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Governance, Location and Avoided Deforestation from Protected Areas: Greater Restrictions Can Have Lower Impact, Due to Differences in Location

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Summary. — For Acre, in the Brazilian Amazon, we find that protection types with differences in governance, including different constraints on local economic development, also differ in their locations. Taking this into account, we estimate the deforestation impacts of these protection types that feature different levels of restrictions. To avoid bias, we compare these protected locations with unprotected locations that are similar in their characteristics relevant for deforestation. We find that sustainable use protection, whose governance permits some local deforestation, is found on sites with high clearing threat. That allows more avoided deforestation than from integral protection, which bans clearing but seems feasible only further from deforestation threats. Based on our results, it seems that the political economy involved in siting such restrictions on production is likely to affect the ability of protected areas to reduce emissions from deforestation and degradation.

Key words — deforestation, protected areas, livelihoods, REDD, Brazil, Acre

1. INTRODUCTION

Loss of standing forest generates a major component of emissions in developing countries, particularly in the tropics, e.g., Brazil and Indonesia, where recent deforestation has been occurring. As a result, the desire for reductions in emissions from deforestation and degradation (REDD), alongside long-standing concerns about species and other forest services (such as water quality), motivates consideration of various new policies—or shifts in policy—that could conserve forest. Yet, forest protection has tradeoffs. It is a challenge to conserve forest and improve livelihoods. As is clear in World Bank studies of development options (World Bank, 2008, 2010a, 2010b), the sectors that drive losses of forest also play major roles within forested countries' economies. Such conservation-development tradeoffs call for efficiency and creativity within policy, based upon solid evidence.

Any such policy deliberation should involve consideration of candidate policies' impacts upon deforestation, economic aggregates, and distribution (Corbera, Kosoy, & Martinez-Tuna, 2007; Scharlemann *et al.*, 2010, e.g., discuss the choice of policy instruments for REDD). We provide evidence that protected areas that differ in governance also differ in location and, thus, in deforestation impact (others make claims about the local *economic* impact of such interventions; see, e.g., Section 2 [1]).

Protected areas generally have been assumed to lower deforestation, yet solid evidence is limited, despite many past

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evaluations (Joppa & Pfaff, 2010a [2]). A policy counterfactual, i.e., a claim about what would have occurred without protection, is required for evaluation. Often, this has not been based upon the characteristics of the protected areas' locations (although lately, the set of conservation evaluations that include more careful counterfactuals has been growing [3]). Our focus is variation in locations. We show that protected-area types which differ in governance also differ in their locations, which, in turn, influence their forest impacts—and thus REDD. [4]

For our study of Acre, in the Brazilian Amazon, local terms for the governance of protection evoke a variety of goals. The less-restrictive governance categories we study are sustainable use (IUCN V–VI [5]), which brings to mind local needs, and indigenous lands (no IUCN bin), which refers to un-empowered peoples. Those two categories can be compared to integral governance (IUCN's I–IV), which is more restrictive, officially not permitting any production and clearing. [6] Acre State clearly sees tradeoffs in improving both forests and livelihoods (e.g., Sills, Pattanayak, Ferraro, & Alger, 2006). Our evidence suggests that local political economy, within various informed deliberate processes (not observed by us, and consistent with Alston *et al.*, 1999), implied that governance differences led to differences across protection types in locations, clearing threats and, thus, forest impacts.

Building upon prior work, [7] we examine deforestation during 2000–04 and 2004–08, in order to estimate the impact on deforestation rates of each of the categories of protected area: sustainable use, indigenous and integral. The impact of a policy is just a difference—between what occurred and a counterfactual scenario, without a policy, that we stress cannot be observed. To estimate such counterfactuals, i.e., what would have happened to the forest in protected areas if not protected, we use clearing of similar unprotected land (supported by theory in Hyde, 2012).

