

# Economics and Conservation in the Tropics: A Strategic Dialogue

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## Protected Areas and Human Well-Being

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### Bottomline

A credible study of the effects of one or more protected areas on the welfare of neighboring communities would include the following elements:

Objectively measurable indicators of human welfare at an appropriate scale of analysis (Appropriate scales include individuals, households, communities, and regions.)

Observations of the relevant indicators before and after the establishment of the protected area (If no pre-establishment observations are available, some other control for the initial state and trend of social welfare is needed.)

Observations of the relevant indicators from both treated units (i.e., individuals or areas known to be potentially affected by protected areas) and control units (i.e., individuals or areas similar to treated units in economic potential but known to be not affected, or less affected, by protected areas)

Observations of pre-establishment characteristics that affect both where protected areas are located and how the selected indicators of human welfare change over time (Such characteristics can mask the effects of protected areas. For example, if protected areas are located on less productive lands, a simple comparison of growth between communities near and far from protected areas may erroneously suggest protection is detrimental to economic growth, when in fact growth differences arise from inherent land productivity differences.)

Without these four elements, separating the effects of protected areas on social welfare from the effect of other contemporaneous factors is difficult. Ideally, a study would also provide some sense of the robustness of the results to hidden bias from unobservable differences in treated and control units. To date, no study with these elements has been published. In my view, there is anecdotal evidence and theory that suggests protected areas have a net negative impact on local communities. However, the empirical evidence for negative impacts is weak and there

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are equally compelling anecdotes and theory, as well as some empirical evidence, for zero or positive net impacts.

## Motivation

Protected areas are the most common tool for *in situ* conservation of biodiversity globally.<sup>1</sup> Social advocates argue that protected areas take away local rights of access to critical resources and thus negatively, and unjustly, impact the social and economic welfare of neighboring communities. This negative human impact, so the argument goes, harms protected area conservation objectives because protected areas cannot succeed without the support of local communities, and because poverty, which is exacerbated by protected areas, is a root cause of ecosystem degradation. In fact, the 2004 World Parks Congress issued a declaration that “many costs of protected areas are borne locally—particularly by poor communities.”

In response to these claims, conservationists offer examples of local communities benefiting from protected areas through employment, continued access to traditional resources that otherwise would have disappeared or been appropriated by others, tourism revenue-sharing schemes, spillovers from infrastructure development associated with the protected area, and the protection or enhancement of ecosystem services on which the local economy depends. Advocates for the rural poor, however, retort that these claims are overblown (e.g., tourism benefits are seasonal and captured by outsiders), and even when net local benefits are positive, they are skewed toward wealthy citizens, thereby exacerbating inequality in rural areas.

## What Is the Evidence Base for Protected-Area Effects on Neighboring Communities?

Little empirical evidence exists to substantiate any claim about the effects of protected areas on local people. Most of what has been written has been anecdotal or descriptive/qualitative. Moreover, most of these qualitative analyses are based on *ex post* observations without comparison to a pre-protected area baseline. These analyses also tend to rely on subjective indicators, which may not be measured in the same way by different people, or on self-reported outcomes, which may be affected by knowledge of the intended use of these

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<sup>1</sup> Terrestrial protected areas now cover more than 11% of the world’s land area. Marine protected areas cover less than half the same area, but are being established at a faster pace.

self-reports (i.e., to substantiate that the park has either negatively or positively affected local lives).

There are about a dozen published quantitative analyses on terrestrial protected areas. All but three comprise *ex ante* predictions using primary or secondary data (see Ferraro 2002 and Sims 2007 for many of the references). To make their predictions, these analyses—with the exception of one study that uses a stated preference survey—extrapolate historical data on ecosystem use and market (or shadow) prices, and make assumptions about behavioral changes and market opportunities as a result of the protected area. (In rare cases, values from maintained or enhanced ecosystem service flows are also included.)

One study from Canada (Fortin and Gagnon, 1999) did compare before and after employment and income data around two parks. Although it found small positive impacts, it included no control groups. Without such groups, one would be unable to assess whether any observed changes in socio-economic outcomes in a longitudinal study of protected area communities result from the establishment of the protected area or from other contemporaneous factors, such as weather or international market prices. Only two studies, both county-level analyses from the United States (Duffy-Denno 1998; Lewis, Hunt and Plantinga 2002), contrast changes in socio-economic outcomes among households/regions affected by protected areas with changes among control households that are unaffected (or less affected) by these areas. These two studies find no effect of protected areas on wage or employment indicators, but they also lack some data on pre-establishment conditions.<sup>2</sup> Note that zero effect may be simply an indicator that protected areas are having no protective effect, rather than an indicator that they are positively affecting communities (e.g., if they are sited in areas that are not threatened with exploitation).

In the context of marine protected areas, there have been a few retrospective quantitative analyses on the effects of protected areas on fishing stocks and catch rates, which, with further assumptions, can be connected to the welfare of fishers and fishing communities. The conclusions drawn from these empirical analyses, however, differ dramatically depending on the disciplinary training of the analysts. Biologists tend to find that marine protected areas have large, positive impacts on fishery stocks (a change assumed to be a net gain for fishers).

