Sedjo, and Sohngen (2012). See also IPCC (2014), figure 11.18, and Houghton, Byers, and Nassikas (2015).

6 Around 1 billion hectares (25 percent) of global forests are currently in managed production plantations, though only 70–100 million hectares are in fast-growing regions (Mendelsohn, Sedjo, and Sohngen 2012). Converting more forestland to plantations (especially in the tropics) could significantly increase carbon storage.

TABLE 5.1
MITIGATION COMMITMENTS FOR LARGE DEFORESTATION EMITTERS

COUNTRY	PARIS MITIGATION PLEDGE[A]	OBJECTIVES AND MEASURES FOR FORESTRY	PERCENT OF GLOBAL CO_2 FROM DEFORESTATION, 2001–2013
Brazil	Reduce GHGs 37% below 2005 by 2025.	Zero illegal deforestation by 2030; restoring and reforesting 12 million hectares of forests by 2030.	45.5
Indonesia	Reduce GHGs 29% (41%) below BAU in 2030 by 2030.	Ban on primary forest clearance; reduce deforestation; restore ecosystem functions; sustainable forest management.	9.0
Colombia	Reduce GHGs 20% (30%) below BAU by 2030.	Reduce deforestation; preserve important ecosystems.	3.4
Bolivia	Increase renewable energy share to 79% in 2030 (relative to 29% in 2010).	Zero illegal deforestation by 2020; increase forest coverage to 4.5 million hectares by 2030; increase sustainable forestry management.	3.1
Madagascar	Reduce GHGs (3.2%) below BAU by 2030 with over half of reduction from forestry.	Reforestation for sustainable timber production and species conservation; reduction of forest timber extraction; agroforestry.	2.3
Peru	Reduce GHGs 20% (30%) below BAU in 2030 by 2030.	Measures to promote forest carbon storage not specified.	2.1
Mexico	Reduce GHGs 25% (40%) below BAU in 2030 by 2030.	Measures to promote forest carbon storage not specified.	2.0
Malaysia	Reduce GHG/GDP intensity 35% (45%) by 2030 relative to 2005.	Measures to promote forest carbon storage not specified.	1.9
Paraguay	Reduce GHGs 10% (20%) below BAU in 2030 by 2030.	Measures to promote forest carbon storage not specified.	1.7
Myanmar	Targets for renewables and energy efficiency.	Increase protected/reserved forest cover to 30% of land area through REDD+ related actions.	1.7
Ecuador	Reduce energy GHGs 20.4%-25% (37.5%-45.8%) below BAU in 2025.	Reforest 100,000 hectares per year to 2025.	1.5
Cambodia	Reduce GHGs (10%) below 2010 levels by 2030.	Increase forest coverage to 60% of land area by 2030.	1.5
Lao PDR	Expand renewables; displace residential biomass burning through electrification.	Increase forest cover to 70% of land area by 2020.	1.5

Source: Details on emissions pledges from UNFCCC 2018 and contribution to deforestation from WRI 2018.
Note: BAU = business as usual; GDP = gross domestic product; GHG = greenhouse gas.
a. Where applicable, more ambitious targets conditional on external finance are in parentheses.

Feebates (fee-rebates schemes) are a potentially promising instrument for reducing net emissions from forestry. These policies, which would be administered at the national level, apply a sliding scale of fees on landowners that reduce their carbon storage relative to a baseline level and corresponding rebates to landowners that increase carbon storage.

This chapter discusses feebates and how they might be designed. Section 2 provides more background on pricing carbon forest storage. Section 3 discusses the economic and practical rationales for using feebates to mitigate net forestry emissions. Section 4 looks at some design issues. Section 5 discusses limitations to the application of feebates.[7]

Mitigation Potential and Current Initiatives: A Closer Look

Midpoint estimates from the literature suggest that CO_2 prices of $20, $50, and $100 per tonne by 2030 would reduce net forestry emissions by around 1.5, 2.5, and 3 billion tonnes per year, respectively. These figures are based on the most recent review of the International Panel on Climate Change,[8] though there is a considerable range of estimates in the literature.[9]

TABLE 5.2
CONTRIBUTION BY REGION AND BEHAVIORAL RESPONSE TO MITIGATING FOREST CARBON (FOR $50 CO_2 PRICE IN 2030)

	SHARE OF MITIGATION BY BEHAVIORAL RESPONSE			
	AFFORESTATION	REDUCED DEFORESTATION	FOREST MANAGEMENT	TOTAL
USA	22	0	77	12
Europe	42	3	55	2
OECD Pacific	46	14	40	2
Non-annex 1 East Asia	31	7	62	11
Transition Countries	34	5	61	11
Central/South America	21	62	17	26
Africa	34	60	6	18
Other Asia	30	29	41	18
Middle East	43	25	32	1
Total	29	34	37	100

Source: IPCC 2007, table 9.3.

7 Some of the discussion draws from Mendelsohn et al. (2012).
8 See IPCC (2014), figure 11.13.
9 For example, some studies suggest a $50 carbon tax would reduce global forestry emissions by more than 9 billion tonnes a year in 2030 (that is, changing human-induced emissions from positive to negative); see IPCC (2014), figure 11.14.

The potential scale of mitigation, and the most promising behavioral responses, differ dramatically across regions. Although a little dated (from IPCC 2007), estimates in table 5.2 give a broad sense of the largest sources of mitigation potential across regions and behavioral responses (for a \$50 CO_2 price in 2030). They suggest Central and South America would account for 26 percent of the global carbon forest mitigation, followed by Africa and Other Asia (each 18 percent); the United States, Non-annex 1 East Asia, and Transition countries (each 11–12 percent); and Europe, OECD Pacific, and the Middle East (each 1–2 percent). Reduced deforestation accounts for about 60 percent of mitigation potential in Central and South America and Africa, but it is far less important in other regions—in fact, forest management accounts for 60–80 percent of mitigation potential in the United States, Non-annex 1 East Asia, and Transition countries, while afforestation accounts for 20–47 percent of mitigation potential across regions. Mature tropical forests contain 300–400 tonnes of CO_2 per hectare, so slowing tropical deforestation has a large and immediate impact on emissions.

The REDD+ program provides technical and financial support for developing countries to reduce net CO_2 emissions from forestry.[10] REDD+ refers to reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries. Funding for REDD+ is managed by the Forest Carbon Partnership Facility through (i) a Readiness Fund, and (ii) a Carbon Fund, which are underpinned by a multidonor fund of governments and nongovernmental entities, including private companies.[11]

The Readiness Fund helps tropical and subtropical developing countries prepare for a future large-scale system of positive incentives for REDD+, most notably by establishing capacity for measuring forest carbon inventories. Forty-seven developing countries (18 in Africa, 18 in Latin America, and 11 in the Asia-Pacific region) are participating in the Readiness Fund.[12] Among other things (for example, identifying the drivers of deforestation to guide future policy responses), this fund helps countries develop capacity for measuring a forest reference emission level inventory of carbon storage for different parcels of land, and its periodic updating—procedures that are commonly referred to as monitoring, reporting and verification systems.[13] The inventory covers emissions and removals of GHGs resulting from direct human-induced land use, land use change and forestry (LULUCF) activities.[14] Specifically, countries are invited to submit a proposed forest reference emission level, based on IPCC guidelines, and each submission is technically assessed by a team in accordance with United Nations Framework Convention on Climate Change (UNFCCC) procedures and time frames.[15] An update report is then submitted (every two years) for countries

10 Initially REDD referred only to emissions from deforestation and degradation. The "+" was added to also include emission reductions from changes in forest management and afforestation.

11 The Readiness and Carbon Funds currently have funds of \$400 and \$900 million, respectively. See "About FCPF," Forest Carbon Partnership Facility, www.forestcarbonpartnership.org/about-fcpf-0.

12 Argentina, Belize, Bolivia, Bhutan, Burkina Faso, Cambodia, Cameroon, the Central African Republic, Chile, Colombia, the Democratic Republic of Congo, the Republic of Congo, Costa Rica, Côte d'Ivoire, the Dominican Republic, El Salvador, Ethiopia, Fiji, Gabon, Ghana, Guatemala, Guyana, Honduras, Indonesia, Kenya, Lao PDR, Liberia, Madagascar, Mexico, Mozambique, Nepal, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Sudan, Suriname, Tanzania, Thailand, Togo, Uganda, Uruguay, Vanuatu, and Vietnam. See "FCPF Country Participants," Forest Carbon Partnership Facility, www.forestcarbonpartnership.org/redd-countries-1.

13 Or if not immediately practical to measure stored carbon, a reference level of forest coverage can be established instead. Reference levels must eventually have national coverage, but they may reflect various subnational reference levels for the interim.

14 LULUCF refers to a GHG inventory sector that covers emissions and removals of GHGs resulting from direct human-induced land use, land use change and forestry activities.

15 The LULUCF experts undertaking the technical analysis check whether data and information provided in the submitted technical annex are transparent, consistent, complete, and accurate. Reference levels need to maintain consistency with the country's GHG inventory estimates that are regularly reported to the UNFCCC.

seeking payments for results-based actions. These inventories and their updating (perhaps with some adjustments) provide a basis against which the taxes and subsidies in a feebate scheme could be applied, though there are other possibilities for the baseline (see below).

The Carbon Fund provides performance-based payments for jurisdictions reducing emissions below reference levels. The intention of these negotiated contracts is to help recipient countries and their stakeholders (including forest-dependent indigenous peoples, other forest dwellers, and the private sector) implement sustainable forest management strategies over the longer term.[16] Currently, there are REDD+ initiatives in 57 countries,[17] but in the future some of the funds might also be used for capacity development for implementing feebates.

Forest carbon inventories can be established through a combination of satellite monitoring, aerial photography, and tree sampling. Satellite pictures can be used to measure forest coverage and over time reveal visible land use changes like clear-cutting of intact forest. Carbon storage per hectare of forested land is more difficult to verify, however, as it varies with land productivity, tree species, and forest management practices (for example, selective harvesting can reduce stored carbon without visible clear-cuts). Low-level aerial photography along forest boundaries, using technologies like lidar (light detection and ranging), can estimate wood volume (and therefore implicitly account for selective harvesting and changes in forest management) much more cheaply than field sampling.[18] However, field sampling (the most expensive technology) is normally still needed for densities below a certain threshold—administrative costs might be kept down by, for example, limiting sampling to once every several years.[19] Underscoring the practicalities of such systems, remote sensing has already been used for fiscal policy (see box 5.1), although not yet for feebates.

16 To receive results-based finance, countries must have a national strategy or action plan, an assessed forest reference emission level and/or forest reference level, a national forest monitoring system, a system for providing information on how the safeguards are being addressed and respected, and an MRV system to validate results-based actions.

17 See the International Database on REDD+ Projects and Programmes, www.reddprojectsdatabase.org/view/countries.php.

18 Lidar sensors (covering areas from a few centimeters to tens of meters in diameter) fire pulses down from airplanes to collect three-dimensional data on forests and can penetrate the upper forest canopy to reveal the density of vegetation underneath all the way to the ground—along with canopy height, tree cover, and vertical structure, carbon density can then be estimated (for example, Asner et al. 2010).

19 Measuring aboveground carbon only (usually about three-quarters of the total) could also keep costs down.

BOX 5.1 AN EARLY EXAMPLE OF SATELLITE MONITORING FOR FISCAL POLICY: DEFORESTATION-RELATED FINES AND RESULTS-BASED PAYMENTS IN BRAZIL AND PERU

MIKAELA WEISSE & JESSICA WEBB

A feebate scheme would require strong remote sensing systems. Some early experience from other price-based forestry policies sheds light on implementation opportunities and challenges. Forested areas, particularly those that hold the greatest value for climate and sustainable development, are often located far from cities and can be difficult to reach—and thus in many cases difficult to monitor. However, satellite-based systems are changing that. New science, products, and capacity are improving our ability to monitor forest cover from space, and once a system is in place, forest monitoring can be done much more cheaply, efficiently, and systematically than relying on traditional methods of ground sampling.

Satellite monitoring (figure B5.1.1) is already used across the world to determine fines and payments related to deforestation. At a national scale, satellite monitoring has been a key component in determining results-based payments related to REDD+. The government of Norway recently announced its first payment of an estimated $24 million to Indonesia for reducing deforestation in 2016 based on satellite monitoring (Royal Norwegian Embassy in Jakarta 2019). As monitoring and national capabilities improve, national governments are also beginning to use satellite monitoring to enforce fines and payments for ecosystem services programs at a local level.

The Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, or IBAMA) sends fines to private property holders for illegal deforestation based on satellite monitoring. IBAMA analyzes data from a half dozen government and civil society monitoring systems, which all use satellite imagery from various sources to automatically detect deforestation in the Brazilian Amazon between a daily and monthly basis. For deforestation areas that overlap with private property boundaries, analysts compare satellite images from before and after the deforestation event to confirm the change, estimate the total area deforested, and determine whether there was a violation of the forest code (which specifies a proportion of private property that must remain forested and prohibits deforestation in certain sensitive areas, such as along rivers). Much like speed or red-light camera systems are used to monitor and issue traffic violations, with illegal forest clearing, IBAMA will mail a report of the results along with a fine based on the area of deforestation. The program, called Remote Control, has been in operation since 2016 and has resulted in more than 1 billion reais ($260,000) in fines (Pontes 2017). A related program, Operation Panopticon, is intended to prevent future deforestation.

FIGURE B5.1.1
SATELLITE MONITORING FOR FOREST FISCAL POLICY

Source: Global Forest Watch / World Resources Institute.

Using satellite imagery, IBAMA identifies areas with high deforestation rates and issues warnings to nearby rural landowners with details of existing laws and the consequences for noncompliance. More than 25,000 warnings have been sent to property owners in eight states in the Amazon (IBAMA 2018). While the effects of the Operation Panopticon and Remote Control programs have not been specifically estimated, IBAMA's law enforcement efforts based on satellite monitoring, which also include field operations and the establishment of embargoes, are estimated to have avoided nearly 60,000 square kilometers of deforestation between 2007 and 2011 (Assunção et al. 2013).

In Peru, the Ministry of Environment (Ministerio del Ambiente, or MINAM) uses satellite monitoring to monitor compliance for a conditional cash transfer program with indigenous communities. The ministry began operating a satellite-based weekly deforestation monitoring system in 2017 on the basis of its annual REDD+ monitoring. The system and its corresponding web portal, Geobosques, are now the main monitoring mechanism for a conditional cash transfer program in which indigenous communities receive payments (at 10 soles/$3 per hectare per year) in exchange for conserving designated forested areas within their territories. Ministry analysts receive automated notifications whenever new deforestation areas are detected within one of the conservation areas, and then they prepare reports on the deforestation event. Those reports are sent to the communities, which are responsible for visiting the site of the event to verify it and report on the cause. Outside invasions are reported to the appropriate authority, while a community found violating its conservation agreement may be removed from the program. As of writing, around 200 native and rural communities representing 15,000 families throughout Peru participate in the program, conserving a total of 2 million hectares of forest (Peru, Ministerio del Ambiente 2019).

Implementing programs like these are not without challenges:

- **Effectiveness**: In IBAMA's program, payment of fines is low. This is likely due to the remoteness of the landholdings and the lack of resources for IBAMA to collect fines. In this context, the more effective "stick" has been an agreement by financial institutions to blacklist violators and lock them out of credit. In a "carrot" policy like a tax incentive, one would speculate that landholders would be motivated to cash in on their reward for good behavior.
- **Liability**: A risk in both the Remote Control and conditional cash transfer programs is punishing landholders for the deforestation activities of others. The burden of proof lies with the landholder or community to prove they are not responsible for the violation. In Brazil, there are also instances of bad actors registering land in the names of others to avoid the consequences of the program.
- **Capacity**: Both types of programs require capacity, both in expertise in the interpretation of satellite imagery and in resources to do ground investigations in the case of disputes, which are costly and time-consuming.
- **Contextual data**: For such systems to work, accurate land tenure boundaries and ownership data must also be available and used in conjunction with satellite information.

Despite these limitations, advances in satellite monitoring systems have made it possible to monitor huge areas on a frequent basis at a relatively low cost. These early examples are just beginning to scratch the surface of potential applications for the monitoring of eligibility for results-based payments and compliance with fiscal policy. More opportunities will continue to arise with further improvements in monitoring systems, new satellites, additional remote sensing capacity in the governments of forested countries, and more accurate, digitized contextual data on land ownership.

Rationales for Feebates

A feebate would involve a system of fees and rebates applied to landowners according to a basic formula:

$$\tau_t^{CS} \cdot \left(CS_t^i - CS_{t,BASE}^i\right) = Y_t \tag{5.1}$$

Here, CS_t^i is tonnes of stored carbon on the property for an individual landowner i at time t; $CS^i_{t,BASE}$ is a baseline level of carbon storage attributed to that landowner at time t;$\tau\tau_t^{cs}$ is a payment per tonne of stored carbon (see below); and Y_t is the landowners' total payment at time t (or subsidy if Y_t<0). Landowners therefore pay fees, or receive rebates, in a future year depending on whether stored carbon is lower or higher than the baseline level.

Feebates have several economic attractions

First, feebates are potentially *effective* at exploiting all potential opportunities for promoting forest carbon storage within national boundaries, at least on privately owned land and possibly on public land subject to private harvesting. With landowners penalized or rewarded according to any change in behavior affecting their observed level of carbon storage on their property, they have incentives to increase storage through all three channels noted above. And, with the feebate applied nationwide, landowners in all regions of the country face these incentives. If instead, for example, feebates were applied to changes in forest coverage rather than stored carbon, this would not promote changes in forest management to increase carbon stored per hectare. In principle, feebates can also be built into concessions granted to private entities harvesting timber on public lands (see below).

Second, feebates promote *cost-effectiveness.* Feebates provide the same reward for an extra tonne of stored carbon across the three mitigation channels and across all landowners (and potentially timber harvesters on public lands)—this encourages equalization of incremental mitigation costs across all mitigation opportunities and regions, which promotes mitigation at least cost (leaving aside domestic environmental co-benefits discussed below). And since the feebate price (see below) is explicitly set, it could be harmonized with carbon prices elsewhere in the economy, particularly those for fossil fuel emissions, thereby striking the cost-effective balance of mitigation across the forestry and energy sectors.

Third, feebates can *eliminate the risk of carbon leakage* among landowners within national borders and any leakage at the international level undermines efforts by other countries to meet their Paris commitments. Carbon leakage refers to (partially) offsetting increases in carbon emissions elsewhere, indirectly caused by a carbon mitigation measure. For example, reduced deforestation for agriculture or timber harvesting may put upward pressure on farmland or timber prices, thereby encouraging more deforestation in other regions, though the empirical importance of leakage effects will be highly site-specific and perhaps difficult to gauge ex-ante. Leakage within national borders across private land is addressed under a comprehensive, nationwide-feebate program because any reduction in carbon storage in one region will automatically result in extra fees. And although potential leakage at the international level may be substantial,[20] the resulting extra emissions in other countries would be reported to the UNFCCC, undermining efforts of those countries to demonstrate progress on meeting their Paris mitigation pledges[21] (international leakage is discussed further below).

Fourth, feebates *avoid large fiscal costs* for the implementing country since they can be designed to be approximately revenue neutral. Baseline inventories for carbon storage can be chosen such that the expected revenues from landowners paying fees equals expected outlays to landowners receiving subsidies (see below). Alternatively, if baselines are simply set relative to historical carbon storage—as recorded in the REDD+ inventories—a feebate is likely to generate net future revenues if deforestation significantly outweighs afforestation/enhanced management in the BAU and involve net fiscal costs if the converse applies in the BAU. To the extent any net fiscal cost is anticipated, there might be possibilities for sharing some of this burden with external donors (for example, if donors are anxious to establish a poster child for forest carbon pricing schemes).

Fifth, feebates are *straightforward to scale up,* at least from a technical perspective. The carbon storage price in the feebate can be ramped up over time in line with emission objectives for the forestry sector with approximately (if baselines are set accordingly) no fiscal costs.

Sixth, expanding forest coverage (through feebates or other policies) can *generate a range of other environmental co-benefits* beyond carbon storage. These co-benefits include, for example, reduced risks of water loss, flood risk, soil erosion, and river siltation, and greater preservation of biodiversity and local cultures and traditions. In principle, these benefits should be netted out from estimated mitigation costs for forest carbon storage (to the extent they are not internalized through other policies), though in practice this is challenging because benefits are site-specific and there may be scant regional-level data for quantifying them. The co-benefits (for example, biodiversity preservation) may be greater for reduced deforestation than other behavioral responses—for example, it is difficult to rebuild complex intact ecosystems artificially—perhaps warranting a higher tax rate on CO_2 emissions from deforestation than the corresponding reward per tonne of CO_2 reduced from afforestation or changes in forest management,[22] though this issue is not taken up here.[23]

Seventh, feebates are complementary with other mitigation efforts. If other efforts to reduce forestry emissions (for example, project-based approaches) continue, their effectiveness is not directly affected by the feebate. In contrast, if forestry emissions were covered by an emissions trading system, other measures, by definition, would have no emissions impact since emissions are fixed by the cap—instead, their impact would be to lower the emissions price (to maintain equilibrium in the market for emissions allowances).

Feebates also have some practical attractions

First, their *administration should be manageable* where landowners are clearly identified taxpayers. Following the establishment of an MRV system, fees and rebates could then be

20 A study for China by Hu and Hodges (2014), for example, estimates leakage rates at 80–90 percent, with most of the extra offsetting forestry emissions occurring in the Russian Federation, Southeast Asia, and the European Union. For the United States, Murray, McCarl, and Lee (2004) estimated the international leakage rate could be anywhere from less than 10 percent to more than 90 percent depending on the type of activity and location.

21 Though not all countries may have the institutional capacity to control the additional pressures put on their forest resources.

22 Moreover, primary forests are denser in carbon than planted forests because logging disturbs carbon stored in soil and peatlands.

23 And more generally, there may be other factors to consider in setting incentives. For example, greater carbon storage might increase risks of forest fires and longer rotations can diminish resilience to storms (as high trees are more sensitive to winds).

routinely assessed (see below), and applied by finance ministries, after completion of a registry of landowners.[24] The main administrative issues are (i) establishing the initial assignment of land parcels (specifically, existing forestland potentially subject to deforestation/degradation and land potentially convertible to forestland) to identifiable landowners, and (ii) the capacity for collecting fees from them, or disbursing rebates to them. It would be natural to delegate collection to the government ministry that currently administers agricultural and forestry taxes, usually the finance ministry, to integrate (rather than risk duplicating) administrative procedures.

Second, use of a REDD+ MRV system *circumvents the need to assess additionality* under a feebate (though this also applies to project-based approaches). In the past, a challenge for project-based approaches to reducing forestry emissions has been the need for projects to demonstrate "additionality," that is, that the project would not have gone ahead anyway in the absence of the contracted payment. With a periodically updated MRV system in place, there is no need to assess additionality under a feebate (or the project-based approach) because the baseline against which changes in emissions are calculated is already available.[25]

Third, there might be *political support for the program.* This might come from landowners who anticipate receiving rebates. These landowners may also have strong incentives to help program administrators with the MRV process.

Feebates have not previously been used in the forestry sector, but there are precedents of sort. Feebates are becoming common in the transport sector as a component of vehicle tax systems designed to promote penetration of low-emission vehicles.[26] And they bear some resemblance to the payments for environmental services program pioneered in Costa Rica (see box 5.2), although (i) this system mirrors only the rebate side of the feebate, (ii) payments are related to not only carbon storage but also other environmental impacts, and (iii) not all landowners are covered by the system.

24 However, many countries, including richer countries like Brazil or Indonesia, are still struggling with creating a unified registry of landownership. In Brazil, for instance, violent conflicts over land ownership are still a problem (see Damasceno Costa, Chiavari, and Leme Lopes 2017).

25 It is quite possible that rebates will be provided to some landowners for afforestation or forest management projects that would have gone ahead anyway without the rebate, though this is inherent in any subsidy program.

26 That is, a sliding scale of fees are applied to vehicles with emission rates above a benchmark rate and rebates for vehicles with emission rates below the benchmark. Variants of these schemes have been used in Denmark, France, Mauritius, the Netherlands, Norway, Sweden, and the United Kingdom (Bunch et al. 2011; Cambridge Econometrics 2014).

BOX 5.2 COSTA RICA'S ENVIRONMENTAL SERVICES PAYMENT PROGRAM

Over the last 20 years, Costa Rica has pioneered the Pago por Servicios Ambientales (PSA) program, administered by the National Forestry Financing Fund (FONAFIFO). The program has been predominantly financed by a 3.5 percent sales tax on fuel use, though the objective is that all beneficiaries of environmental services eventually pay for the services they receive. For example, water users are charged for upstream watershed management services, though there has been more limited success charging for biodiversity and carbon. The program provides, on a project-by-project basis, payments to a limited number of landowners to compensate them for the following services:

- Carbon sequestration
- Protection of water catchment areas for urban, rural, and hydroelectric plant use
- Protection of biodiversity (for ecosystem preservation, scientific research, the pharmaceutical industry)
- Protection of natural landscapes (for tourism and scientific purposes)

Payments are given per hectare, depending on land classification, and provide compensation for complementary regulations preventing conversion of land for commercial purposes. Implicit CO_2 prices in the program have been around $8 per tonne (Porras et al. 2013, 14). Approximately 11 percent of Costa Rica's national territory is protected by the plan, which pays out roughly $15 million a year to around 8,000 property owners. Many small and medium farmers are precluded from the program, however, because of limited funding for the program or legal restrictions on their land.

Although forest coverage in Costa Rica has increased dramatically from well below 30 percent of Costa Rica's total land area in the early 1980s to 54 percent in 2014 (Porras et al. 2013; World Bank 2018), most of the increase occurred prior to the establishment of the PSA program—the program was in part compensating for preexisting regulations.

Source: "Payment Program of Environmental Services (PPES)," FONAFIFO, www.fonafifo.go.cr/en.

Bottom-up, project-based approaches, on the other hand, may face severe limitations

Their effectiveness, cost-effectiveness, and scaling up may be constrained by three key obstacles. One is the high administrative costs associated with contracting for projects on a landowner-by-landowner basis, which requires experts trained in forestry to evaluate projects and national governmental organizations supporting the project. Besides significantly increasing overall program costs, high transaction costs likely preclude smaller-scale landowners and perhaps also some larger ones (depending on budget constraints). A second obstacle is the lack of an automatic mechanism—the same explicit or implicit price on CO_2 across landowners—for guaranteeing that the most cost-effective projects are prioritized. Third, and especially important from the perspective of scaling up, is the need to finance each carbon storage project from domestic/external sources (this finance is automatically provided from the fees paid by landowners reducing carbon storage under the feebate approach).

The potential for emissions leakage within national borders may be greater under project-by-project approaches. This is because there would be no penalties for landowners who are outside of the contracting process for reducing carbon storage in response to program-induced changes in agricultural or timber prices.

Design Issues

Baselines

If the REDD+ reference is used for the baseline in the feebate, the feebate will likely lose some revenue, at least if, at the aggregate level, business-as-usual emissions are constant. For the feebate to be revenue neutral, the reduction in carbon storage aggregated over landowners paying fees must equal the increase in carbon storage aggregated over landowners receiving rebates. In other words, baseline carbon storage aggregated over landowners, in equation (5.1), must equal carbon storage with the feebate aggregated across landowners, that is, from equation $\Sigma_i CS^i_{t,BASE}$ should equal $\Sigma_i CS^i_t$ —if the aggregate baseline falls short of this level, the feebate will lose revenue, and vice versa if the baseline exceeds aggregate storage with the feebate. Therefore, if the baseline level is set equal to the BAU with no mitigation policies, it will lose revenue for the implementing government (as the policy itself causes storage to increase above the BAU), and similarly if the baseline is set equal to the initial REDD+ reference level—the current BAU—and there is no expected change in the BAU. Any net fiscal loss is likely modest, however, because the feebate price applies to the difference between emissions and baseline emissions, which is likely a modest fraction of total emissions.

For revenue neutrality, baseline carbon storage could be set to the initial REDD+ reference level with (national-level) adjustments for future changes in (i) BAU storage and (ii) policy-induced changes in storage. That is, the following formula could be used for setting future baselines such that, in expected terms, the feebate is revenue neutral:

$$CS^i_{t,BASE} = (1 + \Delta^{BAU}_t) \cdot (1 + \Delta^{FEEB}_t) \cdot CS^i_{REDD+REF} \tag{5.2}$$

$CS^i_{REDD+REF}$ is the initial carbon storage for landowner i, as inferred from the REDD+ reference level; Δ^{BAU}_t is any expected proportionate change in aggregate carbon storage in the BAU between a future period t and the current period; and Δ^{FEEB}_t is the proportionate increase in aggregate carbon storage, relative to the REDD+ reference, that would be induced by the feebate in period t. If the feebate price is rising over time, Δ^{FEEB}_t will be increasing over time, requiring updating of baselines to preserve revenue neutrality. Ideally, country-level analysis would be conducted to provide initial estimates of Δ^{BAU}_t and Δ^{FEEB}_t, or in their absence, extrapolations from regional or comparator country studies, and estimates might be updated over time with future experience.

Individual landowners should not be able to affect their future baselines through near-term actions, as this might provide perverse incentives for reducing carbon storage. That is, future changes in baselines at the level of the individual landowner should not be linked to future measures of carbon storage attributed to that landowner from inventory updates under the REDD+ MRV system. Instead, those inventories should be used in the calculation of changes in storage relative to a baseline that is exogenous to future actions of the individual landowner.

Payment formulas

Feebates should involve annual tax/subsidy, or "rental," payments rather than large up-front payments,[27] given that changes in carbon storage may not be permanent. The problem with

27 In the present context, the rental payment for CO_2 refers to an annual payment for carbon sequestered in forests.

one-off, up-front payments is that changes in land use may not be permanent (for example, a new tree farm receiving an up-front rebate may be subsequently harvested or destroyed by fires, pests, or windstorms), requiring complex, ex-post repayment procedures to provide adequate incentives to maintain the land use change.

Annual payments should equal the carbon price times the interest rate.[28] That is, the price per tonne of stored carbon should be:

$$\tau_t^{CS} = r \cdot \alpha_t^{CO2} \cdot \beta \tag{5.3}$$

Where r is the real interest rate, α_t^{CO2} is the price per tonne on CO_2 emissions (see below), and β converts a price per tonne of CO_2 into a price per tonne of carbon—given there are 3.67 tonnes of CO_2 per tonne of carbon, $\beta=3/11$. For illustration, a $50 per tonne price on CO_2 translates into a feebate price (τ_t^{CS}) of $0.7 per tonne of stored carbon per year, with a 5 percent interest rate. Fees/rebates could either be administered on an annual basis (to coincide with the collection of other taxes) or every two years (to coincide with the prospective updating of REDD+ inventories).

Setting the CO_2 price

There are different possibilities for setting carbon prices in feebates, but the most logical would be to equate them with national carbon prices for the energy sector, which in turn could be aligned with countries' Paris mitigation pledges. One approach to carbon pricing in the literature looks at price trajectories applied to global GHGs needed to cost-effectively meet climate stabilization goals—a recent review suggests prices of $40–$80 per tonne are needed by 2020 and $50–$100 by 2030 to contain mean projected warming to 2°C (Stiglitz and Stern 2017). Another global approach is to price GHGs at the "social cost of carbon"[29]—one study puts this at $35 per tonne for 2015, rising to $55 per tonne by 2030 (in 2015 U.S. dollars), though estimates are inherently contentious.[30] Within the Paris process, however, the most immediate concern for national policy makers is to align their emissions prices with emissions objectives in their NDCs. Given that solid evidence on the price responsiveness of forestry emissions at the country level is lacking (and likely will be for some time), a period of trying an initial price trajectory and adjusting it based on the observed future response may be needed in the early years of a feebate program. Generally, phasing in prices gradually according to a preannounced schedule is recommended to promote certainty and minimize disruption costs.

Prices, however, may be constrained by prices elsewhere. Most likely (given political or competitiveness constraints), emissions prices for forestry cannot be too far out of line with prices in carbon tax and emissions trading schemes elsewhere. As of 2018, prices are $5–$25 per tonne of CO_2 for ETS and $5–$35 per tonne for carbon taxes (table 5.3), though carbon taxes are much higher in a few cases (for example, Scandinavia), and prices are likely to rise over time as countries strengthen mitigation efforts.

28 For example, Marland, Fruit, and Sedjo (2001) and Sedjo and Marland (2003).

29 This refers to the discounted damages (for example, to agriculture, from rising sea levels, ecological disruption, more extreme climate risks) from the future climate change induced by an extra tonne of current CO_2 emissions.

30 See Nordhaus (2017). Estimates vary widely with differing perspectives on intergenerational discounting and modeling of extreme climate risks.

TABLE 5.3
CARBON PRICES AROUND THE WORLD, 2018

COUNTRY/REGION	YEAR INTRODUCED	PRICE 2019, US$/TONNE CO_2	COVERAGE OF GHGs 2108	
			MILLION TONNES	%
CARBON TAXES				
Chile	2017	5	47	39
Colombia	2017	5	42	40
Denmark	1992	26	22	40
Finland	1990	65	25	38
France	2014	50	176	37
Ireland	2010	22	31	48
Japan	2012	3	999	68
Mexico	2014	1-3	307	47
Norway	1991	59	40	63
Portugal	2015	14	21	29
South Africa	2019	10	360	10
Sweden	1991	127	26	40
Switzerland	2008	96	18	35
ETSs				
California	2012	16	378	85
China	2020	na	3,232	
EU	2005	25	2,132	45
South Korea	2015	22	453	68
New Zealand	2008	17	40	52
RGGI	2009	5	94	21
CARBON PRICE FLOORS				
Canada	2016	15	na	70
UK	2013	24	136	24

Source: Original calculations based on World Bank 2019 and Stavins 2019.
Note: Coverage rates for fossil fuel CO_2 emissions are significantly higher than for total GHGs. ETS = emissions trading scheme; EU = European Union; GHG = greenhouse gas; na = not available; RGGI = Regional Greenhouse Gas Initiatives; UK = United Kingdom.

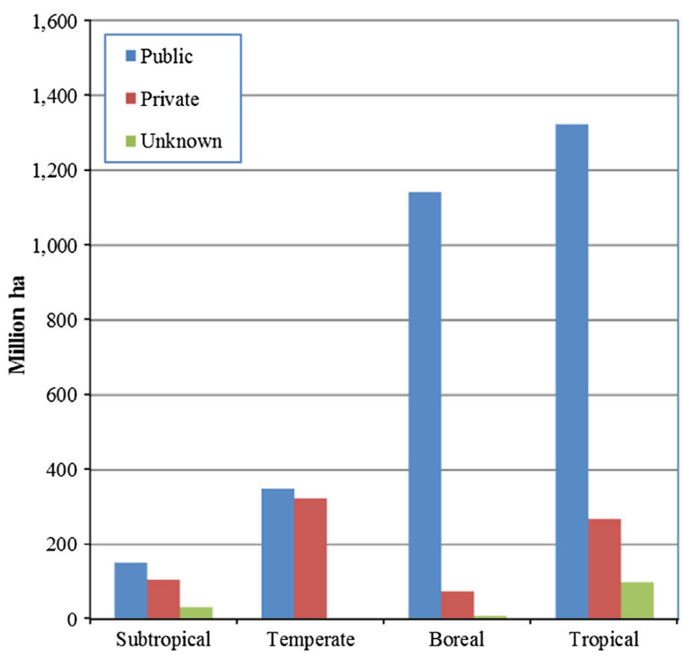
Exemptions

Partial exemptions from fees may be warranted for processed wood. Timber harvested for wood products (for example, furniture and houses) potentially warrants some exemption from fees because the carbon emissions (released at the end of the product life) will be delayed, perhaps by several decades or more. These exemptions might be integrated into existing tax regimes for wood processors and based on analytical analysis of changes in global warming potentials when emissions releases are delayed.

Limitations

The most immediate practical obstacle to feebates is that tropical forests, for the most part, are currently owned and managed by national or subnational governments, whereas feebates are most effectively applied to private landowners. In fact, only about 15 percent of forest area in tropical areas is privately owned, while about 80 percent is publicly owned (figure 5.2). Nonetheless, it is mostly land at the fringe between forests and cropland that is potentially subject to deforestation and afforestation rather than the entire forested area, and this fringe land is largely privately owned. Moreover, future reliance on property rights may expand when, for example, governments attempt to clamp down on illegal logging, or introduce emissions pricing schemes, to demonstrate progress on forestry commitments.

FIGURE 5.2
FOREST AREA BY OWNERSHIP CATEGORY, 2010



Source: Whiteman, Wickramasinghe, and Piña 2015.

A longer-term obstacle is the potential for wide cross-country dispersion in forest carbon prices. Given significant cross-country differences in the stringency of mitigation commitments (table 5.1) and in the price responsiveness of forestry emissions (which vary, for example, with national deforestation rates and the availability of potentially convertible farmland), there will be considerable disparity in the carbon emissions prices consistent with countries' mitigation objectives for forestry, implying potentially significant gains from international price coordination.

One promising form of coordination would be a price floor among large forest emitters. Under a price floor arrangement, each participating country would agree to meet or exceed a mutually agreed emissions price (through feebates or other pricing schemes). This arrangement would provide some protection against international leakage and losses in international competitiveness from pricing, for both participating and nonparticipating countries. Parties need to agree on one main parameter—the common price. And coordination over price floors rather than price levels provides the needed flexibility, given the potentially large dispersion in prices consistent with countries' mitigation pledges.

Provisions in Article 6.2 of the Paris Agreement might encourage broad participation in price floor arrangements and help with enforcement. By recognizing internationally transferred mitigation outcomes (ITMOs)[31] across national governments, Article 6.2.[32] means that countries meeting their mitigation pledges with prices below the price floor can (up to a point) benefit from exceeding their pledges by selling ITMOs at the floor price to other countries (for whom the floor price would be insufficient to meet their pledge). In fact, the threat of suspension of ITMO privileges by compliant participants to any participant not meeting the price floor might be used to provide some compliance incentives.

Focusing the arrangement on "effective" carbon prices would provide flexibility and encourages greater coverage of forestland. Effective carbon prices would average over forestland subject to pricing and other forestland that could potentially be priced but is not (for example, because the land is not under private ownership). Focusing the arrangement on these prices allows flexibility in meeting the requirement, for example, through setting higher carbon prices for covered sectors to compensate for noncovered sectors.

Conclusion

Potentially promising candidates for feebates are countries in existing forestry programs with high capacity readiness and land tenure security. Table 5.4 provides some broad assessment of these criteria for selected countries where existing programs include the CIF's Forest Investment Program (FIP) and the Forest Carbon Partnership Facility,[33] capacity is a qualitative measure of progress on developing REDD+ MRV systems, and land tenure security is measured by an index on ease of registering property. Based on these criteria, potentially promising pilots for feebates might include Costa Rica, Indonesia, Panama, and Vietnam, followed by Argentina, Chile, the Dominican Republic, El Salvador, Fiji, Guatemala, Mexico, Paraguay, Peru, and Vanuatu.

31 Under Article 6.2 of the Paris Agreement, countries exceeding their NDC mitigation pledges can sell excess mitigation credits—ITMOs—to other countries, enabling the latter to meet part of their mitigation pledge through ITMOs rather than domestic actions.

32 See UNFCCC (2016).

33 See www.climateinvestmentfunds.org/topics/sustainable-forests and www.forestcarbonpartnership.org/redd-countries-1.

TABLE 5.4
READINESS FOR FEEBATES

Country	Member FIP[a]	Member FCPF[b]	Current REDD+ MRV capacity[a]	Ease of registering property[b]	Country	Member FIP[a]	Member FCPF[b]	Current REDD+ MRV capacity[a]	Ease of registering property[b]
Argentina	no	yes	medium	57	Liberia	no	yes	low	31
Bangladesh	yes	no	na	29	Madagascar	no	yes	medium	45
Bolivia	no	yes	medium	50	Malaysia	no	no	low/medium	80
Belize	no	yes	low	52	Malawi	no	no	low	65
Bhutan	no	yes	low/medium	73	Mexico	yes	yes	medium	60
Brazil	yes	no	very high	52	Mozambique	yes	yes	low	53
Burkina Faso	yes	yes	low	50	Myanmar	no	no	na	52
Cambodia	yes	yes	low	55	Nepal	yes	yes	low	65
Cameroon	yes	yes	medium	38	Nicaragua	no	yes	medium	47
Cent. Af. Rep.	no	yes	low/medium	42	Nigeria	no	yes	low/medium	29
Chile	no	yes	medium	71	Pakistan	no	yes	medium	46
Colombia	no	yes	low	71	Panama	no	yes	medium/high	65
DRC	yes	yes	high	47	Papua New Guin.	no	yes	low	56
Congo Republic	yes	yes	low	38	Paraguay	no	yes	medium	66
Costa Rica	no	yes	high	74	Peru	yes	yes	medium	75
Côte d'Ivoire	yes	yes	medium	58	Rwanda	yes	no	na	94
Dominican Rep.	no	yes	medium	66	Solomon Is.	no	no	low/medium	47
Ecuador	yes	no	low	66	Sudan	no	yes	medium/high	64
El Salvador	no	yes	medium/high	66	Suriname	no	yes	medium/high	46
Ethiopia	no	yes	low	51	Tanzania	no	yes	medium	50
Fiji	no	yes	medium	72	Thailand	no	yes	low/medium	69
Gabon	no	yes	medium	37	Togo	no	yes	low/medium	55
Ghana	yes	yes	high	56	Tunisia	yes	no	na	65
Guatemala	yes	yes	medium	65	Uganda	yes	yes	medium	55
Guyana	yes	yes	low/medium	57	Uruguay	no	yes	low/medium	58
Honduras	yes	yes	medium	63	Vanuatu	no	yes	medium	66
Indonesia	yes	yes	high	62	Vietnam	no	yes	high	71
Kenya	no	yes	low/medium	56	Zambia	yes	no	low/medium	49
Lao PDR	yes	yes	low	65					

Note: FCPF = Forest Carbon Partnership Facility; FIP = CIF's Forest Investment Program; MRV = monitoring, reporting, and verification.
a. From Ochieng et al. (2016), table 6, and author's informal categorization based on information from the REDD Desk (https://theredddesk.org/theme/mrv) and as noted in country footnotes.
b. From World Bank Doing Business database, www.doingbusiness.org/en/data/doing-business-score?topic=registering-property.

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6

Letting Commodity Tax Rates Vary with the Sustainability of Production

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Environmental versus Conventional Forestry Taxes

A core principle of environmental tax policy is to let tax rates vary so as to encourage sustainable production. In the past, countries used to tax electricity at the same rate independent of how it was produced—for example, whether from coal combustion or from renewable energies. Increasingly, countries are winding down electricity taxes and replacing them with carbon taxes, which likewise raise the price of electricity but differentiate between how the electricity was produced. The new tax burden per unit of output rises with the proportion of carbon emissions instead of blindly taxing all electricity production regardless of how it was produced. This logic equally applies in the case of forestry: Optimal fiscal incentives require varying the tax by how forest-related commodities are produced. But commodity tax systems are still caught in a setting analogous to the electricity taxation regime that prevailed in the energy sector before carbon taxes emerged: Commodities are taxed irrespective of production method. This chapter sets out a mechanism to overcome this problem.

Uncertain impact of standard forestry taxation

Conventional commodity taxes penalize output of the commodity regardless of its sustainability level. Standard forestry taxes such as stumpage and export taxes do not consider timber origin and are instead based on quantity and/or price. Even though the amount of timber produced can cause more or less damage to the forest in question depending on the type of production process used, current tax policies generally do not reflect this variability. For example, a tonne of lumber is charged the same domestic tax rate whether it was harvested from natural forests or from industrial tree plantations, whether it was harvested using reduced-impact logging or by clear-cutting.

The incentive effects of these commodity taxes are suboptimal and can even be detrimental to sustainable forest management in some market circumstances. When the government imposes a tax on timber production, it increases the overall costs firms face.[1] The firm may respond to this increase in costs by intensifying production, which is usually associated with higher environmental damages. Certain tax policies can also encourage the conversion of marginal forestlands to other, more profitable uses such as agricultural production.[2]

Consider the common practice of taxing timber by the tonne: While such a policy may provide an incentive to cut fewer trees, it provides no incentive for sustainable production techniques (Barbier and Burgess 1994; Leruth, Paris, and Ruzicka 2001). Another common practice is to tax based on timber value. Charging based on value (yield taxes) is popular for taxing domestic forest sectors (Amacher 1997) and may incentivize a reduction of negative externalities (Amacher and Brazee 1997; Englin and Klan 1990; Koskela and Ollikainen 1997). By decreasing profitability, a tax on timber value provides an incentive to reduce logging or to selectively harvest. However, on the external margin such a tax also "has the perverse effect of encouraging the outright conversion of still viable (but degraded) natural forests into monocrop plantations" (Leruth, Paris, and Ruzicka 2001; equally Paris and Ruzicka 1993). As such, taxing proxies of the externality, like timber mass or value, comes at a welfare loss (Sandmo 1978), and these unintended consequences may become even worse when timber is taxed at progressive rates (Barbier and Burgess 1994; Lippman and McCall 1981; Mendelsohn 1993).

Those perverse effects are much less likely if tax rates vary depending on *how* a forest product has been produced. If the tax rate is lower when the timber comes from a sustainably managed forest, versus when it comes from an unsustainably managed forest or clear-cutting, the tax imposes a disincentive to both degradation and land use change.[3]

Varying tax rates according to production methods

Making the change to varying tax rates is administratively difficult because fiscal authorities do not have the needed information on production techniques. Indeed, the International Monetary Fund (IMF) has found that such variation may be impossible using standard taxation mechanisms (Leruth, Paris, and Ruzicka 2001). Generally, finance and forestry ministries do not have access to sufficient information on how a forest product was produced. Governments usually must rely on occasional field visits, self-reporting from the firm, or ad hoc reports from civil society groups or nongovernmental watchdogs to verify that both production methods and quantities are in line with regulations and fiscal policy. As a result, governments tax forest products based on the quantity, price, or size of plot without variation based on production methods.

Implementing variable commodity taxes requires a feasible strategy for fiscal authorities to get that data. Mechanisms are needed to overcome the asymmetric information between fiscal administrations and the firms they are trying to tax. This is a challenge especially in the rural sectors of countries with low governance and enforcement capacities—that is, the place where most deforestation happens and where the better commodity taxes would be needed most.

1 While some of the increased tax costs can be passed through to end users of the product, the firm may not be able to fully offset this increase.
2 Behavioral responses to standard forest taxation are discussed in more detail in chapters 3 and 4.
3 Assuming the land that was clear-cut would then be used for agriculture or industrial plantations, a common cause of deforestation and destruction of primary or natural forest.

Sustainability Certification and 'Eco-labeling'

Outside tax policy, a long-tested instrument to raise information on production methods for various commodities is sustainability certification. Environmental certification schemes are voluntary standards relating to environmental as well as social, ethical, safety, and health issues, adopted by companies to demonstrate performance in a specific area. Proof of compliance by a firm to these standards is provided by a certification agency, usually independent from the government and firm. Firms then may label their products with the certifying agency's logo (eco-label). This information is used to influence consumption patterns, as there is evidence that a significant subset of consumers in high-income consumer markets are willing to pay a premium for products with eco-labels (Thøgersen, Hangaard, and Olesen 2010).

Certification relating to the production of forest-based products has long been available for the timber industry. The earliest example is certification by the Forest Stewardship Council, which sets standards for sustainable forest management and has set up a certification scheme for foresters complying with these standards. The FSC also certifies the forest product chain of custody, and labels products as originating "from well-managed forests," using accredited specialized certification bodies. The main alternative to FSC for forest certification is the Program for the Endorsement of Forest Certification (PEFC). Aside from sustainability certification, legal verification and licensing are also becoming more available. For example, FLEGT licenses confirm that timber was legally produced in accordance with relevant domestic laws and the requirements of the EU Timber Regulation. Other third-party agencies are also providing timber traceability and legality verification options.[4]

Environmental certification is also available for most deforestation-related commodities. Beyond timber, certification coverage is growing for soy, palm oil, and biofuels, and it has recently been established for extractive industries, including gold, aluminum, oil and gas, as well as for other goods and services, such as electronics and tourism.[5] The process leading to certification often involves major international roundtables established to convene stakeholders' support for shared principles for production.[6]

Sustainability certificates provide a differentiation of consumer market access conditions. These certificates resemble other instruments of environmental policy like bans in that they modify the terms of access to developed country consumer markets, and thereby they provide indirect incentives for timber producers to improve their standards. Timber certification has the potential to deliver improved yields and quality of output, improved conditions for workers, and reduced operational risk. Environmental certificates are also comparable to taxes, in that they may modify the prices that forestry products can command in the consumer market. However, certificates do not face the same information problems as taxes, as the certification agencies have access to the production sites of participating firms.

Sustainability certificates have been causally linked to premium prices and productivity improvements. There is evidence for various commodities that certification has led to increases of selling prices of certified products as well as to improvements in productivity and incomes

4 For example, SCS Global Services offers "Legal Harvest," a timber traceability and legal verification option.

5 For example, for gold, SCS Global Services, https://www.scsglobalservices.com/services/fairmined-gold-certification; for aluminum, Aluminum Stewardship Initiative, https://aluminium-stewardship.org/about-asi/; for oil and gas, Equitable Origin, https://www.equitableorigin.org/; and for electronics, Sustainable Electronics Recycling Institute, https://sustainableelectronics.org/.

6 For example, see the Roundtable on Sustainable Palm Oil at https://rspo.org/.

(Criscuolo and Cuomo 2018; Marconi, Hooker, and DiMarcello 2017; Mitiku et al. 2017; Waarts et al. 2013). There has been evidence of certification and compliance with standards to provide improvements in productivity, quality and yields, and negotiated supply agreements and market access (Hidayat, Offermans, and Glasbergen 2015; Kissinger, Moroge, and Noponen 2014; Waarts et al. 2013). Through capacity building for production processes, certification can also reduce input costs and increase product quality, which can lead to financial benefits in the short term (Blackmore and Keeley 2012). For example, in Ghana, Rainforest Alliance–certified cocoa was shown to be both more profitable and much higher yielding than typical production methods in the country (Gockowski et al. 2013). In Côte d'Ivoire, certified cocoa farmers who received additional training experienced a 30 percent increase in productivity (Waarts et al. 2013). In Indonesia, palm oil certification has commanded only low price premiums but has nevertheless been shown to be profitable even for smallholders (Hidayat, Offermans, and Glasbergen 2016). Soy certification can improve productivity up to 50 percent (Romijn 2014; Tomei et al. 2010). If producers are able to produce more on less land, this can not only reduce the pressure on forests but also improve returns. However, these price increases—while existent—are sometimes small and can by themselves be insufficient to cover the cost of the certification and production change itself.[7]

TABLE 6.1
ESTIMATES OF PRICE PREMIUMS FOR CERTIFIED AGRICULTURAL COMMODITIES

CERTIFIED COMMODITY	PRICE PREMIUMS
Timber	2%–56%, average 10.5%
Cocoa	5%–18%
Coffee	10%–30%
Palm oil	1%–6%
Soya	0.3%–80%

Sources: Potts et al. 2014; KPMG 2013.
Note: Premiums for organic- and ProTerra-certified soy are expected to remain around 25 percent (Potts et al. 2014). Premiums for certified soy oil tend to be high, as European refineries that import certified soy are given a tax rebate (KPMG 2013).