The characteristics of a protected location are critical to include in impact evaluation. Estimating the counterfactual without them, yields errors. [8] A counterfactual based upon clearing for all unprotected land tends to overestimate protected areas' impacts, as it ignores protection's low-threat locations (globally, protection is biased toward lower threats (Joppa & Pfaff, 2009)). That same approach underestimates impact for situations in which conservation targeted threats, as was suggested by Pfaff and Sanchez-Azofeifa (2004) concerning locations for protected areas and as was done for payments in some cases in Costa Rica and Mexico (which were evaluated in Arriagada, Ferraro, Sills, Pattanayak, & Cordero, 2012 and Alix-Garcia, Shapiro, & Sims, 2012, using counterfactuals based on characteristics).

For Acre, we find that protection's locations are, on average, biased toward lower threats. Our matching (apples-to-apples) impact estimate, based on unprotected land similar to protected land, suggests that a great deal of protected forest would have remained standing without policy. This approach lowers impact estimates by over half (from ~2% avoided deforestation to ~1%).

We also analyze subsets of protected areas that differ in terms of some key characteristics such as distances to roads and cities—influential in deforestation and the location of protection. For all governance types and for each type, protected areas closer to roads or cities avoided more deforestation than the distant protected areas. Those farther than average from roads and cities effectively did not block clearing, while those closer blocked over twice the average clearing. [9] Time periods also provide subsets that differ in deforestation and in protection's implementation.

Building upon all of that, our focus is the variation in impact by protection's governance. Protection types differ in location—perhaps as governance affects tradeoffs that affect locations. Sustainable use protection targets areas with people, while integral protection seems to target an absence of local stakeholders. Thus, sustainable use protection occurs closer to clearing threats. Due to such locations, sustainable use areas have more impact despite permitting more clearing. Thus, the governance type oriented toward local livelihoods has avoided more deforestation. That is not because forest outcomes necessarily are ordered in this way, for any given location. [10] Rather, it seems that sustainable use protection simply is more feasible in high-threat locations, which is important for decisions about how to allocate the global resources in support of REDD.

The paper proceeds as follows. Section 2 provides background on protection in Acre. Section 3 provides relevant frameworks. Section 4 describes data and our matching approach. Section 5 presents all of our results, while Section 6 concludes with summary and discussion.

2. ACRE'S PROTECTED AREAS

(a) *Multiple investments in protection*

In the Brazilian Amazon, protection includes: (i) developing a legal framework for forest conservation and management, (ii) establishing areas, (iii) regularizing tenure, (iv) developing and implementing management plans, (v) investing in technologies to monitor, (vi) building enforcement capacity, and (vii) supporting sustainable economic activities using natural resources. [11] The range of forms of support is considerable, from basic infrastructure provision including secondary roads through direct support for producers' organizations, such as subsidies or targeted government programs that guarantee the purchase of some local production. Importantly for us, such support goes more to sustainable use areas than to integral protection. [12]

Over the past twelve years, Acre State has invested significant resources in a system of protected areas. To finance this, the state has worked with the Inter-American Development Bank (IDB), World Bank (WB), Banco Nacional de Desenvolvimento Economico e Social (BNDES), Caixa Economica Federal (CEF), and the federal government. In these joint efforts, the government has spent nearly US$500 million on multi-sector projects, each with at least one component on capacity to sustainably manage and protect natural resources, to set up a system of protected areas and to develop and implement a plan to support sustainable economic activities. [13]

Basic investments in Acre included the legal framework for protected areas (Lei Estadual n° 1.426/2001) and the State Economic and Ecological Zoning (Lei Estadual n° 1.904/2007), the main tools used to choose where to create protection and to prioritize investments in land tenure, sustainable business development services, and other social services. Acre is one of the first Amazon states with a wall-to-wall fine-scale (detect forest loss of 2 hectares) monitoring system. This investment was followed up by investments in capacity building for the main government agencies which manage and monitor the protected areas. These actions were linked, eventually, to the creation of nearly 1 million hectares of protected areas during 2004–05 (WWF 2009).

One critical choice by Acre was the large share of sustainable use areas. Today, roughly two-thirds of the protected areas in Acre (combining federal and state) are of the sustainable use