Unlike standard commodity taxes, sustainability certificates are thus able to provide price incentives differentiated by production technique. But they have important shortcomings too. Problems include transaction costs, free riding, fraud, accreditation costs, lack of dynamic incentives, and a limited scope for competing certification schemes (see box 6.1). We will show below that these problems can be alleviated in policy packages with taxes.

7 And they may not exceed the costs of certification (for the case of soy, see Cameron 2017). However, where premiums are found to be low, certification has been shown to be profitable in the short to medium term (KPMG 2013).

BOX 6.1 EFFICIENCY PROBLEMS OF USING SUSTAINABILITY CERTIFICATES WITHOUT ENVIRONMENTAL TAXES

1. **Free riding**: Consumers are free to ignore sustainability labels. Those who do can free ride on the efforts of other, caring consumers. Free riding itself can have knock-on effects: Experimental evidence demonstrates that people who would, in principle, be willing to behave ethically choose not to do so when others free ride on their efforts (Bicchieri and Xiao 2009; Fehr, Fischbacher, and Gächter 2002; Raihani and Hart 2010). As for labels in other markets (Carlsson, García, and Löfgren 2010; Noblet, Teisl, and Rubin 2006), consumers of timber products may choose not to purchase a certified wood product because they dislike other consumers free riding on their efforts (Lippert 2009).

2. **Divergence of price premiums from external benefits**: The willingness of consumers to pay higher prices for a product with a sustainability certificate may stand in no relation to the external benefits of that product. A product may create large or small benefits to society, but the price premium that consumers collectively choose to pay could be lower or higher than those external benefits; there is no arbitrage mechanism for the two to coincide.

3. **Fixed costs and the sustainability threshold**: Forest owners face fixed and up-front costs when joining certification schemes (Nussbaum and Simula 2005), including for adjusting to the certificate's production standards. For small producers, these fixed costs can be substantial relative to the commercial gain from selling certified produce (Gullison 2003), which strongly depends on the size of output (de Camino and Alfaro 1998). Certification can also be costly for firms that start off from production standards far below the minimum level of sustainability required by the certificate. One solution is for the state to share in the start-up cost of certification—but then, using what tax revenues? Also, in some countries, companies purchasing from smallholders have been willing to finance certification for them, but this cross-subsidization is only incentive-compatible if the purchaser yields a high enough commercial gain from certified inputs.

4. **Dynamic incentives**: Once a firm has achieved the level of sustainability required by the certificate, there is no dynamic incentive to keep improving (Wüstenhagen 2000). Environmental organizations, therefore, point out the need to progressively raise sustainability standards to support continuous improvement.[a] However, when certification agencies tighten standards, they further raise the entry thresholds. Certification agencies such as the Forest Stewardship Council need to weigh the costs of further increasing their standards against the damages from losing even more of the low-quality market.

5. **Competition among certificates**: Some authors suggest resolving the conflict of participation incentives for low-quality producers (3) and dynamic incentives for high-quality producers (4) by introducing a market for certification services where low- and high-quality sustainability certificates coexist. The end consumer would ideally be presented with commodities carrying a range of certificates of different stringencies. The problem of threshold costs could diminish as even commodity producers starting off from low sustainability standards would have a low-level certificate in reach. Moreover, the problem of dynamic incentives could equally improve: Commodity producers that have already attained a sustainability standard would face an incentive to keep improving to reach a more advanced certificate. Competition among certification agencies could also create commercial pressure to offer low-priced certification services.

6. **Consumer confusion**: This system of competing sustainability certificates (5) could only provide efficient incentives if consumers did have a finely differentiated willingness to pay for products carrying certificates of different stringencies. Empirical evidence points out, however, that consumers react to multiple labels by ignoring labels altogether (Martínez 2013; Spenner and Freeman 2012). Even with just two labels in a market, sustainability may already be reduced unless the labels are so different as to, effectively, compete in separate markets (Fischer and Lyon 2014). With unlabeled products and two labels of varying quality, resulting consumer confusion benefits the producers with the lesser-quality label because consumers do not differentiate between products of different sustainability standards but just consider whether a product bears some form of a label at all (Brécard 2014). Therefore,

as the commercial power of any existing sustainability certification depends on its consumer recognition, and as consumers are not able to adequately differentiate between the different sustainability standards, their demand is not sufficiently differentiated to provide efficient price signals to producers. A differentiation of certificates would then undermine the value of having a certificate at all because only a niche section of consumers would be willing to invest the time to understand the differences between the competing certificates. With the current form of sustainability certificates, the market of certification agencies then does not work more efficiently with greater competition.

There are two important takeaways here: The efficiency of incentives from sustainability certificates could improve if the market allowed competition of certificates, but with the current reliance of certificates on consumers that is not possible.

a. Debate on increasing FSC Principles & Criteria (Feilberg 2008; Greenpeace 2014b).

Sustainability certificates have both built-in resilience and risks to fraud. Many commodity markets are notoriously shady, even plagued by illegality. If even state authorities, with their legal force, struggle to enforce basic production standards in rural producer regions, how can private certification agencies raise fine-grained data about these production techniques reliably? One important feature is the global brand recognition of sustainability certificates: Since the business of a sustainability certificate depends on its reputation with global consumers, a scandal in any individual market can be disastrous. Consumers and nongovernmental organizations thereby have great enforcement power, deterring certification agencies from fraud. Another source of discipline comes from the state itself: if it detects fraud by a certification in its borders, it can withdraw local business accreditation. This instrument is even more powerful if the certification program is state-sponsored, as in Mexico and elsewhere (García-Montiel et al. 2017). A concern for fraud, however, is that certification agencies are often paid by the firms being investigated. This causes the same incentive problems as for business audit and assurance services in most other markets. The problem could be resolved if there was a way the state could pay for the certification, which could equally resolve the smallholder problem discussed in box 6.1.

Combining Certification and Taxation

Here we develop how fiscal policy makers can use the information from sustainability certificates to enable a variation of commodity tax rates according to the sustainability of production. We also show how the efficiency not only of taxes but also of sustainability certificates can improve through this policy mix.

Existing uses of certificates in fiscal policy

Beyond taxation, sustainability certificates have already been used in some areas of fiscal policy.

In public procurement, sustainability certifications have been used to vary conditions for government contracts. Public spending can account for over 30 percent of a country's GDP (World Bank 2018). Governments increasingly seek to use this weight for greening the economy. This can be especially transformational in markets where sustainable products are still in niche markets and where early adoption by the state drives down unit costs. However, for commodities, public procurement faces the same information problems about production methods as tax policy. The British public procurement system for timber provides a good example of how to overcome this problem. From 1997 onward, the United Kingdom first encouraged government departments to purchase only timber whose legality had been confirmed by FLEGT licenses or FSC or PEFC certificates. Since then, several other states have implemented similar sustainable procurement policies.

Several countries offer improved access to state funding or other incentives to firms adopting forest certification. Since 2010, France and Germany have provided grant cofunding for third-party forest certification in the Congo Basin. Belgium's Flemish Regional Agency for Nature and Forests provides domestic cost sharing for group certifications. In Portugal, project-based funding is increased if the plot in question is sustainably certified by a third party. Earlier this year, Estonia introduced grants for landowners to sustainably certify their forest plots. In Japan, various local governments provide subsidies to farmers (usually smallholders) who certify. In Germany, the state of Hessen provides a subsidy worth up to 80 percent of the costs of the sustainability certification as well as subsidies for chain of custody certification at various percentages of the costs.[8] In the United States, Wisconsin offers reduced property taxes for certified land.[9] In the past, Gabon and Bolivia provided incentives for companies that certified their production;[10] however, these programs have since ended. To promote wood and paper export, the Russian Federation provides cost-sharing subsidies for certification, provided that the buyer of the exported goods only accepts certified products. Mexico provides financing for certification through allocation of forest development support. In Brazil, firms competing for a concession have an advantage if they commit to sustainability certification. Additionally, firms that certify are eligible for a tax discount: They can obtain a discount of up to 20 percent on the total taxes paid on the timber harvested annually. Finally, the Peruvian Forest Law provides a 25 percent reduction in the concession price for full certification, and a 5 percent reduction in the harvest payment if the concessionaire has initiated the certification process.[11]

Proposal: Letting forestry taxes vary through sustainability certificates

Countries could more generally use sustainability certificates to let the rates of commodity taxes vary according to production standards. Here we describe a mechanism for such a policy, using the example of commodity taxes on timber and forest sustainability certificates.

Taxation on defaults. Consider a tax chokepoint at which a fiscal authority presently levies a timber tax, in dollars per tonne of timber, irrespective of how the timber was produced. Now a reform takes place: Timber will be taxed at the default rate on the assumption that the wood production was not sustainable unless the timber product is accompanied by a sustainability certificate from an accredited third-party certification agency, in which case the tax rate is reduced. The more stringent the sustainability certificate carried by the timber, the greater the tax discount. By using third-party certification agencies, the tax authority gains detailed knowledge about the relative sustainability of a wood product despite its difficulty at raising this data itself. The tax authority now does not need to regularly verify the sustainability of production methods itself but only perform audits on the certification agency.

8 FSC Germany estimates that this policy has led to an increase of 10,000 to 15,000 hectares of certified land.

9 Property taxes of certified land are about 1/10 to 1/100 of the taxes on uncertified land. Additionally, if landowners provide public access to their land, they qualify for a reduction of 50 percent compared with the tax on closed-access land. The state government also encourages enrolled lands to be certified in order to access credit-eligible inputs.

10 In Gabon, firms operating with a forest management plan qualified for a lower tax on the forest area for the annual allowable cut.

11 These incentives may be too low to encourage new certification; however, they do encourage the maintenance of existing certifications.

In our timber example, the mechanism could be:

$$\textit{Tax payment} = (\textit{Tonnes of wood}) \times [(\textit{Default value of external damage per tonne of wood}) - (\textit{Deduction for the showing of sustainability certificate})] \quad (6.1)$$

With this variation of tax rates, firms face a lower tax burden when they can show proof that they engaged in sustainable production. This tax incentive supports producers in offsetting costs of implementing sustainable practices and certification (Karsenty 2016).

The tax variation supports market formalization. Sustainability certificates include requirements for production to be formal and legal. Hence, the mechanism sketched here would grant a commercial incentive for producers to formalize.

This type of policy combination of a tax (or fee) with a deduction (or rebate) is often referred to as a feebate. This is not a tax expenditure (see box 6.2).

BOX 6.2 THE DIFFERENCE BETWEEN ENVIRONMENTAL TAX INCENTIVES AND TAX EXPENDITURES

Tax expenditures are defined as revenue losses attributable to provisions of the tax laws that allow a special exclusion, exemption, or deduction from a tax base or that provide a special credit, a preferential rate of tax, or a deferral of tax liability. In short, **tax expenditures are exceptions to general tax rules to favor specific taxpayers at the expense of wider society or the general taxpayer**. An example in many countries is the deduction of mortgage interest from taxable personal income: It reduces the effective income tax rate of homeowners relative to the nominal tax rate applied to the rest of the population.

Fiscal economists are generally concerned that tax expenditures distort efficiency. Great caution is hence warranted before introducing any new tax expenditures, and many countries could improve growth, equity, and public finances by reducing tax expenditures. How then does the proposal of varying commodity tax rates according to the sustainability of production methods relate to the objective of minimizing tax expenditures? Is a feebate a tax expenditure? To answer these questions, recall that tax expenditures are exceptions from general tax rules. Here we review two key rules and then judge if the recommended feebate brings us closer to these rules (that is, no tax expenditure) or further away (tax expenditure).

In an economy without externalities, the general rule is to tax all products at the same percentage rate. Consider an economy in which consumers spend their income on two products and a state that is trying to raise public revenue by taxing those products. The most efficient way for the state to raise revenue is by applying the same tax rate to both products, leaving competition between the products for the consumers' income unaffected. Because the deadweight loss of a tax rises in the square of its rate, it is more efficient to charge low tax rates to a wide base of taxable items rather than high rates to a select few and exempt the others. To this end, most tax economists recommend raising revenues with a general VAT that applies the same percentage rate to the consumption of all products.

But when there are major external costs,[a] efficiency is distorted unless specific-rate taxes correct for these externalities and applying the *same* percentage tax across all products then makes distortions *worse*. Consider again an economy with two products, but now the consumption of one of the two products causes a damage to third parties in wider society; consumption of the other product has no impact on wider society. Let's call the two products "brown" and "green" products, respectively. Thus, we have a situation where producers and consumers of the green product bear all of the costs associated with this product, whereas for the brown product, third parties in society bear part of the production costs. The brown product thus has a cost advantage over the green product that is not explained by a true comparative advantage stemming from lower *total* production costs, that is, production costs including the costs borne by third parties. With this setup, it would be inefficient to tax both products alike. In fact, applying the same percentage tax to both products would further distort competition because it scales the cost advantage such that the brown widgets gain over the green widgets.

The point that equal taxation can cause greater costs to wider society is key, so let us illustrate it with a numerical example. Assume the total cost of producing a unit of the brown product is 105, but out of that total cost, 15 is borne by third parties in wider society, so the private production cost is 90. For the green product, the total (private and public) cost is 100. Before taxes, consumers are hence drawn to consume the brown product. Now the government introduces a 10 percent VAT. The new after-tax prices are 99 for the brown product, and 110 for the green product. Applying the same VAT to both products has increased the cost advantage of the brown product from 10 to 11. The distortion of consumer expenditures has worsened. Above, we explained that tax expenditures are exceptions to general tax rules to favor specific taxpayers at the expense of wider society or the general taxpayer. Here, we thus have an example where applying tax rates *evenly* inefficiently favors a specific product and creates external costs at the expense of wider society.

One solution to this problem would now be to grant the green product a lower VAT rate. But that would generally be inefficient, because "external" damages (that is, the costs borne by third parties) accrue per physical unit of the product—they are generally not a function of the product price. For example, there is a certain amount of environmental destruction per tonne of mahogany timber extracted from a forest. If the market price of mahogany timber changes tomorrow, the amount of environmental destruction per tonne of mahogany may still be the same. Hence, it would be suboptimal to correct the distortion of consumer choices with a tax that attaches to the price of products, like the VAT. Instead, the distortion should be corrected by a tax that targets specifically the product, or the production technique, that causes the externality.

The efficient taxation of consumption goods requires that taxes are applied in a set hierarchy or sequence. First the specific-rate taxes are added to the market prices of goods that cause external costs, with the tax rate matching the external cost per physical unit of the product. Afterward, ad valorem taxes are applied to that sum, meaning that the VAT multiplies the specific-rate tax.

$$\textit{After tax price} = (\textit{Pretax price} + \textit{Specific rate tax}) \times (1 + \textit{VAT rate}) \quad (6.2.1)$$

Using this sequence, the specific-rate tax purges any product price differences that are due to externalities. When the VAT is then applied at the same rate across all products, it can raise revenues without causing inefficient expenditures to wider society. The efficient functioning of the tax system needs both elements. **Deviations from this rule would be tax expenditures**.

For specific-rate taxes to vary across industries is thus their core rule-based purpose, not an exception from the rule that would classify as a tax expenditure. In fact, this variation reduces tax expenditures. Letting taxes for products with important externalities vary according to the destructiveness of production methods is the rule, not the exemption.

This definition of tax expenditures is increasingly used by international organizations. In 2015, the IMF updated its definition of tax expenditures for fossil fuels to include unpriced externalities. The IMF explained that tax expenditures should be seen as deviations of tax policy from general rules on how products should be taxed. And since fossil fuels should be taxed for damages borne by third parties, countries that tax fuels like any other product without these externalities are granting tax expenditures for the consumption of these fuels (Coady et al. 2015, 2017).

Other institutions appear to use a similar definition implicitly. Consider the classification of an electricity tax and of a carbon tax on the power sector. An electricity tax imposes the same tax across all forms of electricity; a carbon tax exempts renewable energies from the tax burden as it only charges forms of electricity production that generate carbon. No international organization classifies this exemption as a tax expenditure; instead, they all call for carbon taxes as a way to reduce inefficiency from the tax system. Perhaps this is even clearer in vehicle taxation: The World Bank, OECD, IMF and EU have all recommended feebate systems for vehicles, where cars with emissions below a certain level receive a different tax treatment relative to cars above that emissions level. None of the institutions classify vehicle feebates as tax expenditures.

For administrative and legal reasons, it is sometimes impracticable to directly vary the tax on a commodity according to external costs from its production. Feasibility can require first applying the same tax across all products and then granting a rebate for the amount of tax that has been paid too much. That should not be seen as a tax expenditure because it is a rebate for an amount that has been paid in excess of the rule. Ideally, countries would directly impose specific-rate taxes on products that vary depending on the sustainability of production. Administratively, we have seen that this is often not feasible. The government may lack information about the production or lack the legal ability to enforce checks (see chapter 7). In these cases, we recommend a mechanism that applies the same tax rate for all units of a commodity, with a discount or rebate when the sustainability is proven. This setup turns around the burden of proof to vary the tax incidence—it does not change any of the above principles. The amount of tax rebate that the sustainable producers receive is just the amount that they should not have been taxed in the first place because their production technique imposes fewer external costs. Accordingly, this rebate should not be classified as a tax expenditure. Instead, this rebate is enforcing general tax principles rather than being a deviation from them.

a. The rule for what constitutes a "major" externality requiring public action is that the benefit to society from reducing this externality through policy exceeds the transaction costs for addressing the externality (cf. Demsetz 1967). The scope of these major externalities on which policy makers should act increases as externalities become more serious (for example, with increasing environmental destruction) and as the cost of policy decreases (for example, with new policy designs like feebates).

The mechanism can replace or complement existing commodity taxes. The discounts for certified commodities could be introduced to an existing commodity tax. Alternatively, the tax certification mechanism could be built on top of an existing commodity tax by adding an additional tax and discounts/waivers for sustainability.

The mechanism could accommodate different revenue objectives. In a revenue-neutral reform, the government would raise the default tax on the uncertified commodity to compensate the revenue shortfall from the tax discount on the certified products. Since certified commodities presently account for a tiny share of most commodity markets, governments could finance substantial tax incentives for certified commodities with small increases in the default tax rates. Having a sufficiently large tax incentive is relevant especially in the beginning because certification in most markets has not yet reached increasing returns to scale, so a sufficient incentive is needed to get started. With this incentive, the certified share of the market would increase over time. The government can then either incur some cost (as an investment for the sustainability of the commodity) or hold revenues stable by either further raising the default tax rate or reducing the tax discount. The latter option can be justified given the induced increasing returns to scale in certification.

The optimal choice of default tax rates depends on the policy maker's preference for minimizing environmental damage versus certification costs. If the policy maker's objective is to optimize environmental incentives or maximize public revenues, it is optimal to set a high default tax with different discounts for certificates of different stringency, starting off from offering some level of discounts already for relatively low stringency certificates. In this case, the default tax rate should coincide with the marginal external damage from the worst-case production method for producing timber. Most firms then have an incentive to certify that they have produced the timber in a more sustainable manner and receive a tax deduction. The discount should optimally be set so it coincides with the reduction in the marginal external damage resulting from the adoption of the certified production method.

If the policy maker's objective instead is to create a system with low administration and compliance costs, it is better to set a relatively low default tax with fewer discounts, which are all reserved for high-stringency certificates. In this case, the default tax is set to match the marginal external damage of the "normal" production method used by the average firm. This design spares certification costs for firms that want to continue at the current norm, which will then shift more gradually. The tax deduction is then granted only when adopting the more advanced certificates for levels of sustainability, which are much better than what the average firm complies with.

The mechanism can substitute for costly public traceability and MRV systems. Many countries are currently discussing the introduction of systems to monitor, report, and verify land use emissions and to trace deforestation-related commodities. These systems already exist as part of many sustainability certification systems. There is then no need to establish new public systems where the state can use existing private ones and govern them by deciding which ones receive how much of a tax discount.

This mechanism can be adapted to fit a wide range of governance capacities and institutional arrangements. Taxation-and-rebate mechanisms can be implemented in different forms at varying degrees of institutional capacity. Where governments have the necessary capacity, the rebate mechanism can rely on remote sensing, satellite, or other developed MRV systems (similar to the arrangement described in chapter 5). However, where countries lack the capability to accurately measure and monitor environmental damage or lack the fiscal space to invest in such systems, a feebate combined with third-party sustainability certification (already available for many deforestation-related global value chains) can be relied on instead.

The use of certificates for fiscal policy applications also improves certificate markets themselves. Using sustainability certifications for fiscal policy reduces long-standing certification problems, including dynamic incentives and threshold costs, fraud, and orchestration. Whereas in the present configuration of the market for sustainability certificates there is little scope for increasing competition among labels due to the problem of consumer confusion (see box 6.1), the same problem does not apply when sustainability certificates are used by tax authorities. Tax authorities would be able to distinguish the stringency of competing tax certificates where consumers cannot, because finding out this information is a fixed cost. Such fixed costs, while excessive for individual consumers, are small for a tax authority given the different frequency by which the two would use that information. Because the suggested scheme expands the use of certificates to agents who can handle this mild information complexity, it becomes possible to have several certificates competing in the same market. Competing certificates would receive different tax discounts from the tax authorities (corresponding to relative stringency) and cater to producers at different levels of sustainability. This offering in turn would reduce the problems of fixed costs foreclosing the market participation of low-quality producers and the lack of dynamic incentives for high-quality producers. The first group would have easy entry-level certificates in reach for gradually climbing up the ladder toward sustainability. The second group would have advanced certificates to keep stretching for. The competition would furthermore provide competitive pressures to lower transaction costs for certification. All three are major problems of sustainability certificates relaxed through the new market design. Also the problem of fraud from certificates decreases because (1) the scheme would greatly increase the frequency by which

BOX 6.3 MIMICKING OPTIMAL TAX RATES

Optimal tax rates are those that efficiently collect revenues while minimizing distortions and therefore enhance social welfare (Mankiw, Weinzierl, and Yagan 2009; Ramsey 1927). The additivity property[a] indicates that in the presence of externalities, the externality-generating commodity should be taxed, while other commodity tax rates should remain unaffected (Kopczuk 2003; Sandmo 1975). The efficiency of the tax systems increases if rates are higher for goods that are demanded inelastically ("Ramsey taxation"). Forest products tend to be price inelastic, even in low-income countries (table B6.3.1). As a result, environmental taxation for forest products can be a way to implement Ramsey taxation without high administration, thereby increasing the efficiency of the tax system.

TABLE B6.3.1
PRICE AND INCOME ELASTICITIES OF DEMAND FOR FINAL PRODUCTS

COMMODITY	WEALTH—REGION	PRICE	INCOME
Fuelwood	High income	-0.62	-1.50
	Low income—Africa	-0.10	0.40
	Low income—Other regions	-0.10	0.15
Other Industrial Roundwood	High Income	-0.05	-0.58
	Low Income	-0.37	0.19
Sawnwood	High Income	-0.16	0.32
	Low Income	-0.21	0.46
Plywood and Veneer	High Income	-0.13	0.10
	Low Income—Europe	-0.22	1.20
	Low Income—Other Regions	-0.22	0.74
Particleboard	High Income	-0.24	1.25
	Low Income	-0.05	0.65
Fibreboard	High Income	-0.52	0.82
	Low Income—Asia, Europe	-0.52	1.50
	Low Income—Other Regions	-0.52	1.10
Newsprint	High Income	-0.05	0.21
	Low Income—Asia, Europe	-0.18	1.05
	Low Income	-0.18	0.21
Printing and Writing Paper	High Income	-0.15	0.80
	Low Income	-0.37	1.11
Other Paper and Paperboard	High Income	-0.06	0.65
	Low Income	-0.14	0.92

Source: Turner et al. 2006.

In addition, optimal environmental taxes allow governments to capture a portion of the rents from natural resource extraction. "Ricardian rents" are windfall gains and are not due to the risk-taking efforts of firms. By contrast, "economic profits" are earnings arising from risk-taking efforts. In an efficient economy, rent-seeking activities (where there is no effort to incentivize) would be discouraged relative to profit-seeking activities (which generate output but require effort). As a result, the optimal taxation literature suggests that rents should be taxed higher than profits. Natural resource extraction tends to have a larger proportion of Ricardian rents than other activities. As a result, environmental taxes can capture a portion of the rents from natural resource extraction, and this is possible irrespective of the point of tax (upstream or downstream) or point of extraction (domestic or overseas). Environmental taxes may therefore reduce economic distortions by encouraging profit-seeking activities compared to rent-seeking activities.

The optimal tax rate for natural resources should vary with the stock of the resource. For extractive industries, the optimal tax rate should increase when the stock of the resource is low and decrease when the stock is high (Berck 1981; Semmler 1994). Indeed, uniform taxes may not be optimal in the face of such distortions (Bovenberg and de Mooij 1994; Bovenberg and Goulder 1996; Cremer and Gahvari 1993), and optimal rates may even be greater than those indicated by the marginal external damages (Bento, Jacobsen, and Liu 2017; Cremer, Gahvari, and Ladoux 1998; Schöb 1997), which on the margin will draw informal labor into the formal sector. In addition, optimal tax rates should vary depending on whether externalities are a result of changes in resource stocks or from the extraction process itself (Pongkijvorasin, Pitafi, and Roumasset 2006). Optimal resource tax rates should also consider the costs incurred by firms, if possible (Boadway and Keen 2009; Melhado 2007).

Optimal rates, however, are complicated to implement in practice, mainly because of a lack of information about environmental externalities, firm characteristics, and behavioral responses, as well as due to distortions created by existing taxes (Fullerton and Wolverton 2005; Kocherlakota 2005; Liu 2013; Mirrlees 1971).

The feebate scheme described above acts in place of an optimal tax rate. Assuming that, when production methods are unsustainable, the stock of the resource will be low (in the long term and potentially in the short term as well), the default tax rate should be high based on the worst-case scenario of no sustainability in forest production. The tax rate is high when the production methods used imply that the resource stock will be low. However, when production methods are sustainable, the (future) stock of resource will be high. The tax discounts for certification lower the effective tax rate for certified firms. The tax rate is then lower when production methods imply the resource stock will be higher. In this way, the feebate scheme can mimic the optimal tax rate (Fullerton and Wolverton 2005).

a. See also the more general "principle of targeting" (Dixit 1985).

a certification company interacts with the state so that the Folk Theorem applies (Friedman 1971), (2) the tax discount and the substitutability implied by competition give the government much greater threat value against accredited certification agencies than presently, and (3) the government could replace private certification companies with state-sponsored public certificates. For more information on how the suggested mechanism creates efficiency benefits to the markets for sustainability certificates, see Heine, Faure, and Lan (2017).

Unlike before, each certification agency is now able to issue more than one sustainable forest management certificate to cater to timber producers at varying levels of sustainability. Consequentially, as the market starts offering a greater diversity of certificates for different stringencies of sustainable production, a more significant proportion of forest owners faces a dynamic incentive to improve their sustainability because there exists a certificate in sufficiently close reach to make even a small improvement already bear some fruit. Previously, the discrete distribution of forest management certificates (a duopoly market consisting of two official certificates with one sustainability level each) made it necessary for producers to make big leaps in the sustainability of their production to acquire a certificate. As the range of competing certificates increases, approaching a continuous distribution over different sustainability stringencies, these big up-front changes to production techniques are not required anymore. Producers who are starting off from low sustainability practices then face fewer problems with fixed costs for attaining their first sustainability certificate, while producers who already reached higher sustainability levels receive an incentive to keep improving.

Variant of the mechanism in dual economies where the state needs to reach beyond chokepoints

Incorporating certificates into tax policy sends fiscal incentives for improving production methods to segments of the supply chain that the state cannot tax directly. Given the shady nature of many commodity markets, successful administration of forestry taxes relies on the use of chokepoints. These are segments of the commodity supply chain that are sufficiently hard to circumvent, such as a dominant sawmill that all timber producers in an area must use, or ports that are used for exporting all of a deforestation-related commodity. Unfortunately, this administrative need for chokepoints can be ill-related to where in the supply chain production techniques need to improve. Here, the combination of taxes with sustainability certificates can give a tax authority greater reach. Consider the example of the sawmill: The state may not be able to directly tax timber producers according to their production technique, but it can tax the sawmill for its inputs and provide tax discounts when the sawmill shows that its inputs are certified. In this case, the sawmill has an incentive to makes its suppliers certify, or offer its suppliers different prices for certified inputs, given that those reduce the sawmill's own tax bill. Through this price variation, the government's environmental policy enlists the entity at the chokepoint as a voluntary private enforcer where it lacks public enforcers.

In some commodity supply chains, there may be no good chokepoint at all for enforcing a commodity tax, but the certification mechanism can nevertheless be used. In this case, sustainability certificates can be combined with direct taxes. Consider again the example where the government has identified that all timber suppliers use a certain sawmill. The government would like to apply differentiated tax policy to have the sawmill enforce environmental incentives on the timber suppliers. But suppose the government is not able to observe timber being brought into the sawmill. The sawmill knows but has no incentive to reveal that information if it is used for taxation. In this case, the government needs to make it incentive-compatible for the sawmill itself to trace and demonstrate its quantity of timber inputs. One option is to use the corporate income tax (CIT) of the sawmill. When the sawmill demonstrates that it has purchased a certain quantity of certified timber, it gets a discount on its CIT. Again, this policy can be revenue neutral, by adjusting the default corporate income tax bill, and it again enables the tax authority to provide differentiated price incentives to producers of the timber inputs to adopt certified sustainable production methods.

Varying direct taxes against proof of sustainable purchases would be similar to widespread income tax policy for other types of externalities. The idea to grant CIT tax deductions for proof of sustainable purchases may appear unusual. A similar policy, however, is in place in most OECD countries for dealing with another externality: innovation. Expenditures of a firm for research and development (R&D) are widely believed to create benefits for the economy as a whole, just like expenditures of a firm for sustainable commodity inputs create benefits for the economy as a whole. With innovation, many countries give firms the opportunity to prove that they have spent on R&D and then grant deductions to the CIT tax bill. These tax expenditures are widely considered effective at reducing the R&D externality problem. The above suggestion would do much the same for addressing the externalities from deforestation: The firm would prove that it has spent on sustainable inputs, by showing the sustainability certificates of those inputs, and then get a discount on its CIT. This way, the combination of taxation and certification can apply even without a commodity tax chokepoint and such a mechanism would not be as unusual as one might first think.

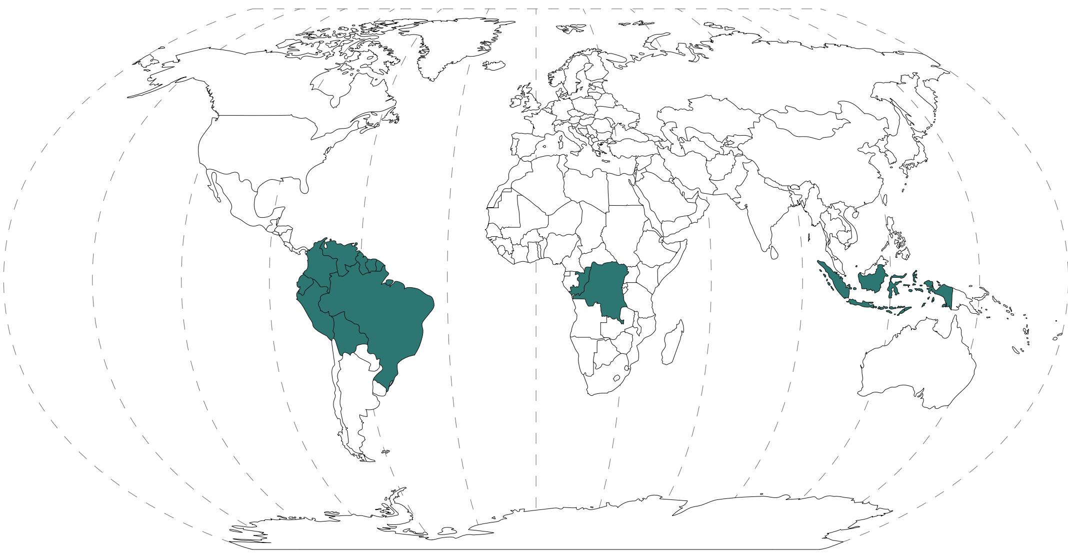
Application of the mechanism across sectors

This feebate mechanism can be applied to various commodities beyond timber. The spread of certifications across different sectors allows for this mechanism to be expanded beyond timber and other forest product commodities. Deforestation-driving commodities such as palm oil in Indonesia, cocoa in Côte d'Ivoire, and beef in Central America could be targeted using the suggested combination of policy mechanisms. Even mineral commodities such as cobalt could be included in such a scheme, given recent developments in third-party certifications for nonrenewable extractive industry products.[12]

Depending on the leading causes of deforestation in a given country, it may even be more appropriate to apply the suggested feebate mechanism to agricultural commodities. The leading drivers of deforestation and forest degradation vary depending on tropical forest region (figures 6.1 and 6.2). In the Amazon Basin, it seems most relevant to introduce differentiated tax incentives for reinforcing available sustainable production methods for beef, timber, and soy, whereas in Southeast Asia, it may be more appropriate to focus on palm oil, or on timber, paper and pulp products.

12 See Kickler and Franken (2017) for an overview of the certifications and eco-labels available for nonrenewable extractive industry commodities.

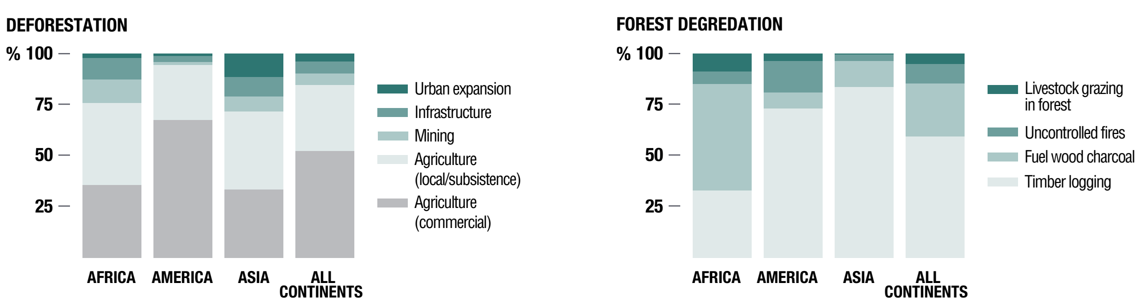
FIGURE 6.1
KEY DEFORESTATION-DRIVING COMMODITIES



AMAZON BASIN	CONGO BASIN	SOUTH EAST ASIA
SOYA	TIMBER	PALM OIL
BEEF		TIMBER, PULP & PAPER
TIMBER		

Source: McFarland et al. 2015.

FIGURE 6.2
PRINCIPLE DRIVERS OF FOREST LOSS IN TROPICAL AND SUBTROPICAL COUNTRIES, 2000–2010



Source: McFarland et al. 2015.

International Collaboration

For both developed and developing countries, the described feebate mechanism has several advantages compared with present forest conservation mechanisms that rely on international funding. At the same time, it is an opportunity for reinforcing international collaboration.

Opportunities for developing countries

The feebate mechanism could grant the host country's fiscal authority more control than expenditure-based instruments that rely on continuous overseas funding. Donor appetite for supporting forest sustainability in developing countries can fluctuate, which poses a challenge to the predictability of today's expenditure-based conservation mechanisms like REDD+. The suggested mechanism would enable developing countries to gain more predictability and reduce dependency by generating a source of sustainability incentives that do not require continuous streams of donor funds.

Using sustainability certificates for tax policy paradoxically increases the control of local governments over sustainability certification companies. The present use of sustainability certification as consumer labels has generated concerns in some developing countries over a perceived loss of control. Private sustainability certification companies make their own rules on what they consider as sustainability, although they often undertake extensive local stakeholder consultation. The resulting certificate requirements normally align with local minimum requirements for legal production but can push the envelope without being subordinate to local governments. The extent of local control is also naturally limited as long as sustainability certificates are merely used as consumer labels. If certificates presently are just information instruments for those consumers, it is the consumers' preference that rules, not necessarily the local policy of host governments. That changes, however, if local governments start using the certificates as information instruments for their tax differentiation. Here, host country governments can formulate the conditions for accepting a sustainability certificate as the basis for tax discounts. If the extent of the tax discount is significant in relation to the price premiums granted by consumers, sustainability certification companies have a strong incentive to coordinate well with local governments. By using private sustainability certificates in fiscal policy, governments in developing countries would thus not lose autonomy. Instead, they might gain more control to effectively use sustainability certification agencies as information and enforcement tools.

Current forest sustainability instruments often rely on public funding. The feebate mechanism creates an incentive for private companies to provide co-financing, including from global commodity firms. Standard forestry regulations are not able to provide dynamic incentives for the private sector to keep investing in improving sustainability, and the informality problems undermine enforcement and hence the consequences of shirking regulations. As a result, many sustainability programs heavily rely on public funds, such as public reforestation funds, instead of private investments into reducing the deforestation of land use activities. The present use of sustainability certification overcomes these problems only very imperfectly: since the prime premiums for certified products are slim in many markets, the private sector incentive to invest in sustainability is equally limited. That changes when the price incentive to adopt certification rises as companies can gain both the consumer price premiums and the tax incentive from going sustainable. Hence, using certificates for tax policy provides an opportunity for a more even burden sharing between the private and public sectors for sustainability efforts.

In the work share of global markets, the feebate mechanism helps host countries move up the value chain. The mechanism encourages formalization of production and product differentiation. Both steps help countries move up global value chains (World Bank 2020).

Opportunities for donor countries

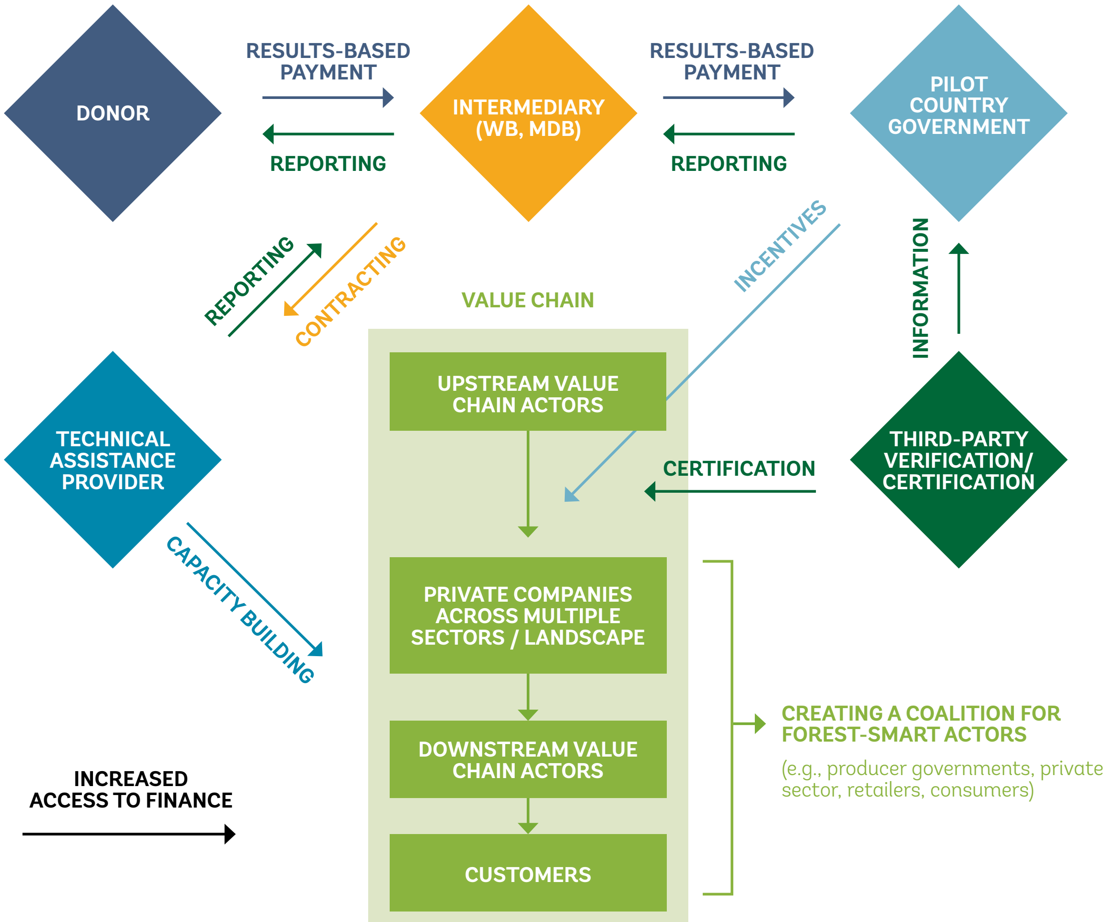
With aid-financed investment projects into forest conservation or forest-smart agriculture, there are often concerns that deforestation will just come back after donor funding streams end. The chance for long-lasting impact is best if projects involve domestic legal change, structurally alter private sector incentives, include domestic co-financing, create domestic vested interest in continuing the change, and bring in the local finance ministry, not only sectoral authorities. The suggested mechanism does all that.

Intertemporal trade-off and opportunity for collaboration

Phasing in the feebates may initially require additional funding to compensate initial revenue losses, cofinance certification costs for smallholders, and set up auditing systems. Feebates can be designed in a revenue-neutral or even revenue-raising manner. But politically, it is easier if the reform starts with just a decrease in taxes for certified sustainable commodities without an immediately matching rise in the default tax rate for commodities without the certification. Fairness, incentives, and market structure can also be improved if the costs of certification itself are not all borne by producers themselves, especially for smallholders, but financed out of a dedicated public fund. Other initial revenue losses may occur as a result of costs for setting up public systems to audit certification companies.

Donors could help cofinance these setup costs. Given the argument on relative costs in comparison with alternative interventions, and elevated chances of persistent change (see above), donors should consider co-financing the setup costs of feebate systems. Such international co-financing in the introduction of environmental fiscal policies could function within existing results-based payment systems. An existing type of results-based payments called policy crediting supports environmental tax policies by providing payments per unit of environmental improvements achieved as a direct outcome of the policy change. Thus, there already exist frameworks for facilitating such international collaboration. However, a more structured approach to potentially expand such collaborations is shown in figure 6.3.

FIGURE 6.3
ITTO PROPOSITION FOR INTERNATIONAL TRANSFER SCHEME TO INCENTIVIZE HARVESTED WOOD PRODUCT VALUE CHAIN



Source: Dieterle 2017.
Note: ITTO = International Tropical Timber Organization.

These international transfers should be transitory. As the recommended policy would provide strong incentives for firms in the informal sector to join the regular economy, the government's ability to raise revenue would improve. Creating a sustainable business model would equally raise that revenue potential against declining BAU trajectories. Most important perhaps, transitory international support of a pilot scheme could reduce the risk and cost for governments in testing such schemes. After it is established that such mechanisms work, international support should be scaled back, and that exit plan should be transparently communicated from the beginning. This will minimize the reliance on the generosity and political winds of donor countries, which can be variable.

Conclusion

For the environmental efficiency of commodity taxes, it is essential to vary tax rates according to the sustainability of production methods. To encourage the maintenance of forests, timber from land conversion needs to be taxed at higher rates than timber from managed forests, and agricultural commodities from agroforestry systems at lower rates than monocrop plantations, which in turn should be taxed less than commodities from illegal agricultural productions in natural forests. In short, tax rates per unit of a commodity need to rise in the marginal social damage.

However, fiscal authorities are generally not able to raise data on production methods themselves. Hence, they apply uniform rates—with ambivalent effects for sustainability. Conventional commodity taxes often set conflicting incentives on the extensive and intensive margins. The same increase in a forest tax can create an incentive for one landowner to reduce logging and an incentive for another landowner to give up forest management altogether and convert the land to agriculture. And even for the landowner that seeks to continue holding forest area, a tax per tonne of timber provides an incentive to take less trees out of the forest but no incentive for reduced-impact logging. Similarly ambivalent, a yield tax can create incentives to both reduce or increase intensity of production, depending on market circumstances. Trying to fight deforestation with invariant commodity taxes is like trying to decarbonize an electricity sector using electricity taxes instead of carbon taxes: It can work, but it is inefficient and potentially self-defeating.

Sustainability certification agencies have the data that tax authorities lack. They can be used for fiscal policy. Sustainability certificates today exist for most deforestation-related commodities. Driven by consumer demand, certification agencies inspect and label sustainable products. Gradually, fiscal authorities have started joining consumers in using this information. Some countries give priority access for certified products to their public procurement systems, thereby creating a beachhead market for certification companies to drive down unit costs for certification and sourcing. Other countries cofinance the certification costs of producers directly. This chapter suggests a mechanism for directly integrating the information from sustainability certificates into commodity tax rates.

Tax authorities should continue applying uniform commodity taxes as the default but provide a tax discount or waiver for proof of sustainable production. This approach turns around the burden of proof, solving the tax authority's information problem through a private market solution. The default tax rates should be set on a specific-rate basis and equal the marginal social damage for the unsustainable production of the commodity. The tax should be combined with a discount or waiver when producers prove, through a sustainability certificate from a government-accredited third-party verification company, that the product has been produced more sustainably than the default assumption. The tax authority is then able to let the net tax vary efficiently without needing to observe individual producers—it just needs to occasionally audit the certification agencies that raise this information for the government.

This mechanism also provides incentives to illegal and informal market participants and levels the playing field. Since sustainability certificates require legality as an entry condition, the tax discounts become a pull to market formalization. They reduce the fiscal disadvantage that today constrains formal and sustainable market participants. Steering the informal sector is possible even when the state does not have perfect tax chokepoints. Even though it is best to apply the default tax at chokepoints that directly catch both formal and informal operators, if that is not possible, the default tax can also be applied to formal sector operators who purchase inputs from the informal sector. As the taxpayers receive discounts when they prove the sustainability and legality of their purchases, they have a strong incentive to tidy up their supply chain. Hence, the government uses the formal sector intermediaries, and the sustainability certification companies, as its agents for cleaning up sections of the market that it cannot govern directly.

Using sustainability certificates as information sources for tax policy yields co-benefits for market price premiums, productivity, and the functioning of the certificate market itself. Certified producers can benefit from two sources of price premiums: the tax advantage plus the market price differentiation from the certificate's consumer label. Furthermore, evidence shows that the formalization and training in improved production methods that come with certification improve productivity.

The mechanism provides an opportunity for improved international collaboration. Donor countries have been looking for mechanisms of forest sector assistance that continue to award long-lasting protection to forests in developing countries without requiring continuous streams of international financing. They should then be interested in supporting the suggested mechanism. It would be anchored in tax law changes, create a continuous source of domestic financing for sustainability, structurally alter private sector incentives to invest in sustainable supply chains, create domestic vested interests against policy reversion, and include the finance ministry, not just sectoral authorities. The mechanism also provides key features that developing countries have sought from global collaboration on forests. It rests the control over sustainability incentives with domestic policy makers, with more predictability and less dependency than expenditure-based instruments that rely on continuous overseas funding. It shifts some of the burden for sustainability investments from the public to the private sector, including international companies that bear an incidence of the differentiated net tax and thus an incentive to take responsibility for their supply chains. In the work share of global markets, the feebate mechanism helps developing countries move up the value chain by encouraging the formalization of production and product differentiation, improvements to productivity, and price premiums. Both developed and developing countries should thus have an incentive to support this mechanism. Developing countries do not forcibly need overseas assistance to make this mechanism work, but international co-financing would help overcome intertemporal trade-offs. These include the potential for short-term revenue losses, the transaction costs of certification, and administration costs for auditing certification companies. Each of these costs is front-loaded, causing a political challenge. Given the advantages of the mechanism for durable change, and long-term self-sufficiency, donor countries should consider supporting the start-up costs of this mechanism—for example, through results-based climate finance or development policy finance.

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7

National Tax Policy for Cross-Border Deforestation Problems

DIRK HEINE & ERIN HAYDE

Trade-Related Deforestation

In many tropical countries, deforestation can be linked to internationally traded commodities. Between 30 and 40 percent of global greenhouse gas emissions from deforestation are estimated to be driven by international trade: "This is substantially higher than the share of fossil carbon emissions embodied in trade, indicating that efforts to reduce greenhouse gas emissions from land use change need to consider the role of international demand in driving deforestation" (Pendrill et al. 2019). The *World Development Report 2020* finds that "through more efficient production and lower prices, trade and Global Value Chains (GVCs) increase the global quantity demanded of certain agricultural resources and commodities. The result can be deforestation, biodiversity loss, and other environmental problems in countries where resources are concentrated" (World Bank 2020). As an example, the report points to Côte d'Ivoire, which has lost 60 percent of its forest cover since 1990, 80 percent of which was caused by land clearing for agricultural commodities, mostly cocoa, almost all of which is exported. In a vicious circle, deforestation is harming productivity of cocoa farming by depleting nutrient sources, changing rainfall patterns, decreasing biodiversity, and threatening long-term cocoa sustainability. While deforestation is a "national disaster" (World Bank 2018), cocoa however accounts for 58 percent of the country's export earnings. It is thus paramount to find policies that continue to enable this important growth factor while converting to deforestation-free commodities. "Building environmental sustainability directly into both the production and governance models guiding GVCs will be increasingly critical to their ongoing viability. That effort will require a combination of appropriate pricing, regulations, and cooperative arrangements" (World Bank 2020).

In principle, the problems of trade-related deforestation might best be addressed through a global treaty. If countries acted together, environmental policies could be tightened much more significantly without concerns over competitiveness losses—which today is a significant concern causing "regulatory chill" (World Bank 2020). A global forestry treaty could also improve the efficiency of global trade itself, by preventing distortions to trade streams (see box 7.1) presently caused by non-enforcement of environmental regulations (Chichilnisky 1994) and failure to tax environmental damages (Stiglitz 2006).

BOX 7.1 MISSING ENVIRONMENTAL POLICY CAN DISTORT TRADE FLOWS

Environmental policies provide two broad functions for global value chains. First, they can protect the environment itself and ensure the sustainability of certain increasingly depleted resource bases on which many GVCs depend. Second, well-designed policies can reduce an important distortion to international trade. The second function is less well known and hence the focus of this box.

To maximize value creation in the global economy, production should be allocated on the basis of comparative advantages that arise from differences in countries' factor endowments or technological progress. It is possible for countries to distort their comparative advantages, for example, when they subsidize local production or when they make other countries pay for part of the cost of producing a good. For example, suppose a country produces steel, emitting air pollution, and the costs of this air pollution are borne by citizens of a neighboring country. In this case, the producer country can artificially reduce its private cost of production just like with a distortionary production subsidy. A lack of regulating or pricing environmental damages can therefore seriously distort trade (Chichilnisky 1994; Stiglitz 2006). To ensure that goods are produced in the location where the opportunity cost to society is the lowest, policies can ensure that polluters pay for their true costs of production. One hundred seventy countries have agreed in the UN General Assembly to the "Polluter Pays Principle,"[a] to "eliminate unsustainable patterns of production and consumption,"[b] and attain sustainable development.[c] Countries also agreed that global trade shall be a force to achieve this sustainable development,[d] and they have called for the abolishment of distorting subsidies. Yet there are still very sizable production costs imposed on third parties, such as for fuels and deforestation-related agricultural commodities. Such "external costs" or subsidies can distort trade patterns. If they are well designed, environmental policies can help further improve the efficient allocation of trade and thereby increase the value creation from GVCs. Against this ideal, however, wrongly designed environmental policies can equally be a barrier to international trade.

a. Rio Declaration, Principle 16 (UN General Assembly 1992).
b. Ibid., Principle 8.
c. Ibid., para. 1–27.
d. Agreement Establishing the World Trade Organization, para. 1 (WTO Agreement 1994).

However, in the continued absence of a global solution, given the pace and irreversibility of deforestation, policy makers have no alternative than to use national policy for cross-border deforestation problems. This can work well despite all its challenges. "At the country-industry level, higher compliance with social and environmental standards is correlated with economic upgrading" (World Bank 2020). For deforestation driven by traded commodities, the *World Development Report 2020* recommends combining private sector solutions like sustainability certification and industry roundtables with public policy. While sustainability certification is praised, "the appropriate regulations and policies will, however, have to be put in place for achieving large scale impact." Certification alone is not enough.

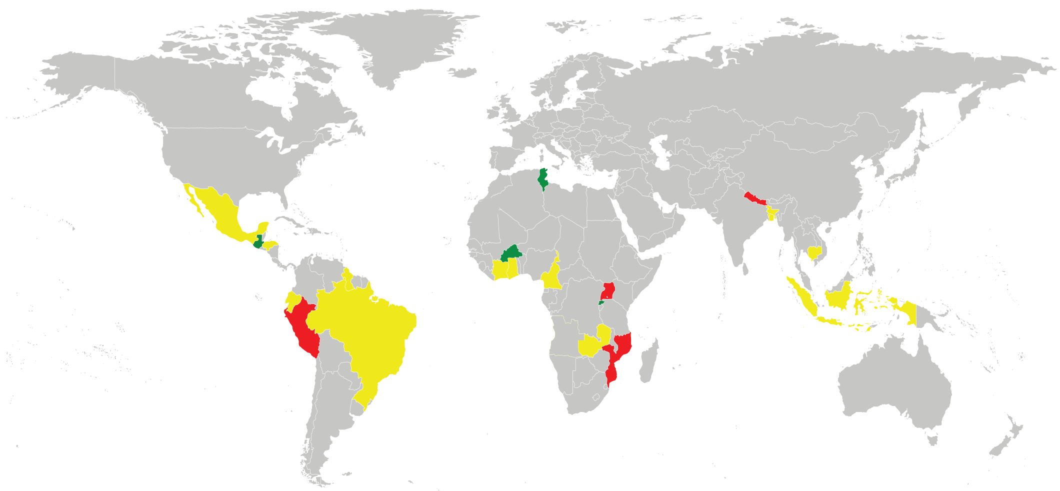
Fiscal Policy for Sustainable Exports

The present reliance on export taxes

Many low-income countries use export taxes or even export bans for deforestation-related commodities (figure 7.1 illustrates FIP member country use of these taxes and bans). The common application is a tax on exported wood products (logs, sawn wood, veneers, and plywood, among others). For example, Cameroon charges a 30 percent tax on log exports (Deckson 2018); the

Democratic Republic of Congo uses a combination of log export quotas and a 10 percent tax on log exports and a 5 percent tax on sawn wood (REM 2013); Suriname charges a 20 percent tax on roundwood exports (PHS 2018); and in the Central African Republic, export fees comprise a 1 percent charge of the FOB value and an additional 19 percent VAT charge (Forest Legality Initiative 2013). Besides reducing deforestation, the motivations include revenue mobilization and incentives for creating domestic processing industries.

FIGURE 7.1
FOREST INVESTMENT PROGRAM MEMBER COUNTRY USE OF FOREST-RELATED EXPORT TAXES AND EXPORT BANS



Source: World Bank staff.
Note: Countries shown in green use neither a timber export tax nor a wood product export ban; countries shown in yellow use a timber export tax; and countries shown in red use either a timber export tax and wood product export ban or a wood export ban by itself.

While addressing deforestation, these taxes also create distortions in domestic processing. There is an economic cost when a country has such a low efficiency in processing that a given log loses value in processing compared to the value that could be realized by exporting it as a log and processing it elsewhere. In other words, there might be a lack of comparative advantage in the wood processing industry. This could be the case if there are relatively high production costs or lack of domestic markets on which to sell the product, as has been demonstrated for Gabon (Karsenty and Ferron 2017). Therefore, the impact of export taxes and bans on domestic industry might prompt countries to implement mechanisms that reduce the impact on domestic industry, like targeted transfers. Export taxes designed to impact domestic processing can also lead to overcapacity. When a tax on log exports depresses domestic prices compared to international markets, even inefficient sawmills can remain competitive (Karsenty and Ferron 2017). Export taxes can also directly discriminate against high-value processing. For example, in Liberia the export tax is halved on processed timber but is charged based on the value of the wood product. This creates a bias against high-value processing, as the tax bill would increase with higher value (Krelove and Melhado 2010). This overcapacity in low value-added industries can create a demand that outpaces sustainable supply (Barr 2001). In combination with low governance capacity, this can exacerbate unsustainable timber outcomes (Hicks 2018).

For some countries, however, the choice has been between taxes or outright export bans. Log export bans can play a role in stopping deforestation. Hansen and Lund (2018) show that a ban can create the incentive for firms to increase recovery rates in primary and secondary processing by reducing domestic competition as well as distorting log prices. But bans are a drastic instrument. Karsenty and Ferron (2017) show the significant tax revenue loss when Gabon replaced export taxes with bans. In these cases, it may be more desirable to replace log export bans with log export quotas that are distributed through public auctions (Hansen and Lund 2011, 2018; Karsenty 2000). In Equatorial Guinea, "production plummeted, from more than 500,000 m^3 in 2007 to 13,700 m^3 in 2009" (Karsenty and Ferron 2017) after a log export ban was introduced. The ban was revoked, and exports are now taxed $0.85 per cubic meter with certain tax exemptions offered to certified companies.

Gradually phasing out export taxes and converting them to environmental taxes

There are good reasons to consider replacing export taxes. But countries should do so carefully because the alternative could be worse. Export taxes inhibit a country's participation in GVCs. Hence, countries are considering phasing them out and several bilateral trade agreements include such conditions (see chapter 9). However, export gates still provide some of the strongest tax chokepoints available in countries with weak tax administrations. Whereas many countries struggle at enforcing internal taxes on the production of commodities, it is often much easier to administer the collection of a tax at the export gate. Replacing export taxes with internal taxes too quickly can thus encourage tax evasion. Even worse, the actors most likely to evade internal taxes may be the ones with the worse production techniques. This is a large problem given the close overlap between the deforestation problems and governance capacities of countries. Repealing an export tax at a central chokepoint seaport and instead levying taxes on many small producers within the rural interior of the country could be dangerous if it is not preceded by sufficient governance capacity building.

A familiar additional problem of current export taxes is that their rates do not vary by the sustainability of the production method. For example, in Côte d'Ivoire cocoa export taxes vary depending on the level of processing and not on the inherent sustainability in the production process. Thus, the present export taxes may only provide incentives to produce less of the commodity. Instead, a solution is needed that will enable countries to continue exporting large quantities but to decouple the export of the commodity from deforestation.

The effectiveness of the taxes can be improved, and the phaseout of export taxes be organized gradually, by granting reduced rates for sustainable commodities. Given the need for caution with phasing out export taxes because of the risks for evasion and lower production standards, and the simultaneous problem that export tax rates do not vary with the sustainability of production, a good reform could be to center the reduction of export tax rates on sustainable commodities only. In this setup, the previous export tax rate would continue to be charged unless a commodity is produced in a sustainable manner.

This reform could be implemented using the combination of tax discounts and sustainability certification instruments from chapter 6. Administratively, the mechanism would be the same, but the export gate would be its chokepoint.

This implementation of the tax and certification mechanism would have several synergies with present initiatives to improve the sustainability of international trade. As the *World Development Report 2020* explains, in GVCs many industry roundtables are trying to improve sustainability via private standards. Often these are organized by lead firms seeking to clean up the supply chain to protect their brand reputation. "Because lead firms have a brand name to protect, they pay attention to how their supply chains function in terms of social and environmental standards" (World Bank 2020). The more stringent industry roundtables use third-party sustainability certification as an enforcement instrument. Sustainability certificates abound for trade-related deforestation issues. Accordingly, especially for export taxes, fiscal authorities could make ready use of already prevalent sustainability certificates to implement the variation of commodity tax rates.

The market price premiums for certified products are generally higher in developed-country consumer markets than in most developing countries. Accordingly, the gain for a developing country government from inciting an uptake of certification among its domestic producers is also greater for exported products. That is not to say that the use of certification for taxation would not make sense for purely domestic products—it does because of its ability to enable the variation of tax rates according to production standards. But the synergies from at the same time also yielding premium consumer prices is greater for the export commodities.

Another synergy is with current efforts of several developing countries to induce international companies to take greater responsibility for their domestic supply chains and invest in sustainability. Some roundtables stay at the level of marketing commitments without leading to substantive change because companies lack incentives to follow through. The tax policy would create these incentives.

For some deforestation-related commodities, there are presently threats of trade embargoes. The suggested mechanism could contribute to avoiding these. For example, in the Amsterdam Declaration several European countries threatened to stop purchasing any chocolate that does not come from deforestation-free cocoa. This is a major concern for economies like Côte d'Ivoire and Ghana, not only because much of their cocoa is not deforestation-free but also because even the subset that is will not be able to reveal its type. The tax-induced greater uptake of certification would help these developing countries prove the status of their commodities and avoid such negative consequences.

Fiscal Policy for Sustainable Imports

The problem of imported deforestation

When deforestation occurs in the production of a commodity that is afterward exported, this deforestation is jointly caused by both the producer firm/exporting country and the consumer/importing country. Both sides contribute to deforestation. The exporting country could have produced the commodity without deforestation, but the importing country could equally have demanded a sustainable product. Thus, both sides could have avoided imposing the global external costs of deforestation on the rest of the world. By financing the production of deforestation-related commodities, developed countries therefore share a responsibility for deforestation caused by the products they demand. This problem is referred to as "imported deforestation" or "embodied deforestation."

Even though most deforestation today happens in developing countries, developed countries have a responsibility to implement policy for the sustainable consumption of imported forest products. In Europe, for example, "Deforestation embodied in EU27 consumption is almost entirely due to imports, as deforestation within the EU is negligible" (Cuypers et al. 2013). Given that deforestation caused by European consumption imposes a global burden, the EU has a duty to improve the sustainability of its consumption. Because deforestation physically happens overseas, this implies a duty to act beyond its borders. However, reducing deforestation outside one's borders may not involve "extraterritorial regulation" and needs to be implemented in a manner that respects the sovereignty and property rights of the exporting countries. As box 7.2 explains in greater detail, importing countries can legitimately act, not by directly intervening overseas but by altering their own participation in the causation of overseas harms by changing their consumption patterns through domestic tax policy. So, whereas it would be extraterritorial for an importing country to impose a legal tax liability on overseas commodity producers who deforest, it is legitimate for the country to tax its own citizens for unsustainable consumption of both domestic and imported commodities. These policy actions must be proportionate and nondiscriminatory, but they are called for because of the importing states' economic co-responsibility for overseas deforestation.

As a result of carbon leakage, countries may also need to address imported deforestation to effectively raise the sustainability of production of their domestic commodities. The natural starting point for a country eager to raise global forest protection is its own forests. Nevertheless, since deforestation-related commodities are traded internationally, protecting only the forests within a given open economy may give rise to carbon leakage. As the price of domestic commodities rises with increased requirements for their sustainable production, consumers may substitute those domestic products with cheaper imports from unsustainable forestry overseas. A proportion of the country's efforts at raising the overall sustainability of the commodities is then lost. This loss may be large.[1] To overcome this problem, a country that raises the sustainability of its own forests must simultaneously also deal with the forestry sector in other countries, either directly or through its imports from those foreign producers.

1 For GHG mitigation from the forestry sector, estimates range from 23 percent (Meyfroidt and Lambin 2009, 16143) to 20–40 percent (Murray, McCarl, and Lee 2004), 71–85 percent (Nepal et al. 2013), 45–92 percent (Grieg-Gran 2008), and above 100 percent in particular regions (Boer et al. 2007; Haim, White, and Alig 2015).

BOX 7.2
ENSURING THE COMPLIANCE OF ENVIRONMENTAL TAXES ON IMPORTED DEFORESTATION WITH THE SOVEREIGNTY AND PROPERTY RIGHTS OF EXPORTING COUNTRIES

The use of taxation for traded forestry products is contested by some legal philosophers, who argue that countries importing deforestation-related commodities would generally have no justification for interfering with the production decisions in overseas forestry sectors. This "eco-imperialism" literature takes up legitimate concerns of developing countries contesting the continued intervention of past colonizers.

One strand of this literature argues that the sovereignty of countries producing deforestation-related commodities means that other nations have no legal right to interfere with domestic decisions over forestry management (Anderson and Grewell 2000; McCleary 1991). This is legally correct to the extent that commodity-importing countries are not allowed to intervene in the internal affairs of other countries. States have "the sovereign right to exploit their own resources pursuant to their own environmental policies."[a] However, while safeguarding the sovereignty of commodity-exporting countries, the sovereignty of commodity-importing countries must also be respected. The sovereignty of the importing states means that they have the right to govern their own domestic markets, including the right to pass taxes and to apply them evenly in the domestic forestry sector as well as at the customs gate.

Economically, the use of taxes can even be required to maintain the sovereignty of nations in forestry policy. One reason is the existence of transboundary harms. Unsustainable forestry in one state creates external costs for other states, undermining the sovereignty of other states by taking away their ability to control their borders ("interdependence sovereignty")[b] and their markets ("domestic sovereignty").[c] By internalizing those external costs through Pigouvian taxes, the importing state regains these powers. The second case requiring taxes for the maintenance of sovereignty is emissions leakage. The systematic occurrence of leakage implies that commodity-importing countries are not free from foreign interference in the governance of their forestry sectors (cf. Dietsch 2015, 121; Ronzoni 2009, 248, 250). They face pressure to keep the sustainability of their own forestry sector lower than they may otherwise prefer. The downward pressure on environmental standards caused by the leakage removes people's self-determination of the sustainability of their domestic commodities production. By reducing leakage, the taxation of the importation of unsustainable forest products restores the ability of each state to manage its own forests. Such a restoration of sovereignty has efficiency benefits described by the concepts of the "tragedy of the commons" and "race to the bottom": As states regain the ability to manage their forests without leakage, their power to exclude access to rivalrous forestry resources increases. Isolating domestic forests from leakage turns an open-access resource into a national club good, reducing pressures for overexploitation. And as the use of taxes internalizing environmental costs at the border reduces leakage effects, nations are enabled to compete on prices instead of on mutually harmful unsustainable production methods. This is a particular benefit to small countries that could otherwise not improve the terms of competition between nations.

Critics have also claimed that the property rights of commodity producers forbid foreign interference with production standards. The argument goes that, because the property right over a forest includes the right to destroy, other countries must not penalize unsustainable forestry practices (McCleary 1991). Only domestic regulators in the commodity-producing state could intervene, as they define the extent of domestic property rights. Overseas governments would have to accept the consequences of production decisions taken by domestic commodity producers exercising their domestically defined property rights. This argument overlooks, however, that for traded commodities, the property right for the product is passed on to consumers. The state where these consumers are located can tax its citizens for unsustainable consumption. There is no conflict with property rights; the taxation just follows the same principles as for other domestic products with externalities, such as gasoline. A consumer is free to purchase gasoline and has full property rights over it, but the state may nevertheless tax the consumer to internalize the costs of pollution. Such a Pigouvian tax restores—not contradicts—the protection of property (of others) because it internalizes external costs.[d]

The imposition of environmental taxes on unsustainable forestry products has also been criticized as a violation of free competition (Anderson and Grewell 2000; McCleary 1991). These critiques ignore that the very foundation of free-market economics requires that all exchanges are voluntary, between freely consenting trade partners, without forcing third parties to pay for external costs arising from the transaction.[e] Because unsustainable forestry causes these external costs, Pigouvian taxes restore free competition rather than inhibit it.

Another critique has been that commodities-consuming states may lack the ethical legitimacy to interfere with the production techniques used by commodities-producing states (McCleary 1991). Principles for the ethical legitimacy of state action are notoriously controversial between different schools of thought, but it is widely agreed that a state may legitimately act on a problem if it either suffers from or contributes to the problem itself.[f] A country has a legitimate interest in minimizing harm to its own population as well as harm originating from its own population. Legally, states are under the obligation to "ensure that activities within their control do not cause damage to the environment of other states."[g]

Economically, activities in one's control may occur overseas. A timber-importing country financially supports overseas timber productions, thereby sharing in the causation of the overseas timber production, including its production standards. Unsustainable timber production as a commercial activity occurs because there is a demand for it; therefore, the state from which this demand originates holds an economically defined control. Third-party states, as opposed to those states that are importing and exporting the timber, are suffering from the importing state's financing of unsustainable timber production. If the importing state does not act, it does "cause damage to the environment of other states" (McCleary 1991). The importing state accordingly has a legitimate interest that its own consumption should not contribute to the causation of damages to humanity. Consequently, it can legitimately act, not by directly intervening overseas but by altering its own participation in the causation of overseas harms by changing its consumption patterns through domestic tax policy.

Taxes do, however, have the downside of embracing an ahistorical view of global forestry problems. Today's deforestation is concentrated in developing countries because many developed countries cleared their forests long ago (Mather 1992). Both current and past deforestation contribute to today's precarious state of climate change and biodiversity losses. A first-best Pigouvian solution would have required taxing deforestation both then and now. Given that we cannot change past policy, the remaining second-best policy should at least be to mitigate current deforestation. The optimal choice of policy instruments for this second-best mitigation action can be understood through two worldviews. One worldview is that countries deforesting today impose an external cost on the world, so they should face a Pigouvian tax to internalize the incentive to protect these forests. The other worldview is that countries that still have significant forests today are providing an external benefit to the world, on which other countries that cleared their forests in the past are free riding (McCleary 1991; Whalley and Zissimos 2001). The free riders should then provide subsidies for protecting the remaining forests overseas. At first sight, these two worldviews contradict each other; on a closer look, they are simultaneously true if one considers that deforestation today would still cause external costs even if past deforestation had not taken place. Past deforestation adversely affected the marginal cost of current deforestation, since the marginal cost of deforestation rises with the scarcity of forests[h]—but even in the absence of past deforestation, cutting forests still releases greenhouse gases and reduces ecosystem services, so marginal external costs still exist. Accordingly, Pigouvian taxes on current deforestation are justified despite their absence during past deforestation. Additional to taxation, however, countries that deforested their land in the past must compensate those that preserved their forests. The optimal policy mix then uses both tax and expenditure policies jointly. Using both instruments together can provide efficient incentives containing current deforestation and a fair share of the burden reflecting the differentiated responsibility of countries for past deforestation. Looking at the present policy mix, however, REDD+ exists as a form of compensation payments, but there is very little use of environmental taxation for imported deforestation. Hence, the focus here on taxes to improve the policy mix.

a. This rule is upheld all across environmental treaties, from Principle 21 of the Stockholm Declaration 1972 to Principle 2 of the Rio Declaration 1992 and derivative treaties (Desertification Convention 1994, Preamble; Forestry Principles 1992, Principle 1a; Biodiversity Convention 1992, Article 3; Climate Change Convention 1992, Preamble).
b. Krasner (2001).
c. Ibid.
d. Economically, a nonpecuniary externality (of the type for which the victim does not contribute to causation) is a forced transfer like an expropriation.
e. The first fundamental theorem of welfare economics, which shows that a free market generates a Pareto-efficient competitive equilibrium, requires that external costs are internalized (for example, Arrow 1951; Lange 1942; Lerner 1934). The very idea of forcing third parties to bear the cost of an exchange contradicts the idea of a free market. Besides, "It is unjust that the whole of society should contribute toward an expense of which the benefit is confined to a part of the society" (Smith 1776, section 1.4). "In the race for wealth, and honours, and preferments, [man] may run as hard as he can, and strain every nerve and every muscle, in order to outstrip all his competitors. But if he should justle, or throw down any of them, the indulgence of the spectators is entirely at an end. It is a violation of fair play, which they [society] cannot admit of" (Smith 1759, section 2.2.2).
f. In the former case, a state can act based on the "right to protect." In the latter situation, every state has "responsibilities to protect its own people and avoid harming its neighbors" (United Nations 2004, 17), constituting "sovereignty as responsibility in both internal functions and external duties" (ICISS 2001, 13). The responsibility on states to act to prevent the imposition of harm on other states includes environmental obligations, such as "eliminating unsustainable patterns of production and consumption" (UN General Assembly 1992, Principle 8) under the general agreement of states to pursue sustainable development (UN General Assembly 2015, para. 54; UN General Assembly 1992, para. 1–27). Whereas the legal force of these environmental duties of states toward mankind is only emerging (Schrijver 1997, 239ff.; 2002; 2008, 208ff.), they do provide legitimacy for states acting upon them.
g. Legally, see UN General Assembly 1972, Principle 21; UN General Assembly 1992, Principle 2; UN General Assembly 1994, Preamble; UN General Assembly 1992b, Principle 1a; UN General Assembly 1992a, Article 3; UN General Assembly 1992d, Preamble. Philosophically, see Perrez (1996).
h. For deforestation, as for any activity emitting GHGs, the marginal social cost of carbon rises in the concentration of GHGs already present in the atmosphere (US-IAWG 2013). Similarly, for biodiversity the marginal cost of destroying a species' habitat rises when previous habitats of the same species have already been destroyed so that they risk extinction.

Promises and constraints of current efforts for addressing imported deforestation

The main public policy instrument that importing countries use today for addressing imported deforestation is bans. Australia, the European Union, and the United States established bans on the production and import of illegal timber through regulatory law applicable in their internal markets,[2] requiring companies placing the timber on these internal markets (through domestic production or import) to exercise "due diligence" that the timber was not illegally sourced. Outside timber, similar bans do not exist for many other deforestation-related commodities.

The clout of a market foreclosure on overseas producers hinges on the size of that market, so countries with large timber imports could leverage their position as consumer markets for political influence; aggregate consumer demand then yields state power for cross-border forestry policy. This points to a challenge because the listed developed countries that implemented these bans are no longer the main markets for certain types of timber. Extending this policy so it also covers large emerging markets would be much more effective.

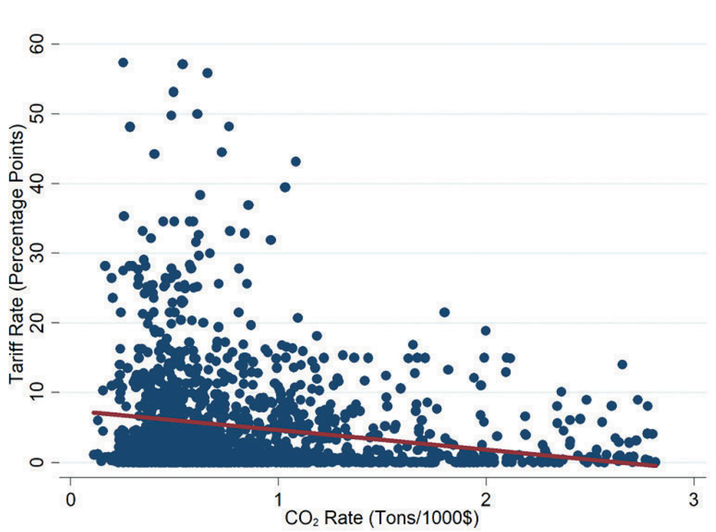
2 Internal in the sense of GATT 1994 Article III.

The main private sector instrument has been sustainability certification. The consumer labels, presented in more detail in chapter 6, have had most of their uptake in developed-country consumer markets.

Both instruments have important roles to play but leave important incentive gaps and have efficiency costs. Bans on illegal timber have been effective at reducing the prevalence of the worst type of production methods for timber. "For the first time there are potentially real consequences for not demonstrating legality when trading in timber" (Othman et al. 2012, 110; see also EC 2016). However, bans provide neither incentives to go beyond mere legality toward sustainability nor dynamic incentives for continuous improvement of production methods over time. Sustainability certificates do provide incentives to go beyond legality, but they suffer from all the constraints discussed in box 6.1. Hence, we next discuss how importing countries could improve this policy mix.

In this policy mix, trade-related tax policy is not just underused. It frequently even undermines sustainability objectives by taxing emissions-intensive products less than low-carbon ones. "In most countries, import tariffs and nontariff barriers are substantially lower on dirty than on clean industries, where an industry's 'dirtiness' is defined as its carbon dioxide (CO2) emissions per dollar of output" (Shapiro 2020) (figure 7.2). That is true for the distribution of tariffs between industries. Within industries, it is important to additionally consider that most tariffs are ad valorem taxes and that unsustainable products impose a share of production costs on third parties (that is, that they externalize costs), whereas for sustainable products the production costs are included in the private product price. Ad valorem tariffs scale up any cost advantage that unsustainable products gain from externalizing costs. Hence, tariffs presently twice distort product choices against sustainable consumption. To deal with the first distortion (tariffs across industries), Shapiro (2020) shows that rebalancing tariffs per tonne of carbon to reach a level playing field would lower emissions while avoiding reducing output. To address the second distortion, we need to vary tariff rates within industries by the sustainability of production. Next, we show how this could work for trade-related commodity taxes and make tax policy play a constructive role in the overall policy mix for addressing imported deforestation.

FIGURE 7.2
NEGATIVE RELATION OF TARIFF RATES AND CARBON INTENSITY OF GOODS

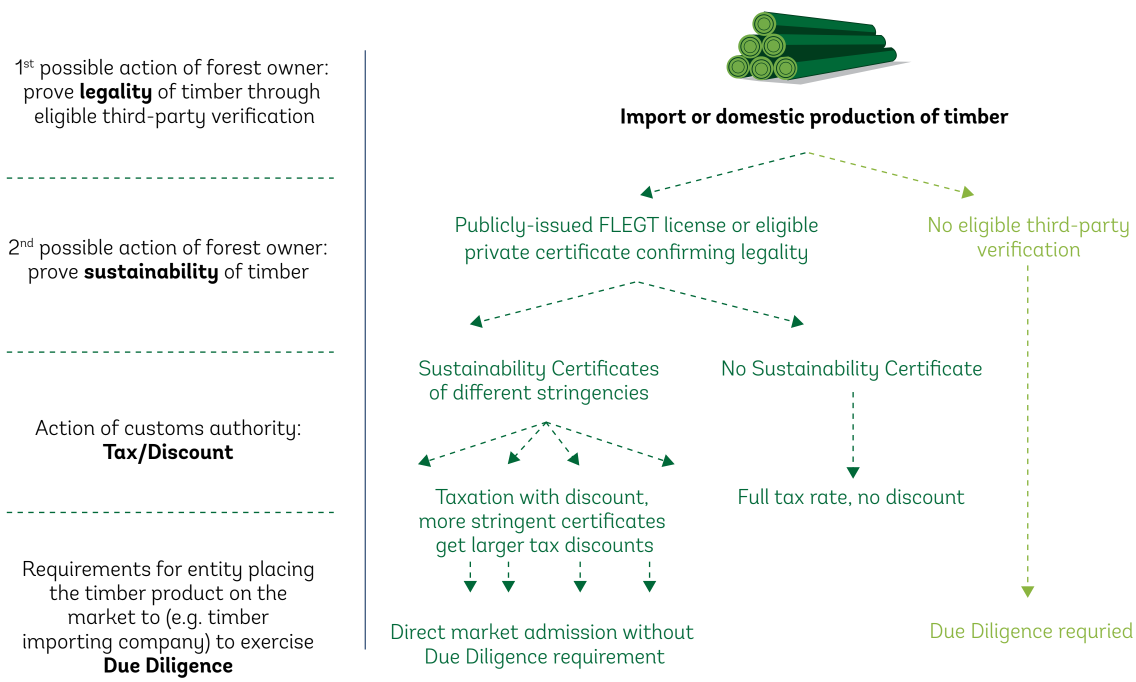


Source: Shapiro 2020.
Note: Data represent all countries in the world. Each circle is one industry in one country. Red line is the linear trend.

Boosting the price signal from certificates with differentiated product taxes

The proposition is again to use sustainability certification for tax policy: implementing consumption tax rates that vary with the sustainability of domestic and overseas production. The mechanism consists of a tax imposed by a commodity-importing country on a default assumption regarding the sustainability of the commodity, combined with a tax discount that is provided on the receipt of proof that the sustainability was higher than assumed. When a commodity arrives at the customs gate without a sustainability certificate, it is taxed on the assumption that the production was not sustainable. When a commodity arrives with its sustainability certified, the tax rate is reduced. The more stringent the sustainability certificate carried by the commodity, the greater the tax discount. Figure 7.3 further suggests how this tax policy could be combined with existing bans on illegally produced commodities, using the example of timber.

FIGURE 7.3
POLICY MIX FOR ADDRESSING DEFORESTATION FROM TIMBER PRODUCTION



Source: Heine, Faure, and Lan 2017.

Design considerations to avoid market or trade distortions

A major problem for letting taxes on imported commodities vary by the sustainability of production is the importing country's access to data. The mechanism solves this problem. Unless there is a special treaty (voluntary partnership agreement, or VPA), consumer countries have very limited authority to access data about the sustainability of production by overseas firms. They are not allowed to send public officials to measure sustainability overseas and differentiate tax rates accordingly. Besides legal restrictions, this data raising would also be administratively costly. However, forest sustainability can take a solution to the legality and feasibility problems from the area of product safety regulation. There, consumer countries use accredited certification companies. These certification companies are commissioned by overseas exporters to gain market access; that demand solves the legal access to the information, and the involvement of the certification agency avoids the administration costs of needing to directly involve government officials with production reviews. The same approach can be used for environmental taxation of commodities. The difference is that, unlike product safety rules that impose fixed standards, the importing state would allow imports of varying levels of sustainability. To show which level of sustainability a product complies with, the customs authorities would not legally force anyone to reveal data on overseas production standards, but it would significantly improve incentives for voluntary data sharing and collaboration. Overseas producers of a commodity taxed using this mechanism have the free choice not to provide information about production standards. In this case, their product will just be taxed at the default values. Economically, however, foreign producers face an incentive to reveal those production standards to certification agencies and hence to the taxing state. Thus, the customs authority is applying an economic incentive for commodity producers to reveal data on their production standards where it does not have the jurisdiction to apply legal force for getting this data to vary commodity tax rates. And efficiently, it uses the private sector solution of certification companies to keep administration costs in check.

This design avoids extraterritorial regulation but still provides both domestic and overseas producers with granular incentives to improve the sustainability of production. Recall that countries may not tax overseas firms for their deforestation as doing so would fall under the prohibition of extraterritorial regulation. Attributing the tax liability to the domestic importer of the commodity avoids this extraterritoriality while still providing incentives for overseas producers to raise the sustainability of their production up to a certified standard. This solution exists because, economically, it does not matter whether the tax liability is attributed to the overseas commodity producer or the domestic importer. The tax incidence—the proportion of the tax that an agent ends up paying after deducting the share of the tax bill that he manages to pass on to his transaction partners—is the same in both cases.[3] If the tax were on the foreign commodity exporter, that person would impose a proportion of the tax bill on his domestic transaction partner in price negotiations. Equally, if the tax is on the domestic importer, that person will negotiate a different timber price with his supplier and thereby pass on the same proportion of the tax. Whereas economically the effects are the same, legally the change of liability makes the difference and prevents the extraterritoriality problem. For example, when the domestic importer imposes some of his tax costs onto a foreign timber supplier, that pass-through is part of private contract law, for which there are no extraterritoriality constraints. This is unlike the counterfactual situation where the government directly imposes the same payment onto the foreign timber supplier, in which case the same payment falls into the domain of public international law and is prohibited. So, changing the attribution of the legal tax liability solves a legal problem, without causing an economic distortion.

This mechanism should be applied not just to imported commodities but also to domestic production.[4] Like domestic products should be subject to the same tax scheme. In addition

3 The economic incidence of a tax that falls onto the transaction partner charged is not changed by the legal attribution of the tax liability (Logue and Slemrod 2010).

4 We started this section pointing out that for any country, the natural starting point for raising forest sustainability globally is its own forestry sector. We then identified the need to flank domestic policies with a mechanism to raise the sustainability of overseas timber, first to prevent leakage effects for the sustainability of internationally traded timber products, and second to have the necessary clout to make a real difference if most deforestation happens overseas.

to conforming to international trade law,[5] this broad tax coverage has the added benefit of impacting a wider section of the timber industry and therefore reducing leakage.

This is not a tariff. It is an internal consumption-based excise tax, which may be levied at the border. Legally, it is essential that the tax is imposed on domestic consumers, at the point where the commodity is placed on the internal market. This is much like a VAT or a tobacco or alcohol tax, which are all internal taxes in the sense of GATT Article III:2. Administratively, they can be levied at the point of import, to use an important chokepoint, without falling under the restrictions of tariff rates. They are also not tariffs in spirit—their purpose is not to provide domestic market protection but to ensure that demand from the domestic market is not causing damage to the world. Furthermore, the equal application to commodities from domestic and overseas production ensures there is no discrimination (see chapter 9).

International Collaboration

All the reasons for international collaboration that are mentioned in chapter 6 hold true also in this application, plus a few more that stem from synergies with trade policy.

The world as a whole benefits when trade flows are allocated along true comparative advantages, and they are presently distorted because relative production costs can appear low in a place merely because a lack of environmental policy means that producers and consumers can pass on a share of production costs to unrelated third parties (Chichilnisky 1994; Stiglitz 2006; see also box 7.1). The suggested mechanisms would alleviate these problems in a manner that is hard to evade. The resulting improvement in the efficiency of global trade would benefit all countries. Accordingly, there is also a case for global collaboration in implementing such mechanisms, especially for developed countries to support developing ones.

If developing countries implement the mechanism at exports, there is no need for developed countries to implement it at imports too. This would spare system costs for developed countries, justifying that they share in the system costs of developing countries. Several developed countries have also made the twin demand on developing countries to both reduce export taxes and raise the sustainability of production. We explained that this is a formidable challenge, given how many of the producer countries are struggling so much at enforcing environmental regulations and the relative robustness of export gates as a tax chokepoint. But the suggested mechanism offers a solution. For developing countries there can, however, be important up-front costs. Developed countries should then consider sharing in the start-up costs—for example, through the setup described in chapter 6.

Conclusion

As pointed out by the *World Development Report 2020*, international trade is a cause of deforestation (World Bank 2020). Between 30 and 40 percent of global greenhouse gas emissions from deforestation can be attributed to traded commodities (Pendrill et al. 2019). "Building environmental sustainability directly into both the production and governance models guiding Global Value Chains will be increasingly critical to their ongoing viability. That effort will require a combination of appropriate pricing, regulations, and cooperative arrangements" (World Bank 2020). This chapter proposes how environmental taxation can contribute to these policy solutions.

5 See chapter 9 for further analysis on this design for trade law compliance.

When deforestation occurs in the production of a commodity that is afterward exported, this deforestation is jointly caused by both the exporting country and the importing country. Therefore, not just the countries where the deforestation is happening need to act; the countries whose demand for unsustainable products finances the deforestation bear a responsibility too. Responsibility is also shared because all UN member states have accepted that "states should reduce and eliminate unsustainable patterns of production and consumption."[6]

And both countries exporting and importing deforestation-related commodities have indeed implemented policies for addressing this issue. But while the existing policies have important roles to play, they are insufficient. Integrating environmental taxation can help improve the policy mix.

A leading policy instrument among low-income countries is the taxation of exports of deforestation-related commodities. While these do address deforestation, they inhibit the participation in GVCs and create distortions in domestic processing. The environmental efficiency is also limited because tax rates do not vary according to the sustainability of production. There are good reasons to consider replacing export taxes. But countries should do so carefully because the alternative could be worse. Whereas many countries struggle at enforcing internal taxes on the rural sector production of commodities, it is often much easier to administer the collection of a tax at the export gate. Replacing export taxes with internal taxes too quickly can thus encourage tax evasion. Even worse, the actors most likely to evade internal taxes may be the ones with the worse production techniques. This is a large problem given the close overlap between the deforestation problems and governance capacities of countries. Repealing an export tax at a central chokepoint seaport and instead levying taxes on many small producers within the rural interior of the country could be dangerous if it is not preceded by sufficient governance capacity building. It is thus important to be careful in removing export taxes as a key current instrument for trade-related deforestation. Instead, countries should improve them.

The environmental effectiveness of the taxes can be raised, and the phaseout of export taxes be organized gradually, by granting reduced rates for sustainable commodities. In this setup, the previous export tax rate would continue to be charged unless a commodity is produced in a sustainable manner. This mechanism is a trade-related application of chapter 6—again using the information of sustainability certificates to vary the rate of commodity taxation according to the sustainability of production. Applying this mechanism to exports uses several synergies with present initiatives to improve the sustainability of international trade. Certificates are already better known and administrative systems more established for commodities destined for exports. The market price premiums for certified products are generally higher in developed-country consumer markets than in most developing countries. Accordingly, the gain for a developing country government from inciting an uptake of certification among its domestic producers is also greater for exported products than for products destined to internal markets. The mechanism also supports current efforts of several developing countries to induce international companies to take greater responsibility for their domestic supply chains and invest in sustainability.

In commodity-importing countries, tax policy has played only a minor role in efforts for reducing deforestation. Tariffs are instead biased against clean production currently. Analysts have also pointed out several factors complicating the use of environmental taxation for embodied deforestation. Restrictions on extraterritorial regulation prevent countries from requiring most information about overseas production and directly imposing environmental taxes. However,

6 UN General Assembly (1992c), Principle 8.

there is increasing agreement that importing countries can legitimately take action, not by directly intervening overseas but by altering their own participation in the causation of overseas harms by changing their consumption patterns through domestic policy on consumers. The main public-policy instrument here has been bans on the import of illegal timber, enforced through due diligence rules on the agent first placing the product onto the importing country's market. Unfortunately, this policy instrument only prevents illegality—it does not provide fine-grained incentives to improve sustainability. This has been achieved to an extent by the main private sector instrument of consumer countries: sustainability certification. But the effectiveness of certification is equally limited by a series of constraints. Both instruments have important roles to play but leave important incentive gaps and have efficiency costs. In this policy mix, trade-related tax policy is not just underused. The proposition is again to use sustainability certification for tax policy: implementing consumption tax rates that vary with the sustainability of domestic and overseas production. The scheme circumvents several standard problems of border tax adjustments. It raises data on overseas production without hard legal requirements; it keeps administration costs of varying tax rates in check by using a tested private sector mechanism for enforcing public policy; and it avoids extraterritoriality by charging domestic consumers instead of overseas firms while still sending price signals to them for improving their production methods.

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8

Export Tariffs as a Policy Tool to Reduce Deforestation

JOHANNA WEHKAMP & GREGOR SCHWERHOFF

Introduction

Designing effective forest conservation strategies on a jurisdictional or national level in low-income countries is hindered by three factors: (1) a heavy reliance on (deforested) land as a relatively low-cost input to agricultural production, (2) high levels of food insecurity, and (3) a lack of political institutions to enforce conservation strategies. Jurisdictional (fiscal) policy strategies for forest conservation need to take these limits into account. For countries where all these factors coincide, the big challenge is to design forest conservation strategies that (i) promote a reduction in deforestation while at least maintaining (ii) the level of agricultural production and (iii) food price levels.

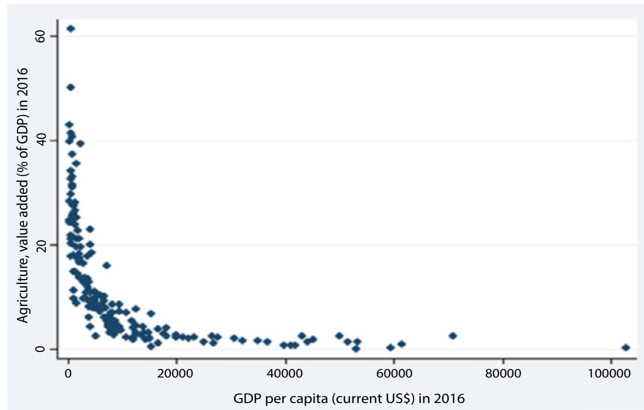
Fiscal policy instruments may be particularly suited to address some of these challenges. In the recent discussions around international efforts for forest conservation, fiscal policy instruments have received more attention, particularly in discussions on the structural drivers of deforestation and integrated or landscape approaches to forest conservation (UNEP 2015).

Export tariffs are one of the few fiscal policy instruments that appear implementable in countries with very weak institutional capacities. More complex fiscal policies such as land taxes or deforestation fees require functioning bureaucracies or land registries. In contrast, export taxes build upon readily existing export tax collection structures. Because of the limited number of tax-collection points, export tax collection becomes logistically manageable even in institutionally weak countries. Nevertheless, countries with advanced institutional capacity should first consider more direct approaches to reducing deforestation, such as explicit forest conservation.

Export tariffs on agricultural goods can be designed to strike a balance between conservation and economic objectives. Countries that simultaneously expand their agricultural exports and have high deforestation rates exploit their natural resources in an unsustainable way. Moderate export taxes would force the sector toward sustainable production without excessively harming business. The tariff revenue can be returned to the sector through the provision of government services—for example, in the form of land property rights or infrastructure.

Structural Impediments to Forest Conservation in Low-Income Countries

FIGURE 8.1
AGRICULTURAL VALUE ADDED AS A PERCENTAGE OF GDP AND GDP PER CAPITA, 2016



Source: World Bank 2016.

Only a few policy approaches discussed as part of international forest conservation efforts take the structural limitations of low-income countries into account. In this section, we discuss the specific structural characteristics of low-income countries that explain why forest conservation is particularly challenging in countries that (1) heavily rely on (deforested) land as a relatively low-cost input to agricultural production, (2) experience high levels of food insecurity, and (3) have weak political institutions.

Low-income countries rely on land as an input factor to the largest part of their economic activity. The agriculture sector is typically the largest contributor to gross domestic product in low-income economies, while in higher-income countries the economy is more diversified (see figure 8.1). These "Kuznet facts" (Kongsamut, Rebelo, and Xie 2001) imply that economic diversification—away from land-intensive economic activities—appears less plausible in agrarian countries where many households are near this threshold.

Low levels of economic diversification imply that economic growth is heavily dependent upon land-demanding agricultural activities. In low-income countries near the subsistence threshold, there are few economic alternatives to agricultural activities. As the low-income economy grows, the agriculture sector grows, and as demand for land increases, so do land prices. In the absence of economic diversification and hence different income sources, landowners are more likely to convert forested land to agricultural land.

In low-income countries, a globally exporting agriculture sector and a local food producing sector typically exist in parallel. In low-income countries, agricultural raw materials represent on average 11 percent of merchandise exports (World Bank 2020), a larger share than in any other income group. Low-income levels also tend to coincide with food insecurity (Rahman, Matsui, and Ikemoto 2013) and undernourishment (FAO 2013).

Agriculture in low-income countries is divided into two largely disconnected sectors (Henson, Brouder, and Mitullah 2000). A highly productive internationally exporting sector tends to coexist with a local food producing sector. Production in the internationally exporting sector is highly specialized on high-value markets in developed countries (for example, palm oil, cocoa, coffee), while the domestic food producing sector is shaped by artisanal production. Because of weak infrastructure, especially in remote areas, this sector is poorly connected to global markets. Hence, in these remote areas food supply shocks cannot be smoothed by imported supplies.

A growing body of empirical literature shows that the quality of political institutions is a central parameter to forest conservation. Low-income countries that are specialized in resource extraction tend to exhibit weak scores in control of corruption and rule of law. Weak institutions directly limit the capacity of governments to enforce forest conservation or to implement internationally financed forest conservation projects (Karsenty and Ongolo 2012). Key elements regarding the quality of political institutions, such as the strength of rule of law (Corderí Novoa 2008), reliable land tenure rights (Arcand, Guillaumont, and Jeanneney 2008; Bohn and Deacon 2000), or the absence of corruption (Koyuncu and Yilmaz 2009) significantly impact whether a country is likely able to conserve its forests or not. The IPCC concludes that national forest conservation policies have had limited success in developing countries with insufficient institutional and regulatory capacities (Nabuurs et al. 2007).

Forest conservation cost is an important obstacle for countries with low domestic revenue mobilization. For example, de Souza Cunha et al. (2016) estimate that the international community would have to pay the Brazilian government between $1.09 and $3.25 per tonne of carbon dioxide. It can be assumed that this cost is much higher in low-income countries as a result of higher transaction costs. Given that institutionally weak countries tend to be equipped with a lower ability to collect taxes (Besley and Persson 2013), enforcement cost can be an important obstacle to better conservation.

Weak political institutions prevent the structural transformation of economies away from land-demanding on economic activities. Institutional quality is a central explanation for diverging patterns of long-run economic growth (Acemoglu, Johnson, and Robinson 2005). Herbst (2000) links the absence of sustained high rates of economic growth in many African countries to weak political institutions. This finding is supported elsewhere in the literature (Gennaioli and Rainer 2007; Nunn and Trefler 2013). Hence, weak institutions can function like a trap for low-income countries, preventing economic diversification and ultimately the emergence of less land-demanding types of economic activity.

Using Export Tariffs as a Policy Instrument for Forest Conservation

The literature documents both beneficial and harmful effects of export tariffs, with the net effect depending on country circumstances and complementary policy. Historically, there have been three main motivations for export tariffs on agricultural goods: (1) reducing domestic food prices during a supply crisis, (2) stimulating a domestic processing industry and structural change in general, and (3) raising revenue. Results are thus not immediately transferable to the use of export tariffs for the purpose of forest conservation as suggested here. Nevertheless, it is important to review the historical experience with export tariffs to avoid past mistakes. We will first consider the benefits of export tariffs and then discuss some risks.

Could export tariffs be a useful policy tool for low-income countries?

The theoretical economic literature shows that in specific circumstances export tariffs can bring economic benefits to countries. Export taxes are used as a source of public revenue (Bouët and Laborde 2010) and can be used to improve the terms of trade of a country, by raising the world prices of an export commodity (Kim 2010). Furthermore, they can reduce the domestic prices of commodities (Marks, Larson, and Pomeroy 1998), benefiting domestic production processes that rely on intermediate inputs to production (Bernhofen 1997; Corden 1972).

Export tariffs can be used to support the national processing industry. Especially, differential export taxing schemes (Bouët, Estrades, and Laborde 2014) tax raw commodities to support the development of the national processing industry and thus foster a structural transformation of the economy (Just, Schmitz, and Zilberman 1979). Goodland and Daly (1996) confirm this theory empirically by analyzing the use of export bans on tropical logs in Indonesia in 1985. Furthermore, Solberg et al. (2010) empirically support this idea with the example of the logging and wood processing industry in Russia.

Exporting countries faced with monopsonistic market powers can use export taxes to increase domestic welfare. Export taxes can be welfare-increasing in larger countries hosting international trading firms with monopoly or oligopoly powers over certain goods (Eaton and Grossman 1986; Rodrik 1989). Deardorff and Rajaraman (2005) find that exporting countries faced with monopsonistic market powers can use export taxes to increase welfare domestically.

Export tariff revenues can be used to finance public infrastructure. Jones and O'Neill (1994) show that export taxes on agricultural commodities can be used to finance public infrastructure as an input to the manufacturing sector, which then causes a relocation of labor from the rural to the urban area and thus decreases deforestation. Furthermore, Schulz (1996) finds that policies that disincentivize trade can be used to make the harvest less profitable and thus protect the resource stock.

Risks associated with the use of export tariffs

Using export tariffs to induce a structural transformation of the economy may affect productivity negatively. Export tariffs can have negative impacts in terms of efficiency losses to the domestic economy (Kishor, Mani, and Constantino 2004). Several authors are skeptical about the potential of differential export taxes to induce structural change (Bates 1981; Mwabu and Thorbecke 2004; Rattsø and Torvik 2003; Warr 2001) and argue that, on the contrary, by reducing wages and thus national savings, incentives to invest are curtailed, which is likely to lead to slower growth in productivity.

Distortionary trade policies may be a risk for the agriculture sector. Dennis and Iscan (2011) argue empirically that distortionary agricultural policies slow down the reallocation rate of labor from agriculture to other sectors. However, they use the general index on distortionary agricultural policies of Kym and Ernesto (2013) and thus cannot actually draw any isolated conclusions on export taxes.

Export tariffs may not always result in the desired effect on the processing industry. Hasan, Reed, and Marchant (2001) and Marks, Larson, and Pomeroy (1998) analyzed an export tax that was used in the palm oil sector in Indonesia and found that it did not have the desired effect on the processing industry.[1] Local circumstances and existing policy schemes must be carefully analyzed on a country level to fully understand possible secondary effects, including interactions with other policies or country-specific characteristics of the internationally exporting agriculture sector or the land market.

Historical experiences with export tariffs

Post-independence, a range of African countries imposed export tariffs on agricultural commodities to reach a quick diversification and industrialization of their economies (Sarris 1994; Young 1986). This economic diversification was to be funded through export tariffs (Killick

1 Despite this, the palm oil industry has still been one of the fastest growing industries in Indonesia over the last decades.

1993). The export tariff policy was accompanied by an import substitution policy, which aimed to support domestic industries (Mkandawire and Soludo 1998).

In the 1970s and 1980s, export tariffs were a recurrent agricultural policy tool. In Chile, Colombia, Costa Rica, Ethiopia, Malaysia, Mexico, the Philippines, Sri Lanka, and Tanzania, they contributed up to 5 percent of public income (FAO 1994). In Madagascar, income from export tariffs constituted 30 percent of the government revenue in 1983 (Anderson and Masters 2009).

The use of restrictive export policies in African countries failed to achieve economic diversification in the post-independence period. Kherallah et al. (2002) argue that the oil price shocks in the 1970s led to a sudden increase in fertilizer costs. Governments in a range of Sub-Saharan African countries responded by subsidizing fertilizers. However, owing to the oil-price shock, foreign exchange rates were mostly overvalued, which harmed producers in the exporting sector because of lower real prices.[2]

Droughts and unsuitable policy design worsened the agriculture sector crisis. When various Sub-Saharan African countries were then hit by severe droughts, agricultural output levels declined. Furthermore, some marketing boards imposed pan-territorial pricing schemes (Rugambisa 1994) to avoid disadvantaging producers in remote areas with transport costs. As a reaction, larger producers shifted production to crops that were not part of the unitary pricing schemes (Masters 1994), which limited the tax base for governments. In the late 1970s, the fiscal policies in the agriculture sector of a range of African countries had led to decreasing terms of trade as well as a fiscal and balance of payments crisis.

Bretton Woods institutions pushed a range of low-income countries toward abolishing all types of distortionary trade policies. The Washington Consensus (Williamson 1990) marked a period where the Bretton Woods institutions advised developing countries to liberalize their trade policies. Consequently, they significantly reduced existing export tariffs (Reichert et al. 2009; Williamson 1993). In Benin, for instance, most export tariffs were suppressed in 1993 (WTO 2004).

Export tariffs are still used and introduced today and there is a potential for further increases. While export tariffs have been abolished to increase economic efficiency and reap gains of trade, they are still in use and some countries have introduced them recently. Table 8.1 shows how export tariffs have been used in agrarian, lower-income countries with weak institutions, but currently only low levels of export tariffs are used for major cash crops. This table first illustrates that there is some legal space allowing for export tariffs. Furthermore, it shows that already countries see a benefit in export tariffs and do not consider them economically destructive. And finally, the table shows that export tariffs are currently at very low levels, so they could be increased without becoming prohibitive.

Recently, export tariffs have been reintroduced to stabilize domestic food supply. Export tariffs were reintroduced to stabilize the national food supply during food price crises that unfolded in a range of low-income and lower-middle-income countries in 2005 (OECD 2014). This was, for instance, the case for rice in Bangladesh, Brazil, Cambodia, Egypt, China, Madagascar, India, Nepal, Thailand, and Vietnam; and for wheat in Argentina, India, Kazakhstan, Nepal, and Pakistan (Bouët and Laborde 2010). Especially in the context of WTO negotiations (Anania 2013), but also in other trade agreements (such as the European Partnership Agreements), least-

2 In many instances, less than half of the world market prices.

developed countries insisted on the right to use export tariffs to react to food or environmental crises (Reichert et al. 2009).

TABLE 8.1
EXPORT TAXES IN AGRARIAN, LOWER-INCOME COUNTRIES WITH WEAK INSTITUTIONS

COUNTRY	COMMODITY (LEVEL, DATE OF INTRODUCTION)
Benin	Cocoa beans, crude oil, minerals, gold (3%, 2000)
Burkina Faso	Poultry, sheep, cattle, leather, fur
Burundi	Green coffee (31%, 1992), vegetables, seeds, flour, cereal (15%, 1992); tea (6%, 1992), leather and fur (3%, 1992) (*has set them equal to 0 in 2003*)
Cambodia	Wood (10%, 2011; 15%, 2012), marble granite and stone (10%, 2012), petroleum (10%, 2010), rubber (10%, 2012)
Cameroon	Ayou wood (CFAF 4,000/m^3, 2015), other wood species (CFAF 3,000/m^3, 2015), cocoa (CFAF 25/kg, 2006); coffee (CFAF 25/kg, 2006)
Central African Republic	Gold (1%), diamonds (4%), tree trunks (10.5%), processed wood (4.5%)
Chad	Dried fish (2%), cattle (2%), Arabic gum tree (0.5%), cotton (0.5%), palm oil (0.5%), tobacco (0.5%), soap (0.5%), rubber (0.5%), leather (0.5%), butter (0.5%), raw tobacco (0.5 %), raw wood (0.5%)
Congo, Dem. Rep.	Green coffee (1%), mineral products (10%), mineral oil (5%), electric power (5%), logs (10%), edged timber (5%), water (5%), metals (2%), different timber types (2%), unrefined mineral oil (1%), gold and diamonds (4%, replacing 10% on mineral in general)
Congo, Rep.	Wood (1%, 2005); trunk wood (15%, 2004)
Côte d'Ivoire	Cocoa (28.7%, 2001; 38.4%, 2004); coffee (2%, 2001; 10.3%, 2004); cotton (0%, 2001; 3.2%, 2004)
Myanmar	Grains and rice (5%, 2011)
Sudan	Arabic gum tree (10%, 1993)

Applying Export Tariffs Combined with Public Investments in the Context of International Collaboration on Forest Conservation

Agricultural export tariffs could be used as an effective and realistic tool for forest conservation when embedded in a comprehensive policy mix. Export tariffs reduce the incentive to exploit natural resources in an unsustainable way. At the same time, they slow one of the few thriving businesses in low-income economies. The revenues of the tariffs and possible support by the international community, however, provide an opportunity to invest in agricultural productivity. This would reduce the land intensity of agriculture without reducing business opportunities or creating unwanted side effects like rising food prices.

Two agriculture sectors and the role of elasticity of demand

The Borlaug hypothesis and Jevons paradox postulate opposing effects of agricultural productivity on land use. The agronomist Norman Borlaug developed the hypothesis that an increase in agricultural productivity will decrease land use for agricultural production and thus deforestation. The argument is that increasing productivity will reduce the amount of land needed to produce the same amount of goods. The economist William Jevons, by contrast, observed the opposite effect, which seems to be a paradox: As agricultural productivity increases, more resources are used. The reason is that the increased productivity makes production more profitable. Production is thus expanded, and more resources are used. In an agricultural context, this means that land use, and hence deforestation, increases. There is empirical evidence for both the Borlaug hypothesis and the Jevons paradox, even though they draw opposing conclusions.

Whether deforestation increases or decreases as agricultural production increases depends on the elasticity of demand. The apparent puzzle described above can be resolved, when considering the elasticity of demand. As Hertel (2012) and Schwerhoff and Wehkamp (2018) show, the Borlaug hypothesis applies when the elasticity of demand is low and the Jevons paradox occurs when it is high. When the market for agricultural products is limited, it is not meaningful to extend production because the goods cannot be sold. When there is a large international market, the agriculture sector can expand rapidly after a productivity increase. There is thus no automatic link between agricultural productivity and deforestation. The link can be weakened by managing effective demand.

Export tariffs on agricultural products can be designed to manage effective demand and avoid a Jevons paradox. Increasing agricultural productivity in developing countries is often highly desirable in many respects. It can improve food security and reduce food prices. However, it can have the undesired side effect of accelerating deforestation. For this reason, Schwerhoff and Wehkamp (2018) distinguish between the agriculture sector, which produces staple foods for the domestic market, and the agricultural export sector. Increasing the productivity of agriculture has obvious benefits. Export tariffs have the purpose of managing effective demand for the export sector, to control the negative side effect.

Four stakeholders in low-income countries

Forest conservation involves multiple stakeholder groups that all need to endorse the respective policies. To be successful, a fiscal forest conservation policy needs to satisfy the interests of all political stakeholders. The four relevant stakeholder groups are domestic consumers, producers, the domestic government, and the international community.

Agricultural market stakeholders are unlikely to accept a conservation policy that reduces their status quo welfare. It is expected, for example, that domestic consumers are unwilling to accept rising food prices. Producers exporting agricultural goods will likely protest any policy that reduces their business opportunities. They may, however, accept a policy that provides them with better infrastructure in exchange for higher export tariffs.

Given other policy priorities, many domestic governments will not be interested in spending more on forest conservation. A conservation strategy based on improving agricultural productivity with the objective of allowing more production on less land to reduce deforestation will thus have to compensate governments for the increased cost. The international community, by contrast, has funds available for forest conservation and could compensate the government for expenses aimed at reducing deforestation.

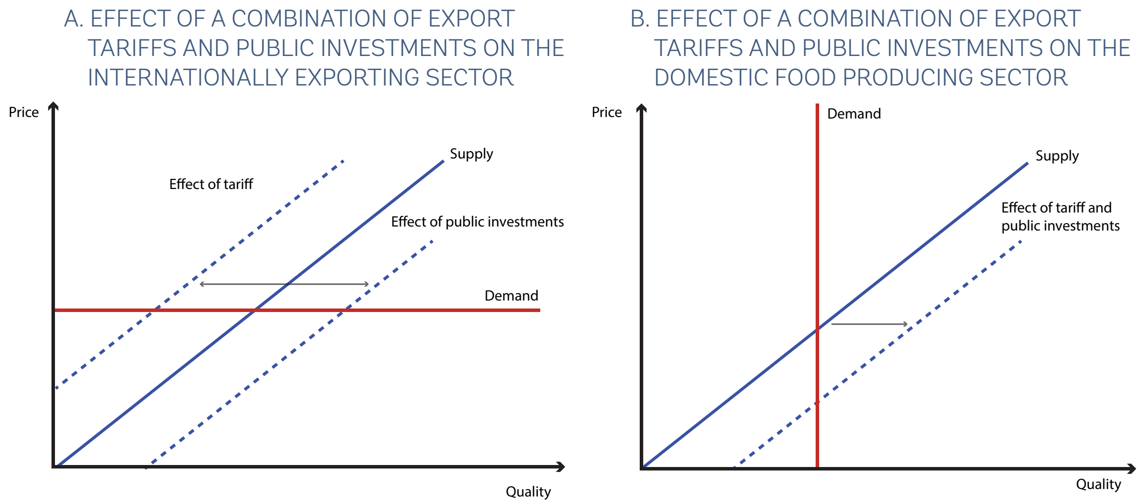
Combining export tariffs with public investments to reduce deforestation and satisfy all stakeholders

A policy of agricultural intensification through improved infrastructure could satisfy all relevant stakeholders and conserve forests. Public investments can be made toward publicly provided institutions and infrastructures. These public investments can boost productivity and allow agricultural producers in both sectors to increase land intensity. One relevant public investment is electrification (Assunção, Lipscomb, and Mobarak 2015; Lipscomb, Mobarak, and Barham 2013). Many low-income countries have weak electrification in rural areas. Providing electricity by extending the national grid or establishing local grids gives farmers the opportunity to intensify production. Electricity can be used for processing machinery and pumps for irrigation, for example. Providing land tenure rights is known to increase agricultural investment (Abdulai, Owusu, and Goetz 2011; Bambio and Agha 2018; Robinson, Holland, and Naughton-Treves 2014). When farmers have formal proof of their land ownership, they can invest without fear of expropriation. Well-designed transport infrastructure (which avoids giving easier access to forests) can also aid in facilitating doing business.

The combination of export tariffs and public investments can reduce deforestation while keeping agricultural production stable. The provision of public services is complementary to private capital investments of farmers and thus incentivizes production growth and increasing land use intensity. The export tariffs check this development to ensure that the expansion is limited and does not trigger additional deforestation. The idea of the export tariffs is thus not to downscale the agricultural production but to shift it from land-intensive production to capital-intensive production. Given that developed countries have a much more capital-intensive agricultural production than developed countries, the technology for such a shift is well established. In a modeling study, Schwerhoff and Wehkamp (2018) provide a formal proof that the combination of higher export tariffs and public investments can achieve a combination of equal production with less deforestation. See figure 8.2, panel a, for an illustration of the balancing effects in the exporting sector.

The combination of export tariffs and public investments can also keep domestic food prices stable. Producers supplying the domestic food market benefit from the public investments to agricultural producers, but so do the exporters. However, the exporting farmers face a counteracting pressure in the form of the export tariffs. This ensures that the exporting producers do not expand at the expense of the producers for the domestic market. In combination, the two policies support the domestic food producers so prices will not increase. The effect of the policy on the domestic market is illustrated in figure 8.2, panel b.

FIGURE 8.2
EFFECT OF EXPORT TARIFFS AND PUBLIC INVESTMENTS AS A FOREST CONSERVATION POLICY TOOL



Note: D = demand for food, S = supply of food, P = food price, Q = food quantity.

Export tariff revenues can be used to cover the costs of public investments. The model analysis in Schwerhoff and Wehkamp (2018) shows that a decrease in deforestation can be achieved while maintaining the output level of exporters and the food prices at least stable. So, what will be the effect of this policy on government finances? Many developing countries cannot afford additional spending to reduce deforestation. The modeling analysis shows that the combination of the instruments increases tariff revenue in a concave way (as a result of decreasing returns to government-provided capital), while the cost of the policy increases linearly. This means that for low ambition levels, the additional tariff revenue could fully cover the cost of the public investments.

REDD+ funds could be used to compensate the government for a highly ambitious forest protection policy. The concave increase in tariffs means that for ambitious levels of forest protection, the tariff revenue might fall short of the required investments into public services. However, the REDD+ program demonstrates that the international community is willing to support countries that reduce deforestation effectively. The REDD+ funds could thus be used to cover the additional cost of the policy for the government. This would keep the policy revenue neutral for the government. As productivity in agricultural production increases over time, the policy would become increasingly self-financing.

The policy package is designed so that all stakeholders participate in the benefits of the policy. While exporters of agricultural products are typically politically influential, food price increases have sparked widespread protests. A policy package designed to reduce deforestation thus needs to convince all involved stakeholders that they can benefit. The policy is thus designed to achieve a win-win situation. The win-win situation is possible because in many rural areas there is an inefficiently low supply of productive public goods. Improving production efficiency generates an overall welfare gain. While the policy will still require political will to be successful, it is designed to address the most important political economy forces.

Conclusion

There are structural challenges to forest conservation in low-income countries. Reducing deforestation in low-income countries is particularly difficult due to three structural characteristics: (1) heavy reliance on (deforested) land as a relatively low-cost input to agricultural production, (2) high levels of food insecurity, and (3) weak political institutions to enforce such strategies.

Export tariffs combined with public investments could represent a policy mix to reduce deforestation in low-income countries. Export tariffs appear to be one of the few fiscal policy instruments tolerated by WTO rules that appear implementable in institutionally weak low-income countries. The analysis in this chapter furthermore shows that export tariffs combined with public investments could reduce deforestation without reducing agricultural production levels or increasing food price levels.

Historical experiences with export tariffs point to the risks associated with secondary economic effects. While theoretical and empirical literature on the use of export tariffs points to the potential beneficial effects of export tariffs, local market structures and characteristics must be considered when assessing the likely economic impact of using export tariffs as a forest conservation policy instrument. Experience with export tariffs shows that the concrete implementation of the proposed policy mix requires a careful analysis of the compatibility with existing policies on the country level and a better understanding of the causes of failure of similar policies in the past.

Implementing the proposed policy mix could be complicated by the practical administrative obstacles. Depending on how taxes are collected in a country, implementing the policy mix could be challenged by a lack of interministerial collaboration. In many instances, the agriculture ministry would have to collaborate with the ministry of finance or tax collection authorities. At the same time, these administrative obstacles are likely to be lower than for many other options because export tariffs are already collected in many places—even in institutionally weak low-income countries. Also, coordinating and implementing public investments can be challenging if an administration doesn't have sufficient planning and project coordination capacities.

Policy implementation would require an in-depth country analysis and customization of the policy mix. As the different model calibration scenarios studied in Schwerhoff and Wehkamp (2018) show, the effect of the proposed policy mix crucially depends on country-specific parameters, such as the size of the domestic agriculture market relative to the international export market, elasticities of demand and supply, elasticity of demand for forestland relative to domestic food prices, whether there are options to invest the tariff revenues in public investments that would allow to "satisfy all relevant stakeholders" and will have the desired effect, or getting budgetary support from the international community. Hence, before policy implementation could be considered, additional analysis and country-specific customization would be necessary. As Subramanian (1992) points out, there are a lot of uncertainties when it comes to the effects of trade policies and care needs to be taken to avoid unintended negative side effects.

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9

Fiscal Incentives for Decreasing Deforestation: Does International Trade Law Restrict Export Taxes?

DYLAN GERAETS

Introduction

This chapter examines whether international trade law, as composed of the World Trade Organization Agreement and other free trade agreements, restricts timber-exporting countries' freedom to implement export taxes. First, the basic concepts and core principles of international trade law are explained. Second, the chapter focuses on the constraints that these rules pose on states' ability to impose export taxes in general. Third, it assesses whether they restrict states' ability to adopt export taxes on timber products, and whether it would be possible legally to develop an export tax system fostering adherence to sustainability standards in the timber sector. Finally, the chapter assesses in detail the extent to which member countries of the CIF's Forest Investment Program would be constrained by rules of international trade law, should they wish to adopt such taxes.

International Trade Law and Regulatory Autonomy

International trade law is the body of public international law containing rules and disciplines concluded between states that govern the way in which they regulate trade relations between economic entities. International trade law consists of multilateral, as well as bi- and plurilateral, agreements in which the contracting parties lay down rules that govern trade relations between them. At the multilateral level, the WTO Agreement and its predecessor, the General Agreement on Tariffs and Trade 1947 (GATT 1947), form the foundation of "international trade law." At the bi- and plurilateral level, there are diverse regional economic integration agreements concluded between states—such as customs unions (for example, the European Union) and free trade agreements (FTAs), for example, the North American Free Trade Agreement (NAFTA) and its planned successor, the United States–Mexico–Canada Agreement (USMCA).

The WTO Agreement defines member countries' mutual rights and obligations regarding both imports and exports. The WTO Agreement is the successor to the GATT 1947, which is incorporated into the agreement by reference through the General Agreement on Tariffs and Trade 1994 (GATT 1994, hereafter just called GATT). Its essence lies in the principles of nondiscrimination and market access. The principle of nondiscrimination can be divided into the most-favored nation treatment obligation and the national treatment obligation. Whereas the former provides that WTO members must not treat products from a particular foreign origin more favorably than foreign products originating in any other country, the latter requires WTO members not to treat imported products less favorably than domestic products in terms of internal taxation or domestic regulation. While the WTO Agreement predominantly provides rules that restrain importing members' ability to discriminate against imported products from one country in favor of domestic products or products from another country, it also includes provisions limiting their ability to restrict the export of domestic products.

The WTO allows its members to conclude regional economic integration agreements with each other, in the form of FTAs or customs unions, which may contain additional rules and obligations that go beyond those contained in the WTO Agreement. For instance, the EU, like many other WTO members, has concluded such agreements with several of its trading partners, including many timber-exporting countries.

The WTO Agreement, including the GATT, and FTAs contain rules that limit member states' ability to restrict the export of goods, such as timber products. These rules can be broadly divided into (i) quantitative export restrictions and (ii) export taxes or duties (collectively referred to throughout this chapter as "export taxes"), that is, charges levied upon the exportation of a product outside of the customs territory of the state imposing that measure.

Export Restrictions on Timber Products and the WTO Agreement

The GATT prohibits the imposition of quantitative restrictions on the export of goods but does not prohibit the imposition of export taxes if they are applied in a nondiscriminatory manner.

Quantitative restrictions on exports

Quantitative restrictions on the export of goods, such as timber products, are prohibited under GATT Article XI:1 (box 9.1). Measures that would restrict the volume of timber products exported from a WTO member would therefore result in a violation of the WTO commitments of the member adopting the measure.

BOX 9.1 GATT ARTICLE XI:1 – GENERAL ELIMINATION OF QUANTITATIVE RESTRICTIONS

1. *"No prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licenses or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any other contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party."*

Export taxes

Export taxes are taxes levied on the exportation of goods outside of the exporting country's customs territory. Upon presenting the goods to the customs authorities prior to exportation, the exporter must pay a certain amount over the value of the exported products (ad valorem tax), or in relation to the number of items exported (unit-based tax). Crucially, an export tax is not due if the products are not exported; that is, if they remain within the customs territory of the country of origin.

The application of export taxes, like many other fiscal instruments, can be tied to (non) compliance with certain sustainability criteria. In other words, a country imposing an export tax may make the payment of such a tax conditional upon fulfilling certain sustainability standards. Where products comply with these criteria, an exporting country may refrain from imposing the export tax, whereas the tax would be due in the case of noncompliance.

The GATT does not prevent WTO members from adopting export taxes if they are implemented in a nondiscriminatory manner. Contrary to quantitative restrictions, the GATT does not explicitly prevent WTO members from adopting export taxes. GATT Article XI:1 states, "*No prohibitions or restrictions other than duties, taxes or other charges…shall be instituted or maintained by any contracting party on the…exportation or sale for export of any product destined for the territory of any other contracting party.*" Thus, in principle, export taxes or other charges are not prohibited. WTO members are, therefore, in principle entirely free to adopt export taxes on exports of certain products without risking violation of their WTO commitments.

This freedom to impose export taxes is however constrained by the most-favored-nation treatment obligation as contained in GATT Article I:1 (box 9.2).

BOX 9.2 GATT ARTICLE I:1 – GENERAL MOST-FAVORED-NATION TREATMENT

1. *"With respect to customs duties and charges of any kind imposed on or in connection with importation or exportation or imposed on the international transfer of payments for imports or exports, and with respect to the method of levying such duties and charges, and with respect to all rules and formalities in connection with importation and exportation, and with respect to all matters referred to in paragraphs 2 and 4 of Article III,* any advantage, favor, privilege or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties."*

Consequently, WTO members cannot impose an export tax dependent on the destination of the product in question. GATT Article I:1 requires WTO members, when they adopt export taxes ("*customs duties…imposed on…exportation*"), to ensure that they grant "*any advantage, favor, privilege or immunity…to any product…destined for any other country…immediately and unconditionally to the like product…destined for the territories of all other contracting parties.*"

Commitments in WTO protocols of accession of timber-exporting countries

WTO members that joined the organization after its founding in 1995 have on some occasions had to accept additional obligations, such as prohibitions on the imposition of export taxes,

as a condition for their accession (Geraets 2018).[1] Generally speaking, WTO members have often sought commitments from acceding states that would preclude them from adopting export taxes.

Commitments on the elimination of export taxes contained in protocols of accession have been used successfully to challenge such taxes in WTO dispute settlement proceedings. In *China – Raw Materials* and *China – Rare Earths*, panels and the Appellate Body found that China had acted inconsistently with its WTO commitments by imposing export taxes on certain raw materials and rare earth metals.[2] Complaints against these taxes had been filed by, among others, the EU and the United States. In 2016, the EU and the United States filed new complaints against China's use of export taxes on raw materials.[3]

Importantly, none of the four FIP member countries that acceded to the WTO after its establishment (Cambodia, Ecuador, the Lao People's Democratic Republic, and Nepal) have accepted such an obligation in their respective protocol of accession. Consequently, like founding WTO members, they would not violate any WTO law provision by adopting export taxes, provided they did so in a nondiscriminatory manner.

Rules on export restrictions in FTAs concluded with FIP member countries

In addition to WTO rules, states may be bound by other international economic law agreements, such as FTAs. A country-by-country and agreement-specific analysis is required to determine whether FTAs prevent timber-exporting countries from imposing export taxes. Canada, the EU, and the United States are the most significant export markets with which FIP member countries have concluded FTAs. Whether these FTAs prohibit FIP member countries from adopting export taxes on timber products can only be determined based on an analysis of the exact commitments contained in these agreements.

FTAs signed with the EU include provisions restricting export taxes. The EU has concluded FTAs, sometimes named economic partnership agreements or association agreements, with 17 of the 23 FIP member countries (and is negotiating one with four others). Each FTA contains a prohibition on both the EU and the partner country to impose "*new customs duties on exports.*" The language used to define these commitments varies from agreement to agreement and may include references to the following:

- "*duties or taxes on exports or charges with equivalent effect*"
- "*customs duties on exports*"
- "*duties or taxes imposed on or in connection with the exportation of goods*"
- "*any tax or charge on the exportation of a good to the other Party that is in excess of the tax imposed on that good when destined for domestic consumption*" (EU-Mexico FTA 2018)

The EU-Mexico and EU-Vietnam FTAs contain the most recent articulations of commitments not to adopt or maintain export taxes (WTO 2018a) (box 9.3 and box 9.4).

1 The list of WTO members that have accepted such commitments include Afghanistan, Bulgaria, China, Croatia, Estonia, Georgia, Kazakhstan, Latvia, Mongolia, Montenegro, Russia, Saudi Arabia, Tajikistan, Ukraine, and Vietnam.
2 WTO, *China – Raw Materials, DS394/DS395/DS398; and China – Rare Earths*, DS431/432/433.
3 WTO, *China – Raw Materials (II) (EU) and China – Raw Materials* (II) (US), DS509/DS508.

BOX 9.3 EU-MEXICO FTA: ARTICLE X.4 – EXPORT DUTIES, TAXES, OR OTHER CHARGES

1. *"No Party shall adopt or maintain any tax or charge on the exportation of a good to the other Party that is in excess of the tax imposed on that good when destined for domestic consumption.*
2. *No Party shall adopt or maintain any duty or charge of any kind imposed on, or in connection with, the exportation of a good to the territory of the other Party, that is in excess of those adopted or maintained on that good when destined for domestic consumption. . . .*

BOX 9.4 EU-VIETNAM FTA: ARTICLE 2.11 – EXPORT DUTIES, TAXES, OR OTHER CHARGES

1. *"A Party shall not maintain or adopt any duties, taxes, or other charges of any kind imposed on, or in connection with, the exportation of a good to the territory of the other Party that are in excess of those imposed on like goods destined for domestic consumption, other than in accordance with the schedule included in Appendix 2-A-3 (Export Duties Schedule of Viet Nam) of Annex 2-A (Reduction or Elimination of Customs Duties).*
2. *If a Party applies a lower rate of duty, tax or charge on, or in connection with, the exportation of a good and for as long as it is lower than the rate calculated in accordance with the schedule included in Appendix 2-A-3 (Export Duties Schedule of Viet Nam) of Annex 2-A (Reduction or Elimination of Customs Duties), that lower rate shall apply. This paragraph shall not apply to more favorable treatment granted to any other third party pursuant to a preferential trade agreement.*
3. *At the request of either Party, the Trade Committee shall review any duties, taxes, or other charges of any kind imposed on, or in connection with, the exportation of goods to the territory of the other Party, when a Party has granted more favorable treatment to any other third party pursuant to a preferential trade agreement."*

The EU-Vietnam FTA is a special case because Vietnam is not a FIP member country. However, the export tax elimination commitment is particularly detailed, as it refers to the "Export Duties Schedule of Viet Nam," that is, Appendix 2-A-3 to the agreement (WTO 2018b). This appendix contains export tax reduction commitments for a large group of products falling within chapter 44 of the Harmonized System nomenclature, that is, timber and forestry products. For each product, an export tax reduction commitment with a base rate and a final rate (of 0 percent) has been included.

The United States and Canada have also concluded FTAs with FIP member countries that include commitments not to adopt or maintain export taxes. Like the EU FTAs, a detailed textual analysis of these commitments is required to establish the scope of the commitments in each case. Table 9.1 lists the agreements concluded by the EU, the United States, and Canada with FIP member countries and indicates whether a commitment exists that would prevent or restrict the ability of FIP member countries to adopt export taxes.

TABLE 9.1
AGREEMENTS CONCLUDED BETWEEN THE EU, THE UNITED STATES, AND CANADA AND FIP MEMBER COUNTRIES

	COMMITMENT OR OBLIGATION TO ELIMINATE OR NOT (RE)-INTRODUCE EXPORT DUTIES?		
FIP COUNTRY	**EU FTA**	**US FTA**	**CANADA FTA**
Bangladesh	No	No	No
Brazil	No	No	No
Burkina Faso	Yes, Article 13 EU – ECOWAS EPA, but exception for environmental protection	No	No
Cambodia	No	No	No
Cameroon	Yes, Article 15 EU – Central Africa EPA, but exception for environmental protection	No	No
Congo, Dem. Rep.	Yes, Article 15 EU – Central Africa EPA, but exception for environmental protection	No	No
Congo, Rep.	Yes, Article 15 EU – Central Africa EPA, but exception for environmental protection	No	No
Côte d'Ivoire	Yes, Article 13 EU – ECOWAS EPA, but exception for environmental protection	No	No
Ecuador	Yes, Article 25 EU – Andean (with Colombia and Peru)	No	No
Ghana	Yes, Article 13 EU – ECOWAS EPA, but exception for environmental protection	No	No
Guatemala	Yes, Article 88 EU – Central America AA	Yes, Article 3.11 CAFTA-DR (Dominican Republic–Central America FTA)	No
Guyana	Yes, Article 14 EU – CARIFORUM EPA	No	No
Honduras	Yes, Article 88 EU – Central America AA	Yes, Article 3.11 CAFTA-DR (Dominican Republic–Central America FTA)	Yes, Article 3.11 Canada-Honduras Free Trade Agreement
Indonesia	No	No	No

Lao PDR	No	No	No
Mexico	Yes, Article X.4 EU – Mexico FTA (Agreement in Principle, 2018)	Yes, Article 2.13 United States–Mexico–Canada Agreement	Yes, Article 2.15 Trans-Pacific Partnership
Mozambique	Yes, Article 26 EU – South African Development Community EPA, but exception for environmental protection	No	No
Nepal	No	No	No
Peru	Yes, Article 25 EU – Andean (with Colombia and Peru)	Yes, Article 2.11 Peru Trade Promotion Agreement	Yes, Article 2.15 Trans-Pacific Partnership
Rwanda	Yes, Article 14 EU – East African Community EPA, but exception for environmental protection	No	No
Tunisia	Yes, Article 26 EU – Tunisia AA	No	No
Uganda	Yes, Article 14 EU – East African Community EPA, but exception for environmental protection	No	No
Zambia	Yes, Article 15 EU – Eastern and Southern Africa EPA GSP EBA	No	No

Note: AA = association agreement; CARIFORUM = Caribbean Forum; ECOWAS = Economic Community of West African States; EPA = economic partnership agreement; EU = European Union; FTA = free trade agreement; US = United States.

General FTA commitments on export taxes do not in every instance preclude FIP member countries from adopting such taxes. Depending on the FTA, a commitment may be phrased differently and may provide for more flexibility. The economic partnership agreement concluded between the EU and the Economic Community of West African States (ECOWAS) provides a case in point (WTO 2014). The FIP member countries Burkina Faso, Côte d'Ivoire, and Ghana are party to this agreement, which has its own commitments on export taxes (box 9.5).

BOX 9.5 EU-ECOWAS EPA: ARTICLE 13 – EXPORT DUTIES AND TAXES

1. *"No new duties or taxes on exports or charges with equivalent effect shall be introduced, nor shall those currently applied in trade between the Parties be increased from the date of entry into force of this Agreement.*
2. *The duties, taxes on exports or charges with equivalent effect shall be no greater than the same duties and taxes applied to similar goods exported to any other countries that are not party to this Agreement.*
3. *In exceptional circumstances, if the West Africa Party can justify specific needs for income, promotion for fledgling industry or* ***environmental protection****, it may, on a* ***temporary basis*** *and* ***after consulting the European Union Party, introduce duties, taxes on exports or charges with equivalent effect on a limited number of additional goods or increase the impact of those that already exist****.*[a]
4. *The Parties agree to review the provisions of this Article in the framework of the Joint Council of the EPA in accordance with the revision clause of this Agreement, taking full account of their impact on the development and diversification of the economy of the West Africa Party."*

a. Emphasis added.

The wording of Article 13:3 of the EU-ECOWAS economic partnership agreement therefore leaves open the possibility to introduce an export duty for environmental protection considerations. However, where a FIP member country would contemplate the adoption of such an export tax, it would—in any event—have to "consult" the EU and the measure would have to be temporary.

Conclusion

The WTO Agreement does not prohibit the imposition of export taxes, but the EU and the United States, as WTO members with significant market power, have concluded FTAs with the majority of FIP member countries that in some cases include restrictions on export taxes. These agreements may include commitments by both parties to eliminate any existing export taxes and/or to refrain from adopting new export taxes. Consequently, timber-exporting countries that have concluded FTAs with relevant export markets would be well advised to verify that they are not prevented from adopting export taxes under these agreements. Whereas the adoption of export taxes on timber for environmental reasons may not in every case be prohibited, prior consultations with partner countries may be required under existing FTAs.

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10

WTO Law Compatibility of a ‘Feebate’ Scheme on Imported Products

GORAN DOMINIONI

Introduction

Any tax on imported products needs to comply with international trade law. This chapter analyzes whether the feebate scheme proposed in chapter 7 complies with the World Trade Organization’s General Agreement on Tariffs and Trade, its Agreement on Subsidies and Countervailing Measures (SCM Agreement), as well as with free trade agreements between Canada, the European Union, and the United States, on one side, and CIF’s Forest Investment Program (FIP) countries, on the other side. The risk of trade retaliation, while important economically and politically, is outside the scope of the present chapter, which focuses on legal compliance aspects.[1]

Case law can guide policy makers in designing a tax scheme that minimizes concerns with WTO law incompatibility, although some legal uncertainty remains, which is discussed below.

Besides avoiding tax features that violate WTO law provisions, policy makers should include elements that allow for the application of exceptions to these violations. GATT Article XX provides environmental exceptions to violations of other GATT provisions. A measure that is incompatible with other GATT provisions can still be GATT-compatible if it meets the requirements set in the Chapeau of Article XX and at least one of the exceptions listed in the article. The same exceptions may also apply to violations of the SCM Agreement and FTAs.

Avoiding Features That Violate GATT Provisions

Applying an internal tax at the border is more likely to comply with GATT provisions than introducing an import charge. GATT Article II constrains the amount of import charges on goods to established tariff schedules. Article II:1(a) reads, “*Each contracting party shall accord to the commerce of the other contracting parties’ treatment no less favorable than that provided for in the*

1 For general discussions on WTO law and climate policy, see Esty (1994), IISD and UNEP (2013), and Pirlot (2017).

appropriate Part of the appropriate Schedule annexed to this Agreement." Article II:1(b) further shields imports from import charges by adding that they should not be subject to any other charge or duty imposed on importation or in connection with importation. Thus, to comply with Article II, an import charge set to incentivize imports of sustainable timber cannot exceed established tariff schedules. While such schedule varies by product, a complying tax rate might be too low to achieve the intended effect for the feebate scheme. However, the constraints set in Article II do not apply to internal charges, which fall under GATT Article III.

Various design features determine whether the scheme is an import charge or an internal charge. A charge is internal if it applies to forestry products with a factor that occurs internally, that is, within the customs borders of the importing country and after importation (*China – Autoparts).*[2] Consumption can qualify as an internal factor. However, it is uncertain whether *consumption* could qualify as an internal factor that triggers an obligation to pay for the sustainability of timber *production*. The legal qualification of a tax as internal under domestic law does not automatically make it internal under the GATT. While according to some analysts a border tax adjustment (BTA)[3] is necessarily an internal tax (Van den Bossche, Henry, and Zdouc 2017), under WTO law it is not settled whether adjustment is allowed for carbon taxes (Pirlot 2017). In any case, the characterization of a tax as internal does not prevent the collection of payments upstream (that is, at the moment of importation), as long as the obligation to pay arises subsequently (*China – Autoparts*).[4] The use of sustainability labels on timber products increases consumers' awareness of the climate and environmental impacts of their choices, potentially strengthening the argument that the obligation to pay accrues by virtue of consumption.[5]

Varying the tax rate per product type instead of per the sustainability of production is more likely to comply with GATT provisions. Analysts disagree on whether GATT Article III applies only to charges on products or also to charges on production processes (Howse and Regan 2000; Trachtman 2017). If Article III applies only to taxes on products, the feebate scheme would fall outside its application, with the consequent application of the tariff limit set in Article II. However, case law is not clear on this point. In the tuna case, the panel took the stance that Article III applies only to products (*US – Tuna*)[6] and a previous panel found that the chemical elements physically present in the imported good could be a basis for BTA (*US – Superfund*).[7] However, both of these cases are from the pre-WTO era. No panel or the Appellate Body has provided guidance on this point in more recent years; thus, legal uncertainty remains.

The same tax rate should apply to imported and domestic "like" products. GATT Article III:2 requires that imported products are not subject to higher taxes than like domestic products. Even a slightly higher tax would be incompatible with this provision. Whether two products are

2 Appellate Body Reports, China – Measures Affecting Imports of Automobile Parts, WT/DS339/AB/R, WT/DS340/AB/R, WT/DS342/AB/R, adopted 12 January 2009, DSR 2009.

3 BTAs on imports are fiscal measures that impose on imported products part or all the tax charged in the importing country on similar domestic products.

4 Appellate Body Reports, China – Measures Affecting Imports of Automobile Parts, WT/DS339/AB/R, WT/DS340/AB/R, WT/DS342/AB/R, adopted 12 January 2009, DSR 2009.

5 The use of consumer labels needs to comply with WTO law. Relevant provisions would be GATT Article III:4 and the Agreement on Technical Barriers to Trade (TBT Agreement). A measure that does not comply with the TBT Agreement might be WTO law-compatible if it meets the requirements set in GATT Article XX, even though the applicability of Article XX exceptions to TBT provisions is debated (Van den Bossche, Henry, and Zdouc 2017).

6 GATT Panel Report, United States – Restrictions on Imports of Tuna, DS21/R, September 3, 1991, unadopted, BISD 39S/155.

7 GATT Panel Report, United States – Taxes on Petroleum and Certain Imported Substances, L/6175, adopted 17 June 1987, BISD 34S/136.

like needs to be determined on a case-by-case basis. Relevant aspects are, for instance, the properties of the product, its use, consumers' preferences, and the product tariff classification (Van den Bossche, Henry and Zdouc 2017). While there is no close number of relevant aspects or a clear hierarchy between these aspects, in essence the like test checks whether two products are close to being perfect substitutes (*Philippines – Distilled Spirits*).[8] Following this logic, if forestry products produced with different sustainability standards compete on the market, they should not be subject to different tax rates. The use of sustainability labels may affect consumers' preferences and reduce the substitutability between timber products obtained with different sustainable forest management levels. Yet this effect (even if present) may not necessarily be considered by a future panel or the Appellate Body to establish likeness.

GATT Article III also provides that domestic and imported "directly competitive or substitutable products" (DCSP) should not be differently taxed to afford protection to domestic production. DCSP is a broader category than "like" products, encompassing products that have a high degree of substitutability but are not almost perfect substitutes. In *Korea – Alcoholic Beverages*,[9] the Appellate Body found that in assessing DCSP, not only is current competition relevant but so too is potential competition. The cross-price elasticity of demand for products is thus a relevant, but not necessarily decisive, criterion to establish DCSP. More recently, the Appellate Body found that price competition is a very relevant criterion to establish DCSP, even if it occurs only in one segment of the market (*Philippines – Distilled Spirits*).[10] Moreover, the determination of potential competition can be based on consumer preferences in other WTO member markets, at least when the two markets are sufficiently similar (*Korea – Alcoholic Beverages*).[11]

Because of the focus on potential competition, forestry commodities produced with a different level of sustainability are likely to be DCSP, if not found to be "like."[12] DCSP should not be taxed differently, but contrary to like products, here a *de minimis* rule applies, meaning that a difference in taxation can exist within certain limits (*Japan – Alcoholic Beverages II*).[13] These limits have to be determined on a case-by-case basis (*Korea – Alcoholic Beverages*).[14] Previous rulings suggest that neither a tax difference that prevents access to a market (*Canada – Periodicals*)[15] nor tax rates that are 10 to 40 times higher than those applied to domestic products satisfy the *de minimis* threshold (*Philippines – Distilled Spirits*).[16]

Differential taxation of DCSP is incompatible with GATT Article III if the tax is applied to afford protection to domestic production. Determining whether a measure affords protection to domestic production requires performing a comprehensive analysis of the measure,

8 Appellate Body Reports, Philippines – Taxes on Distilled Spirits, WT/DS396/AB/R, WT/DS403/AB/R, adopted 20 January 2012, DSR 2012:VIII.
9 Appellate Body Report, Korea – Taxes on Alcoholic Beverages, WT/DS75/AB/R, WT/DS84/AB/R, adopted 17 February 1999, DSR 1999:I.
10 Appellate Body Reports, Philippines – Taxes on Distilled Spirits, WT/DS396/AB/R, WT/DS403/AB/R, adopted 20 January 2012, DSR 2012:VIII.
11 Appellate Body Report, Korea – Taxes on Alcoholic Beverages, WT/DS75/AB/R, WT/DS84/AB/R, adopted 17 February 1999, DSR 1999:I.
12 Note that, because even products that are qualitatively different could be considered as being like, the fact that a commodity is not produced in an importing country does not necessarily make taxation of these products WTO law-compatible. The imported product could still be considered a substitute for a domestic produced good, and thus a tax on imported products could be seen as protecting internal production.
13 Appellate Body Report, Japan – Taxes on Alcoholic Beverages, WT/DS8/AB/R, WT/DS10/AB/R, WT/DS11/AB/R, adopted 1 November 1996, DSR 1996:I.
14 Appellate Body Report, Korea – Taxes on Alcoholic Beverages, WT/DS75/AB/R, WT/DS84/AB/R, adopted 17 February 1999, DSR 1999:I.
15 Appellate Body Report, Canada – Certain Measures Concerning Periodicals, WT/DS31/AB/R, adopted 30 July 1997, DSR 1997:I.
16 Appellate Body Reports, Philippines – Taxes on Distilled Spirits, WT/DS396/AB/R, WT/DS403/AB/R, adopted 20 January 2012, DSR 2012:VIII.

considering for instance the magnitude of differential taxation (*Japan – Alcoholic Beverages II*),[17] the competitiveness effects of such differentiation (*Korea – Alcoholic Beverages*),[18] and the relative proportion of domestic and imported products that fall under the higher tax bracket (*Chile – Alcoholic Beverages*).[19] The intent of the measure is unlikely to play a role in this assessment (*Chile – Alcoholic Beverages*).[20] Given this plethora of criteria,[21] it is difficult to establish whether the feebate scheme is incompatible with GATT Article III. This assessment will necessarily depend on the specific features of the scheme, such as how the tax brackets are defined and the relative sustainability level of imported and domestic timber products.

A tax rate that varies depending on the sustainability level of the forestry regime in place in the exporting country is more likely to violate GATT provisions. GATT Article I forbids parties to differentiate treatment of like products depending on their country of origin. This prohibition applies also to internal taxes. While various criteria define when two products are like (Van den Bossche, Henry, and Zdouc 2017), commodities that compete on the market are plausibly found to be like (Trachtman 2017). Article I prohibits both *de jure* and *de facto* discrimination that grants any competitive advantage to products based on their country of origin (*Canada – Autos*).[22] *De facto* discrimination can occur when a measure does not explicitly differentiate import conditions by origin, but the requirements set for more favorable import conditions are not met by products from certain countries. To establish whether an advantage exists, the actual trade effects are not necessarily relevant (*EC – Seal Products*),[23] and even mere *potential* trade advantages for a country can count as an advantage (*EC – Bananas III*).[24] Thus, a tax rate that varies depending on the SFM regime or practice in place in different countries may violate Article I despite the nominal tax rate being equal per equal level of SFM.

GATT compliance may require guaranteeing foreign producers' equal access to sustainability certification. The panel in *EEC – Imports of Beef* found that an EEC measure that limited suspension of an import levy to beef products certified by a US agency discriminated imports from Canada because the agency had the mandate to certify only meat from the United States.[25] Foreign forestry producers need thus to have possible access to sustainability certificates for the feebate to comply with GATT Article I. Some existing standards, such as FSC, are widely available.

There is significant legal uncertainty regarding the possibility for the proposed feebate scheme to comply with GATT Article II and Article III. Compliance issues may notably arise if domestic and imported forest products produced with different sustainability levels are nonetheless considered like, and if the scheme entailed exceeding limits set in the importing country's WTO tariff schedule.

17 Appellate Body Report, Japan – Taxes on Alcoholic Beverages, WT/DS8/AB/R, WT/DS10/AB/R, WT/DS11/AB/R, adopted 1 November 1996, DSR 1996:I.

18 Appellate Body Report, Korea – Taxes on Alcoholic Beverages, WT/DS75/AB/R, WT/DS84/AB/R, adopted 17 February 1999, DSR 1999:I.

19 Appellate Body Report, Chile – Taxes on Alcoholic Beverages, WT/DS87/AB/R, WT/DS110/AB/R, adopted 12 January 2000, DSR 2000:I.

20 Ibid.

21 For a full discussion of these criteria, see Van den Bossche, Henry, and Zdouc (2017).

22 Appellate Body Report, Canada – Certain Measures Affecting the Automotive Industry, WT/DS139/AB/R, WT/DS142/AB/R.

23 Appellate Body Report, European Communities – Measures Prohibiting the Importation and Marketing of Seal Products, WT/DS400/AB/R, WT/DS401/AB/R.

24 Appellate Body Report, European Communities – Regime for the Importation, Sale and Distribution of Bananas, WT/DS27/AB/R, adopted 25 September 1997, DSR 1997:II.

25 GATT Panel Report, European Economic Community – Imports of Beef from Canada, L/5099, adopted 10 March 1981, BISD 28S/92.

Including Features That Qualify for Exceptions to GATT Violations

Determining whether an exception applies is a two-step process. For an exception to apply under GATT Article XX, the measure needs to meet the requirements set in at least one of its subparagraphs. In particular, subparagraphs (b) "*measures necessary to protect human, animal or plant life or health*" and (g) "*measures relating to the conservation of exhaustible natural resources*" provide exceptions based on environmental considerations. In addition, the measure needs to meet the requirements set in the Chapeau of Article XX. Each of these elements are reviewed below.

Article XX(b) – Measures necessary to protect human, animal, or plant life or health

Fiscal measures for SFM are likely seen as "necessary," especially when their tax rate varies per degree of sustainability of production processes. A measure is necessary if it contributes substantially to achieving a common interest. The stronger the common interest to protect and the more the measure contributes to protecting this interest, the more the measure is necessary (*Brazil – Retreaded Tyres*).[26] Preserving forests for climate change mitigation is a key societal interest, as recognized in many international agreements; environmental taxes need to target the external cost of timber production or incentives for SFM will be diluted. Thus, a feebate scheme with a tax rate that varies per degree of SFM can be seen as necessary. Another relevant aspect to consider is the impact of the measure on trade. The higher this impact, the less the measure is necessary (*Brazil – Retreaded Tyres*).[27] The trade impact of the feebate scheme will depend on various factors, such as the applied tax rate and the administrative complexity of obtaining sustainability certificates. In *Brazil – Retreaded Tyres*,[28] however, the Appellate Body found that an import ban can be necessary, despite significant restrictive impact on imports.

No reasonably available, less trade-restrictive alternatives should exist. The responding party needs only to make a *prima facie* case that the measure is necessary. It is then up to the complaining party to indicate the existence of alternative, less trade-restrictive measures, and eventually for the responding party to rebut this indication. The alternative measure needs to be "reasonably available," and thus not be available only in theory (*Brazil – Retreaded Tyres*)[29] or be very difficult to implement (*EC – Asbestos*).[30] Attempting to negotiate an international arrangement before acting unilaterally helps to show that no available alternative exists, and open-mindedness toward an international solution should also remain after the tax scheme is introduced (Trachtman 2017).

Alternative measures with similar effects might not be reasonably available. Expenditure-side policies are limited by fiscal constraints and risk incentivizing the exploitation of forests that would remain otherwise preserved. Forestry certificates alone are subject to free riding and, similarly to bans, may not provide dynamic incentives for SFM (see box 6.1). Bans are also a more restrictive measure than a Pigouvian tax and are widely used in combating deforestation.

26 Appellate Body Report, Brazil – Measures Affecting Imports of Retreaded Tyres, WT/DS332/AB/R, adopted 17 December 2007, DSR 2007:IV.
27 Ibid.
28 Ibid.
29 Ibid.
30 Appellate Body Report, European Communities – Measures Affecting Asbestos and Asbestos-Containing Products, WT/DS135/AB/R, adopted 5 April 2001, DSR 2001:VII.

The sustainability impact of the measure should be material. Measures that have only insignificant effects on protecting the policy aim pursued may not meet the requirement set in Article XX(b) (*Brazil – Retreaded Tyres*)[31] despite there being no predefined threshold to meet (*EC – Seal Products*).[32] If the criteria used to determine SFM degree yield sustainability outcomes, the mitigating effects of a tax rate that varies per SFM degree are stronger than those of a measure that does not target the external cost of production methods. The former are thus more likely to make a material contribution toward environmental sustainability.

The suggested tax scheme can satisfy the requirements of Article XX(b).

Article XX(g) – Measures relating to the conservation of exhaustible natural resources

Measures that incentivize SFM are likely to qualify as "relating to" the conservation of exhaustible natural resources. A measure "relates to" if it has a close and genuine relationship with its ends (*US – Shrimp*).[33] Various factors are relevant to establishing the existence of this relationship, such as the design and the structure of the measure, and its effects (*China – Rare Earths*).[34] Conservation does not only refer to measures that preserve a resource; it also encompasses policies that reduce the pace of extraction of a resource (*China – Rare Earths*).[35] As it makes forests more sustainable and mitigates climate change, the suggested scheme likely fulfills this requirement. The protected natural resource can be forests themselves or even the climate, as the identification of the relevant resources must be made in light of the "*current concerns of the community of nations*" (*US – Shrimp*, para. 129).[36]

If the scheme applies to both imported and domestic forestry products, it can satisfy the conditions of Article XX(g). Restrictions on domestic production need to be real and even-handed compared with restrictions on imports, but Article XX does not require identical treatment between domestic and imported products (*China – Rare Earths*).[37]

Article XX's Chapeau

To comply with Article XX's Chapeau, the measure should neither (i) be arbitrary or unjustifiable nor (ii) constitute a disguised restriction on international trade.

Well-designed fiscal policies for SFM are neither arbitrary nor unjustifiable. Whether a measure is arbitrary or unjustifiable depends more on its objectives than on its effects (*Brazil – Retreaded Tyres*).[38] Coherently, the measure should not conceal an intention to restrict

31 Appellate Body Report, Brazil – Measures Affecting Imports of Retreaded Tyres, WT/DS332/AB/R, adopted 17 December 2007, DSR 2007:IV.

32 Appellate Body Reports, European Communities – Measures Prohibiting the Importation and Marketing of Seal Products, WT/DS400/AB/R, WT/DS401/AB/R.

33 Appellate Body Report, United States – Import Prohibition of Certain Shrimp and Shrimp Products, WT/DS58/AB/R, adopted 6 November 1998, DSR 1998:VII.

34 Appellate Body Reports, China – Measures Related to the Exportation of Rare Earths, Tungsten, and Molybdenum, WT/DS431/AB/R, WT/DS432/AB/R, WT/DS433/AB/R.

35 Ibid.

36 Appellate Body Report, United States – Import Prohibition of Certain Shrimp and Shrimp Products, WT/DS58/AB/R, adopted 6 November 1998, DSR 1998:VII.

37 Appellate Body Reports, China – Measures Related to the Exportation of Rare Earths, Tungsten, and Molybdenum, WT/DS431/AB/R, WT/DS432/AB/R, WT/DS433/AB/R, adopted 29 August 2014.

38 Appellate Body Report, Brazil – Measures Affecting Imports of Retreaded Tyres, WT/DS332/AB/R, adopted 17 December 2007, DSR 2007:IV, p. 1527.

international trade (*EC – Asbestos*).[39] The aim pursued by fiscal measures for SFM finds support in the climate regime and is therefore neither arbitrary nor unjustifiable, especially if the tax rate varies by degree of sustainability of production. Seeking a multilateral solution with exporting countries in good faith signals that the unilateral action is not unjustifiable (*US – Shrimp*).[40]

The measure should not coerce other countries to adopt a specific SFM regime or join an international agreement (*US – Shrimp*).[41] Instead, it should allow for flexibility, to account for differences that prevail in exporting countries, even though Article XX does not require the importing country to explicitly consider the conditions that prevail in every other state (*US – Shrimp*, Article 21.5 – Malaysia).[42] Allowing flexibility in proving SFM via various practices and via a diverse range of certificates reduces coerciveness. The different certificates accepted should be roughly comparable in their stringency so equity and effectiveness are not compromised.

Due process in applying the tax scheme to imported products is necessary (*US – Shrimp*).[43] The certification process and the recognition of these certificates at customs authorities should be transparent, predictable, and accessible.

If the scheme is carefully designed, it can comply with the Chapeau of Article XX.

Extraterritoriality

WTO law may restrict countries' ability to consider the features of production processes that take place in foreign jurisdictions. While various elements indicate that the scheme could fall within the jurisdiction of the importing state, legal uncertainty remains.

The transboundary negative externalities caused by unsustainable forest management may provide a jurisdictional basis for the feebate scheme. While Article XX does not contain an explicit jurisdictional limit, it may contain an implicit one (Van den Bossche, Henry, and Zdouc 2017). Uncertainty exists on this issue because no case law explicitly addresses this matter. The Appellate Body held that the United States had jurisdiction to impose a ban on imports of shrimp harvested with methods that endangered sea turtles because sea turtles sometimes migrate through waters where the United States has jurisdiction (*US – Shrimp*).[44] This case suggests that jurisdiction exists if there is a *sufficient nexus* between the state that imposes the measure and the interest protected (ibid.). A panel previously held that the European Communities (EC) did not have the jurisdiction to regulate activities that were not protecting human life and health in the EC (*EC – Tariff Preferences*).[45] If this line of reasoning is followed, a country may not have the jurisdiction to apply an SFM scheme to conserve forests abroad under Article XX(g). However, jurisdiction might be still based on the fact that climate change is a threat to the economy and security of many countries, potentially making the nexus "sufficient."

39 Panel Report, European Communities – Measures Affecting Asbestos and Products Containing Asbestos, WT/DS135/R, 18 September 2000, DSR 2000:VII.

40 Appellate Body Report, United States – Import Prohibition of Certain Shrimp and Shrimp Products, WT/DS58/AB/R, adopted 6 November 1998, DSR 1998:VII.

41 Ibid.

42 Appellate Body Report, United States – Import Prohibition of Certain Shrimp and Shrimp Products – Recourse to Article 21.5 of the DSU by Malaysia, WT/DS58/AB/RW, adopted 21 November 2001, DSR 2001:XIII.

43 Appellate Body Report, United States – Import Prohibition of Certain Shrimp and Shrimp Products, WT/DS58/AB/R, adopted 6 November 1998, DSR 1998:VII.

44 Ibid.

45 Panel Report, European Communities – Conditions for the Granting of Tariff Preferences to Developing Countries, WT/DS246/R, adopted 20 April 2004, as modified by Appellate Body Report WT/DS246/AB/R, DSR 2004:III.

Making the consumer or the importer of forestry products the nominal taxpayer may strengthen the jurisdictional claim of the importing country.[46] States have jurisdiction over conducts that take place within their territory (territoriality principle). If the action seen as producing emissions is the purchase of timber products by consumers, that is, an internal act, the jurisdictional claim of the importing country could be based also on the territoriality principle. As discussed above, whether a future panel or the Appellate Body will see the feebate scheme as a consumption tax remains unclear, as the legal qualification of a tax as internal under domestic law does not make it automatically internal under WTO law. If instead the act of importing timber is identified as the taxable activity, GATT Article II, and its tariff limits, would likely apply. There is thus a trade-off between making the scheme compatible with Article II and making the exceptions of Article XX applicable.

If carefully designed, the importing country could have jurisdiction to implement the feebate scheme.

Agreement on Subsidies and Countervailing Measures

Fiscal policies for climate change need to comply with the SCM Agreement. Compatibility with this agreement requires considering whether the measure is an "actionable" subsidy, that is, a specific subsidy that harms the interest of a foreign industry or the interests of another state.[47] The subsidy could take the form of forgone tax revenues (otherwise due) or direct fund transfers.

A Pigouvian tax calibrated on the sustainability of production is unlikely to be seen as incompatible with the SCM Agreement. The suggested tax scheme lowers the tax rate upon proof that the emissions released were actually lower than assumed. The lower tax rate could either be applied directly when the tax is first collected or it could take the form of a rebate to be received in a later period. In the former case, the scheme is a Pigouvian tax tailored on SFM levels, and it is thus unlikely to be seen as a subsidy (Trachtman 2017). The rebate could instead be seen as a direct transfer, as it is granted to producers, despite the nominal tax liability falling on consumers/importers.

Policy makers need to establish objective criteria to grant rebates. To be actionable, a subsidy needs to be specific, meaning that it targets certain enterprises. A subsidy is unlikely to be specific if objective criteria define eligibility. Linking the rebate to sustainability practices has a high degree of objectivity, which may, therefore, make the "subsidy" nonspecific.[48] If found specific, the rebate should not have adverse effects for other countries' industries or interests. If the rebate scheme is applied to both internal and imported products, it may not be seen as harming foreign producers—also because it aims to level the playing field. If foreign producers tend to adopt lower sustainability practices, they may receive lower rebates, but they may also avoid part of the tax liability if they fall below the assumed default value.

If the scheme is found contrary to SCM Agreement provisions, GATT Article XX exceptions may apply. As discussed above, the scheme can meet the requirements set by Article XX. The

46 For an application of this strategy to carbon pricing in the international shipping sector, see Dominioni, Heine, and Martinez Romera (2018).

47 The SCM Agreement distinguishes two types of specific subsidies: prohibited ones and actionable ones. Most subsidies fall into the category of actionable subsidies. While not being prohibited, actionable subsidies are subject to challenge if they cause adverse effects to the interests of other WTO member states. Actionable subsidies can be challenged either via countervailing action or multilateral dispute settlement (read more at: https://www.wto.org/english/tratop_e/scm_e/subs_e.htm).

48 Similarly, related to carbon taxes, see Trachtman (2017).

applicability of these exceptions to non-GATT provisions is, however, uncertain under WTO law, at least for agreements that do not make explicit reference to Article XX (Van den Bossche, Henry, and Zdouc 2017). While the SCM Agreement does not contain an explicit reference to GATT Article XX, Article 32 states that "no specific action against a subsidy of another Member can be taken except in accordance with the provisions of GATT 1994, as interpreted by this Agreement." It is not clear, however, whether as a result of this provision GATT Article XX applies.

EU Import Taxes in Free Trade Agreements

Countries' ability to impose taxes on imported goods may be constrained by FTAs. In particular, Canada, the EU, and the United States have established FTAs with some FIP member countries.

FTAs signed by Canada, the EU, and the United States with FIP member countries do not forbid implementing an internal tax on imported products if the measure is in line with GATT Article III.[49] Some of these agreements, however, limit the imposition of new, or require the dismantling of existing, charges imposed on or in connection with the importation of commodities. Therefore, the compliance of the feebate scheme with FTAs will depend on its design, particularly on whether it is designed as an internal tax. Internal taxes that do not comply with Article III because the tax rate varies according to the external cost caused by unsustainable forest management could be justified under Article XX, even though the application of these exceptions outside the GATT may depend on the specific wording contained in each FTA.[50]

Conclusion

If carefully designed, the feebate scheme described in chapter 7 is not a priori incompatible with WTO law. In particular, it could be compatible with the GATT, the SCM Agreement, and FTAs that have been established between the EU and FIP countries.

While design of the scheme will be key in reducing WTO law compatibility concerns, seeking an exception under Article XX might remain the safer option under the GATT. Structuring the feebate scheme as an internal tax could reduce incompatibility concerns with respect to both the GATT and FTAs. A scheme that applies an equal tax rate per marginal external damage to domestic and imported products is also more likely to comply with WTO law. Obtaining sustainability certificates and rebates should be accessible to both domestic producers and exporters. Distributing the rebates based on objective criteria, such as the sustainability level of production processes, can also support the legality of the measure. Although these design features may reduce WTO law compatibility concerns, the scheme may remain incompatible with GATT Article II and Article III. For this reason, seeking an exception under Article XX might be the safest way to comply with the GATT.

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49 For instance, Article 19.1 of the "stepping stone" economic partnership agreement between Côte d'Ivoire and the European Community and its member states establishes that "*Products imported from the other Party shall not be directly or indirectly subject to internal taxation or other internal charges of any type surpassing those which are directly or indirectly applicable to similar domestic products. Furthermore, both Parties shall refrain from applying any other form of taxation or other internal charges with the aim of providing protection for domestic production.*" Article 19.2 adds, "*Products imported from the other Party shall benefit from treatment which is no less favorable than the treatment given to similar domestic products in respect of all laws, regulations and requirements applicable to their sale, offering for sale, purchase, transportation, distribution or use on the national market. The provisions of this paragraph shall not prevent the application of tariffs for differentiated internal transportation based exclusively on the fuel-efficient use of transport and not on the origin of the product.*"

50 For a discussion of the conditions needed for the application of Article XX outside the GATT, see Trachtman (2017).

A feebate scheme that violates GATT provisions is more likely to qualify for GATT Article XX exceptions if it is designed to meet the following criteria: The scheme has a material effect in improving the sustainability of forestry. The scheme is applied to respect the canons of transparency, accessibility, and predictability. Unilateral action is preceded by good faith negotiations at the international level. It is also important to provide flexibility to obtain rebates to not force foreign jurisdictions to adopt a specific type of forestry management regime. Accepting forestry certificates released by different, international and national, certification agencies could provide sufficient flexibility in application. To ensure that the measure is effective and equitable, there should be a minimum comparability between the stringency of the different certifications accepted.

Similar criteria may support the legality of the measure if it is found to be incompatible with the SCM Agreement or FTAs established between the EU and FIP countries, even though the applicability of these exceptions to these agreements is debated.

Making the consumer of forestry products the nominal taxpayer may strengthen the jurisdictional claim of the importing country.

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11

Addressing Public and Community Actors in Biodiversity and Forest Conservation: Ecological Fiscal Transfers and Land Tenure

IRENE RING & GIULIA BARBANENTE

Introduction

Although well documented in public finance literature, intergovernmental fiscal transfers remain a somewhat neglected instrument in environmental policy. Despite ecological fiscal transfers being well suited to address the spillover benefits that often accrue with conservation policies, there is scant research and literature on them compared with other economic instruments such as environmental taxes, tradable permits or payments for environmental services (Ring 2011). In fact, very few countries make practical use of EFT to mainstream environmental and conservation objectives. Thus, EFT are an innovative instrument and may contribute to filling a gap in the conservation policy mix (Ring et al. 2011).

Fiscal policies addressing public actors at decentralized levels can improve incentives for sustainable forest management. Intergovernmental fiscal relations between central governments and regional or local governments and communities provide manifold options for promoting sustainable development and creating synergies with environmental and conservation policies. Intergovernmental EFT distribute fiscal revenues between different governments based on ecological indicators such as protected areas for biodiversity and water conservation (Ring et al. 2011) or—more recently—forest areas (Busch and Mukherjee 2018). Depending on the institutional context, lower-level governments may be compensated for conservation or monitoring expenditures, opportunity costs owing to land use restrictions, or providing spillover benefits beyond their boundaries. Given that more than three-fourths of forests fall under public ownership (FAO 2018), EFT schemes are crucial for providing incentives to public actors to engage in forest conservation. EFT schemes also have the potential to operate in combination with international REDD+ payments.[1]

1 While external funders provide payments to national governments for reducing emissions, EFT from national to state and local governments can be designed to protect and restore forest cover (Irawan and Tacconi 2016; Irawan, Tacconi, and Ring 2014; Ring et al. 2010).

The decentralization of public functions including decentralization of forest tenure can support sustainable forest management. Where central governments predominate in assuming major decision-making and financial competencies, the decentralization of public functions and fiscal revenues can help provide regional governments or municipalities and communities with the incentive to ensure both SFM and revenue collection. Additionally, the decentralization of discretionary power could lead to more creative fiscal administration, which could help incentivize public and private investment for SFM. Decentralization of forest tenure, such as to community forest management units, is also a promising policy for the promotion of SFM.

From Environmental Taxes to Ecological Fiscal Reform

The concept of environmental or green tax reform has attracted increasing attention (OECD 1997; Schlegelmilch 1999). The basic idea of an environmental tax reform consists of introducing environmental taxes, thus greening public income, and using these additional revenues for both ecologically and socially motivated goals. Developed during the late 1980s and implemented in several European countries from the late 1990s onward, the early focus on the public revenue side was on energy taxes (Dresner et al. 2006; Klok et al. 2006; Ring 1997). This focus was soon enlarged to include other ecotaxes and fiscal policies more broadly (Boyd et al. 2005; OECD 2005).

Taking a broader view of *ecological* fiscal reform needs to be strengthened to also take account of ecological public functions including conservation objectives (IPBES 2018; Ring 2008b, 2011). In this vein, fiscal instruments are increasingly being used to provide incentives for conservation and to raise funds for conservation purposes (Emerton, Bishop, and Thomas 2006; Kettunen et al. 2017; OECD 1999). Beyond that, fiscal instruments are central to social policies and the redistribution of wealth and income. Thus, they are especially suited to combine biodiversity and forest conservation with sustainable livelihood issues and poverty reduction (for example, Boyd et al. 2005; OECD 2005), an indispensable perspective for the design and implementation of policy instruments in developing countries.

In contrast to environmental policies, which mostly deal with pollution and negative externalities, biodiversity and forest conservation policies are associated with the provision of public goods and services involving positive externalities. There are few incentives for actors (either public or private) to engage in conservation activities when conservation costs are borne locally, whereas most conservation benefits cross local boundaries (Perrings and Gadgil 2003; Ring 2008a, 2011). If such spatial externalities or spillovers are not adequately compensated for, they may lead to an under-provision of the public goods and services concerned, such as water protection zones or nature reserves, and their management.

Rewarding conservation benefits through payments for environmental services to land users is now widely applied, while using EFT to reward public actors for conservation benefits is on the rise. During the last decades—and elaborated first in a developing country context—the concept of PES put the internalization of positive externalities center stage (Porras et al. 2013; Wunder 2015; Wunder, Engel, and Pagiola 2008). PES became a focus of research in conservation policies globally, while the role of intergovernmental fiscal transfers addressing public actors in conservation policies is slowly gaining momentum.

Ecological Fiscal Transfers

Greening intergovernmental fiscal transfers

In federal as well as unitary systems, tax revenues are redistributed from national to state and further on to local governments. These transfers serve allocative, distributive, and fiscal functions (Boadway and Shah 2007). Their specific design is regulated in financial constitutions and fiscal equalization laws. In developing and transitioning economies, about 60 percent of subnational expenditure is financed by these transfers; in non-Nordic Europe and Nordic OECD countries, they account for 46 percent and 29 percent, respectively (Shah 2007).

Intergovernmental fiscal transfers help lower-tier governments cover expenditures for providing public goods and services. The transfers provide decentralized jurisdictions with monies to fulfill their public functions: building schools and hospitals or constructing and maintaining roads. They also serve to equalize fiscal capacities among different jurisdictions based on equity and efficiency considerations (Boadway and Shah 2009). In many countries, the fiscal capacity (own-source public revenue) and fiscal need (based on specified indicators such as population or area) of a subnational government determine the amount of transfers received, introducing a distributive element in the form of "fiscal equalization." Another purpose of such schemes is to compensate decentralized governments for expenditures incurred in providing so-called spillover benefits to areas beyond their boundaries (Olson 1969). The bulk of fiscal transfers is allocated in the form of lump-sum or general purpose (unconditional) transfers. The recipient government is free to decide upon their use and thus local autonomy is preserved. In addition, there are specific-purpose (earmarked or conditional) transfers, allocated for the provision of only specific public goods and services.

EFT schemes can change existing revenue distribution without requiring additional expenditures. As such, they may be a low-cost policy option to incentivize conservation. Transaction costs associated with these policies are also low, as minimal changes to the fiscal transfer scheme are needed (Droste et al. 2017; Ring 2008c; Ring et al. 2011). Many countries already use the area of a municipality, district, state, or province as an indicator for assigning fiscal transfers (Ring 2002, 2008b), so it is only a small and cost-effective step to consider "protected area" or "forest cover" as a basis for an indicator that takes account of nature or forest conservation in fiscal transfer mechanisms.

Fiscal transfer systems are in the realm of finance ministries, which rarely consider ecological matters. The same holds for the public finance literature on intergovernmental fiscal transfers, where basic local environmental services related to water provision, sewage, and waste disposal are often considered, while conservation issues are of no specific interest (for example, Boadway and Shah 2007; McMillan 2007; Ring 2002). Environmental, resource, and ecological economic literature, in turn, has largely missed this type of policy instrument and its potential for realizing ecological objectives. Consequently, EFT schemes addressing long-term and precautionary conservation issues between different levels of government rarely exist (Ring 2002).

Comparatively new is the rationale for EFT in biodiversity and forest conservation. Decisions about where conservation areas are located are frequently taken by higher levels of government, even though the costs of losing these areas for other social and income-generating developments are borne by local governments and communities (Perrings and Gadgil 2003; Ring 2008a). Fiscal transfers are therefore seen as an innovative instrument to provide incentives for local governments to support and maintain the quality of water, nature, and forest conservation areas within their territories, but which can also provide wider ecological benefits beyond municipal boundaries (Ring 2008c; ten Brink et al. 2011).

Box 11.1 provides an overview of different possible rationales for introducing EFT schemes (Ring et al. 2011; Ring and Barton 2015). They may be allocated in the form of lump-sum or specific-purpose transfers. In addition, EFT represent any earmarked transfers for ecological or conservation purposes. These latter earmarked transfers have been used more commonly in intergovernmental fiscal relations in many countries, especially for end-of-the-pipe and infrastructure-related ecological public functions such as sewage and waste disposal (Ring 2002).

BOX 11.1 DIFFERENT RATIONALES FOR ECOLOGICAL FISCAL TRANSFERS

1. Compensation of expenses/supply costs for ecological public goods and services
2. Compensation of opportunity costs
   - 2.1 Loss of land use revenue on municipal property
   - 2.2 Loss of tax revenues from private landowners prevented from doing business
3. Payments for external benefits to local and state governments for providing spillover benefits beyond their boundaries
4. Fiscal equalization/distributive fairness
   - 4.1 Vertical equalization between higher and lower levels of government
   - 4.2 Horizontal equalization between jurisdictions at the same level of government

Sources: Ring and Barton 2015, 438; adapted from Ring et al. 2011, 99.

The choice of indicators for the distribution of intergovernmental fiscal transfers is an important design issue. For specific transfers, the selection of indicators is quite straightforward. They are usually based on objective indicators closely related to the purpose of the specific transfer. The more substantive part of intergovernmental fiscal transfers is distributed as general or lump-sum transfers on the basis of the fiscal capacity and needs of the respective jurisdictions. Whereas fiscal capacity is comparatively easy to determine, the adequate fiscal need of a jurisdiction has been the focus of much research and political debate from both a theoretical and a practical perspective (Shah 2007).[2]

Indicators for the redistribution of tax revenues among different levels of government provide incentives to realign the behavior of public actors. Public actors—that is, local, regional, and national governments—usually generate tax revenues from their own sources but, depending on the country's financial constitution, also rely on intergovernmental fiscal transfers to fulfill their public functions, such as providing schools and education, health and social care, and so on. To a certain extent, the indicators used for the redistribution of tax revenues among different levels of government do indeed provide incentives to realign the behavior of public actors. In most countries today, this incentive mechanism works toward attracting more businesses, inhabitants, and construction projects, followed by land use activities that destroy, fragment, and degrade

2 A basic tension exists between the direct identification of a more realistic and "adequate" fiscal need of a jurisdiction on the one hand and approaches that build on widely available and more objective, abstract indicators such as inhabitants or area of a jurisdiction on the other hand (inhabitants and area of a jurisdiction are commonly used indicators for identifying fiscal needs in many countries). Although the "direct" identification of fiscal needs may be more accurate, it nonetheless entails systematic weaknesses and political disadvantages (Lenk 2009, 29). The indicator-based identification of fiscal needs, although a second-best solution, continues to be the more transparent and flexible system.

natural habitats and forests (Ring 2011). They thus may serve to exacerbate deforestation and biodiversity loss. If intergovernmental fiscal transfers included consideration of biodiversity and ecosystem-based indicators when allocating taxes to lower governmental levels, public decision-makers might be expected to take care of nature as a basis for public revenues in a similar way that they take care of their other tax bases today (Ring 2011).

EFT are allocated based on ecological or conservation-based indicators, such as protected areas. The most common indicator used in EFT builds on designated protected areas (Borie et al. 2014; May et al. 2002; Ring et al. 2011; Ring, Droste, and Santos 2017; Santos et al. 2012; Schröter-Schlaack et al. 2014). Revenue is allocated to decentralized jurisdictions (thus far municipalities) that host protected areas on their territory. Current EFT are predominantly distributed as lump-sum transfers that can be spent on any public function the municipality sees fit.

Ecological fiscal transfers in practice

Most practical experience with EFT using conservation-based indicators exists in Brazil, where many Brazilian states have introduced the so-called ICMS Ecológico since the early 1990s (Grieg-Gran 2000; May et al. 2002; Ring 2008c). To date, 17 out of 26 Brazilian states have introduced this scheme in their states' constitutions (figure 11.1), while 16 have actually implemented the EFT through appropriate enabling legislation (table 11A.1 in annex 11A) (Droste et al. 2017; Ring et al. 2011, 2017). Protected area in the form of conservation units is the most common indicator used, but some states also consider avoided or reduced deforestation, reduced forest fires, and some further environmental indicators.

EFT schemes can incentivize biodiversity and forest conservation (Droste et al. 2017; Grieg-Gran 2000; May et al. 2002; Ring 2008c). For Brazil, Droste et al. (2017) found that introducing the ICMS Ecológico in a state on average corresponded to higher overall protected area coverage compared to states without this policy instrument. At the municipal level, there were clear indications for local responses: after the implementation of a new EFT scheme, additional municipal-level protected areas were designated, indicating an incentive effect of this newly introduced policy instrument on local decision-makers (Droste et al. 2017).

FIGURE 11.1
BRAZILIAN STATES THAT HAVE IMPLEMENTED THE ICMS ECOLÓGICO

Source: Ring, Droste, and Santos 2017, based on data from The Nature Conservancy 2014.
Note: States that have implemented the ICMS Ecológico indicated in green.

Regarding the choice of indicator, Brazilian states introduced a conservation factor that weighs protected areas according to their management categories. The higher the land use restrictions associated with the protected area category, the higher the conservation factor and thus the fiscal transfers received (May et al. 2002; Ring 2008c; Ring et al. 2011). The incentive effect toward effective conservation is even stronger if the quality of the relevant area is also included, as in the states of Paraná and

Minas Gerais in Brazil (Loureiro 2008). Indicators could also be adapted to incentivize SFM, for example, by using the number of certified forests in a region.

In 2007, Portugal became the first European country to systematically integrate EFT into its Local Finance Law (Santos et al. 2012). The Portuguese system of annual fiscal transfers from the national to the local level (municipalities) now considers land classified as part of the European Natura 2000 Network or other national protected areas as a conservation-based indicator.[3] Table 11.1 and figure 11.2 demonstrate the relevance of the new ecological component for Portuguese municipalities.

TABLE 11.1
RELEVANCE OF ECOLOGICAL FISCAL TRANSFERS FOR MUNICIPAL BUDGETS IN PORTUGAL, 2008

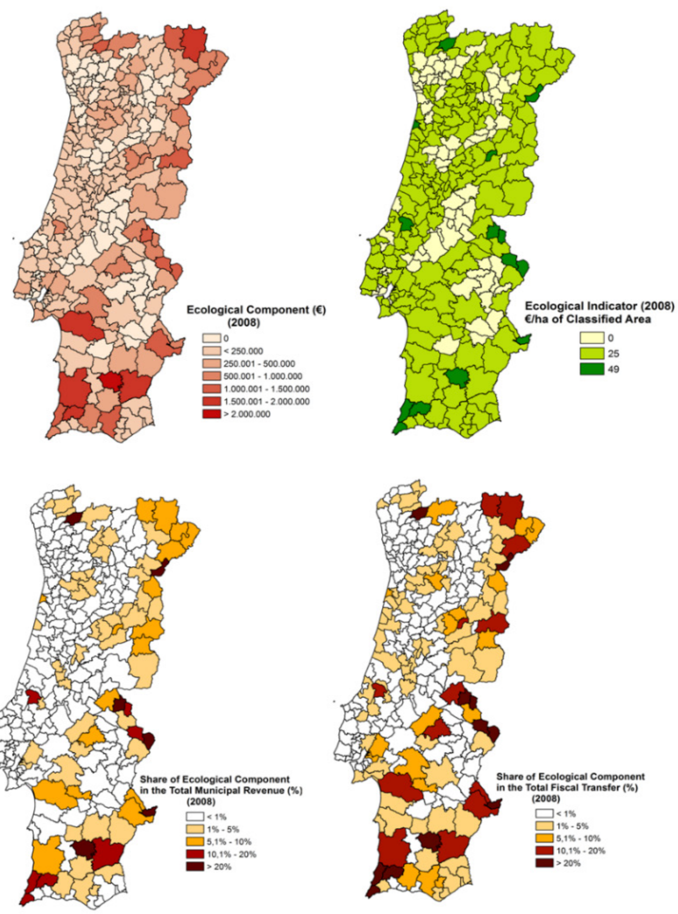
MUNICIPALITIES	SHARE OF DESIGNATED CONSERVATION AREA PER MUNICIPALITY (%)	ECOLOGICAL COMPONENT (EFT) (EUR)	SHARE OF ECOLOGICAL COMPONENT IN PROPORTION TO TOTAL FISCAL TRANSFERS (%)	SHARE OF ECOLOGICAL COMPONENT IN PROPORTION TO TOTAL MUNICIPAL REVENUES (%)
Barrancos	100	843,298	26	26
Vila do Bispo	97	873,332	22	13
Castro Verde	76	2,167,498	38	34
Porto de Mós	76	1,002,546	15	11

Source: Adapted from Santos et al. 2012.
Note: EFT = ecological fiscal transfer.

3 Natura 2000 sites belong to the network of protected areas of major community significance; thus, spillover benefits beyond even national boundaries are given.

In Portugal, conservation areas now affect the allocation of funds from the General Municipal Fund to municipalities. Thirty percent of the General Municipal Fund is allocated to municipalities based on area. In municipalities with less than 70 percent of their territory under designated conservation area, 25 percent of transfer revenues are allocated in proportion to the area, weighted by elevation levels, and 5 percent in proportion to land designated as Natura 2000 or other nationally protected areas. In municipalities with more than 70 percent of territory under conservation regimes, 20 percent of the transfer is allocated in proportion to the area, weighted by elevation levels, and 10 percent in proportion to land designated as Natura 2000 or other protected areas. Thus, municipalities with higher land use restrictions receive higher transfers per hectare conservation area than those municipalities with less territory under protection (Ring et al. 2011; Santos et al. 2012).

FIGURE 11.2
ECOLOGICAL FISCAL TRANSFERS IN PORTUGAL, 2008



Source: Santos et al. 2014.
Note: Ecological component in euros (top left), ecological indicator in euros per hectare of designated conservation area (top right), share of the ecological component as a proportion of total municipal revenue (bottom left), and share of the ecological component as a proportion of total fiscal transfers (bottom right).

At the same time, a legislative reform in Portugal amended the legal regime for nature and biodiversity that allowed decentralized governments to designate conservation areas (Droste et al. 2018; Ring, Droste, and Santos 2017). This 2008 reform widened municipalities' competencies in the designation and management of conservation areas. Contrary to the previous situation, local and regional authorities were now allowed to designate all protected area categories except national parks. Droste et al. (2018) show a significant increase in the ratio of municipal and national protected area designations following Portugal's EFT introduction. Results seem to indicate that the role of the EFT in the creation of new protected areas was more important than the change in the municipalities' competencies.[4]

4 A qualitative analysis of motivations of those municipalities having designated more protected areas could identify the underlying reasons in the decision-making processes (Droste et al. 2018; Ring, Droste, and Santos 2017).

Especially in remote and rural areas, EFT can represent a significant share of the overall municipal budget (Santos et al. 2012, 2014). EFT can represent a significant share in proportion to total fiscal transfers received and even total municipal budget, especially in municipalities with a high share of designated conservation areas in relation to their municipal area (figure 11.2, table 11.1). Although EFT represent only a small part of the total intergovernmental fiscal transfers in Portugal (2.2 percent), they are very important for some municipalities. For example, in 2008 they represented 38 percent of total fiscal transfers received and 34 percent of total municipal budget in the municipality of Castro Verde; see table 11.1 (Santos et al. 2012).

The institutional context of EFT reforms matters. Because of a number of amendments to the Local Finance Law and the 2008 financial crisis, which hit Portugal especially hard, some Portuguese municipalities with conservation areas on their territory received fewer fiscal transfers compared with the situation under the old law (Santos et al. 2012). This reduced the financial incentive offered to municipalities through the ecological signal. However, the significance of EFT for municipalities with a high proportion of conservation areas already is clear. Usually, these municipalities highly depend on fiscal transfers due to a comparatively poor economic structure, implying a weak fiscal capacity. A key requirement for introducing EFT schemes, therefore, is a good information policy—otherwise municipal actors and citizens may simply not know how much their municipal budgets benefit from the new indicator (Santos et al. 2012).

India amended its intergovernmental fiscal transfer system in 2014 to include forest cover as an indicator for distributing fiscal transfers from the national level to the state level (Busch and Mukherjee 2018; Kissinger 2015). From 2015 to 2019, 7.5 percent of the tax revenue transferred to the states was distributed in proportion to their 2013 forest cover, with the government of India estimating that this would amount to about \$6.9 billion–\$12 billion per year, or \$174–\$303 per hectare of forest per year (Busch and Mukherjee 2018). This renders India's EFT for forest cover the largest EFT scheme across the globe—and as such it can also provide important lessons for large-scale performance-based payments in general (see box 11.2). The primary motivation for introducing the forest cover indicator "was to compensate states for the 'fiscal disability' caused by forgone opportunities to convert forests to other uses resulting from the implementation of the 1988 National Forest Policy" (Busch and Mukherjee 2018, 4). However, the government of India (2014) also argued that forest cover provides huge ecological benefits; therefore, the consideration of forest cover in the distribution formula was additionally justified on wider ecological reasoning.

BOX 11.2 INDIA'S ECOLOGICAL FISCAL TRANSFERS AS A TEST CASE OF PERFORMANCE-BASED PAYMENTS

JONAH BUSCH

In 2014, India's 14th Finance Commission added forest cover to the multi-element formula that determines how much tax revenue India's central government distributes annually to each of its 29 states (Government of India 2014). From 2015 through 2019, India's central government devolved approximately $6 billion–$12 billion per year to states in proportion to their 2013 forest cover (Busch and Mukherjee 2018). This funding had no conditions besides forest cover and went into states' general budgets, where it could be spent on any purpose. **Here we analyze to what extent India's experience with ecological fiscal transfers can serve as a test on the effectiveness of performance-based payments more generally**.

The central premise underlying international payments for Reducing Emissions from Deforestation and Forest Degradation (REDD+) is that offering governments ex-post payments for verified success in reducing greenhouse gas emissions will motivate them to increase protection and restoration of forests above baseline levels. If the offer of performance-based payments has this incentivizing effect, then REDD+ payments represent an opportunity to mobilize a high-volume, low-cost source of emission reductions while making efficient use of public or private funds.

India's EFT are not billed as REDD+, and there are some notable differences between the two schemes (Busch 2018). For one, the EFT pay for stocks of forest cover, while REDD+ mechanisms pay for reductions in the rate of forest carbon emissions relative to a baseline. For another, EFT between 2015 and 2019 were based on the state of forests in the recent past, as monitored in 2013, rather than at the end of a near-future performance period as in REDD+. Thus, the EFT would only give governments an incentive to undertake policy changes if they believed that near-future changes in forest stock would be rewarded in payments after 2020, that is, that the 15th Finance Commission would include an updated measure of contemporaneous forest cover in the revenue-distribution formula in five years. This happened in November 2019 when, in its interim report for the 2020/21 fiscal year (Government of India 2019), the 15th Finance Commission extended forest-based ecological fiscal transfers, increased their share of devolved tax revenue from 7.5 percent to 10 percent, and updated the year of monitoring from 2013 to 2017 (Busch et al. 2020).

Despite these differences, India's EFT and REDD+ share some important commonalities. Both promise recurring payments to governments in proportion to their performance in achieving a forest-related outcome. Both operate at the scale of state-level governments (in this regard, India's EFT are most similar to REDD+ in its state-level formulations: for example, the Forest Carbon Partnership Facility, Germany's REDD Early Movers program, or the voluntary Verified Carbon Standard's Jurisdictional and Nested REDD+ program). And both seek to operate on the scale of billions of dollars per year—funding through the EFT works out to around $174–$303 per year per hectare of forest.

In numerous aspects that make a program suitable for evaluation, India's EFT have advantages relative to existing REDD+ programs. First, most REDD+ programs make payments contingent on multiple facets beyond performance in achieving a single forest-related outcome. In contrast, **India's EFT represent essentially a "pure" payment-for-performance instrument**. The only condition for receiving payment is the level of forest cover, with no additional requirements about how the outcome is produced or funds are spent.

Second, REDD+ programs often take place in the context of contemporaneous and potentially confounding changes in forest policy. India's EFT, however, originated outside the forest sector and were not accompanied by other changes in forest policy.

Third, the financial scale of most REDD+ programs is small relative to the size of the economies in which they operate. In contrast, India's EFT amount to around 2 percent of states' budgets, with a higher percentage in more-forested states (Busch and Mukherjee 2018). While not massive, this scale of funding is plausibly large enough to motivate state governments.

Fourth, participation in other REDD+ programs is voluntary by design. To evaluate voluntary programs in which enrollees self-select, researchers must find ways to compare households or sites that would have been equally likely to conserve in the absence of the program. But for researchers of India's EFT, such techniques are not necessary since participation by states in India's EFT is universal.

Fifth, most REDD+ programs only have a few recipients. India's EFT, on the other hand, involve dozens of states, enabling comparative analyses across states.

Finally, most countries with REDD+ programs lack their own time-series data on forest outcomes spanning the periods before and after the introduction of the program. However, the India Forest Service has been monitoring forest cover biennially since 1987. Thus, researchers can evaluate the program using both domestic data (for internal legitimacy) and externally collected data (for independent validation).

India's EFT have attractive features that make them easier to evaluate, but they also have features that make them more difficult to evaluate relative to other REDD+ programs. One such feature is the lack of variation in the enrollment, timing, or magnitude of potential incentive across states within a country. Variation makes it easier for researchers to compare results across treatment and control states, or across states with different levels of treatment.

In total, India's EFT offer an especially useful test case for the payment-for-performance premise of REDD+ as well as for related questions regarding social and environmental safeguards, motivations of state-level governments to respond to financial incentives, and state-level policies for protecting and restoring forests.

Source: Based on Busch 2018.

Forest Tenure and Fiscal Policy

Publicly owned forests

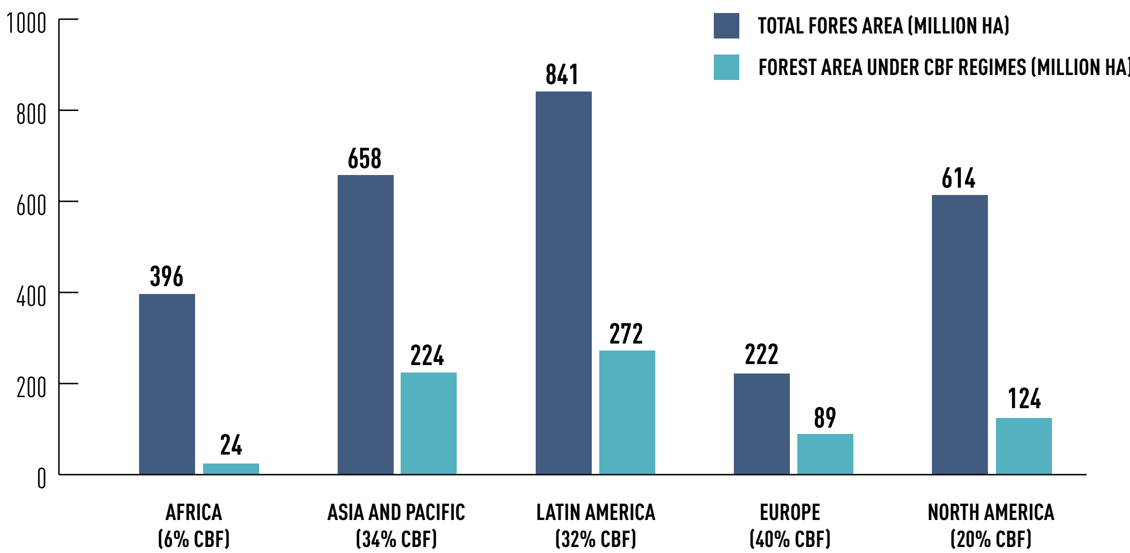
Forest tenure refers to "the combination of legally or customarily defined forest ownership rights and arrangements for the management and use of forest resources" (FAO 2008a, 3). These rights and arrangements define the way in which private actors, public institutions, and local communities interact in the context of and in relation to forest resources. The growing value of services that can be produced by forests—combined with the increased competition to extract that value—has led in the past 20 years to an increased focus on forest tenure (White and Martin 2002). Recent trends in forest governance have been characterized by an increased decentralization, with a shift in management rights toward community-based organizations (Agrawal, Chhatre, and Hardin 2008).

While approximately 85 percent of the world's forests are publicly owned, a range of legal and customary tenure arrangements have developed over the past 30 years. In a general process of decentralization, the percentage of publicly owned forests managed by the public administration decreased between 1990 and 2010 from 95 to 82 percent worldwide. In the same period, the management rights of private companies and communities increased: The percentage of privately owned forests went from 15 to 18 percent worldwide, mainly driven by upper-middle-income countries, while the management rights of public forests by private companies increased from 6 to 14 percent (FAO 2016).

The degree of decentralization of forest management varies across countries and geographic regions. Figure 11.3 shows the area of forest under community-based forestry, which includes both community forest management and forestry practiced by smallholders on privately owned land, for different regions of the world (FAO 2017). In Africa, for example, the ongoing wave of land reforms has led to the inclusion of decentralization measures in several countries, strengthening the role of local communities for forest management. At the same time, the actual status of the local communities' rights in relation to forest resources varies greatly, from the statutorily defined recognition of the right to access, use or manage, to usufruct rights or de facto use of land and resources (Barrow et al. 2016).

In the context of publicly owned forests, understanding the specific tenure systems in place is essential for the definition of fiscal policies toward SFM. By identifying the actors who are in practice managing the forest, governments can identify the best policies to be developed for the management of forests and their resources (FAO 2008a). Identifying customary forest tenure systems can help target forest user groups and local governments for revenue collection and the creation of incentives toward SFM. Furthermore, forest management by either private sector or local communities requires a degree of organization that allows for monitoring and decision-making and can require different public interventions for institutional development and support (Ostrom 1999; Springate-Baginski et al. 2003).

FIGURE 11.3
AREA OF FOREST UNDER COMMUNITY-BASED FORESTRY, BY REGION



Source: FAO 2017.
Note: CBF = community-based forestry.

Community forest management

Community forest management (CFM) is a widely recognized approach for forest protection, allowing for indigenous people and local communities to traditionally manage their resources in a collective way. CFM "refers to land tenure as well as forest use and governance arrangements under which the rights, responsibilities, and authority for forest management rest partially or fully with local communities of forest users" (Newton et al. 2014, 11). CFM, especially indigenous management, is associated with lower rates of deforestation (Stevens et al. 2014).

Nepal is a notable example where CFM has increased forest sector sustainability by slowing deforestation in a relatively pro-poor way (Springate-Baginski and Wollenberg 2010).

More than 20 percent of Nepal's forests are currently under CFM, and more than 18,000 community forest user groups have been established. Partially as a result of strengthened provisions for CFM in the 1990s, deforestation rates have decreased in the past 15 years, from 1.9 percent in the period 2000–2005 to 0.7 percent for the period 2005–2010 (MongaBay 2011).

Participatory land use planning contributes to better land and resource management by directly involving local users in SFM decision-making. The process is carefully designed for the participation of all sections of a specific community—including in terms of ethnicity, gender and age. Participatory planning allows users to identify collectively the way in which different parcels of land that are under shared management should be used (Uisso et al. 2018). When applied to forests, participatory land use planning encourages a sense of ownership of the choices reflecting the needs of the community. Participatory land use planning helps identify compromises and tailor solutions to the specificities of the local cultural, economic, technological, and environmental context (Wehrmann 2012). This can, in turn, lead to the sustainable use of resources and has been observed to improve monitoring and sanctioning at the local level.

In the Lao People's Democratic Republic, the integration of participatory land use planning as a policy instrument for SFM has proven very successful. In a context of rising deforestation linked to the practice of shifting agriculture, participatory land use planning was introduced in the early 1990s to stabilize cultivation and protect forests (Manivong and Sophathilath 2009). Evidence of the positive impact of participatory land use planning for SFM comes from northern Lao PDR, where it has been adopted as a core policy instrument for sustainable development. Participatory land use planning has led to an increase in security of access to land and natural resources for local users, lower levels of deforestation and an improved resolution of land-related conflicts (IFAD 2014; Manivong and Sophathilath 2009).

In contexts where market access and land use are developed outside of formal regulatory frameworks, both CFM and participatory land use planning can help overcome informality. Informal market and tenure systems can be addressed by developing a legally defined structure around forest management. Community-based forest management offers a valuable approach to empower local communities' institutional and governance capacity, allowing a move out of informality (Cronkleton, Bray, and Medina 2011). The incorporation of CFM in the formal forest tenure system can also improve communities' tenure security. For example, in Bolivia, almost 2 million hectares of forest have been formally transferred to communities under communal property rights (Pacheco et al. 2008).

Forest tenure and fiscal policy for sustainable forest management

Decentralized forest tenure intersects in different ways with fiscal policy for SFM. Concessions to CFM units can improve traceability of timber and other forest products along the entire value chain as well as ensure producers and communities follow through on their commitments to SFM (Karsenty 2016). In some contexts, the introduction of good forest management practices is initially supported by external donor funding and there is the risk that the activity will be discontinued once funding stops (FAO 2008b). Fiscal policy can create lasting incentives toward improving the sustainability of forest management practices. The examples of Brazil linking fiscal policy instruments to forest tenure and Tanzania's promising policy context show the potential of linking forest tenure, SFM, and fiscal policy instruments.

In the Amazon region in Brazil, the ICMS Ecológico and other policy instruments to combat deforestation have been linked to forest tenure reform. During the implementation of a mixture of policies to protect forests in the Amazon region, the formalization of forest tenure improved tenure security and was identified among the key policy instruments contributing to the success of the EFT (May et al. 2012). The latter study also highlights the formalization of forest tenure as an outcome that should be pursued in the implementation of any fiscal policy objective. In this context, the legal recognition of the forest tenure rights of indigenous communities also had remarkable results. The World Resources Institute reports that between 2000 and 2012, deforestation of indigenous community forests was less than 1 percent, compared with 7 percent in forests held by others (Stevens et al. 2014).

Tanzania's forest management legislation demonstrates how the formal recognition of CFM can yield SFM best practices. Under the Village Land Act villagers are encouraged to define areas that belong to the community, such as forests, through their Village Land Use Plan. Forests within village boundaries are managed by village governments. The Tanzanian community-based forest management approach identifies forest users as forest managers (FAO 2004). A case study from the FAO finds that "forests are being restored, unregulated activity is being reduced and encroachment is declining," and concludes that when "forest management responsibilities are devolved to the community…the potential for achieving the goals of poverty reduction and sustainable forest management is maximized" (FAO 2008a, 306). While there is no EFT in place in Tanzania, a system for intergovernmental fiscal transfers already exists and central government transfers constitute the majority of budgets at the district level (Masaki 2018).

In particular, Tanzanian fiscal policies were used to promote forest production by village communities. The establishment of village land forest reserves is encouraged under the Forest Act (2002), which grants a waiver of state royalties on forest products; exemption from local government taxes on forest products from village management; and confiscation and sale of illegally harvested forest products and illegal equipment to the benefit of the village (Akida and Blomley 2007).

Challenges

Despite the potential of new policy instruments such as EFT and devolving public functions in forest tenure to contribute to the incentives for SFM policies, certain challenges remain. These include various critical design features of EFT schemes and forest tenure. Issues of local governance also need to be addressed, such as restricted capacity for monitoring and managing relevant schemes, or problems of corruption and elite capture, coordination problems, weak commitments from the central state, and land tenure conflicts.

Building on a review of existing and proposed EFT schemes, various critical design features have been identified (Schröter-Schlaack et al. 2014). Which rationale is chosen (box 11.1) will depend on the relevant country's institutional context that may impose legal or constitutional constraints on fiscal transfers. The choice and quantification of suitable indicators, as well as their adaptability to changing economic, political, and social conditions, remain relevant research questions. Options include quantitative indicators such as protected area or forest cover and qualitative indicators such as protected area quality.[5] Furthermore, the scale of the scheme (that

5 Usually, there is a trade-off between the ecological accuracy of indicators and the reduced complexity required for calculating fiscal transfers based on available data.

is, categories of protected areas or forest cover considered), the origin or type of funds to be allocated (that is, fixed amount or share of a certain fund available), and the overall amount of financial resources distributed are critical issues for the political uptake of EFT proposals, but also for their potential incentive effects. Finally, which type of EFT is chosen: earmarked or lump-sum transfers? Most EFT to date are designed as lump-sum transfers that leave local governments the freedom to decide on their spending.

Spatially explicit modeling and geographic information system (GIS) tools can help illustrate the consequences of EFT where they have not yet been introduced. Fiscal transfer schemes are country specific and highly politicized because of the substantial financial flows involved. Building on existing fiscal transfer schemes and integrating suitable ecological indicators can help decision-makers promote innovative solutions. For Switzerland, Köllner et al. (2002) developed a transfer system based on biodiversity indicators and cantonal benchmarking. Ring (2008b) suggested ways of incorporating protected areas into the intergovernmental fiscal transfer system at the local level in the state of Saxony, Germany.

Regional or municipal governments may have limited governance capacity. Local governments may be operating under budgetary constraints. This is not unique to local administrators, however, and the central government might also be operating under such constraints, especially in low-income countries. Small budgets can contribute to a lack of information about ecological processes. Therefore, there is the potential that local governments might underestimate impacts from productive or other activities on the environment. These problems may require investments from the central state into information sharing, monitoring capacity, and regulatory agencies. Issues of limited capacity can be mitigated using third-party certification agencies (discussed in more detail in chapters 4, 6, and 7).

Particularly in relation to forest tenure, limited capacity for dispute resolution can hinder sustainable management practices. Conflicts relating to access to and use of forest resources can arise within communities as well as between different stakeholders such as private actors. The increase in value of forest resources following improved access to markets for forest products can further exacerbate the tension. In the context of CFM, the development of conflict-resolution mechanisms designed as part of forest management have proven successful. In Duru-Haitemba in Tanzania, where communities manage their own resources, conflicts resulting from competing land uses between farming, grazing, and forests were addressed through reconciliatory committees (Odera 2004). Elements like the technical and institutional capacity of communities should be considered when designing effective instruments that can work in a decentralized context. In contexts where limited local capacity is apparent, "simpler" forest management plans should be pursued (FAO 2004).

Decentralized management of valuable resources in low-income countries is at risk of elite capture. Evidence from Nepal points to the fact that the bottom-up formation of forest user groups is exposed in practice to the risk of being driven by elite groups (Springate-Baginski et al. 2003). In Africa, challenges to decentralized forest management are twofold. First, the decentralization of forest management has generally been applied to low-value forests, while those of higher value are retained by the central governments and given in concessions to the private sector (Barrow et al. 2016). Second, elite groups holding central positions in community forest management can capture most of the benefits and opportunities to the detriment of vulnerable poorer members of the community—leading to what has been referred to as "committee forestry" instead of community forestry (FAO 2008a).

Designing a 'Forest-Smart' Policy Mix

Biodiversity and forest conservation are complex issues that require the use of more than one policy. Robust regulatory policy is needed to protect endangered or threatened species, to establish protected forest areas, and to prohibit illegally sourced forest products from entering markets. Expenditure policies are also needed, such as investments in education, information, and technology sharing. Expenditure programs, such as PES, are particularly useful in providing incentives for smallholders or rural populations who might be difficult to tax. Information instruments, such as certificates, are a useful complement to fiscal policy, which can reduce problems of administrative costs and risks as well as other problems.

Fiscal instruments are an important component of the policy mix. Fiscal policy reform is needed to provide private industry with incentives for investments into SFM practices. This can be done by better aligning the incentives of forest producers and operators along the timber commodity supply chain with feebates (see chapters 6 and 7 for more details). However, addressing public and community actors at regional and local levels through EFT and decentralized forest tenure can also help improve sustainability.

EFT for biodiversity conservation build on existing protected area regulation by using officially designated protected areas as an indicator to allocate fiscal transfers (Ring et al. 2011). In this way, they complement conservation law with an economic instrument that accounts for local conservation costs and spillover benefits related to protected areas. The recently introduced EFT scheme considering forest cover in India addresses state governments in their role to conserve forests and reduce deforestation and forest degradation. EFT explicitly address public actors, that is, governments at different governmental levels and related public authorities. In this way, EFT schemes complement policies that primarily address land users and thus private actors in their conservation costs.

The diversity of forest management systems across countries requires the combination of tenure and fiscal policy to be adapted to each specific context. Adaptation is best achieved by learning from and empowering those communities and other stakeholders that best know the forests and their resources. Approaches taking account of and adapting to existing CFM practices have proven to be a successful tool for SFM (Odera 2004). The adaptation of forest tenure to a bottom-up approach can enhance the ongoing shift toward decentralized management. The identification of sustainable local practices to be enhanced and integrated into a national system can benefit from the support of fiscal incentives to local administrations and communities.

Land tenure reform can support forest management planning at different government levels that allow for links with fiscal policy to be established. By increasing tenure security, forest tenure reform can also help overcome conflicts on access to and control over land and natural resources (Barrow et al. 2016). In particular, tenure reforms can support the identification of the "locus of decentralized power and responsibility" (Odera 2004, 61) which, linked to local communities and institutions, is instrumental for fiscal policy.

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ANNEX 11A

TABLE 11A.1
COMPARISON OF THE TIME OF INTRODUCTION AND DESIGN OF ICMS ECOLÓGICO IN BRAZILIAN STATES

BRAZILIAN STATES	YEAR OF FIRST LEGISLATION	YEAR OF LEGAL ENACTMENT	PROPORTION OF ICMS DEDICATED TO BIODIVERSITY CONSERVATION	ECOLOGICAL INDICATORS
Acre (AC)	2004	2010	1% (2010), 2% (2011), 3% (2012), 4% (2013), 5% (from 2014)	PA (areas recognized in the national PA system and/or state system
Amapá (AP)	1996	1998	1.40%	PA
Ceará (CE)	2007	2008	0% (only solid waste management is considered)	Waste management
Goiás (GO)	2011	2012	Up 5% in the form of a composite indicator (1.25 in 2012, 2.5% in 2013, 3.75% in 2014, 5% in 2015)	Sustainable development plans (PA, waste management, environmental education, reduced deforestation, reduced forest fires, watershed protection, etc.)
Mato Grosso (MT)	2000	2002	5%	PA and indigenous lands
Mato Grosso do Sul (MS)	1994	2002	2% (2002), 3.5% (2003), 5% (2004) for various environmental criteria	PA, indigenous lands, waste management plans
Minas Gerais (MG)	1995	1997	PA 1 of 3 environmental criteria 0.5% (2010), 0.45% from 2011	PA per municipal area, conservation factor (~PA category) and conservation quality factors
Pará (PA)	2012	2014	For all environmental criteria 2% (2012), 4% (2013), 6% (2014), 8% (from 2015)	PA expanse, avoided deforestation, registered rural lands, etc.
Paraíba (PB)	2011	pending	5%	PA
Paraná (PR)	1991	1992	2.5% for PA for biodiversity conservation and 2.5% for PA for watershed	PA, PA category, and variation of conservation quality

Pernambuco (PE)	2000	2001	1%	PA share per municipal area, their category and degree of conservation
Piauí (PI)	2008	2009	Overall environmental criteria are 1.5% in 2009; 3.5% in 2010; 5% from 2011 (PA 1 out of 9 environmental criteria)	Waste management, watershed protection, reducing deforestation, pollution control, PA, etc.
Rio de Janeiro (RJ)	2007	2009	1% (2009), 1.8% (2010), 2.5% from 2011	PA, water quality, waste management, plus an extra for designation of municipal PA
Rio Grande do Sul (RS)	1997	1998	7% (for a composite indicator)	municipal area, 3 times PA, indigenous lands, inundated lands
Rondônia (RO)	1996	2003	5%	Proportion of PA per municipal area, number of PA and past year total PA area
São Paulo (SP)	1993	1994	0.5% only accounting for state PA	PA and PA category
Tocantins (TO)	2002	2007	3.5%	PA and indigenous land (+ another 3.5 for watershed protections, waste management, etc.)

Sources: Ring, Droste, and Santos 2017; and Droste et al. 2017; adapted from Ring et al. 2011, based on information provided by The Nature Conservancy 2014.
Note: PA = protected area.

12

Agriculture, Subsidies, and Forests

MADHUR GAUTAM, ERIN HAYDE & YIXIN ZHANG

Introduction

The significant role agriculture plays in driving deforestation is now widely recognized. Until the early 1990s, most analyses focused on conservation and protection strategies to avoid deforestation. Since then, the focus has shifted toward the need for a multisector approach (for example, World Bank 1991), with rising attention paid to the role of agriculture and "land-saving" approaches (that is, increasing productivity on existing land to avoid expansion into forests). In reality, most of the gains in global food security over the past 60 years have been achieved through higher productivity, despite a doubling of global population, with physical area expansion contributing significantly less than might have been the case without technology advances, for example, from the green revolution (Fuglie et al. 2020). This global picture, however, needs to be nuanced as the "net saving" of land at the global level masks a large variation in land use change at the local level across individual countries, often with significant environmental costs such as forest loss (Byerlee, Stevenson, and Villoria 2014). Experience shows that intensification by itself has proven not to be a panacea for reducing deforestation (Byerlee, Stevenson, and Villoria 2014): Along forest frontiers, the higher profitability of intensified (that is, more productive) cropping systems can provide a strong incentive to expand further into forests (a phenomenon often referred to as the rebound effect or the Jevons paradox).[1]

More broadly, and looking ahead, the evolving global trends present a worrisome picture. The world population is expected to reach 10 billion by 2050. Incomes are rising and consumer tastes are changing, often rapidly. This means that the world will need to produce approximately 50–80 percent more calories (as estimated by various studies) by 2050 (compared to 2010) while meeting the growing demand for diverse foods. The biggest challenge facing the global food system is to meet these needs in the face of climate change and from an increasingly stressed and severely limited natural resource base.

The IPCC Special Report (2019) on global warming of 1.5°C notes that climate impacts are occurring faster than anticipated and that the Paris Agreement is insufficient to prevent a disastrous 3°C warming of the Earth. This has dire implications for the world's poor and

1 Especially when intensification is not accompanied by additional, complementary policy interventions, such as strengthened enforcement of forest boundaries.

undernourished as the impacts are likely to be most prominent on agriculture and food security. Such impacts are likely already being felt—the Food and Agriculture Organization of the United Nations notes an alarming reversal in the global trend of the number of undernourished—rising for a third year in a row since 2014 to 826 million people, reversing a steady decline since 2000 (FAO et al. 2019). Reduced yields and growing food insecurity will put additional pressures on extensification of agriculture in some areas to meet basic food needs.

Public support for agriculture around the world has historically been focused on improving food security and making progress on other socioeconomic indicators, but with insufficient focus on climate and environmental outcomes. Countries around the world have long provided public support for agriculture. Food security remains a priority for many emerging and developing economies, and it also continues to be the main rationale for high levels of public support in many developed countries. The motivations for public support have also broadened over time—to accelerate the pace of structural transformation, to deal with persistent rural poverty, to bridge a widening rural-urban income gap, as well as to provide strategic support to promote exports (or substitute for imports). The economic and food security imperatives, typically in poor and early development settings, are to trigger a quick boost in food production. Political and social imperatives compel policy makers to find ways to boost the incomes of a large share of the population engaged in agriculture. "Visible" public support that benefits producers financially is often seen as an expedient way of doing both.

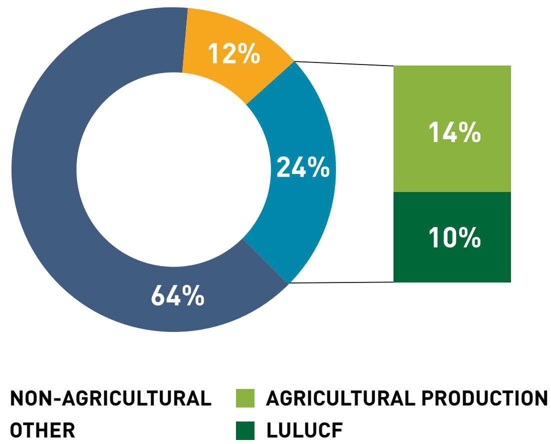
The form that agricultural support takes can have potentially large impacts on environmental outcomes. At worst, direct input subsidies to producers may encourage production through area expansion (for example, into forest, ecologically sensitive, or marginal areas) or excess use of inputs that generate a great deal of pollution (for example, nitrogen fertilizers) while discouraging production in areas that generate smaller environmental externalities. In an intermediate case, support that is partially decoupled (for example, transfers without distorting input or output prices, but with use or production conditions) still creates incentives to encourage excess production of targeted commodities or overuse of certain inputs, and eventually for expansion. At best, fully decoupled support might encourage producers to move in a direction that is economically efficient (through income transfers not tied to any inputs or outputs) or environmentally efficient (through transfers as payments for environmental services or conditional on climate-smart production practices).

This chapter focuses on the likely links between agricultural fiscal policies and forest loss through land expansion or conversion. Fiscal instruments, and in particular public support for agriculture, can play a greater role in ensuring that public policies are aligned to reduce deforestation and achieve more sustainable outcomes. Sectoral policies should be reformed not only to promote climate-smart agriculture (CSA) practices but also to limit expansion into forests as part of both climate mitigation and adaptation strategies.

Agriculture and the Environment

Agriculture is both a victim and a major culprit of climate change. The most severe impacts of climate change are expected to be felt in agriculture, threatening hard-fought gains in global food security. Among the countries expected to be hit hardest are also some of the poorest, generally in the tropical belt. Yet agriculture itself is a major contributor to climate change, accounting for 24 percent of global emissions (figure 12.1). Emissions from agriculture fall into two broad categories: the conversion of land from forests and other natural habitats to agriculture (10 percent) and harmful methane and nitrous oxide emissions from livestock, rice cultivation, and fertilizer application (14 percent) (Searchinger et al. 2018).

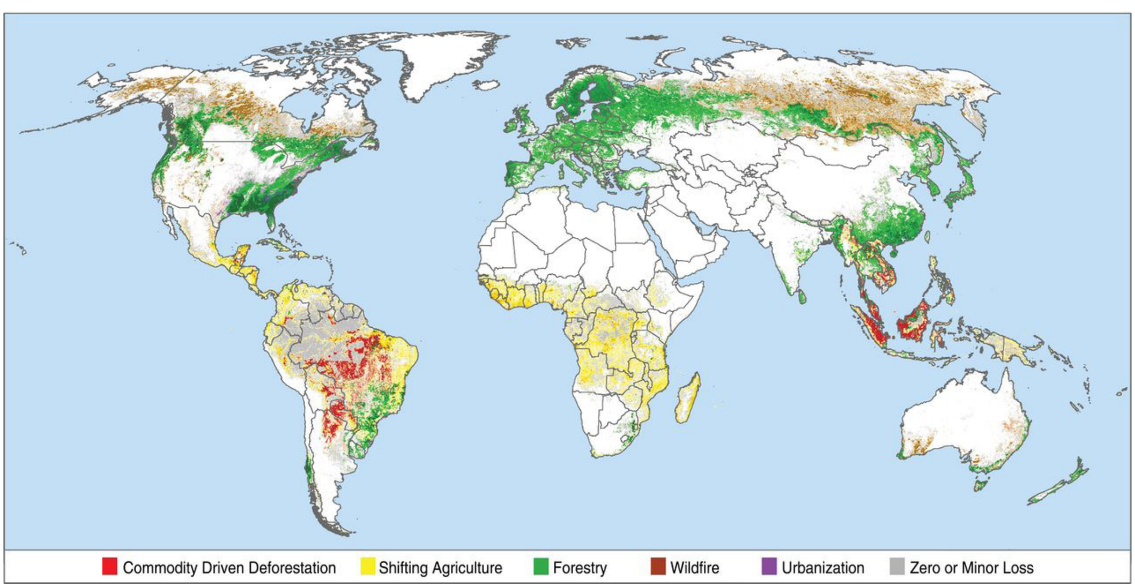
FIGURE 12.1
SOURCES OF GLOBAL GREENHOUSE GAS EMISSIONS



Source: Searchinger et al. 2018.
Note: LULUCF refers to emissions from land use, land use change, and forestry.

To understand the potential interactions between agricultural policies themselves and forest loss through land expansion or conversion, it is first important to understand where deforestation is concentrated. A recent study identifies the significant role of agriculture as a primary driver of deforestation (figure 12.2). It differentiates between permanent conversion of forests (that is, deforestation) and temporary loss of tree cover (from forestry activities or wildfires). This distinction is important because the latter does not entail land conversion since the affected areas are expected to recover, and as such, should not be considered as deforestation. The study finds that while there is a significant amount of forest disturbance globally, almost all deforestation per se is directly associated with agriculture—either from commodity (or commercial crop) production or from subsistence agriculture.

FIGURE 12.2
PRIMARY DRIVERS OF FOREST COVER LOSS, 2001–2015

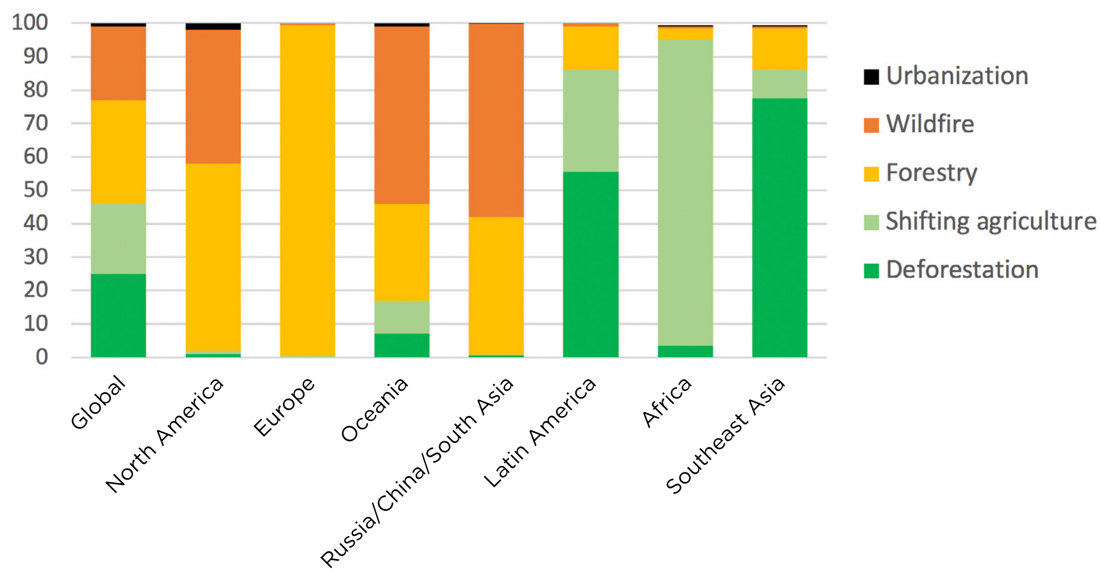


Source: Curtis et al. 2018.
Note: Darker color indicates greater intensity of forest cover loss.

Deforestation is highly concentrated in tropical forests. Differentiating across regions, figure 12.3 shows that about 46 percent of total forest disturbances across the globe are caused by agriculture. The role of urbanization, despite the pace at which it is progressing in many countries, is minimal. The impact of subsistence agriculture, primarily in Sub-Saharan Africa, is also found to be low—shifting cultivation is seen as a temporary loss of tree cover, but the affected forest is expected to eventually regrow. As such, the main driver of global deforestation (98 percent) is agriculture. The picture is, however, vastly different across regions. The impact of wildfires or forestry is very low in tropical forests (in Latin America, Africa, and Southeast Asia), while these two sources dominate in the temperate and boreal forests of other regions. In the tropics, deforestation accounts for 89 percent of all forest disturbances (nearly 95 percent in Africa and 86 percent in the other two regions).

A second important dimension is the extent of forest loss by region. The largest loss between 2001 and 2015 in millions of hectares (mHa) was in Latin America (78 mHa), followed by North America (70 mHa) and Russia/China/South Asia (64 mHa). Africa and Southeast Asia each experienced a loss of 39 mHa. Combined with the shares from different sources, these statistics indicate that commodity-driven deforestation outweighs shifting cultivation as the main driver of deforestation—accounting for 54 percent of the tree loss resulting from agriculture.

FIGURE 12.3
DISAGGREGATION OF GLOBAL AND REGINAL TREE COVER LOSS BY DRIVER, 2001–2015



Source: Curtis et al. 2018.

A third important dimension is to understand the factors behind the drivers of deforestation. Many commodities linked to deforestation are exported, primarily from Latin America and Southeast Asia. As such, the analysis of the impact of domestic policies and support for agriculture on deforestation becomes complicated—the proximate trends in the nature of local subsidies or agricultural policies may not be sufficient to explain the dynamics of deforestation.

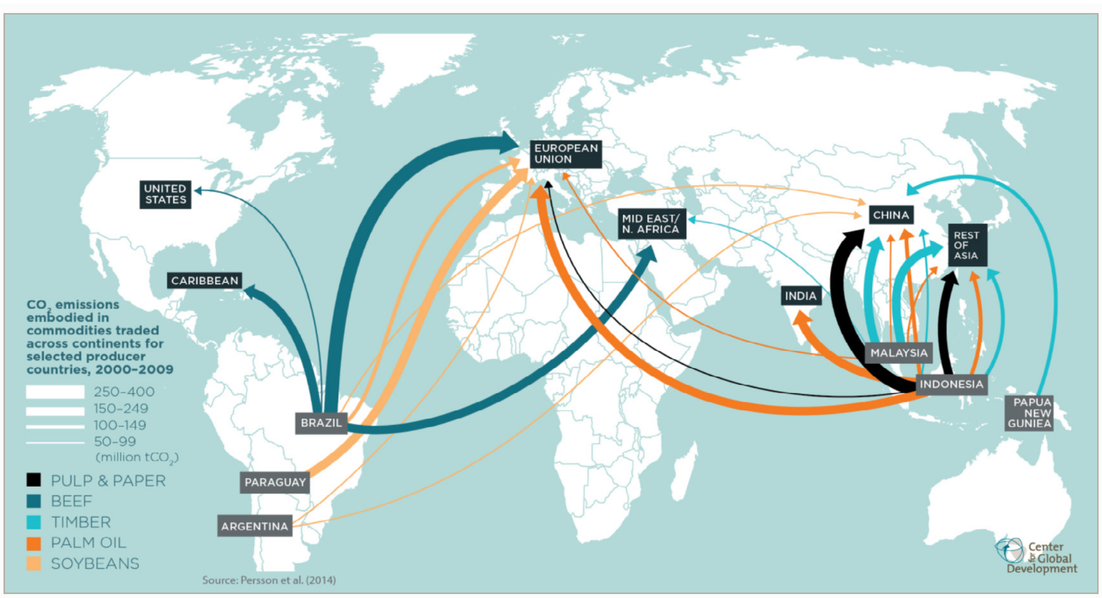
As a purely hypothetical example, suppose country X provides market price support for cereals; this price distortion creates a disincentive for the production of oilseeds (and hence cooking oil). Also assume that cereal production areas are far from the forest frontier, so in principle the domestic price distortion does not drive deforestation. Country X, however, then has to import oil from producers in country Y (widely recognized as "efficient" producers of oilseeds but with significant forests and production situated at the forest frontier). Therefore, even if country Y was to have no distorting policies, it is clear that the subsidies embedded in market support policies in country X (and for non-oilseed crops in this hypothetical case) create strong commercial incentives to drive global demand for country Y's oilseeds and thus play a major role in deforestation in country Y.

More generally, trade policies of both exporting and importing countries become important as potential drivers of deforestation. The analysis of the relation between domestic agriculture support policies and forest degradation and loss becomes complicated as it needs to account for the potential "offshoring" of environmental externalities through trade—often possibly in countries with weaker (public or private) governance systems.

The importance of trade and global consumption in driving deforestation-related carbon emissions is highlighted in a study by Persson, Henders, and Kastner (2014), who looked at global trade for just four commodities—beef, soybean, palm oil, and wood products (commodities with the largest impact on tropical forests in terms of deforestation or degradation)—originating in eight tropical countries (Argentina, Bolivia, Brazil, the Democratic Republic of Congo, Indonesia, Malaysia, Papua New Guinea, and Paraguay). Their results show that between 2000 and 2009, a third of the deforestation in the study countries was embodied in agricultural exports, mainly to the EU and China (figure 12.4). With the exception of Bolivia and Brazil (which have large domestic markets), exports are the dominant driver of deforestation. Excluding Brazil, on average 57 percent of the deforestation observed in this period was due to the export of the studied commodities. Importantly, other than Bolivia and Malaysia, all countries showed an increase in the share of emissions embodied in the exported commodities over the study period.

FIGURE 12.4

TRADE IN DEFORESTATION-DRIVING AGRICULTURAL COMMODITIES, 2000–2009



Source: Persson, Henders, and Kastner 2014.

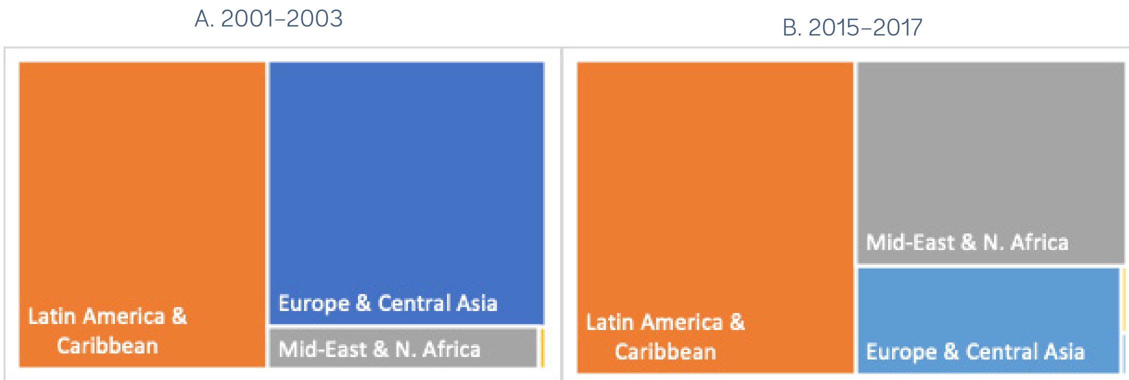
Finally, establishing links between specific policies and deforestation is further complicated by the potential substitution and displacement effects that policies targeted at specific areas or actors might trigger. This is highlighted by the Brazilian experience with environmental regulations aimed at reducing loss of Amazon forests from soy and cattle production (de Waroux et al. 2019). While Brazil had the laws and regulations in place to protect and regulate forests (such as the Forest Code), deforestation of the Amazon continued because of low enforcement. To address this, under pressure from environmental activists, a number of private industry-led initiatives were developed in the 2000s to curtail sourcing of first soy, then beef from illegally forested areas. The Soy Moratorium was signed by several multinational traders in 2006. This was followed by commitments from a number of countries, companies, and civil society organizations to ensure their supply chains were deforestation-free.[2]

The Soy Moratorium was effective in reducing the direct impact of soy in the Amazon despite the strong growth in international demand for soy (driven by the livestock industry, particularly in China). However, the area under soy cultivation expanded rapidly outside the Amazon forest at the expense of pastures, displacing cattle ranching into the forests (Arima et al. 2011). Thus, while improved governance in supply chains and regulations was successful for one segment of the soy supply chain in reducing its direct impact on the forests, it triggered strong indirect impacts on forests as the (strengthened) regulations did not impact the overall expansion of soy area (de Waroux et al. 2019).

The experience with Brazilian beef agreements demonstrates similar frustrations: (i) Pasture expansion was reduced in the Amazon biome as a result of the 2009 G-4 cattle agreement, but investments in cattle ranching shifted to regions with less restrictions. And while deforestation initially declined in the more regulated biomes, and specifically the Amazon, it started to increase again in 2012. (ii) With 80 percent of Brazilian beef destined for domestic markets, and with significant scope for "leakage" through a very large number of relatively small processors who are difficult to effectively monitor, de Waroux et al. (2019) also find significant substitution effects with local market suppliers sourcing more beef from the restricted biomes, while international importers switched to beef sourced from other regions. Thus, despite a reduction in Brazilian beef imports by some countries, such as in Western Europe, the UN COMTRADE data show that overall Brazilian exports increased (in quantity terms) by 86 percent between 2004 and 2017, with a rapid growth in exports to countries within South America and the Middle East and North Africa region (figure 12.5), which may also perhaps reflect less stringent sourcing conditions.

2 The meatpacking companies signed the Terms of Adjustment of Conduct ("MPF-TAC") and the G-4 zero-deforestation agreements in 2009. In 2010, Banco de Brasil also signed the agreement to limit public credit to farmers who deforested after 2006. A number of countries, including most Western European countries, also committed themselves to reduce deforestation from their supply chains by signing the 2014 New York Declaration on Forests (for details, see de Waroux et al. 2019).

FIGURE 12.5
DESTINATION OF BRAZILIAN BEEF EXPORTS BY REGION, 2001–2003 VS. 2015–2017 (%)



Source: Original calculations using UN COMTRADE data.

Nature of Public Support to Agriculture

Public support for agriculture can take different forms:

- Expenditures on pure public goods and services required to promote and sustain productivity growth
- Input subsidies (funded by public expenditure, that is, by taxpayers) in the form of transfers to producers to finance part of the input costs—often referred to as "coupled subsidies"
- Income transfers not tied to any inputs or outputs—often referred to as "decoupled subsidies"
- Indirect subsidies through market price supports,[3] either by maintaining minimum price supports for certain strategic food crops (typically food grains) or by tariff and nontariff barriers restricting imports (or effectively raising the domestic price of agricultural commodities)

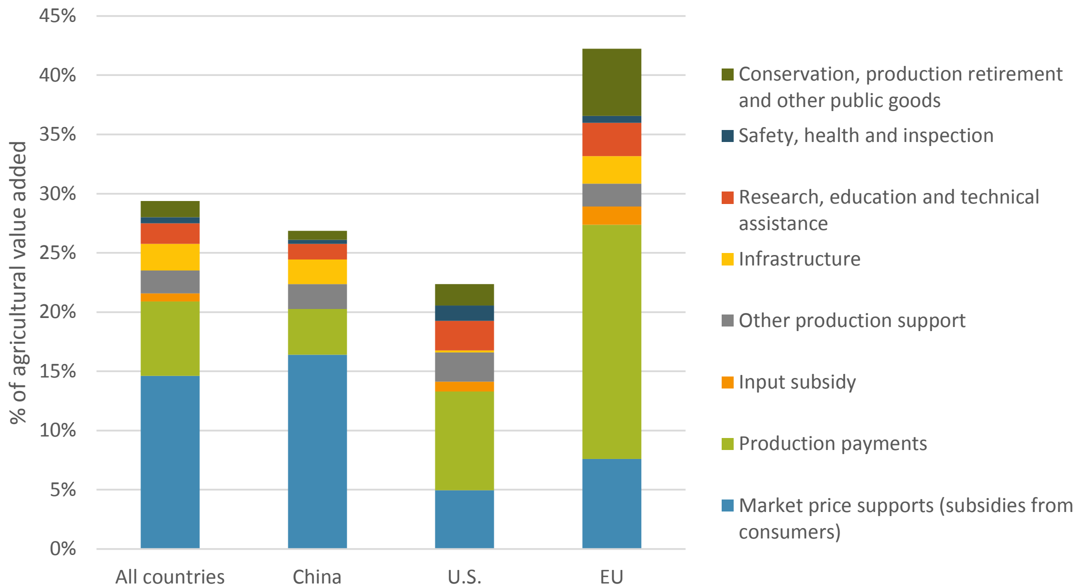
What is the magnitude of support to agriculture? Lack of reliable data prevents an estimate of the totality of this support across all countries; however, data are available for 53 countries (all the OECD countries plus 10 other emerging and large agricultural economies) that account for two-thirds of global agricultural output. These data show that as a group this subset of countries provided a total of $560 billion annually (on average between 2016 and 2018) to agricultural producers, equivalent to about 15 percent of gross farm receipts (OECD 2018).[4]

A breakdown by the type of support provided, by all countries as a group and by the countries with the largest level of support, is given in figure 12.6 for the period 2014–2016. The OECD estimates that two-thirds of the current support to farmers is in a form that strongly distorts farm business decisions. To put this in perspective, the total amount of global climate finance invested in 2014 was $391 billion, of which only a small fraction (about $6 billion to $8 billion) was directed at agriculture, forestry, and land use. In other words, the amount of funding that distorts agricultural production decision-making far outweighs the funding provided to reduce the impact of agriculture, including land use change and deforestation, on climate change.

3 These subsidies are "indirect" in the sense that they are implicit transfers to farmers from consumers (who have to pay a higher price than they would otherwise have had to) but do not place any financing burden on the government budget (that is, taxpayer).
4 These 53 countries account for about two-thirds of global agricultural output.

FIGURE 12.6

AGRICULTURAL SUPPORT AS A FRACTION OF AGRICULTURAL VALUE ADDED, AVERAGE FOR 2014–2016



Source: Searchinger et al. 2019 using OECD 2018, PSE and GSSE databases.

Given the large environmental footprint of agriculture, directly as well as indirectly through induced changes in land use, the potential impact of climate-friendly agricultural support policies could be very large. With only 15 percent of current producer support directed at public goods and a small 1 percent directed toward promoting environmental protection (conservation, production retirement, and so on), the majority of the support provided to agriculture in the 53 countries included in the OECD's analysis has potentially substantial implications on economic and environmental outcomes. The incentive distortions that such support policies create for farmers impact the food system by changing not only *what* commodities are produced (the production patterns), but *how much* is produced (the scale of production), *how* they are produced (with artificially inflated returns diminishing the focus on efficiency in favor of extensive cultivation), and *where* they are produced (geographical pattern).

Evolution of agricultural subsidies

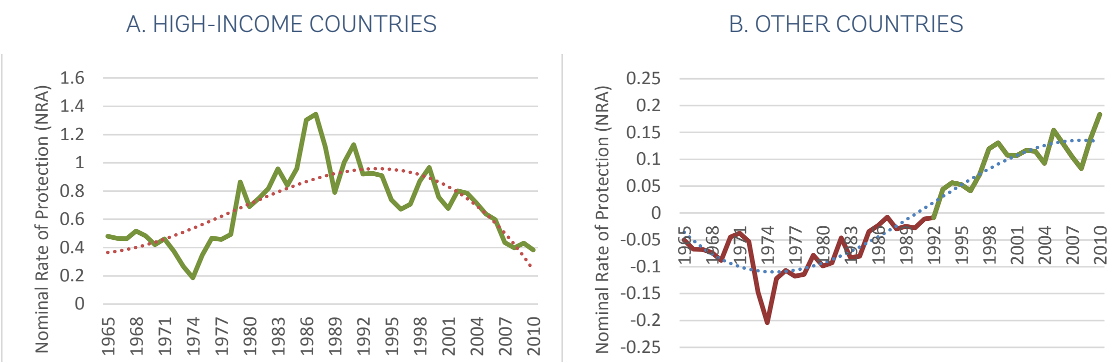
Government interventions in agricultural markets are a global phenomenon, making agriculture the most distorted sector of the world economy (Panagariya 2005). Agricultural policies have shown two distinct patterns of intervention—the developmental pattern and the anti-trade pattern (Lindert 1991). The former shows a switch from taxation in the early stages of development to subsidization as the economy develops. The latter shows a general tendency of taxing exportable commodities and subsidizing importable commodities—using various measures to restrict trade. One or both of these patterns have endured and are observed consistently across the spectrum of economic development (Anderson 2009; Krueger, Schiff, and Valdes 1991).[5]

5 The taxation to subsidy pattern was observed in medieval European times to ensure low food prices for the fast-rising urban populations and to extract surplus from agriculture for investment in other parts of the economy. The notable exception to this pattern were England's Corn Laws (in effect from 1660 to 1846), which raised domestic grain prices in favor of the dominant landed aristocracy, until they were repealed as the political landscape changed in favor of industrial interests (Lindert 1991).

High-income countries heavily subsidized their agriculture in the post–World War period, initially to stimulate production and later to maintain farm incomes, with significant impacts on world agricultural markets (Sumner 2007). The levels of subsidies in OECD countries have moderated over the past two decades but remain high (see figure 12.7). This is despite commitments by OECD countries to improve the functioning of world agricultural markets through reduced distortions (Legg 2003).

Agricultural protection and barriers to trade are not just a developed-country phenomenon, nor are they the only source of problems for developing countries' agricultural development. Various subsidies for inputs, price supports, and trade interventions have been an integral part of the economic policy landscape of developing countries themselves at least since the 1960s. These policies have been equally distortionary and harmful to developing countries' own interests (Panagariya 2005). These trends are evident in figure 12.7, which shows that on average, developing countries have followed a pattern remarkably similar to Lindert's historical developmental pattern observed in developed countries.[6]

FIGURE 12.7
NOMINAL RATES OF PROTECTION IN HIGH-INCOME AND OTHER COUNTRIES, 1965–2010



Source: Based on data from Anderson and Nelgen 2012.

The discussion above is based mostly on indirect subsidies resulting from market price supports. Direct subsidies for agriculture have a relatively shorter but still quite long history. The documented modern agricultural subsidy programs date back to the United States in 1933 with the enactment of the Agricultural Adjustment Act in the wake of the Great Depression (Sumner 2007). US farm programs since have included commodity price supports, stock acquisition, import barriers, production controls, marketing orders, and crop insurance (Edwards 2009; Sumner 2007). While distortionary input subsidies have not been part of farm programs in the United States in recent decades, price supports for specific commodities have proved to be highly distortionary by encouraging overproduction of the targeted commodities.

To reduce the distortionary effects of the farm subsidy programs, in recent years the United States has shifted toward farm income support programs. In practice, however, the overall negative impact of distortions remains significant, their benefits regressive, and the programs

6 See Lindert (1991). Note that individual countries and regions are at different stages on the stylized evolutionary path, depending on their level of agricultural development. African counties, with a generally lower level of agricultural development, heavily taxed agriculture until the recent food price spikes in 2007/2008 and have since exhibited a generally neutral policy stance. Asian countries (excluding Japan and Korea) moved from taxing to favoring agriculture around 1990.

overall a heavy drain on the public budget (Edwards 2009). Similar reforms have taken place in the EU, with farm support shifting from distortionary subsidies toward decoupled payments. The effectiveness of farm subsidy programs, however, remains questionable. The transfer efficiency of such programs (that is, net gains in farmer incomes relative to the amount of the public resources spent on various subsidies) is found to be low: Less than half of the transfers result in incremental gains for farmers even with the most efficient support measures (for example, area-based payments); price supports (less than a fourth of transfers) and input subsidies (less than a third of transfers) are significantly less efficient (OECD 2003).

The bottom line is that not only are various subsidy and market price support programs likely to have large environmental impacts, but the intended farmer or production benefits are likely not being realized either. Many agricultural support programs provide very poor value for money. Thus, there is evidence to suggest that agricultural expenditures could be substantially reduced without reducing actual and effective support to the agriculture sector. Reducing such inefficient expenditures would then free up resources that could be used for other purposes.

Conceptual foundations for subsidies

Welfare economics has long recognized the potential usefulness of subsidies in situations where the social benefits of individual actions exceed purely private benefits. The conceptual underpinnings of the debate stem from the standard economist's benchmark of perfect and complete markets, which is useful to evaluate the impact of policy interventions such as subsidies. On the one hand, under perfectly competitive markets, no case can be made for a subsidy. On the other hand, economic theory also recognizes market failures (that is, incomplete, imperfectly functioning, or missing markets), which are a reality in many settings. The markets for environmental services are a good example of such market failures. It has long been understood that in the presence of externalities, a judicious mix of taxes and subsidies could be applied to correct for negative (GHG emissions, loss of biodiversity, and so on) and positive externalities (payments for environmental services, sustainability of natural resources, and so on), respectively (Pigou 1920).

In developing countries, persistent concerns with food insecurity are the main rationale for a resurgence of subsidies. These are often justified to promote productivity growth in the face of multiple failures or to overcome the impacts of other constraints (Morris et al. 2007; OECD 2006; World Bank 2008).[7] These arguments include the following:

- Lack of awareness of technology: Prevents adoption of productivity-enhancing innovations.
- Insufficient knowledge: Constrains the effective use of inputs or technology.
- Learning by doing: Efficiency and productivity improve with experience.
- Risk: Producers reduce input use in response to weather/market risks to limit financial exposure, especially for inputs that increase both rewards and risks.
- Non-affordability: Credit/liquidity constraints limit input use or critical investments.
- Accessibility: Logistical barriers/poor infrastructure raise costs of inputs.

7 Specific circumstances also exist, including in more developed economies and nonagricultural settings, in which subsidies are justified to exploit potential economic of scale, the potential for innovations with large transformative impacts, strategic trade intervention opportunities, or environmental benefits, as well as for social equity considerations.

- Market "thickening": Low demand constrains the viability of investment in input marketing, while low volumes prevent exploiting economies of scale to lower input supply costs.

These constraints often bind farmers in a low-level productivity trap. Relieving these constraints would not only improve agricultural productivity but also potentially unleash strong dynamic general equilibrium impacts—boosting nutrition and incomes; lowering food prices; raising real wages, employment, and broader economic growth through forward and backward links; promoting structural transformation; and strongly contributing to poverty reduction (World Bank 2007, 2008). The dynamic gains associated with subsidies could potentially far outweigh the short-term costs, as is often associated with the green revolution in Asia (Chirwa and Dorward 2013; Hazell and Rosegrant 2000).

Nevertheless, it is important to reiterate that even in such a suboptimal setting, social gains from subsidies may accrue only under certain circumstances (Gautam 2015). Several pitfalls in the application of subsidies are often overlooked and could undermine their potential benefits or contribute to an overall net social loss:

a. For most agricultural situations, the gains (in excess of the associated costs, say due to deadweight losses or administrative and implementation costs) depend on market conditions, and specifically the magnitudes of supply and demand elasticities (Dorward 2009). Inelastic demand tends to generate consumer gains, while supply shifts (outward or downward) tend to favor producers/suppliers. It thus follows that, in many developing settings, subsidies may be useful for food staples in countries/regions with large import-export parity price differentials.

b. Many developing situations are beset by multiple market failures. In such circumstances, a specific input subsidy may address a particular constraint, but its effectiveness and impact may crucially depend on making complementary investments to address the other binding constraints.

c. Long-term development and efficiency also require that care be taken to ensure that subsidized inputs do not substitute for market demand for those inputs: Inframarginal transfers are essentially a waste from a budgetary resource-efficiency point of view (the inputs would have been purchased and used in any case, so subsidies are a pure income transfer). More important, they may have large associated economic and developmental costs because they disrupt and impede market development and crowd out the private sector—a clearly negative long-term outcome, especially in economies with nascent markets and a fragile private sector.

d. Finally, important choices need to be made between input and output subsidies, and whether to subsidize a single or multiple inputs. There may be exceptional conditions when a single input subsidy may be optimal, such as to offset a distortion that affects a specific input, or if there are large positive externalities associated with the use of a specific input (for example, modern seed varieties). In general, however, output subsidies are argued to be relatively less distortionary because they do not alter producer incentives in the use of inputs. But there is no guarantee that they are less costly in terms of budgetary resources. Output subsidies can also hugely distort the patterns of production, often resulting in overproduction of targeted commodities. Further, output price and income support subsidies often manifest as rents for fixed factors, which means they disproportionately benefit factor owners, such as landowners, and not the renters.[8] The choice of subsidies for a single or multiple inputs will depend on their impacts on budgetary outcomes as well as the degree of input substitutability—which need to be carefully analyzed to determine the final impact on production, the ultimate objective (Parish and McLaren 1982). Under certain, but not all, circumstances single input subsidies may be more cost-effective and efficient.

Political economy considerations

As noted earlier, food security along with inclusive growth and poverty reduction objectives keep agriculture high on policy makers' agendas. Rising rural-urban income inequality makes it politically necessary for policy makers to devise mechanisms to support the incomes of a large, rural, and mostly agricultural constituency. The rekindling of food security concerns in the post-2007 period and continuing weather-related anomalies (likely a reflection of a changing climate) provide a renewed impetus to improving agricultural productivity and domestic availability of food.

These aspects shape the political economy of decision-making in most settings, with government "support" often translating into budgetary allocations—a clear signal of the government's commitments (Jayne and Rashid 2013). Input subsidies are very visible in demonstrating tangible and direct support to the rural population and are thus popular among policy makers and politicians. But the incidence of subsidies is often regressive, resulting in less developmental and distributional gains than political and patronage ones. Such programs persist, as the political science literature highlights, because a vocal and politically aligned minority can often influence policy decisions and emerge as winners as other actors are very often too dispersed or otherwise much less visible and so lose out in this process.

The second important aspect of political economy is the timing of benefits accruing from public expenditures: Here, subsidies provide instant (or almost) gratification to the beneficiaries, while most public capital investments (for example, expenditures on public goods such as roads and R&D) or environmental benefits (such as improved soil, water, or climatic conditions for production growth and stability) are realized only over a much longer period, are often widely diffused, and are not clearly attributable to the original decisions or decision-makers. The myopic financial (and the associated political) benefit thus often overshadows the well-demonstrated and large benefits from investments in public goods. Clearly, the timing of benefits from long-term investments does not fit well with the logic of politics, with its much shorter time horizon, typically tied to the electoral cycle in functioning democracies. The result is that political economy more often than not trumps economic or technical considerations.

8 The impact of indirect subsidies with output price and income supports on land values has been rigorously shown for the United States (Goodwin, Mishra, and Ortalo-Magne 2011).

The bottom line

The efficacy of subsidies in achieving desirable development objectives continues to be vigorously debated (for example, Chirwa and Dorward 2013; Jayne and Rashid 2013; Morris et al. 2007; Wiggins and Brooks 2010; World Bank 2008; Fan, Gulati, and Thorat 2008). Despite the conceptual rationales provided in specific circumstances, the empirical evidence on the impact of subsidies is not encouraging. The criticisms of subsidies reflect real and serious implementation problems as well as design shortcomings—issues that are observed with a remarkable degree of consistency across countries and settings (Gautam 2015). On implementation, the problems have been extensively analyzed and documented, including issues related to targeting, political patronage, leakages, elite capture, distorted incentives (through prices) encouraging overuse or imbalanced use of inputs, crowding out the private sector, opportunity costs in terms of foregone investments on essential public goods (such as infrastructure), and often the sheer size of program costs (Chirwa and Dorward 2013; Jayne and Rashid 2013; Wiggins and Brooks 2010). The experience shows that subsidy programs are difficult to implement in the best of circumstances.

The debates on agricultural subsidies and their potential impacts, however, have not yet paid sufficient attention to the "hidden" costs of subsidies. Environmental impacts have not been a big part of this debate, though this is starting to change as the role of agricultural policies and support programs is increasingly scrutinized given the large environmental and climate footprint of the agriculture sector. The long-term impacts, while recognized at times, have also yet to be rigorously estimated in terms of the potential negative impact of environmental and resource degradation on future agricultural productivity itself; in other words, whether the short-term productivity gains (assuming that they indeed materialize) justify the likely substantial longer-term decline in productivity, potentially compromising food security itself.

Yet there are political and social reasons many governments provide agricultural support to producers, raising the question of whether this support can be provided in a manner that does not generate the externalities associated with distorting forms of support. This idea is now taking root at the global level through the idea of repurposing agricultural policies and support programs to deliver the "triple wins"—higher productivity (and hence incomes and food security), increased resilience to climate change, and reduced impacts on negative environmental externalities. It is against this backdrop that this chapter explores the complexities of the links between support policies and deforestation.

Link between Agricultural Support Policies and Deforestation

Despite a growing consensus that agriculture plays a significant role in global deforestation, few analyses examine the role of agricultural support policies in deforestation. The consensus among these limited analyses is that deforestation is strongly linked to agricultural commodity prices (Busch and Ferretti-Gallon 2017). Previous studies have therefore used the impact on agricultural prices as a proxy for the impact of various policies on deforestation (see table 12.1). However, studies linking specific agricultural support policies to the environment generally focus on greenhouse gas emissions or the link between input subsidies and resource overconsumption (for example, water or fertilizer use).

TABLE 12.1
EXPECTED EFFECTS OF SELECTED POLICIES ON DEFORESTATION

POLICY	INSTRUMENT	EFFECT ON DEFORESTATION	COMMENTS
Fiscal	Devaluation	Increases	Raises agricultural prices of commodities
	Restricted monetary supply	Indeterminate	Has conflicting effects
Commercial	Trade liberalization	Indeterminate	Has conflicting effects
	Export incentives	Increases	Improves agricultural products terms of trade
	Agricultural export taxes	Reduces	Lowers agricultural products terms of trade
	Agricultural import restrictions	Increases	Raises agricultural prices
Agricultural	Price controls on food	Reduces	Lowers agricultural prices
	Agricultural price supports	Increases	Raises agricultural prices
	Credit subsidies for crops	Indeterminate	Has conflicting effects
Other	Increased road investment	Increases	Lowers agricultural prices and increases access to land
	Spending on settlements	Increases	Motivates migration to the agricultural frontiers
	Securing land tenure	Indeterminate	Has conflicting effects

Source: Adapted from Pacheco 2006.

With the rise of climate change on the global agenda, greater attention is now focusing on how best to harmonize agricultural policies with simultaneously achieving the goals of raising productivity (and hence incomes and food security), increasing farmer resilience to climate change, and reducing emissions associated with agriculture, half of which arise from deforestation and forest degradation. In terms of financing (despite the high levels of subsidies relative to financing in support of REDD+) and the need for reform, there has been limited focus on the identification, estimation, and reform of subsidies and their role in deforestation (McFarland, Whitley, and Kissinger 2015). For example, many countries do not establish REDD+ interventions that address deforestation drivers, including agricultural expansion (Carter et al. 2015; McFarland et al. 2015; Pirard and Belna 2012; Salvini et al. 2014). While this idea has been largely absent from climate finance discussions (Whitley 2013), this issue is now starting to be raised and needs to be pursued vigorously.

Attention is increasingly being focused on how to sustainably deliver and increase agricultural yields without requiring additional land expansion. In response to a growing appreciation of the impact of agricultural expansion on deforestation (Geist and Lambin 2002; Gibbs et al. 2010; Hosonuma et al. 2012; Houghton 2012; Kissinger, Herold, and De Sy 2012) and biodiversity (Balmford, Green, and Scharlemann 2005), research is starting to focus on policies and essential public goods investments (such as agricultural R&D) to reduce pressures for agricultural expansion while assuring needed food supply. Inferences can then be made from these results regarding specific agricultural support policy effectiveness at achieving environmental, economic, and social goals.

Several policy approaches have attempted to influence agricultural expansion onto forestlands (Angelsen 2010). These have included policies to reduce rents from extensive agriculture (for example, by reducing support for extension by promoting intensive agriculture, or through land tenure reforms, marketing, infrastructure, and alternative livelihood investments). A second group of policies aims to increase forest rents and their capture by land users (for example, community forest management or payment for ecosystem services programs). The final set involves regulatory policies that directly limit forest conversion (for example, protected areas). Keeping rents from extensive agriculture low may be effective in conserving forests (Wunder 2003), but such policies tend to be socially, economically, and politically unacceptable—see, for example, World Bank (2007) and Kaimowitz, Byron, and Sunderlin (1998)—and are not considered here. The feasible approaches can be classified under two main competing hypotheses: land sparing and land sharing.

Land-sparing hypothesis

Targeting intensive agriculture[9] is an intuitively appealing way to reduce the expansion of agricultural land (that is, producing more from same or less land), promote forest conservation (Angelsen 2010), and mitigate carbon emissions (Burney, Davis, and Lobell 2010; Carter et al. 2015). The land-sparing (or Borlaug) hypothesis argues that for a given level of consumption, there is a one-to-one trade-off between increased yields and demand for cropland (Angelson and Kaimowitz 2001; Borlaug 2007; Grau, Kuemmerle, and Macchi 2013). A major strategy to accomplish land sparing is to promote the intensification of agricultural production on a given area of land.

While widely cited and used to justify policy interventions (Carter et al. 2015; Green et al. 2005; Stevenson et al. 2013), the simple land-sparing hypothesis does not hold up under theoretical or empirical analysis (Angelsen 2010; Angelsen and Kaimowitz 2001; Barbier 2001; de Waroux et al. 2017; Ewers et al. 2009; Phalan et al. 2011; Phelps et al. 2013; Pirard and Belna 2012; Rudel et al. 2009; Udondian and Robinson 2018).[10] The impact on expansion depends in part on production factor intensities: Farmers tend to adopt extensive systems to compensate for the relative scarcity of labor and capital (Angelsen and Kaimowitz 2001; Boserup 1965). The impact on expansion also critically depends on demand responses—a fall in food prices might invoke a "rebound" effect, where a lower cost of food increases consumption (Desquilbet, Dorin, and Couvet 2016; Matson and Vitousek 2006; Pirard and Belna 2012).

9 Here, intensive is understood as intensive in production factors other than land (that is, labor or capital).

10 However, imperfect markets may moderate the tendency toward expansion: Factors of production may be scarce, transaction costs of technological adoption may be high, or risks may be high enough to influence investment decisions (Pirard and Belna 2012). Additionally, in subsistence farming, intensification may enable smallholders to meet subsistence needs with less land (as demand remains stable).

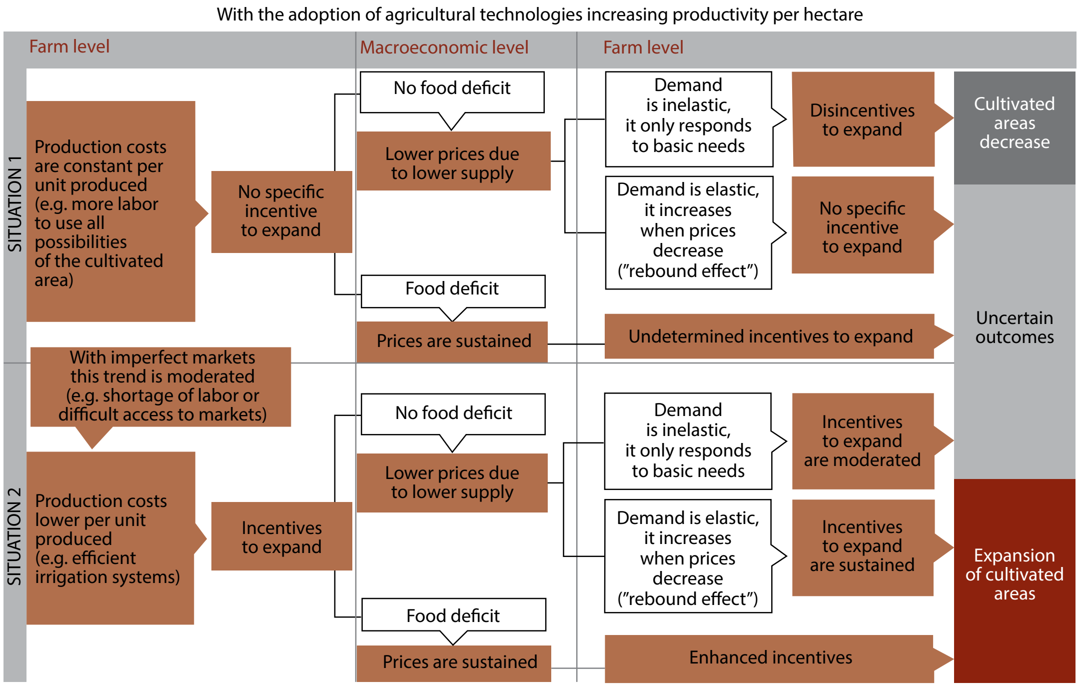
In a global analysis of agricultural cropland changes in 161 countries, Rudel et al. (2009) found no significant correlation between productivity and land use change.[11] Indeed, agricultural land area declined with intensification *only* when complementary conservation programs and import substitution of grain occurred. Ewers et al. (2009) examined the impact of the rebound effect and found that agricultural subsidies created surplus production in non-staple crops, negating the positive effects from intensification. In the Hua Meuang District of northeastern Lao PDR, intensification led to agricultural expansion and forest loss (Vongvisouk et al. 2016). Intensive production has also been found to be more likely than smallholder production to expand into forests (Gutiérrez-Vélez et al. 2011).

However, land sparing as a result of intensification is seen in some cases, but usually in combination with other policy measures (Cohn et al. 2011; Minang et al. 2011). For example, in the Philippine lowlands, improvements in small-scale irrigation led to increases in labor demand and wages, which drew labor from more extensive regions and reduced forest clearing by almost 50 percent (Shively 2001; Shively and Pagiola 2004).[12] In the case of slash-and-burn farming, land expansion was reduced through investments in new higher-yielding varieties in Zambia, and agroforestry in Borneo (Angelsen and Kaimowitz 2001). A recent study found that intensifying Brazilian cattle production (in combination with new and existing command-and-control measures, financial instruments, PES programs, and compensation for potential distributional impacts on low earners) would lead to zero deforestation with low overall economic impacts and virtually no social losses (Instituto Escolhas 2017).[13] Figure 12.8 diagrams the effectiveness of the land-sparing hypothesis under different scenarios.

Many agricultural interventions have various impacts on forest cover that are dependent on external factors (for example, Singer 2009). Without strong enforcement against expansion and other policies, there is no guarantee that an increase in agricultural productivity on its own will result in less agricultural expansion (Byerlee, Stevenson, and Villoria 2014; Pirard and Belna 2012). For example, higher profits in intensive agriculture could be used to fund further expansion as was seen in Indonesia in the 1990s (Ruf 2001). The land-sharing hypothesis can then be updated to this: *Intensification in itself does not result in land sparing, unless accompanied by specific policies and measures, such that expansion can be controlled.*

11 A negative (but insignificant) correlation was found in 34 countries, consistent with the land-sparing hypothesis.
12 However, if policies promote labor-saving technologies, the labor pull effect may be negligent or reversed (Angelsen 2010; Angelsen and Kaimowitz 2001).
13 According to the study, on average, Brazilian cattle production would need to improve by 0.29 percent and 0.13 percent for beef and milk, respectively, annually between 2016 and 2030.

FIGURE 12.8
WHEN IS THE LAND-SPARING HYPOTHESIS VALID?



Source: Pirard and Belna 2012.
Note: The figure above presents a diagram of the conditions under which land-sparing approaches might work. Note that production costs, demand, and relative prices—along with technology availability—play a particular role.

Land-sharing hypothesis

Another main policy response to limit deforestation from agricultural expansion is built on the idea of land sharing (Balmford, Green, and Scharlemann 2005; Green et al. 2005). Land sharing implies that production and conservation are integrated on the same land through biodiversity-friendly production methods (Jiren et al. 2017). Land sharing has been shown to have reduced deforestation (in addition to improving tree cover on participating farms) in at least one case (Palmer 2014; Lerner et al. 2017). While there is some debate on how land sharing should be implemented (Vongvisouk et al. 2016), a consensus is emerging on the need for a mixed approach based on the specific context (Fischer et al. 2014; Grau, Kuemmerle, and Macchi 2013).

Policies to promote land sharing include land use planning and management and the promotion of environmentally beneficial agricultural technologies (for example, CSA), among others. And while technically much more needs to be done to develop and improve CSA technologies and practices, a number of options are readily available. If extended and adopted by farmers, CSA practices can contribute significantly to the triple wins of higher productivity, reduction of agriculture sourced greenhouse gas emissions, and adaptation by making agriculture more resilient. A relevant question then is whether public policies and support for the agri-food system are aligned to achieve these outcomes.

Repurposing Agricultural Policies and Support

There is no simple, unequivocal relationship between changes in agricultural systems and tropical deforestation. In land sparing, sustainable intensification is not a self-sufficient condition for success. Moving forward, the expected impact on deforestation, climate change, and the environment should be factored into the design of market price support policies (World Bank 2015). Agricultural support policies need to be carefully designed to promote environmentally beneficial outcomes, especially through CSA. Support policies also need to be complemented with institutional reforms, such as strengthened enforcement (of protected areas, environmental regulations, and so on) and the provision of conservation incentives through PES and other programs (see table 12.2 for a brief review of forest conservation policy instruments).

TABLE 12.2
OVERVIEW OF FOREST CONSERVATION POLICY OPTIONS

POLICY	EFFECTIVENESS (FOREST CONSERVATION)	DIRECT COSTS OF POLICY (EFFICIENCY)	EFFECT ON INEQUALITY/ POVERTY	AGRICULTURE YIELD (NOT PRODUCTION)	POLITICAL VIABILITY
1. Reduce (extensive) agriculture rent					
Depressing agriculture prices	High	Negative	Negative	Very negative	Very low
Creating off-farm opportunities	High	Medium/high	Neutral/positive	Uncertain	High
Support to intensive agriculture sector	Moderate/high	High	Uncertain	Positive	High
Selective support to extensive agriculture	Uncertain/moderate	High	Positive	Positive	Moderate
Ignore extensive road building	High	Negative	Negative	Negative	Low/moderate
More secure property rights	Uncertain	Medium	Uncertain	Positive	Moderate/high
2. Increase forest rent and its capture					
Higher price of forest products	Moderate	Low	Positive/uncertain	Small	Moderate
CFM: Capture local public goods	Moderate	Low/medium	Positive	Small	Moderate
PES: Capture global public goods	Potentially high	Medium/high	Uncertain/ positive	Small	Moderate/high
3. Protected areas	Moderate/high	Medium	Uncertain	Small	Moderate

Source: Angelsen 2010.
Note: CFM = community forest management; PES = payments for ecosystem services.

While direct and definitive links cannot yet be made between specific agricultural support policies and levels of deforestation and forest degradation, there are some best practices policy makers should adhere to in order to promote economically, socially, and environmentally sustainable agricultural systems. The rest of this section outlines various agricultural support policies and how policy makers can optimize each not only to reduce agriculturally driven deforestation and forest degradation but also to promote the adoption of more environmentally beneficial practices.

Research and development. Governments could make public investments in agricultural R&D and extension services (NRC 2010). In addition to environmental benefits, investments in R&D may be one of the most cost-effective policies to mitigate agriculturally driven deforestation (Lobell, Baldos, and Hertel 2013) as well as climate-related sectoral challenges, as underinvestment in R&D is one of the most significant barriers to the implementation of CSA (Sova et al. 2018). R&D should be inclusive of smallholders and focus on important non-staple, nutritionally dense foods and integrated production systems (FAO 2018). R&D should also be promoted within the context of REDD+, keeping in mind lower yields associated with tropical crops (Streck and Zurek 2013).

"Green" credit. Governments could provide support for green credit and input support programs, like those available for the preservation of other natural resources (for example, water, biodiversity). Green credit mechanisms include funds or credit lines that support small projects and aggregate risk, made available for specific investments and linked to changes in practice (Streck and Zurek 2013). This type of funding can facilitate the adoption of new technologies, cover increased labor costs, or provide capital for smallholders to invest in improved agricultural practices.[14] Support programs that reduce transaction costs and risks could facilitate farmer engagement; credit support may be a particularly effective policy to influence agricultural impact on deforestation (Assunção et al. 2016). Credit programs that fund activities requiring deforestation should be removed (as done for agricultural producers in Brazil).

14 Such policies would also help improve PES-related outcomes, as farmers previously unable to invest in ex-ante investments to implement new practices would be able to do so.

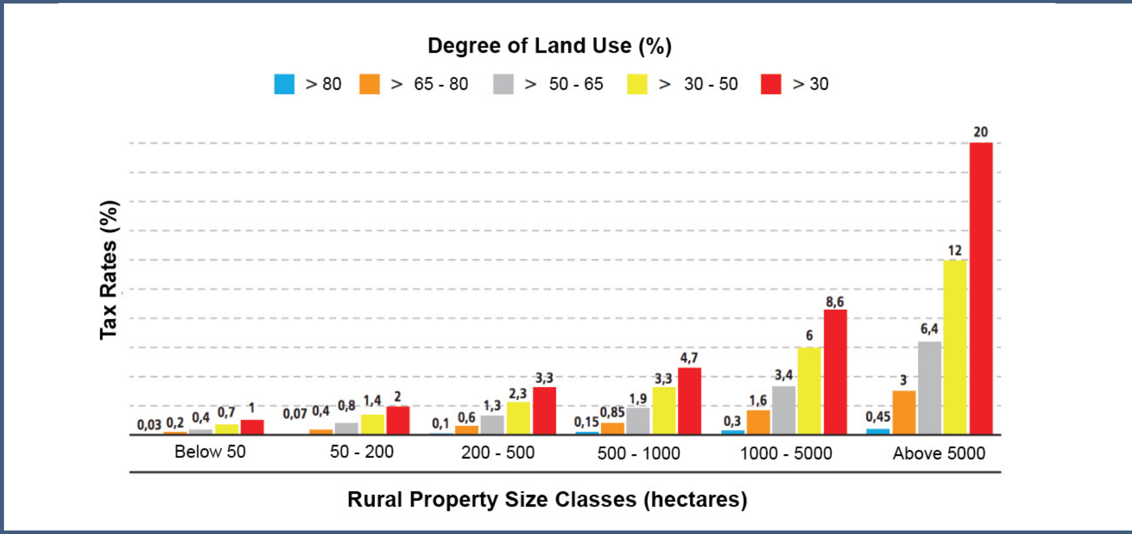
BOX 12.1 INCREASING AGRICULTURAL PRODUCTIVITY THROUGH LAND TAXES

Land taxes are one avenue through which policy makers can reduce agricultural land expansion and associated deforestation.[a] One example that has the potential to influence forest conservation in the Amazon biome is the Rural Property Tax (ITR), which is levied on local landowners in Brazil.

In addition to public revenue goals, the ITR was created to increase agricultural land productivity. Low agricultural productivity means that increased production requires the expansion into new (forested) areas. Land taxes can create an incentive against such expansion and therefore stimulate improvements in productivity. The ITR charges larger, low-yield properties a higher tax rate than smaller, more productive land (figure B12.1.1). Beyond its effect on land productivity and expansion, the ITR can also have a broad effect on rural development; by encouraging more productive use of land, the tax can stimulate increases in production, income, and jobs.

FIGURE B12.1.1

PROPERTY TAX RATES ON RURAL PROPERTY ACCORDING TO DEGREE OF LAND USE AND SIZE OF PROPERTY



ITR revenues increased after federal reforms allowed municipalities a greater role in tax administration and collection. In 2003, Brazilian municipalities gained the right to oversee the administration and collection of the ITR and can keep 100 percent of the revenues collected if they enter into an agreement with the Special Secretariat of the Federal Revenue of Brazil (RFB).[b] Largely as a result of this reform, the amount of revenues collected through the ITR in the Legal Amazon jumped from $17 million in 2000 to $240 million in 2017.

Despite this increase in revenues, ITR collection is still below its potential. Not all municipalities have taken advantage of their ability to oversee and keep tax revenues: In 2018, only 38 percent of municipal governments had signed the agreement with the RFB. If ITR collection were improved, it has the potential to improve conservation outcomes for 93 million out of 110 million hectares of deforested land in agricultural use in the Amazon. Low collection also limits the ability of municipalities to provide goods and services, which to a large extent depend on tax transfers collected by state and federal governments. To improve ITR collection, administrators should focus on technical adjustments to the tax calculation process[c] and measures to prevent political barriers to tax enforcement, among other actions.

Source: Based on Pereira, Barreto, and Baima 2019.

a. See box 3.1 in chapter 3 for more details on land taxes.

b. Before this policy reform and without entering an agreement with the RFB, municipalities keep only 50 percent of the ITR.

c. For example, the land value index (VTN) used to calculate the ITR does not correspond with current market values; in 58 percent of municipalities, the VTN used in ITR calculations was 25 percent below the market average. Updates should also be made to the land productivity index: The current index is based on data from 1985 so that even low productivity lands meet the minimum degree of utilization and therefore pay lower tax rates.

Taxation and tariffs. Governments could use taxation and tariffs (as well as tax expenditures) to create incentives for producers to engage in more environmentally friendly and climate-smart practices. For example, the Brazilian Rural Property Tax (ITR) was established not only to raise revenues but also to act as a regulating force, taxing unproductive property at a higher tax rate than productive property.[15] Taxes and tax expenditures can also be used to make targeted technologies more attractive and create a network of agencies responsible for disseminating agricultural technologies (Pirard and Belna 2012). For example, taxes on fertilizers or pesticides can be used to promote input efficiency (Vermeulen et al. 2012). In particular, export taxes that penalize agricultural exports may be able to discourage expansion of agricultural commodities (Pacheco 2006).[16] Furthermore, combining taxation with voluntary instruments like sustainability certifications may be able to reduce agriculturally driven deforestation even in countries with limited administrative capacity.[17] See boxes 12.1 and 12.2 for a discussion of various fiscal policy instruments used to reduce deforestation in Brazil.

15 Unfortunately, the ITR has been largely ineffective as a result of several design flaws: (1) the Livestock Capacity Table (which sets the minimum levels of productivity) has not been updated since 1980, and (2) the land value is self-declared by the landowner and is often depreciated, rather than based on the market price of the land. However, these problems could be addressed relatively easily by updating these parameters, along with other measures to increase compatibility with environmental legislation (Instituto Escolhas 2019).

16 For a more detailed discussion on export tariffs, see chapters 8 and 11.

17 See chapters 6 and 7 for more details.

BOX 12.2 FISCAL POLICY TO REDUCE DEFORESTATION FROM CATTLE RANCHING: THE CASE OF MATO GROSSO, BRAZIL

AVERY COHN, CORNELIUS FLEISCHHAKER & GABRIEL ABRAHÃO

Given its role as home to much of the Amazon rain forest as well as the largest commercial cattle herd in the world, Brazil plays a crucial role globally for GHG emissions from deforestation linked to cattle ranching. Ex-ante models of fiscal policy suggest that taxes and subsidies aimed at incentivizing intensification of cattle ranching in Brazil could lead to considerable sparing of forests and GHG abatement. Such policies are starting to be put into practice.

Cattle ranching intensification is a promising option for reducing deforestation and GHG emissions. The typical Brazilian cattle ranching system is extensive, with large extensions of pasture with little management, supporting very few heads of cattle per hectare. Most emissions linked to cattle in Brazil do not come directly from the ranching activity but from the substitution of natural vegetation with pastures to support these extensive systems (Bustamante et al. 2012; Cederberg et al. 2011), as pastures are the main destination for deforested land in Brazil (Arvor et al. 2012; Byerlee et al. 2010; Macedo et al. 2012). Although a reduction of pasture area cannot be directly attributed to a proportional reduction in deforestation as a result of the complex land use and land tenure dynamics in the region (see for example, Bowman et al. 2012; Cohn et al. 2016; Morton et al. 2006), promoting more intensive cattle ranching systems has been advocated as one of the most promising options for reducing GHG emissions in Brazil (for example, Byerlee et al. 2010; Gouvello 2010; Stocco and Ferreira Filho 2019), and is a central part of the country's actions to achieve its GHG mitigation targets (De Oliveira Silva et al. 2018; UNFCCC 2015).

If these more intensive systems were widely adopted throughout Brazil, it could be possible to increase cattle production without deforesting more land. Intensification of cattle ranching could even free up land for the expansion of other crops, further increasing production (Gouvello 2010; Strassburg et al. 2014). As they still rely on pastures, these systems are commonly called semi-intensive to distinguish them from full confinement systems that, although growing, are still relatively uncommon in Brazil (Vale et al. 2019).

Relatively simple management practices can more than double productivity with fertilization, rotational grazing, feed supplementation, and reproductive management (EMBRAPA 2011). More complex integrated crop-livestock-forestry systems can lead to even higher improvements in stocking rates, among other benefits such as the revenue from alternative land uses, risk amortization, breaking of pest cycles and better soil quality (Gil, Siebold, and Berger 2015). All those systems use more inputs but can be much more profitable despite the higher up-front costs. Besides using less land per head of cattle, in some cases those systems also emit less direct GHGs per kilogram of meat produced (for example, Bogaerts et al. 2017), and integrated systems promote carbon storage in the soil (Brazil 2012). However, important questions remain as to which policies can be implemented to achieve large-scale adoption of more intensive systems and how effective they can be.

Fiscal policies designed to foster adoption of intensive systems must make them more attractive than the extensive systems, either through incentives to intensive systems or disincentives to extensive ones (Cohn et al. 2014). Taxes per unit of product and on inputs to production are examples of the former (Gerber et al. 2010). Either way, these policies promote intensification but also generate market-mediated changes that can lead to side effects undermining the GHG mitigation potential of the policy. For example, a policy that disincentives low productivity systems by increasing their cost increases the price of the agricultural product, which can stimulate more production locally and in other regions (Cohn et al. 2014), possibly leading to more emissions as well as compromising food security by making the product less affordable for consumers. Also, stimulating intensification in regions near deforestation frontiers and far from markets can lead to increased land rents and stimulate more deforestation in the region instead of sparing land (Fontes and Palmer 2018; Stevenson et al. 2013).

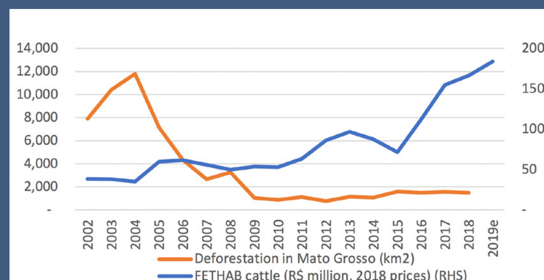
Both taxes and subsidies can be effective in incentivizing intensification. Cohn et al. (2014) studied the net effects on agricultural outcomes, land use changes, and GHG abatement resulting from two potential targeted policies in Brazil: a tax on cattle from conventional pasture and a subsidy for cattle from semi-intensive pasture. Under either policy, Brazil could achieve considerable sparing of forests and abatement of GHGs, in line with its national policy targets. The land spared, particularly under the tax, is less than proportional to the productivity increased, indicating leakages due to a rebound effect. However, the tax, despite prompting less adoption of semi-intensive ranching, delivers slightly more forest sparing and GHG abatement than the subsidy. This difference is explained by increased deforestation associated with increased beef consumption under the subsidy and reduced deforestation associated with reduced beef consumption under the tax. Complementary policies to directly limit deforestation could help limit these effects. GHG abatement from either the tax or subsidy appears inexpensive, but over time the tax would become cheaper than the subsidy. A revenue-neutral combination of the policies could be an element of a sustainable development strategy for Brazil and other emerging economies seeking to balance agricultural development and forest protection.

An existing per head cattle tax in the state of Mato Grosso could have some of the attributes of a tax that favors intensification. Mato Grosso has, since 2000, collected per unit fees on agricultural commodities under a program named FETHAB (Fundo Estadual de Transporte e Habitação–State Fund for Transportation and Housing). Commodities produced for export are exempt from the States' Goods and Services Tax (ICMS) by Federal legislation. The FETHAB therefore is a tool for the Mato Grosso government to obtain revenue from the highly productive, export-oriented agriculture sector in the state. Rather than charging an ad valorem tax, the FETHAB applies a fixed fee (adjusted regularly for inflation) per unit of agricultural product (for example, per tonne of soy beans, per head of cattle), thus resembling the setup of a tax on externalities (see chapter 1 for more details on environmental taxation).

Although not by design, it is expected that this levy contributes to the intensification of livestock practices and therefore to a reduction in deforestation and GHG emissions.

The introduction of the levy on wood in 2000 is cited as having contributed to reduced deforestation.[a] The levy on cattle is estimated to amount on average to a tax per tonne of CO_2-equivalent of up to $7.80.[b] Since the tax on cattle is a per head levy, the effective tax rate varies significantly depending on the weight of the animal and quality (value) of the beef. The effective tax rate is highest on cattle produced by inefficient farms that produce low-weight, low-value cattle, which is the case of low-input extensive systems. Therefore, the introduction of the tax and increases in the per unit levy are an incentive for intensification of livestock production, which can lead to a reduction in carbon emissions through land sparing.

FIGURE B12.2.1
FETHAB CATTLE REVENUES AND DEFORESTATION



However, economy-wide responses to the tax, such as changes in consumption, will affect its net ecological and economical effects. Those will depend on several factors, such as how prices will respond to such a tax, how producers and consumers will respond to price changes, the distribution of specific systems across the state's territory, and how the government will use the tax revenue. As agriculture in the state is relevant to both global food production and the Brazilian economy, effects on other sectors and the global economy can also be important (Cohn et al. 2014; Zech and Schneider 2019). Fiscal and environmental effects of the tax will also depend on how revenue from the tax is deployed. In the case of the FETHAB, part of the revenue is earmarked for investments in transportation in the municipalities where the tax has been collected.

TABLE B12.2.1 TAX RATES ON VARIOUS AGRICULTURAL PRODUCTS IN MATO GROSSO

PRODUCT	TAX UNIT	LEVY AS OF 2019 (R$)	ESTIMATED AD VALOREM (%)	ESTIMATED CARBON PRICE (US$ PER tCO_2E)
Cotton	R$ per ton	104.60	1.63%	16.41
Soy	R$ per ton	27.86	2.51%	40.82
Maize	R$ per ton	8.36	2.35%	7.08
Cattle (for slaughter)	R$ per ton	32.17	1.2%–3.1%	2.0–7.8
Semi-processed beef	R$ per ton	42.18	0.55%	0.50
Wood	R$ per ton	13.99	2.73%	—

Source: Original calculation based on Mato Grosso data and emissions estimates reported in Cerri et al. 2016 and Raucci et al. 2015.
Note: — = not available.

As part of the revenue from FETHAB is directed at transportation investments, interactions between transportation costs, deforestation, and intensification have the potential to both undermine and enhance the environmental effects of the tax. Although roads are generally associated with deforestation (see, for example, Casella and Paranhos 2014; Soares-Filho et al. 2004), both economic theory and empirical evidence suggest a more complex relationship (Weinhold and Reis 2008). In very remotes areas that have seen little human activity, roads are indeed likely to induce deforestation. However, in regions where a greater proportion of the land is already cleared, reducing transport costs has a much weaker effect and might actually slow the rate of future clearing. Similarly, promoting intensification in remote, pristine areas can lead to more deforestation through land tenure effects, while intensification in areas with lower transportation costs is not only easier to promote but also more likely to have a land-sparing effect (Fontes and Palmer 2018). With such considerations in mind, investments in transportation infrastructure can be planned to maximize positive impacts and avoid environmental impacts (Laurance et al. 2014). Investments should prioritize improving networks in already settled areas. When developing infrastructure in more remote regions, delimitation of protected areas can help minimize negative impacts (Barber et al. 2014).

Applying the tax by land area instead of by unit of product could lead to better mitigation outcomes without compromising its revenue. A land tax applied to pastures (but not to protected areas) would create a direct disincentive for expansion, thus favoring intensification. This would be an incentive for intensive cattle ranching systems, but it would also put a disproportionate burden on activities with less potential earnings per hectare, such as cattle ranching, and favor activities that are more profitable per hectare, such as soybean cultivation. To balance this effect, a combination of per unit and per hectare levies can be conceived not only to generate the same revenue but also to have the same proportion of effective rates between activities.

Despite these caveats, the literature and initial results in Mato Grosso suggest that fiscal policies that incentivize the intensification of cattle ranching can contribute to reduced greenhouse gas emissions. The intensification of cattle ranching, by increasing the stocking rate (animals per hectare), is linked to reduced GHG emissions through avoided deforestation (land sparing) as well as, in some cases, through lower enteric emissions per unit of beef produced.

a. Impacts on cattle are based on discussion with agricultural associations. The impact on wood is studied by Dalfovo (2016).
b. Based on enteric emissions estimates in Cerri et al. (2016) and exchange rate of June 2019.

Subsidy reforms. Even though public spending can yield high returns,[18] governments tend to favor subsidies over public good investments for various reasons. Subsidies such as price supports (51 percent) and producer transfers linked to input or output (34 percent) make up most of the current farm support, whereas only 15 percent is allocated to public goods, such as R&D, infrastructure, and food safety and standards (World Bank 2018).

In terms of efficiency, market price supports tend to be the easiest to implement, with low budget outlays (World Bank 2018); however, these tend to be highly distortionary as they restrict imports or exports, which impacts relative prices and hence deforestation. Governments have recently been shifting from market price supports to less distortionary, direct payments to farmers. In the United States and the EU, these policy shifts have resulted in increased yields and reduced fertilizer use (World Bank 2018). Recent reforms that link payments instead to environmental objectives have been done successfully in Brazil, China, EU,[19] India, and Kenya (World Bank 2015, 2018).[20]

Direct payments, while still encouraging overuse of resources, are less distortionary. Decoupled direct payments to farmers, which are not linked to input or output, tend to be the least impactful on prices and production decisions. Efficiency-enhancing investments in public goods can increase agricultural intensification, and when combined with reforms of preexisting distortionary policies, they can positively influence input use and production decisions (Sova et al. 2018).

Support should be tied to environmental outcomes (Hunter et al. 2017). Farm assistance should be contingent upon compliance with mitigation standards (Vermeulen et al. 2012) and contingent upon environmental practice (Angelsen and Kaimowitz 2001). Direct payments to farmers should be conditional on the adoption of environmentally friendly practices, such as CSA, sustainable intensification, SFM, and enhancing ecosystem services (World Bank 2015).

In addition to the abovementioned specific policy reforms, a number of beneficial agricultural practices and technologies can move agricultural production onto a more sustainable path. To reduce deforestation from agricultural production and expansion, policy makers should consider programs that promote the following:

Climate-smart agriculture. Governments should foster awareness of CSA and "save and grow" models to build natural capital while improving yields and enhancing resilience against climate change (FAO 2011, 2013; Garnett 2012). In particular, investments in capacity building through information and training services would help overcome a major barrier to CSA implementation (Sova et al. 2018). This involves more support for sustainable intensification as well as other interventions (World Bank 2018). Policies to support CSA adoption include R&D investments toward new and better plant varieties (for example, heat-tolerant seeds), extension services and other programs to spread awareness of CSA practices, land use planning, and management, engagement with the private sector to encourage adoption and innovation, institutional reforms, increasing farmer access to input and output markets, and risk-sharing programs (Sova et al. 2018).

18 Subsidies can yield net negative impacts, that is, overuse of resources (World Bank 2018).

19 Under the EU Common Agricultural Policy, 30 percent of direct farm payments require the adoption of environmentally beneficial practices (World Bank 2015).

20 Other environmentally beneficial subsidy reform is already taking place as well. For example, Brazil reformed rural credit to exclude activities that relied on deforestation, invested in stronger enforcement, and provided support (including technical assistance) to sustainable agricultural practices (McFarland, Whitley, and Kissinger 2015); the robust policy combination was successful in reducing forest loss (Assunção et al. 2016).

Sustainable intensification. Governments should promote a wide variety of productivity investments. Policies aimed at agricultural intensification[21] include credit programs, subsidized fertilizers and seeds, irrigation, marketing assistance, and extension programs (ADF 2003; Awotide et al. 2015; Rudel et al. 2009; Udondian and Robinson 2018; You et al. 2011).[22] Subsidies should target distribution of improved crop varieties, and ensure that smallholders have access to techniques and inputs required to increase productivity (McFarland, Whitley, and Kissinger 2015). Policies that target low-forest areas or crops and production methods unsuitable for the agricultural frontier are more likely to reduce deforestation pressures (Angelsen 2010).[23] For example, policies that promote perishable crops and irrigation investments and crop varieties suited for already-deforested areas increase agricultural output in nonmarginal lands, depressing prices and discouraging expansion in other areas (Angelsen and Kaimowitz 2001). Fertilizer subsidies can help promote intensive agricultural practices if they are below market prices (to discourage farmers from using standing forests as a cheap alternative) (Angelsen and Kaimowitz 2001). Input support should be reformed[24] and tied to efficiency (Cohn et al. 2014; Vermeulen et al. 2012). Efficiency gains can be made through promoting smart resource links and enhanced nutrient flows in integrated farming systems, better quality feeds and animal diets, improved energy use, and use of information and communication technologies to facilitate technology transfer (FAO 2019).

Labor-intensive technologies. Labor- (and even capital-) intensive technology may slow rates of deforestation, even if it increases profitability at the same time (Angelsen 2010). Labor-intensive technologies (for example, replacement of shifting cultivation by sedentary annual crop production) reduce pressure on forests while benefiting the poor (Angelsen and Kaimowitz 2001). While labor-intensive technologies can reduce pressure to clear forests when labor is scarce (ibid.), improved agricultural technology (combined with market integration, strong commodity prices, and easy access to land) has led to rapid deforestation (Pfaff et al. 2010). However, labor-saving technologies can promote expansion as a result of lower production costs (Angelsen 2010; Seidl, dos Santos Vila de Silva, and Moraes 2001); therefore, policy reforms that promote labor- (or capital-) intensive technologies should be considered carefully and in conjunction with other reforms.

Targeting commercial versus subsistence agriculture

Agricultural support reforms targeted at limiting agricultural expansion and thus deforestation and forest degradation can be divided into two groups: those appropriate in the case of commercial agriculture and those better suited for subsistence agricultural production (Streck and Zurek 2013). Policy makers should carefully consider which sector is being targeted during the design or reform of agricultural support policies, as the same policy may have contrasting impacts depending on whether it targets smallholders or large operations. For example, in commercial agriculture, a reduction of credit or an increase in input costs may reduce deforestation, whereas the same policy would increase deforestation from subsistence farmers—

21 Such policies have also been called reduced emissions agricultural policy (REAP) (Rudel 2009).

22 Agricultural support policies that increase the expansion of agriculture include government subsidies targeting agro-industrial actives and cattle production, agricultural price support, and government-sponsored resettlement programs (Barbier 2004; Pacheco 2006).

23 In contrast, agricultural support policies (that is, subsidized credit, price supports, infrastructure investment) in forest margin areas with rapidly growing labor forces tend to increase forest clearing (Angelsen and Kaimowitz 2001).

24 "An example of this could include increasing the costs of accessing land, or in the case of timber the price per stump, and simultaneously reducing the overall costs of commodity production by reducing post-production taxes or increasing post-production subsidies. This way the overall level of support to commodity production can be maintained, but a greater emphasis would be placed on investment in productivity without expansion" (McFarland, Whitley, and Kissinger 2015).

for example, by encouraging migration to the forest frontier (Pfaff et al. 2010). The following paragraphs outline key practices in each sector that policy makers should promote to reduce negative environmental impacts from agriculture.

Commercial agriculture

- **Sustainable intensification and CSA.** Policy makers can promote sustainable intensification and CSA by supporting conservation agriculture and no-tillage practices, cover crops and crop rotations, integrated soil and pest management, agroforestry and the use of improved and better adapted crop varieties and new technologies.[25] Policy makers should design intensification policies with appropriate safeguards and regulations to protect forests and avoid negative environmental outcomes. Strong land tenure security and land use planning and zoning as well as strong regulatory measures are necessary to ensure that intensification does not increase expansion into forests (Streck and Zurek 2013).
- **Shifting production to degraded land.** Specially designed lending schemes, tax breaks, and low-interest funding can be implemented to encourage farmers to shift production to already-degraded lands (Angelsen and Kaimowitz 2001). Investments in R&D as well as extension services are another important component of this policy goal.
- **Enacting demand-side measures.** Market incentives (for example, public procurement, eco-labeling, consumer awareness campaigns) as well as supply chain links (for example, certification systems, responsible sourcing policies) and accountability and transparency networks (for example, MRV systems, information sharing) are all important policies for influencing commercial operators and their commodity chains (Streck and Zurek 2013). See box 12.3 for examples of demand-side reforms in France.

Subsistence agriculture

- **Addressing market constraints.** Policies that address the market constraints faced by smallholders and subsistence farmers include land tenure reforms ensuring rights to land, strengthened institutional arrangements (for example, credit services, extension programs), enhanced access to resources, increasing smallholder productivity, and building local capacities for sustainable management.
- **Sustainable intensification and CSA.** Policies for subsistence and smallholder agriculture should encourage labor-intensive innovations to avoid increased expansion pressure on forests. Whereas capital-intensive technologies allow farmers to expand the area under cultivation (Angelsen and Kaimowitz 2001), labor-intensive policies tend to benefit the poor more than capital-intensive policies, which tend to displace labor to the agricultural frontier (Streck and Zurek 2013). Capital-saving technologies include those which improve input efficiency, erosion control measures, and integrated pest management practices. Government-supported fertilizer programs in combination with support for sedentary agricultural systems are potentially effective in encouraging intensification without expansion but are less suited to the forest frontier region (Angelsen and Kaimowitz 2001). Agroforestry should be promoted among subsistence and smallholder agricultural producers as it has been shown to both reduce costs and increase yields. In addition, a number of environmentally beneficial practices are available

25 New technologies include high-yielding varieties, introduction of new crops, integrated fertilizer application and pest control, and improved fallows.

and should be promoted for smallholders (World Bank 2015). Information campaigns and training programs can overcome barriers related to capacity (Sova et al. 2018), while tax expenditures or subsidized credit can provide incentives needed for smallholders to adopt beneficial technology.

Complementary policy to reduce deforestation from agricultural expansion

A number of broader policies and institutional reforms are necessary to reduce deforestation from agricultural production and promote climate-smart agriculture, including "sustainable intensification" (World Bank 2015). In particular, policies that enable land users to capture a higher share of the benefits provided by forests (such as protected areas, institutional arrangement reforms, and payment mechanisms) are particularly effective for forest conservation (Angelsen 2010).

Most important, strong enforcement against encroachment into forests is needed (Angelsen and Kaimowitz 2001; Byerlee, Stevenson, and Villoria 2014; McFarland, Whitley, and Kissinger 2015). A range of regulatory policy measures are necessary to complement agricultural intensification support policies, including protecting high conservation value forests, regulations on forest clearing, land use zoning, and satellite monitoring of forest cover.

Policy makers should ensure that sectoral public policy is harmonized, including agriculture, trade, infrastructure, regional control, migration programs, and so on. For example, the Selva Lacandona region in Chiapas, Mexico, restructured rural development policies to adhere to its REDD+ readiness framework (Pirard and Belna 2012).

Infrastructure policies should be evaluated to ensure they do not inadvertently promote deforestation. Agricultural infrastructure investments have mixed impacts on deforestation. Transport infrastructure investment decisions need to consider the potential impacts on forests (Angelsen 2010). In particular, policies that encourage migration toward the forest frontier tend to increase deforestation (Pfaff et al. 2010) and should be managed cautiously. However, if carefully designed and accompanied by complementary measures, improved infrastructure can play a role in intensification by lowering the effective costs of inputs to farmers (Byerlee, Stevenson, and Villoria 2014).

The adoption of payments for ecosystem services programs is one of the most effective policies in reducing deforestation and forest degradation; see chapter 1 for more details (Angelsen 2010; Pirard and Belna 2012; Vermeulen et al. 2012). In addition to providing important incentives to landowners for preservation, results-based conservation payments (that is, PES or REDD+) can compensate for certain agricultural support policy reductions. For example, in areas where agriculture is marginally profitable and forest encroachment is a high risk, subsidies can be reduced and PES can compensate for this reduction (Pfaff et al. 2010).

Policy makers can implement measures to act on global demand.[26] To address potential rebound effects from lower agricultural prices, policies are needed that can impact global demand. Not all countries will need to follow the same food transition (Chaumet et al. 2009), and efforts need to be made to reduce food demand by reducing waste (West et al. 2014) and shifting diets (Davis et al. 2016). Taxes based on carbon content may be effective in shifting demand (Zaks et

26 Particular policy mechanisms that address international demand are discussed in chapters 7, 8, and 11.

al. 2009); see chapter 6 for more details. Voluntary markets and consumer-related incentives (for example, eco-labeling) are additional options that can help influence demand (Byerlee, Stevenson, and Villoria 2014; Tilman et al. 2002).[27] See box 12.3 for examples of demand side and other agricultural policy reforms undertaken in France.

BOX 12.3 THE ROLE OF GLOBAL DEMAND ON DEFORESTATION: THE CASE OF FRANCE

NICOLETTA BATINI

As major importers and consumers of many commodities that include embodied deforestation, **advanced economies are both responsible and a potential solution to halting deforestation by adopting more coherent approaches, including via shifts to consumption**.

France is an interesting example. The French forest area has increased significantly since the mid-19th century, partly as a result of the progressive abandonment of total land farmed, and it continues to grow, gaining on agricultural lands, wastelands, and heathlands, albeit at a slowing pace. However, France's demand for forest products outstrips supply, and the sector is in difficulty (Solagro 2016), generating increasing imports of wood from tropical forests. In addition, to feed its huge bovine herd—the largest in the EU—France imports large volumes (1.5 million tonnes yearly) of genetically modified organism (GMO) soybeans grown by permanently displacing tropical rain forest. Europe's imports of agricultural products—ranging from beef and soybeans from Latin America to palm oil from Southeast Asia and cocoa from Africa—are responsible for more than a third of deforestation (EC 2013).

To fight imported deforestation, France recently adopted an ambitious new national strategy (*Strategie Nationale de Lutte contre la Deforestation Importée 2018–2030*), using trade to help decouple economic development from tree-cutting and unsustainable agriculture in poorer countries. The plan, which pioneers the implementation of a European plan advocated by a wider coalition including Denmark, Germany, Italy, the Netherlands, Norway, and the United Kingdom to eliminate deforestation from agricultural commodity chains and move to a fully sustainable palm oil supply, proposes to stop **importing commodities linked to deforestation and unsustainable agriculture by 2030**.

The strategy includes practical measures to help companies meet their own goals for combating the import of products linked to deforestation and encourage financiers to take environmental and social issues into account for investment decisions. But while the plan promises key regulatory changes from origin certification to consumers' sensitization, reducing imports of wood and soybeans implies primarily changing production systems in France to (i) reduce France's bovine herd by shifting production from animal-based to plant-based proteins; (ii) validate the new supply with a shift in demand via a shift in diets; and (iii) develop French agroforestry and the production and harvesting of associated crops.

To this end, existing French-specific agri-food and forestry transition scenarios could be used to set up production and consumption targets for the agri-food market in 2030 and 2050. Among these, Afterres2050, the most comprehensive study currently available, can provide both practical benchmarks for interim (2030) and final (2050) supply and demand levels and an analysis of socioeconomic outcomes associated in expectation with the recommended sectoral shift. Batini (2019) examines several policy tools to accelerate the country's ambitious agri-food reform agenda, comprising a range of interventions that financially motivate (fiscal levers) as well as nudge and empower (structural reforms) firms and individuals to make the required behavioral changes will be necessary.

27 Fiscal policies to promote eco-labeling and sustainability certification are discussed in chapters 7 and 8.

ON THE SUPPLY SIDE, SPECIFIC INTERVENTIONS TO CHOOSE FROM INCLUDE THE FOLLOWING:

i. A recalibration of direct and indirect taxes and social security contributions on agri-food production and agri-food sales based on the level of externalities these generate. For example, net profits from conventional animal farming (which involves feed crops from deforested areas) should be taxed more than net profits from pasture/raised organic animal farming, as the former are associated with deforestation externalities, whereas the latter are not. By the same token, a recalibration of the system of subsidies to agri-food production to better reflect the level of externalities it generates on global deforestation. For example, animal-based protein production from faming livestock in excess of transitional targets should receive no subsidies or relatively less subsidies than plant-based protein production that implies no deforestation.

ii. A recalibration to the way subsidies from the Common Agricultural Policy are allocated in France once received using the flexibility in the allocation of subsidies to member countries in the context of both pillar 1—funded by the European Agricultural Guarantee Fund—and pillar 2—that is based on Rural Development Programs cofinanced by the European Agricultural Fund for Rural Development and EU member states. Main areas of flexibility include (a) transfer of funds from pillar 1 to 2 or vice versa to shift support in favor of low- or no-deforestation-externality-generating activities; (b) targeting to desired commodities commodity-specific payments funded from the national budget in addition to SAPS aid, including through the transitional national aid scheme; (c) leveraging of rules under the Common Agricultural Policy's new voluntary coupled support to allocate a larger subsidy envelope to desired production (that is, low-deforestation-externality crops and breeds) subsectors or regions (to better tailor the use of domestic resources/energy to low-externality crops and breeds).

ON THE DEMAND SIDE, POLICY MEASURES COULD FOCUS ON THE FOLLOWING:

i. A recalibration of indirect taxes on consumption and retailing based on the level of deforestation externalities these generate. For example, a (Pigouvian) tax on meat and dairy for livestock fed with crops from, or directly imported from, deforested areas, calibrated to the elasticity of French-specific demand and the desired quantity equilibrium for these foods, along the lines of what was proposed by Simon (2013) and Joyner and Warner (2013) for the United States. The success of these taxes in shifting consumption is well known for tobacco smoking. Tax credits could be introduced to offset the potential extra tax burden on each taxpaying individual or family (after adjusting for lower consumption) from the recalibration of indirect taxes so that consumers' ability to eat will not be diminished. The credit could be funneled via tax credits on specific plant-based foods or foods not associated with deforestation, to ensure proper targeting to consumers who have embarked in an actual demand shift toward sustainable produce.

Structural reforms to shift supply and demand could include a combination of regulatory, education-reinforcing, and financially incentivizing steps. Prominent examples comprise (a) incentives for all voluntary greening schemes beyond those linked to direct payments under the Common Agricultural Policy and in line with the "4‰ Initiative" under the 2015 Lima Paris Agenda for Action; (b) food-waste reduction schemes beyond those provided in the 2018 Food and Agriculture Bill; (c) sponsoring food-industry businesses initiatives to research, test and scale up new strategies and plans that help consumers select sustainable foods; (d) public campaigns to raise awareness about the public environmental impact of alternative food choices beyond existing government plans; (e) more ambitious mandatory targets for the type, combination and quantity of food served in public canteens; and (f) regulatory marketing and retailing reforms to encourage the demand of deforestation-free food and/or discourage the demand for deforestation-generating food.

Land tenure and migration policy reforms can also be used to reduce agriculture's environmental impact on forests. While land reforms that strengthen tenure rights can contribute to higher yields (Holden, Deininger, and Ghebru 2009), they can actually increase deforestation by increasing the net present value of land clearing (Angelsen, 1999; Araujo et al. 2009). However, *insecure* tenure may also contribute to forest degradation and agricultural expansion (Angelsen 2010). Net impacts of tenure reforms are therefore context specific. Often, forest conversion is used to establish property rights (Alston, Libecap, and Mueller 2000; Araujo et al. 2009; Rudel 1993); thus, at minimum, provisions linking property rights with forest clearing should be removed. Additionally, migration policies that encourage resettlement into forest margins should be reformed so that policies attempting to promote rural development do not do so at the expense of forest landscapes (Peres and Schneider 2012).

Policy makers should ensure stakeholder participation and coordination during reform processes (Elgert 2015). Stakeholders may vary in their strategic preferences regarding policy responses to agricultural expansion. For example, in an empirical analysis in Ethiopia, *policy* stakeholders preferred a land-sparing approach, while *implementation* stakeholders preferred a land-sharing approach as it aligned with existing informal institutions (Jiren et al. 2017).[28] This preference alignment is reflected across developing countries; while land-sharing policies are present, the land-sparing approach dominates (Loconto et al. 2019; Mertz and Mertens 2017). It may also be more appropriate to implement a mixed approach (Habel et al. 2015; Law et al. 2015; Mertz and Mertens 2017). Agricultural landscapes are complex systems; in addition to ecological aspects, social and institutional dimensions need to be considered in land use strategies.

28 Furthermore, preferences were influenced by household income levels; poor farmers tended to prefer land sharing, while richer landholders preferred land sparing, presumably because richer households are more able to afford more expensive inputs and produce for market exchange. See Jiren et al. (2017) for more details.

TABLE 12.3
ADVANTAGES AND DISADVANTAGES OF DIFFERENT FOREST CONSERVATION POLICIES

INSTRUMENTS	STRATEGIES	ADVANTAGES	DISADVANTAGES	APPLICATION
Payments for services	Payments for conservation efforts, tree planting, improved agricultural management, etc.	Increases financial attractiveness of alternative practices; results based	Relies on local institutions, implementation and enforcement capacities	Policies Programs
Payments for GHG emission reductions and removals	Market transactions for emission reductions credits; monetization of (future) emission reductions	Increases financial attractiveness of projects that might not otherwise be feasible; direct link to mitigation benefits	Requires significant area as well as effective management and benefit sharing	Programs Projects
Debt	Preferential loans that subsidize particular inputs/practices	Sources of financing for technology, labor and other investments	Requires collateral and revenue stream; repayment risk; difficult to find local lenders	Programs Projects
Tariffs and taxes	Tax incentives to support policy objectives; enhanced tax deductibility and tax rebates; removal of taxes that create perverse incentives	Steers investment into activities that would otherwise be economically unrewarding	Relies on tax discipline and collection; limited relevance for smallholders	Policies
Grants	Financial support to projects that serve the public interest, often provided by governments or not-for-profit organizations	Increases the financial attractiveness of projects that might otherwise not be economically feasible; comes at no cost for smallholders	Availability is limited and continuity is uncertain; unlikely to cover entire investment costs	Programs Projects
Insurance	Weather, political, and crop insurance; other risks	Shifts investment and adoption risk away from smallholders	Inappropriate use distorts markets; excessive risk taking	Policies Programs
Loan guarantees	Mitigation of political or credit risks in public or private sector loans	Effectively mobilizes co-financing from external sources; leverage potential for long-term debt finance for development	Risk of principal loss for issuer of guarantee	Policies Programs

Public-private partnerships	Financial and policy support for targeted investments	Flexible model accommodates multiple instruments; proven in large-scale project investments	Historically favored larger investment projects; risk of benefits accruing to larger private players rather than smallholders	Policies Programs
Labeling and certification	Voluntary initiatives; supply chain investments	Pilots can inform public policy; can result in large investment if high market demand	Transaction costs of verification and certification may be prohibitive for smallholders; price premiums uncertain	Policies Programs

Source: Adapted from Streck and Zurek 2013.

Conclusion

The agriculture sector is a major driver of deforestation. While there are substantial (international) market forces that affect agriculture's impact on forests, domestic decisions made by policy makers may also be able to influence this impact. Policies and programs designed to promote commercial agriculture often result in rapid expansion with significant consequences for converting forests and other natural habitats to agricultural production. In other circumstances, insufficient public policy support—typically investment in essential public goods such as R&D, advisory services, connectivity (roads and communication)—or the enabling environment through which appropriate policies for attracting private investment in value chains can perpetuate subsistence agriculture and, with continued population growth, put a different pressure on natural habitats for subsistence agricultural expansion.

Agricultural support policies thus play a significant role in driving deforestation from the expansion of agriculture in various ways. For example, public support policies can promote expansion through their impact on prices and in combination with low capacity to enforce other policies, or by allocating limited public expenditures toward subsidies that crowd out public goods investments. Policy planning and evaluation do not usually consider the impact on forests (though this is recently changing to include environmental impacts), nor do they pay needed attention to the long-term and hidden costs of the distortions such policies create.

Reforms to agricultural support policies may be able to help reduce agriculture-driven deforestation. Removing coupled (for example, input- or production-based) subsidies, replacing them with decoupled transfers (for example, income), or explicitly tying payments to environmental outcomes (as payments for environmental services) would remove the distortionary impacts on producer decisions and encourage environmental stewardship, including preservation of natural forests. Such reforms would go a long way in moving toward economically, socially, and environmentally sustainable agricultural systems.

An important message from the experience so far is that complementary measures in addition to fiscal reforms will be necessary to limit deforestation from agricultural expansion. Fiscal policy is not a panacea. In particular, strengthened enforcement against forest encroachment will be essential to limit forest destruction.

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13

Forest-Smart Fiscal Reforms for Extractive Industries

TUAN MINH LE & ERIN HAYDE

Introduction

The extractive industry (EI) contributes to deforestation and forest degradation in many ways, both direct and indirect. It directly contributes to deforestation through land clearing, waste discharge, and other production processes. The EI sector also indirectly contributes to deforestation, in particular through infrastructure development that opens previously isolated forest areas to human encroachment and economic activity. EI activity is also expanding in ecologically sensitive forest basins, threatening ecosystem services, biodiversity, and other important benefits provided by forests.

Despite the (sometimes considerable) environmental costs incurred because of EI activity, fiscal regimes do not typically include environmental considerations. Most fiscal regimes for the EI sector focus on promoting industry investment, industry expansion, and (increasingly) formalization or efficiency improvements.[1] Given that in many countries the EI sector is a key component of economic development, policy makers will need to carefully consider the various impacts of any potential fiscal reform.

There is an opportunity to reduce deforestation and forest degradation associated with extractive industries by reforming the sector's fiscal regime. There are multiple opportunities to better incorporate environmental considerations into the fiscal regime of extractive industries. Specific instruments might be particularly effective that can be applied under a wide variety of governance arrangements, such as reforming fiscal incentives that inadvertently contribute to forest loss, increasing production- and area-based charges, and implementing variable environmental taxes and taxation-and-rebate mechanisms. These reforms also have benefits beyond the creation of beneficial environmental incentives: They can contribute toward domestic resource mobilization, reduce enforcement and monitoring costs, and complement and strengthen the impacts of other "forest-smart" policies.

Fiscal policy reforms are nested within a forest-smart policy approach. Environmental fiscal reforms are not a silver bullet. There are many interrelated causes of environmental

1 One exception is the use of performance bonds for mine reclamation, which was implemented by many developed countries (some as early as the 1970s) in response to widespread crises of "abandoned mines" whereby mining companies defaulted on their obligations to restore degraded land post-operation.

degradation from EI sector activity. As such, policy makers need to adopt a comprehensive, forest-smart approach, which includes strengthened governance and institutional capacities, promoting responsible corporate behavior, empowering communities, and engaging civil society stakeholders.

The Extractive Industry's Impact on Forests

EI production can cause a range of impacts to forest landscapes. EI activity can be associated with a range of deforestation—from undetectable to very significant levels—depending on a number of factors.[2] Policy makers should look beyond deforestation as a measure of impact: The effects of extractive industries on forests can be complex and may not be detectable through satellite imagery.[3]

EI operations have *direct* impacts on forests. The EI sector is one of the main drivers of tropical and subtropical forest loss after agriculture, logging, and urbanization, especially in Africa and Asia (McFarland, Whitley, and Kissinger 2015). Large-scale mining (LSM) can directly cause major amounts of deforestation because of its large footprint, tailings dam failures, and waste disposal implications (World Bank 2019). Artisanal and small-scale mining (ASM) has a comparatively minor direct impact on forest loss, though there are exceptions to this (World Bank 2019). Furthermore, direct forest loss from EI operations may also be more intensive than for other land uses; in Brazil, deforestation within "leases was triple the average Amazon clearing rate" (Sonter et al. 2017). While deforestation related to the EI sector may make up a small portion of *global* forest loss, in certain countries, such as in Suriname, it is the lead driver (World Bank 2019). This forest loss reduces biodiversity, reduces the ability of forests to provide ecosystem services, impacts the livelihoods of forest-dependent communities, and contributes to climate change. Direct impacts on forest degradation (such as the pollution of air, soil, and water) come from the disturbance of habitats, basic siltation from tailings mismanagement, and the release of heavy metals and toxins (World Bank 2019). These impacts can often be more severe than deforestation, with long-lasting impacts. Indeed, post-mining forest recovery is often slow and "qualitatively inferior compared to regeneration following other land uses" (Peterson and Heemskerk 2001).

EI operations also have *indirect* impacts on forests. While the EI sector *directly* causes a relatively small amount of total deforestation, the *indirect* (or induced) impacts on deforestation are much stronger.[4] For example, in the Amazon Basin indirect or induced deforestation from the EI sector is 12 times greater than that of on-lease (Sonter et al. 2017). One of the most significant indirect impacts on forests from the EI sector is human encroachment into previously isolated forest landscapes. This effect occurs in almost all LSM and many ASM sites (World Bank 2019). High road density is also a key driver of forest degradation; the expansion of roads and railways increases access to forests for various economic activities, which can result in negative environmental and social consequences (World Bank 2019).[5] For example, in Ecuador much of Amazonian deforestation was the result of colonization along oil access roads (Finer et al. 2008). In northern Guatemala, oil and gas development contributed to settlement and expansion of

2 These factors include the type of mineral or compound in question and its distribution, depth, and extraction method, among others (World Bank 2019).

3 For example, the potential effects include species disturbance, changes in forest structure and function, illegal trade, contamination of water and soil, and loss of cultural value (World Bank 2019).

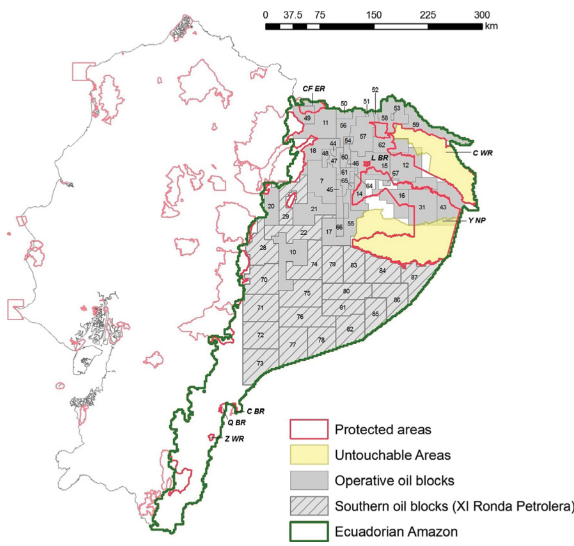
4 See Hund et al. (2013) for a detailed discussion of the direct, indirect, induced, and cumulative environmental impacts from the EI sector.

5 The World Bank estimates that for every kilometer of new roads built through forests, 400 to 2,400 hectares are deforested and colonized (Ledec 1990).

slash-and-burn agriculture within the Maya Biosphere Reserve (Rosenfeld, Gordon, and Guerin-McManus 2003).

EI sector activity is increasingly located in ecologically sensitive forests. Hund et al. (2013) found that a third of all active mines and exploration sites are situated in high conservation value areas and stressed watersheds, and certain exploration permits also overlapped with REDD+ projects.[6] In Ecuador, although 32 percent of the Amazon is already covered by operative oil blocks, the government plans to further intensify production to cover 68 percent (Lessmann et al. 2016); see figure 13.1. In contrast, protected and "untouchable" areas cover just 22 percent of the forest. Furthermore, many of these protected and untouchable areas are overlapped by oil and gas blocks, so only 16 percent of the Ecuadorian Amazon is protected and free from oil and gas development (Lessmann et al. 2016). Such expansion makes the environmental damages from EI activity especially concerning.

FIGURE 13.1
OIL AND GAS BLOCKS IN THE ECUADORIAN AMAZON



Source: Lessmann et al. 2016.
Note: Solid gray indicates operative blocks. Hashed gray indicates southern oil blocks, part of the XI Ronda Petrolera. Protected areas are Yasuní National Park (Y NP), Cuyabeno Wildlife Reserve (C WR), Limoncocha Biological Reserve (L BR), Cofán Bermejo Ecological Reserve (CB ER), El Quimi Biological Reserve (Q BR), El Cóndor Biological Reserve (C BR), and El Zarza Wildlife Reserve (Z WR).

Increasing demand will be placed on the extractive industry sector. High commodity prices, national development objectives, and the global transition to a low-carbon economy are already impacting the expansion of EI activity (Asner et al. 2013; Bebbington 2012; Lessmann et al. 2016; Alvarez-Berríos and Aide 2015; EIA 2018; RAISG 2018; Reed and Miranda 2007). The global transition away from fossil fuels toward renewable energy sources will increase the demand for certain minerals (World Bank 2017). One important example is cobalt, which is used in the production of rechargeable batteries for cell phones, computers, and electric vehicles. More than half of global production comes from a single country, the Democratic Republic of Congo, and a large amount of this production is unsustainable both environmentally and in terms of human health and welfare (Nkulu et al. 2018). Therefore, policies are needed to ensure that mineral extraction can meet future demand in an efficient and environmentally and socially responsible manner.

Special Features of Extractive Industries: Paradox of Plenty

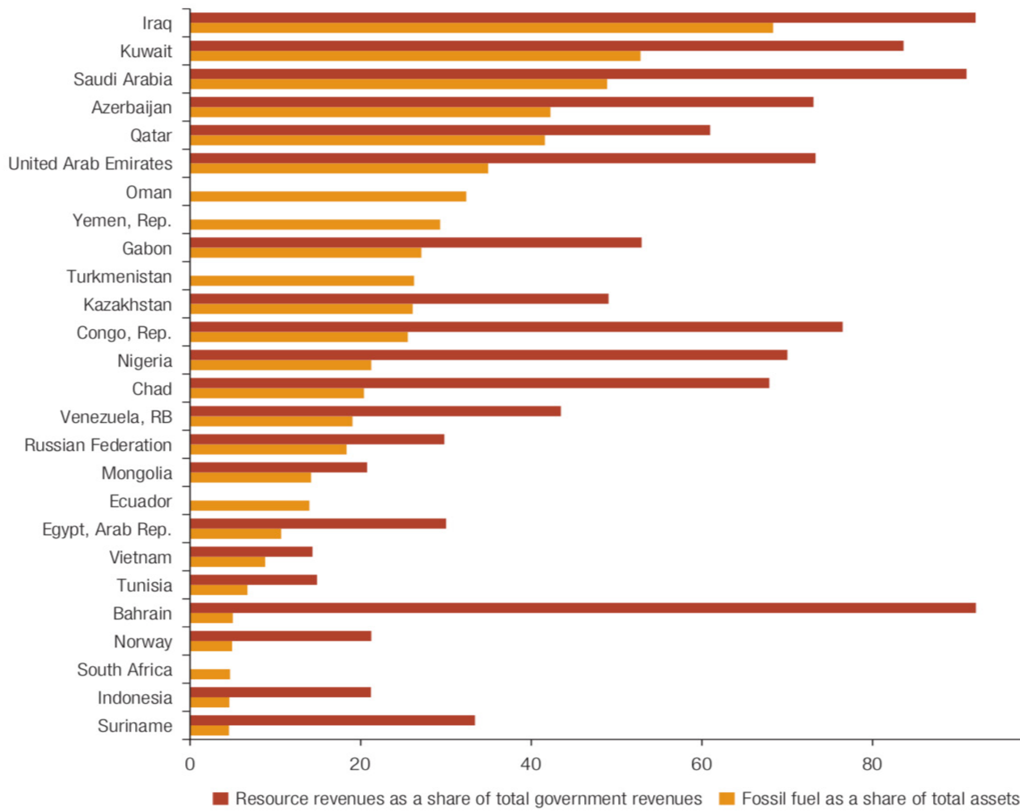
Blessing or curse?

In many countries, particularly resource-dependent countries, the EI sector is a key component of economic growth and development. It can significantly contribute to government

6 This overlap may be an intentional strategy in some cases: For example, both Ecuador and Bolivia explicitly allow oil and gas exploration within national park boundaries (Finer et al. 2008).

revenue (figure 13.2) as well as provide other important economic benefits—for example, by providing rural employment opportunities. The sector is also crucial for the low-carbon energy transition and a resource-efficient economy (World Bank 2017). When the extractive industries are well managed, they can be a significant boon to the domestic economy.

FIGURE 13.2
FOSSIL FUEL ASSETS COMPARED WITH GOVERNMENT REVENUES, 2010–2014



Source: Lange, Wodon, and Carey 2018.

However, the link between the EI sector and economic growth and development is not automatic; it depends on country-level factors such as domestic institutions and macro-management (for example, see Bailey 2014; Barma et al. 2012; Mehlum, Moene, and Torvik 2006; and Auty 1993). For example, out of the 24 countries that have remained low-income since 1995, two-thirds are classified as resource-rich states or fragile and conflict states, or both, indicating that the availability of resources alone does not guarantee development (Lange, Wodon, and Carey 2018). With weak institutions, poor legal frameworks, and insufficient local capacity, the EI sector can be damaging to domestic economies. For example, the negative environmental externalities resulting from EI production may outweigh the sector's contributions to gross domestic product. Alternatively, the development of the sector could lead to the so-called Dutch disease, leading to a relative economic decline, irrespective of environmental damages (see box 13.1 for more details on Dutch disease and a way in which it might be harnessed to improve forest-related environmental outcomes). A careful examination of the special features of the EI sector as well as its contributions to both the economy, society, and the environment will help determine how the sector should be promoted through fiscal policy.

BOX 13.1 DUTCH DISEASE: CAN FISCAL POLICY ON FOSSIL FUELS IMPACT PRICE INCENTIVES FOR DEFORESTATION?

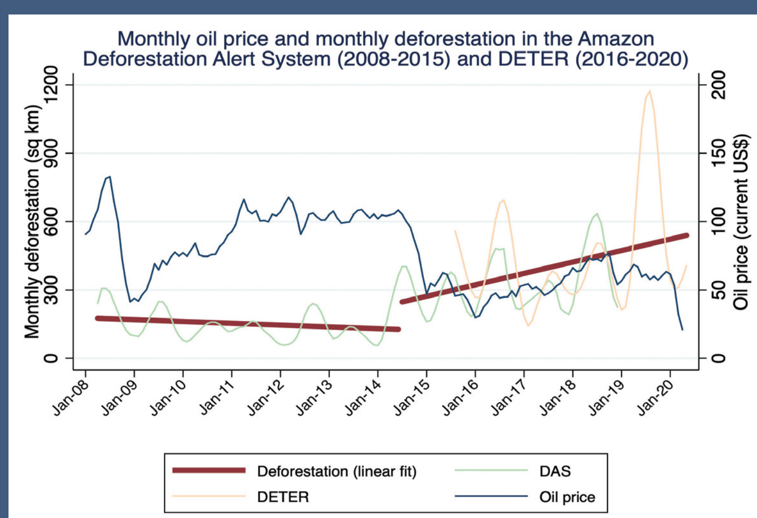
JAMES CUST

The extraction of resources can have indirect impacts on deforestation by affecting the price incentives for other deforesting activities, such as agriculture. While resource extraction activity can have direct and indirect impacts on the forest arising from the sector itself, it can also exert structural influences on other sectors of the economy with additional implications for the forest. This structural channel can involve diverting or inducing economic activity in other economic sectors as a result of a booming extractive industry impacting relative prices. Examples of this structural channel include the real exchange rate effects caused by export earnings (macroeconomic Dutch disease) or changing the relative demand for factors and changing factor prices at the regional within-country level (localized Dutch disease).

Increasing the share of mining products headed for export can reduce incentives for producing other deforestation-related commodities. In resource-exporting countries, rising resource exports earning foreign currency can put pressure on the competitiveness of other exporting (traded) sectors via an appreciation of the real exchange rate. This is known by the famous term "Dutch disease"—named for the de-industrialization concerns arising from the Dutch gas export boom of the 1970s (Corden and Neary 1982), and its impact on the non-oil sectors of the economy around the world is now well documented (see for example, Harding and Venables 2016). Such phenomena may likewise impact the forest sector for countries that have large export-oriented agriculture or forestry sectors—or those exposed to import competition. Where such sectors take—rather than set—their output prices as a result of international or regional trade, a resource export boom could crowd out these activities. This crowding out could reduce pressure on the forest frontier, leading to reduced deforestation via this structural channel. A positive world price shock for the abundant subsoil resource can exert a similar effect. The resulting boom can see an expansion of the comparatively less land-intensive resource sector. This expansion can appreciate the exchange rate and raise factor prices faced by the land-intensive agriculture or forestry sector, crowding them out. This crowding out can be forest saving in net terms, even if some forest clearance is associated with the expanding oil or mineral sector.

Early empirical evidence confirms the existence of these theoretical findings. Analyzing case studies of eight tropical, developing oil-exporting countries, Wunder and Sunderlin (2004) identify anecdotal evidence for this potential Dutch-disease effect. They acknowledge that indirect effects from oil drilling such as road construction and frontier colonization may however reverse this forest-friendly effect, which Sonter et al. (2017) also find. The first empirical evidence on this effect has shown that booming commodity prices of minerals do indeed reduce pressure on the forest. Furthermore, these estimates suggest that the crowding-out effect may exceed the direct clearance effect. This implies that a large area of forest may have been spared from clearance as a consequence of this Dutch disease effect (Cust, Harding, and Vézina 2019).

FIGURE B13.1.1
MONTHLY OIL PRICE AND MONTHLY DEFORESTATION IN THE AMAZON, 2008–2020



Source: Original elaboration using 2008–2015 data from the Deforestation Alert System (DAS) published by Imazon (2019), 2016–2020 data from the Deforestation Detection in Real Time (DETER) produced by the National Institute for Space Research (INPE) of Brazil (accessed June 2020), and World Bank Commodity Markets data.

Fiscal policy on fuels can impact price incentives for deforestation. It has long been known that the environmental impacts of domestic consumption of fossil fuels can be reduced by taxing fuels or reducing fuel subsidies (see chapter 1). But the Dutch disease mechanism suggests that fiscal policy on fuels creates an additional, previously unknown, co-benefit for reducing deforestation. Consider the example of a country that produces a deforestation-related commodity as well as oil. Some of the oil is used in domestic consumption and some is exported. The export share depends on the country's fiscal policy: For a given level of oil production, a subsidy on oil prices will raise the level of domestic consumption and reduce the level of exported oil. According to the Dutch disease theory, this dependency implies that the fuel subsidy weakens the exchange rate appreciation effect of oil exports, thus reducing the crowding-out effect faced by other traded sectors of the economy, including those that might be more land and forest intensive than the fossil fuel sector. Therefore, actions by government to reduce fuel subsidies or increase taxes on the domestic consumption of fuels might also reduce deforestation by dampening the price incentives for exporting other deforestation-related commodities through the Dutch disease. The same effect holds for a country that imports fuel: As fiscal policy reduces domestic consumption and thereby net imports, it appreciates the exchange rate, which again induces the above mechanisms. It follows that fiscal policy on fuels—for example, by internalizing the social cost of carbon, or simply removing the subsidy below world prices—would have a forest-saving effect relative to the counterfactual, to the extent it reduces domestic consumption and increase oil net exports.

Institutional and political determinants of fiscal regime

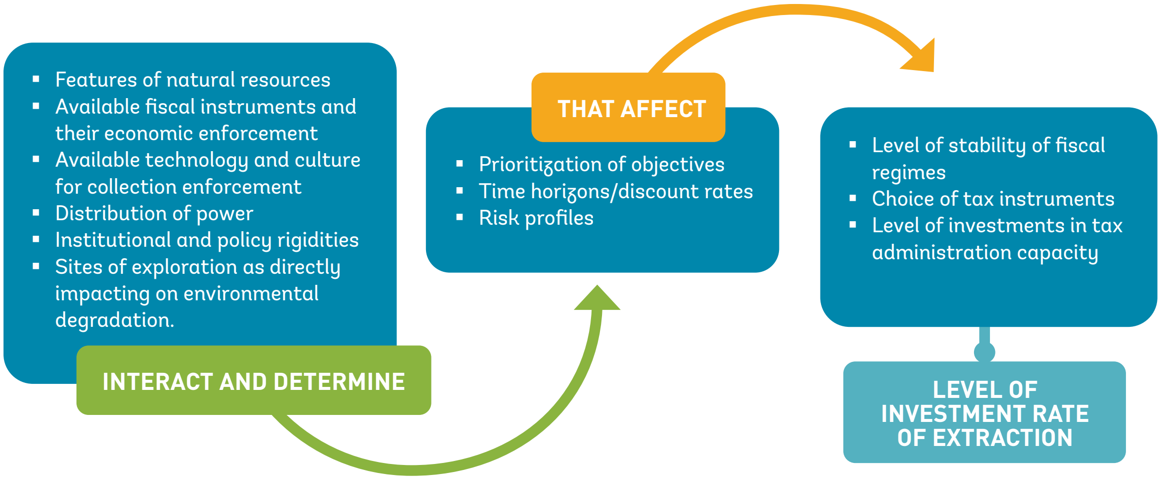
Given its importance to the economic development of many countries, policy makers will need to carefully consider the impacts of any potential fiscal policy reforms. On the one hand, several sectoral features indicate that governments should provide more fiscal incentives to EI investors. This is due to the uncertainties and risks associated with the industry, especially regarding volatility in production and prices. Large-scale EI investments also tend to be quite capital intensive and exploration activities require significant expenditures. In addition, investments may not see returns for years; in the case of oil blocks, for example, a firm may not see profits for over a decade.

On the other hand, the government needs to capture a certain share of revenues from the sector. Because extractive industry resources (that is, minerals and oil and gas) are exhaustible, the resources used today are forgone tomorrow. Governments collect revenues from the sector to account for the user cost trade-off associated with exploitation. From an economic point of view, there is also an economic rent associated with the sector and governments collect revenues to tap into this resource rent.[7]

The preferred fiscal regime in a given country is determined by geological and institutional characteristics as well as political vested interests. These determinants impact the prioritization of objectives, which affects the choice of the fiscal regime and ultimately the decisions made by firms and investors (figure 13.3). The incumbent's discount rate exerts the most dominant effect on the choice of tax instruments—and the level of investment for enhancing the tax administration capacity. Impacts on the environment play a rather weak role as a fiscal regime determinant. Consequently, countries typically ignore the specific impact on forests in favor of new investment in or expansion of mining exploration sites.

7 "Resource rent is the price of a natural resource in situ whose supply is fixed at a point in time, thus resulting in scarcity relative to demand. Markets for many natural resources in situ are missing or very limited, so there is no observed market price, or rent. The rent is incorporated in the market price of the resource only after it is extracted and sold, along with the costs of other inputs used for extraction. Rent is commonly measured as the difference between the market price of a resource and its costs of production" (Lange, Wodon, and Carey 2018). However, resource rents alone do not guarantee development: Strong institutions and governance capacities are needed to ensure that rents are used to invest in other assets and not entirely used for consumption.

FIGURE 13.3
GEOLOGICAL, INSTITUTIONAL, AND POLITICAL DETERMINANTS OF FISCAL DESIGN FOR EXTRACTIVE INDUSTRIES



Source: Updated from Barma et al. 2012.

What is not usually part of the calculation for both the government and firms operating in the sector is the cost to the environment. While the Natural Resource Charter recommends that the government carefully consider the whole chain of decisions—taking measure of all environmental, social, and economic factors before deciding on extraction (Bailey 2014)—this is not always followed in practice.

Environmental fiscal instruments and reforms therefore have a role to play within a forest-smart policy approach. Certain fiscal policies and instruments may be able to help incorporate environmental considerations into the decision-making of firms while promoting the sustainable growth of the sector.

Extractive Industry Regulatory Chain: Environmental Fiscal Instruments, Challenges, and Policy Implications

The next section identifies individual fiscal policy interventions that are effective at different stages in the extractive industry regulatory chain. Specific fiscal instruments are discussed along with the ways in which the selected fiscal policy can impact the exploitation and exploration profile of the firm to minimize the expected impact on forest landscapes. While the discussion is organized around the EI regulatory chain (figure 13.4), policy makers will need to determine which instruments to implement outside of this framework; here, it is used to illustrate how each instrument is effective at reducing deforestation and forest degradation at different points in the chain. The fiscal instruments under discussion are summarized in table 13.1.

FIGURE 13.4
EXTRACTIVE INDUSTRY REGULATORY CHAIN

Source: Alba 2009.

TABLE 13.1
SELECTED FISCAL MECHANISMS, THEIR EXPECTED IMPACT, AND SOME KEY NOTES ON THEIR APPLICATION

FISCAL MECHANISM	EXPECTED IMPACT	NOTES ON APPLICATION
▪ Removal of fiscal incentives associated with deforestation	▪ Reduce adverse incentives for firms to engage in deforestation	▪ Can be applied under a wide variety of governance arrangements ▪ Government determines incentives to be offered before contract negotiation
▪ Higher tax burdens for EI sector overall	▪ Reduce fiscal basis for comparative advantage between sectors that may be promoting higher than optimal investment in the EI sector	▪ Can be undertaken under a wide variety of governance arrangements ▪ Government increases the overall tax rates for the EI sector to reduce over-investment
▪ Sufficient budget allocated to line ministries (i.e., ministry of environment)	▪ Increase enforcement of ecologically designated boundaries, especially where EI blocks overlap or encroach on these sites ▪ Enable development of consistent application and enforcement of policies	▪ May require additional investments in governance capacity to ensure that increased budget translates to increased enforcement ▪ Budget allocation determined by central government
▪ Variable environmental tax rates that increase for mining operations located within ecologically important sites (PAs, NPs, NRs, HCV sites)	▪ Increase access costs to ecologically important sites (increase ore cutoff grade threshold to operate in such sites) ▪ Incorporate environmental costs into tax regime	▪ Can be undertaken under a wide variety of governance arrangements, as the needed tax rate calculations are relatively simple ▪ Government determines different environmental tax rates for operations based on location, where operations located in key ecologically designated sites are charged a higher tax rate

▪ Production-based charges (per unit royalty on output, ad valorem royalty, and variable royalty; area-based fees like property taxes)	▪ Increase ore cutoff grade to minimize expansion of EI activity in ecologically sensitive forests	▪ Can be undertaken under a wide variety of governance arrangements, as administrative costs are relatively low ▪ Government reduces, replaces, or supplements profit-based taxes with higher production-based taxes ▪ Governments could impose variable environmental tax rates on production-based taxes to increase impact
▪ Area-based charges	▪ Increase fixed costs of operators, which encourage investments in productivity	▪ Can be undertaken under a wide variety of governance arrangements, as administrative costs are relatively low ▪ Government reforms fiscal regime to include area-based fees
▪ Variable environmental tax rates that increase with the size of the mining operation	▪ Increase in taxes to account for higher income, technical capacity and potential environmental destruction	▪ Can be undertaken under a wide variety of governance arrangements; however, administrators must have access to information on firm sizes ▪ Government determines different tax rates for different firm/operation sizes, where larger firms/operations are charged a higher tax rate
▪ Variable environmental tax rates on EI inputs, based on environmental criteria	▪ Promote the use of sustainable inputs and transition away from unsustainable inputs	▪ May require more advanced administrative capacities, as information would need to be known on EI inputs and their relative environmental impacts ▪ Government determines variable tax rate schedule for relevant EI sector inputs, firms pay more for inputs associated with higher environmental damage (pollution, emissions, etc.)
▪ Taxation-and-rebates ("feebates")	▪ Provide fiscal incentives to firms to reduce environmental damages from production	▪ Can be undertaken under a wide variety of governance arrangements (third-party certification agencies should be used in jurisdictions with low administrative capacities) ▪ Government implements a tax-and-rebate system whereby all operations are charged a relatively high tax rate to account for environmental damage; firms are then offered rebates when they prove that their production was sustainable (e.g., through third-party or government-sponsored certification agencies)
▪ Performance bonds combined with damaged land tax	▪ Promote effective land reclamation post-operation	▪ Can be undertaken under a wide variety of governance arrangements; however, administrators must have access to information regarding environmental damages ▪ Government collects performance bond from firm after contract negotiation and returns the bond post-operation; government also collects damaged land tax from firms based on marginal damage costs to society

▪ Fiscal incentives for afforestation during post-operation	▪ Promote effective land reclamation post-operation	▪ Can be undertaken under a wide variety of governance arrangements ▪ Government offers fiscal incentives (e.g., tax rebates or reduced rates) for afforestation of land post-operation
▪ Fiscal component to control systems for remaining infrastructure ▪ E.g., fees for mining/oil road use, linked to deforestation rates	▪ Reduce access to isolated forest areas, reduce encroachment of economic activity, including settlement, hunting, and others ▪ Penalize deforestation by both informal and formal operations that use existing access roads	▪ Can be undertaken under a wide variety of governance arrangements; however, administrators must ensure that road fees do not become an opportunity for corruption or bribes ▪ Government enacts fees (which could be linked to local deforestation rates) on access roads post-operation

Note: EI = extractive industry; HCV = high conservation value; NP = national park; NR = nature reserve; PA = protected area.

Award of contracts and licenses

Contract negotiation

Countries promoting EI investments may participate in a "race to the bottom," whereby governments reduce tax rates and environmental standards to attract or retain economic activity. In most developing countries, governments attract EI firms by providing substantial fiscal incentives for investment. Companies have been able to secure considerable outright tax holidays, tax rate reduction, or various exemptions in the form of base depleting deductions (that is, for depreciation and other costs) and value added tax exemptions. For example, in Zambia EI royalties were set at 0.6 percent, a figure much lower than those of neighboring countries, which did not charge less than 2 percent and in some cases charged as much as 20 percent (Baunsgaard 2001; Fraser and Lungu 2008). Development contracts in Zambia have also been mostly negotiated and agreed upon with investors in secret.

Subsidies or other tax incentives that are determined to contribute to deforestation should be removed or reformed. The removal of adverse subsidies may free up domestic revenues that could be used for other policy objectives, such as environmental goals or other development projects. Where the removal of subsidies is not feasible (because of economic impacts, political resistance, or other reasons), it may be necessary to reform subsidies to align environmental and economic objectives. To strengthen beneficial environmental outcomes, any incentives offered should promote sustainable forest management, mixed land use, and effective land reclamation post-operation.[8]

Mining and other extractive industry cost-benefit analysis could give sufficient weight to environmental criteria. A common problem in resource-rich developing countries is that this analysis is normally disregarded, or if it is conducted, insufficient weight is given to environmental criteria. Cost-benefit analyses or environmental impact assessments should at least include both direct (on-lease) and indirect/cumulative (off-lease) impacts on deforestation (Sonter et al. 2017).

8 For example, depreciation rules could be provided for EI assets that meet certain environmental criteria.

When the true value of forest assets and their contributions to local and national economies are incorporated into these analyses and other evaluations, the benefits of some EI projects may no longer outweigh the costs.

Fiscal concessions should be evaluated for their contribution to deforestation and forest degradation. During contract negotiations, it is normal for EI firms to negotiate concessions regarding fiscal and environmental legislation. While offering concessions to companies might incentivize investment, fiscal administrators should ensure that this investment does not come at the expense of sustainable development. Any concessions offered to companies should therefore be evaluated for their potential contributions to deforestation and forest degradation.

Evidence suggests that the EI sector enjoys a comparative advantage in fiscal policy compared with other sectors. For example, in Zambia the EI sector enjoys a corporate tax rate of 25 percent compared with the national average of 35 percent (Fraser and Lungu 2008). In their study of the mining fiscal regime for the case of Tanzania, Shukla and Le (1999) found that special incentives far and above those normally granted were routinely provided to the EI sector. This implies that there is room to increase the tax burden of mining and other extractive industry operators (Fraser and Lungu 2008). An increase in the tax take for the EI sector will not directly impact environmental decisions; however, on a macro scale, it would contribute toward balancing the advantages the sector currently enjoys at the expense of less environmentally damaging activities.

Artificially low taxes and fees could therefore be increased. If more EI activity is occurring than is desirable in terms of the macroeconomy and development objectives, an increase in the overall fiscal costs could reduce over-investments, particularly those near rich biodiversity hotspots. Tax mechanisms with the potential for reform include income tax for employees, corporate taxes on profits, value added tax paid on services purchased by the mines, border taxes paid on EI imports and exports, and mineral royalties (Fraser and Lungu 2008; Weeks and McKinley 2006).

Exploration and discovery

Budget allocations to relevant line and environmental protection ministries (for example, the ministry of environment) should include enough funding for enforcement activities. Protected area and other high conservation value site boundaries should be enforced so encroachment onto ecologically important sites is minimized. Stronger budgetary support would enable the development of a supportive policy and regulatory environment for forest-smart development and enable key capacity building (World Bank 2019). Furthermore, sufficient budgetary allocation for forest administration can help policy makers and administrators stay ahead of the development of the EI sector, adequately address both LSM and ASM, and ensure that policies are consistently applied and enforced (World Bank 2019).

While the location of geological mineral reserves cannot be changed, fiscal policies may be able to better incorporate environmental damages in ecologically sensitive sites. Governments can charge differential environmental tax rates on the basis of location. Sites located in or adjacent to officially designated protected areas, national parks, national reserves, or other high conservation value areas could be charged a higher tax rate than sites in less ecologically sensitive areas. By charging a higher rate in ecologically important areas, the government better internalizes the environmental costs of EI production into the fiscal regime.[9]

9 This depends to some extent on the ability of policy makers to choose an effective environmental tax rate that incorporates all the estimated damages incurred through EI production. See chapter 1 for more details on choosing effective environmental tax rates.

When variable tax rates are well-targeted, they can influence whether firms operate in a given location. Variable environmental tax rates should be used for taxes and fees that *increase* the ore cutoff grade used for a given site. An ore cutoff grade is the minimum grade (or quality) required for a mineral or metal to be economically mined/processed. Production-based charges are a prime candidate because these charges tend to increase ore cutoff grades (see table 13.2).

The royalty, for example, is normally considered a regressive and therefore inefficient fiscal mechanism, but it might be particularly useful in this case.[10] If firms face a royalty that is too high compared to the value of the mineral ores in a given site, the firm will choose not to exploit that site. In 2003, Peru *reduced* royalties to spur additional investment, which led to an oil exploration boom (Finer et al. 2008). If royalties were increased instead (at least for certain geographical sites), this could help minimize production in ecologically important regions.

Production-based charges have other notable advantages for governments under budgetary and other constraints. Production-based charges provide up-front revenues and are more stable compared to profit taxes (table 13.2). Such charges might be especially attractive to developing countries, which tend to have a low discount rate and therefore prefer present cash flows to future revenues. Furthermore, production-based charges tend to have low and intermediate costs of administration (Barma et al. 2012), making them more accessible for countries with low governance and other capacities.

TABLE 13.2
SELECT ECONOMIC IMPACTS OF ALTERNATIVE TAX REGIMES

TYPE OF TAX/FEE	ORE CUTOFF GRADE	COST OF ADMINISTRATION	REVENUE VARIABILITY
Per unit royalty on output (nominal)	Increases	Low	Low
Ad valorem royalty	Increases	Intermediate	Intermediate
Variable royalty	Increases	Intermediate	Intermediate
Property tax	Increases	Intermediate	Low
Profits tax	Unchanged	High	High
Profits tax with cost depletion	Decreases	High	High
Profits tax with percentage depletion	Decreases	High	High

Source: Adapted from Barma et al. 2012.

10 Resource economics literature would recommend using progressive fiscal instruments such as profit-based taxes (Alba 2009; Halland et al. 2015). However, this policy choice disregards both the environmental impacts from EI production as well as country-specific political, economic, and institutional settings. Technical recommendations on fiscal regimes cannot be one size fits all, and for sustainable development, the factor of the exploration site location is too important to be discounted.
Furthermore, there are problems associated with profit-based charges that are especially relevant to countries with governance and other constraints. One important problem with profit-based (especially corporate) taxes is information asymmetry between firms and the government. Fiscal administrators might not have access to firms' accounts and therefore may not be able to determine an appropriate amount of revenue to collect. For example, the government may be constrained in its ability to collect profit taxes because of corruption or low administrative capacity. In Ghana, the government still faces some trouble evaluating the accounts of EI firms and usually just accepts the results of the firm's self-assessment reporting mechanism (Ayee et al. 2011). For these reasons, production-based taxes may be more appropriate in countries with low governance capacities.

Regulation and monitoring of operations

Extraction

Formalization and efficiency gains can be promoted through certain fiscal instruments. Increasing efficiency in the EI sector helps reduce resource intensity; therefore, it improves productivity while reducing the demands on the environment. Area-based fees, like property taxes, could be used to encourage efficiency gains. Area-based charges increase the costs EI operators face regardless of their production output (that is, fixed costs increase); to reduce their overall costs, firms must invest in productivity-enhancing improvements. However, additional policies will also be needed, like public investments in R&D and funding for project cost sharing to aid in technology adoption, along with strengthened enforcement, to ensure that increased productivity does not come at the expense of further land degradation.

Variable tax rates can better incorporate environmental damages associated with EI production. Policy makers can implement variable tax rates that increase with the size of the mining operation (World Bank 2019). Similar to environmental tax rates that vary with the *location* of EI production, the increase in taxes for larger operations accounts for the higher potential environmental destruction as well as for the higher income and technical capacity associated with LSM and other large-scale EI projects. While this might not impact the levels of environmental destruction, it would at least better incorporate the environmental costs of EI production into the cost structure of operators. This approach is used in both Ecuador and Colombia, in part to help facilitate the formalization of their ASM sector (World Bank 2019).

Environmental input taxation can reduce the environmental impacts resulting from EI production (IGF-OECD 2018). Inputs could be taxed differently based on environmental criteria (Macey 2017). Many environmental impacts arise from the extractive industries' use of chemical, fossil fuel, and water inputs. Governments could then implement differential taxes on these inputs to encourage firms to source more sustainably. Under this policy, environmentally damaging inputs should be taxed more than less damaging inputs. Differential environmental tax rates create an incentive for firms to reduce their use of "dirty" inputs in favor of "cleaner" inputs to reduce their tax burden (that is, input substitution effect). Policy makers would need to determine what objectives they would like to achieve (for example, reducing emissions or forest degradation), which environmental tax rates to adopt, and which inputs should be taxed.

Taxation-and-rebate mechanisms can also help improve the sustainability of EI production.[11] Taxation-and-rebates, or "feebates," are one fiscal policy that can be used to target the performance of companies based on specified criteria, such as the sustainability of production (Adamowicz and Olewiler 2016). Taxes and royalties target output and therefore create a disincentive for *production* itself; the feebate gives governments the opportunity to target the *method of production* instead. With a feebate, the EI operator is charged a high tax based on the assumption that production was unsustainable. When operators can prove to the government that production was more sustainable than assumed, they are offered a rebate on their taxes. A feebate scheme for the EI sector could be based on either the stored carbon biomass remaining on the land as directly monitored by governments,[12] or on whether the firm has acquired a

11 Earlier in this publication, this mechanism was discussed for forestry (chapters 5, 6, and 7) and agricultural production (chapter 12), and a similar feebate scheme could also be applied to extractive industry production.

12 Described in more detail in chapter 5.

sustainability certification.[13] Third-party sustainability certifications exist already for the EI sector (Kickler and Franken 2017); however, policy makers could also create a government-sponsored certification scheme (like the Indonesia Sustainable Palm Oil scheme or the Mexican Forest Certification System). With this mechanism, problems with traceability are remediated,[14] as firms who cannot prove their sustainable supply chains face a higher tax burden.

Post-operation

EI production has environmental impacts after operation because of the quality of land remaining at the site. Depending on the terms of the contract and development agreements between the government and EI firms, firms may leave without consideration of land reclamation or the quality of the land after they finish mining. The additional costs of remediation are a challenge specific to the extractive industries,[15] and any tax policy instruments to internalize environmental damages will vary in performance depending on the broader regulatory environment of the industry.

Effective land reclamation is needed to ensure that a former mining site is sustainably productive, ecologically healthy, and economically attractive. Land regeneration following mining and other EI activity occurs more slowly and is qualitatively inferior compared with that after other land uses (Banning et al. 2008; Bradshaw and Chadwick 1980; Hüttle 1998; Peterson and Heemskerk 2001). Furthermore, some countries have struggled with firms abandoning mining sites post-operation; for example, in the United Kingdom the Woods Reef asbestos mine was abandoned in 1983 and had not been rehabilitated after 27 years (White et al. 2012). Policies are needed to ensure land reclamation efforts effectively address this long-term degradation (Shrestha and Lal 2006). One way to incentivize effective land reclamation is through performance bonds (see box 13.2).[16]

13 Described in more detail in chapters 6 and 7.

14 Mineral ores from ASM are often processed with ores from LSM, which restricts the ability to identify the source of the ores and whether they were produced sustainably (Nkulu et al. 2018). Using a feebate mechanism in this way puts the burden of proof on operators to show that illegally or unsustainably produced ore has not been mixed in.

15 The challenge is even more pronounced when international prices of resources fall steeply. At such times, governments may be willing to sign EI exploration and exploitation contracts or development agreements without any provisions on post-operation remediation.

16 See also Adamowicz and Olewiler (2016); Cheng and Skousen (2017); Davis (2012, 2015); Gerard (2000); Gerard and Wilson (2009); Kuusela and Amacher (2016); and Rosenfeld, Gordon, and Guerin-McManus (2003).

BOX 13.2 PERFORMANCE BONDS

A performance bond (or contract bond) is a bond issued to guarantee satisfactory completion of a project by a firm. In the case of mining, a firm posts a performance bond with the regulating authority, and the bond is released when land reclamation is successfully accomplished. If site reclamation is not completed, the firm forfeits the bond and the proceeds are used by the government to finance reclamation. In practice, bonds are typically set based either on expected reclamation costs or on the area (for example, per acre or hectare).[a]

Performance bonds transfer risk and responsibility from the public to the private sector. Performance bonds act as a guarantee that the firm will pay a certain amount if they fail to meet an obligation. This provides firms with a direct monetary incentive to comply with reclamation obligations. Performance bonds also ensure that resources will be available for reclamation even if the firm fails to meet its obligations. Furthermore, bonds shift the burden of proof to the firm: Once a bond is posted, it is the firm's responsibility to demonstrate that the reclamation meets the terms of the agreement before the bond can be released.

Performance bonds are used in the EI sector worldwide. Despite having some drawbacks (Gerard 2000; Shogren, Herrigies, and Govindasamy 1993; White et al. 2012), international experience with performance bonds indicates that the procedure is effective at ensuring reclamation in the case of default when bond rates correspond to actual reclamation costs (Cheng and Skousen 2017). Thus, mine reclamation performance bonds are used throughout the world. For example, Canada, Australia, New Zealand, China, and the United States all have established mine reclamation bond programs, which are typically implemented at the subnational (that is, state or provincial) level; the United States' reclamation bonding system has been in place since 1977.

a In some cases, bond amounts may be set too low (Morrison-Saunders et al. 2016). For example, Goldcorp posted a performance bond of $1 million to Guatemala for the Marlin gold mine; however, by its own estimates total closure costs are closer to $17 million and experts estimated costs of up to $49 million (Goodland 2012).

It may be appropriate to combine performance bonds with an environmental fiscal instrument. While many countries utilize performance bonds, their effectiveness is still unclear (Edwards and Laurance 2015). Therefore, it might be appropriate for countries to use a *combination* of fiscal policies instead. For example, White et al. (2012) derive an optimal mechanism for mined land reclamation that combines a performance bond with a "damaged land tax" to account for lost ecosystem services. The performance bond is implemented in the standard way (see box 13.2) and reduces the risk to the regulator of default. The environmental, or damaged land, tax rate is set equal to the marginal costs of environmental damages (that is, standard Pigouvian taxation). Under this combination, the bond addresses the regulator's risk-sharing concerns and the environmental, or damaged land, tax provides additional incentives for reclamation.

To ensure effective reclamation management, fiscal incentives for afforestation and revegetation can be provided to EI producers. One important component of land reclamation management is reforestation or revegetation on mined lands (Karu et al. 2009; Sheoran, Sheoran, and Poonia 2010; Shrestha and Lal 2008). By providing fiscal incentives (like rebates, reductions, or subsidies) for afforestation, policy makers can help the landscape recover during the post-operation phase.[17]

17 Furthermore, if and when the site is reopened for other economic activity, fiscal incentives could be offered to land users who engage in agroforestry-specific practices. Agroforestry has been shown to provide important ecological and economic benefits (such as carbon sequestration) in post-mining landscapes (Dixon et al. 1994; Quinkenstein et al. 2012).

To address deforestation and forest degradation resulting from the remaining infrastructure after site closure, fiscal charges can be added to infrastructure control systems. EI infrastructure can be used by local populations and increases the access to previously isolated forests for economic development. While increasing access is generally considered welfare-enhancing, the impact on ecologically sensitive forests can be large. Control systems could be set up to manage access to these infrastructure elements; for example, a control system could be put in place for oil and mining access roads, such as road closure or fees for use.[18] This would reduce the access to isolated forest areas, reducing encroachment of economic activity including settlement, hunting, and others. Furthermore, road fees could be linked to local deforestation rates, which would penalize deforestation by both informal and formal operations that use existing access roads (Nelleman and INTERPOL 2012). However, policy makers should consider the impacts on vulnerable populations, such as rural or forest-dependent communities, when determining whether or not to institute road closures or fees.

Collection of taxes and royalties

Many different fiscal mechanisms can influence environmental outcomes for the extractive industries. Alba (2009) and Le and Viñuela (2012) note that the extent to which taxes and royalties are collected efficiently would be dependent upon both the quality of the fiscal regimes and the capacity of tax administration as well as the agencies involved in the mineral contracting, regulation, and collection of revenues. However, it is worth noting that negotiations on fiscal regimes in resource-rich, governance-constrained countries typically take place in largely informal, uncertain, and nontransparent arenas—all attributed to the ubiquitous time consistency and commitment problems, ultimately leading to low collection (Le and Viñuela 2012). Such governments may have high discount rates and low incentives toward long-term investments in enhancing the capacity of administration of taxes, fees and royalties.

Revenue management and allocation

The collection of extractive industry revenues presents a double-edged fiscal instrument. The extent of its economic as well as social benefit generation depends on multiple factors: (1) the level of the tax intake (including a share of the rents from EI projects); (2) efficiency in resource allocation; and (3) the quality of their ultimate use. Mismanagement of revenue collection and its allocation would risk perpetuating corruption, inequalities, and even civil conflicts—on top of the detrimental sequential impact on the environment, including deforestation and forest degradation. First, governments will need to optimize revenue collection. This involves collecting appropriate amounts of rents from the EI sector as well as understanding how to manage the resources sustainably (Ossowski and Halland 2016; Barma et al. 2012; Hund et al. 2013; Nkulu et al. 2018).

Fiscal administrators could ensure that tax revenues are used to invest in public goods and other assets. Administrators can use tax revenues to provide a secure investment environment through the provision of public services, including health, education, and infrastructure (Fraser and Lungu 2008). Additionally, as these resources are nonrenewable and therefore depleting, countries should use some portion of revenues to invest in productive assets, such as human or renewable natural capital (Lange, Wodon, and Carey 2018). To address deforestation and forest

18 Alternatively, a fly-in, fly-out model could be used, provided that local populations directly benefit from EI site development (Laurance 2008).

degradation, revenues should be used to invest in post-closure land reclamation and afforestation. With careful macroeconomic management and strong institutions, revenues can be used to finance sustainable growth (Lange, Wodon, and Carey 2018).

Implementation of sustainable development policies and projects

This stage of the EI regulatory chain relates to the way EI resources are allocated and used to promote sustainable development. As Alba (2009) notes, the efficiency to be attained depends on key elements like the quality of public investment management and the design and implementation of community development and environmental protection programs in regions affected by EI activities.

However, by all accounts, this stage of the EI regulatory chain exposes the weakest link in sustainable development. High discount rates in many resource-rich developing countries mean that policies tend to be designed regardless of environmental aspects. Some key issues in resource management in resource-rich or resource-dependent countries indicate the following:[19]

- More attention could be paid to the efficient allocation of resources to clean up or reforest project sites post-operation.
- Public investments in the overall public financial management system could be backed by strategic documents instead of serving political vested interests.
- Guidance on sustainable development investment decisions could be provided, and several key functions of effective public investment management could be further developed.
- Effective "gate-keeping" functions could be instituted.
- Implementation capacity, including procurement and project management (coupled with planning), could be strengthened to avoid chronic underspending of the environment-sensitive investment budget.

Fiscal Policies and Beyond

The role of fiscal policy in a forest-smart mix

While the fiscal policy mechanisms discussed are not silver bullets, they can complement and strengthen the impacts of other forest-smart policies for the EI sector. First, some of the fiscal reforms mentioned can increase domestic revenue mobilization, which can be used to improve forest-smart governance and institutional capacities. Removing fiscal incentives that inadvertently encourage deforestation not only reduces the incentives for deforestation but also potentially frees up revenues that can then be used for further forest-smart reforms or investments in public goods or other assets. Implementing higher overall tax burdens for the EI sector (for example, increasing the corporate income tax rate on par with rates for other industries) can equally raise revenues for further reforms. Providing sufficient budget allocation for enforcement can help key ministries improve the good governance of the sector and is one of the most important fiscal reforms to enable forest-smart EI sectors.

Second, the fiscal mechanisms described can reduce monitoring and enforcement costs while improving environmental outcomes. Variable environmental tax rates (based on location, size

19 Country examples have been assessed and summarized in Rajaram et al. (2014).

of operation, or inputs) can raise revenues while reducing enforcement and monitoring costs if firms choose not to operate in ecologically sensitive forests, or if the reduction of “dirty” inputs brings firms into compliance with or go beyond environmental standards. Production-based charges can also reduce enforcement and monitoring costs if they cause firms to avoid operations in ecologically sensitive forests. Area-based charges (by incentivizing the formalization and increased efficiency of the sector) reduce material demands on the environment, bring operators into compliance with environmental regulations, and can complement efficiency-enhancing investments (like technical support and capacity building). Tax-and-rebate mechanisms also reduce the costs of monitoring and enforcement, especially when used in combination with third-party sustainability certification agencies. Using performance bonds and control systems with fees in combination with these other policies can also help reduce monitoring needs.

A forest-smart policy mix

Fiscal policy alone will not be enough to address the deforestation and forest degradation caused by extractive industries. Environmental impacts on forests from EI activity are caused by many interdimensional factors, both economic and noneconomic. Policy makers then need to adopt a comprehensive, forest-smart approach, which includes strengthening governance and institutional capacities, promoting responsible corporate behavior, empowering communities, and engaging civil society stakeholders.[20] Integrated land use planning will be key for greater efficiency and transparency in policy planning and implementation (World Bank 2019).

Policy makers can create an enabling environment for forest-smart EI activity by improving governance. Policy and legislative frameworks that integrate forest-smart approaches should be robust, stable, and consistently applied; furthermore, the roles and responsibilities of different actors should be clearly understood. Increasing transparency in the sector is also a key strategy.[21] Governments can also help develop forest-smart EI activity through coordination between ministries and different levels of authority. If forest landscapes are well-governed, the environmental impacts on forests can be relatively minor even when operators are not completely forest-smart (World Bank 2019). Legislative frameworks should recognize the different scales of EI operation and adapt policies accordingly. Different policy responses may be required for ASM versus LSM; ASM policies should support miners while encouraging formalization and improvements in production practices. In particular, environmental requirements for ASM should be cost-effective for and comprehensible to operators.

Policy makers can also create an enabling environment for forest-smart EI sectors by promoting responsible corporate behavior. Governments should require operators to undertake comprehensive environmental impact assessments prior to extraction. Policy makers should also enact specific laws that promote the implementation of forest-smart activities, like rehabilitation

20 For more comprehensive details on forest-smart policies for the mining sector, see World Bank (2019).

21 Increasing transparency in the EI sector includes publishing contracts, annual reports, and fiscal regimes, as well as increased transparency along the commodity supply chain itself. In particular, a robust monitoring and chain of custody system is needed (Chatham House 2015). Environmental impact assessments and management plans alone will not protect against adverse environmental impacts from EI sector activities. An effective monitoring system should be enacted that considers both the direct and indirect environmental impacts of EI production (Rosenfeld, Gordon, and Guerin-McManus 2003). Transparent commodity supply chains are essential for tracing the impact on the environment from EI production (Nkulu et al. 2018). The Extractive Industries Transparency Initiative (EITI) establishes a global standard for good governance practices of oil, gas, and mineral resources and promotes open and accountable management of the industry. While not focused on sustainability dimensions, the EITI is a crucial policy for the extractive industries and such reporting and disclosure measures can support environmental objectives, including the protection of biodiversity. For example, compliance with the EITI can contribute to the integration of biodiversity values into national accounting and reporting, one of the strategic targets of the Convention on Biodiversity (Timpte, Marquard, and Paulsch 2018).

requirements. Government can also support mechanisms for companies to fulfill their offset obligations, including development of the REDD+ mechanism to mitigate mining impacts (World Bank 2019). Policy makers can improve forest outcomes by encouraging the progressive formalization of ASM in part through providing technical support and capacity building as well as removing existing barriers to formalization (World Bank 2019).

Policy makers can enable forest-smart EI activity by empowering communities and engaging stakeholders. Policy makers can ensure that local communities are empowered by the establishment of clear forest tenure and rights, and the awareness of and support for exercising these rights. In particular, tenure systems should recognize and respect both modern legal and indigenous and/or customary rights (World Bank 2019); policy makers can also involve community organizations in forest management and protection. Policy makers can also establish requirements for and mechanisms to support the inclusion of local stakeholders in the planning and decision-making processes.

Monitoring of EI performance throughout all stages of the chain is critical to enhance transparency and accountability on both sides, government and sector investors. The current setting of EITI, while necessary, is in no way sufficient. Transparency should be enforced across the entire value chain to inform better design and effectuate the implementation of appropriate regulatory and fiscal instruments, including those addressing the EI externalities and their detrimental impact on deforestation and forest degradation.

Finally, diversification of the economy can enable countries to grow out of their dependence on extractive (and carbon-intensive) resources. With progress being made toward global economic decarbonization, the value of fossil fuel resources will be diminished (Cust, Manley, and Cecchinato 2017; Lange, Wodon, and Carey 2018). Natural resource–dependent developing countries will need to diversify their economies while avoiding increased carbon risk from fossil fuel–based industries and infrastructures to deal with a declining global demand for fossil fuel and high-carbon resources (Lange, Wodon, and Carey 2018).

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