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<sup>2</sup> Two unpublished studies, one from Costa Rica and one from Thailand, have found no negative impact, and some small positive impacts, on economic indicators in communities that are affected by protected areas.

Economists tend to find little or no effect on stocks or catch because they more directly model fisher behavioral changes as a response to protection.

It should be noted that in the context of terrestrial ecosystems, there is little formal economic theory on the effects that protected areas can have on the welfare of neighboring communities. Given that protected areas restrict the supply of agricultural land and ecosystem material products (e.g., timber), but maintain the flow of less tangible ecosystem services (e.g., pollination), one would expect that impacts may differ across landowning and landless households, as well as among net sellers and net buyers of agricultural and material products. (Landowners and net sellers might benefit from price increases related to restrictions in the supply of productive capacity.) Moreover, the property rights system in neighboring communities would have a large influence on the level and distribution of economic impacts.

In contrast, there is a small theoretical literature on how marine protected areas can affect fisheries. Most economic models identify a limited set of bio-economic conditions and harvest-sector behavior under which protected areas would enhance fisher returns. (Further restrictions would likely be needed to assume that entire fishing communities would benefit, on average, from marine protected areas.) Such conditions often include the reserve being a net exporter of biomass (particularly adults, rather than larva) and having high costs of fishing, while assumed behaviors include maximum or open-access harvesting outside the reserve. As noted above, the empirical evidence for the effect of marine protected areas on neighboring fisheries is controversial.

### **Obstacles to Knowledge**

As emphasized above, estimating the welfare effects of protected areas on neighboring communities requires pre- and post-establishment observations on consistently measurable outcome variables, as well as of covariates (i.e., characteristics that affect protection and outcomes) and control populations that can remove the confounding effects of other factors unrelated to the protected area. Even if a study were to have these elements, there are additional obstacles, such as addressing the emigration and immigration that result from protected areas and the distributional impacts within and across communities. Changes in cultural and spiritual outcomes will be difficult to measure (e.g., loss of political autonomy, increases in social cohesion), as might any option value lost with the establishment of the protected area. These latter issues raise a larger issue of who selects the relevant outcome variables: outside analysts or members of the community? Finally, it is unclear whether impacts should be monetized and, if

they should be, should one do so through revealed or stated preferences (and, for the latter, through willingness-to-pay or willingness-to-accept).

Beyond these empirical modeling issues, there is one other barrier: the diversity of types of protected areas makes generalizations about the effect of protected areas elusive. Some protected areas force households to relocate, with or without compensation. Others allow households to remain, but restrict access and use. Among areas that restrict access and use, some are highly restrictive (e.g., IUCN Class I) and others are less restrictive (e.g., biosphere reserves).<sup>3</sup> There are traditional parks and reserves nominally owned by governments; there are indigenous or community reserves, which are nominally owned (or co-owned) by indigenous groups or rural communities with some form of local governance; and there are private reserves, which are owned by private landowners. Among the latter two forms of protected areas, there are examples in which a government or non-government conservation agency leases the ecosystem from the community, indigenous group, or private landowner and operates it as a national protected area (e.g., Richtersveld in South Africa). One would expect that each form would have different impacts on neighboring communities.

## The Way Forward

Two on-going analyses, one in Costa Rica and one in Gabon, illustrate how the causal relationship between protected areas and neighboring community welfare might be better elucidated in the future. In Gabon, scientists are tracking changes in socio-economic outcomes<sup>4</sup> in a panel of 1,000 households that traditionally used the resources of four newly created national parks. These changes will be compared at regular intervals to changes in the same outcomes for 1,000 control households that live outside the influence of the same national parks. In Costa Rica, scientists are using observable biophysical and socio-economic characteristics that affect deforestation and protected areas to match census tracts near protected areas established in the 1960s, 1970s and 1980s to similar census tracts that were not located near a protected area during the time period of analysis. Changes in census tract economic variables (e.g.,

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<sup>3</sup> The Millennium Assessment Biodiversity Responses chapter indicates that “most countries use only the more strictly protected categories at the national level, thereby foregoing benefits from additional areas established under categories allowing some forms of human use.” Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Policy Responses* (Washington, DC: Island Press, 2005), 126.

<sup>4</sup> Outcome variables are selected from the same set used by the World Bank to examine the impact of relocation projects, and include community-level variables.

employment, household assets) over three decades can then be evaluated and the causal impacts of protected area establishment can be determined.

Each analysis has its own methodological strengths and weaknesses<sup>5</sup> and only represent two cases out of thousands, but both represent the kind of analysis that conservation practitioners and scientists should be doing more of. Developments in formal theory could be beneficial for guiding empirical analyses, but given what is known from field observations and from advances in microeconomic theory of development, development of such theory seems a lower priority than empirical analyses. Likewise, structural dynamic models would also greatly expand our understanding of the effects of protected areas on human welfare. Such models not only measure the impact of protected areas (as do the reduced form models described above), but they also explain the causal mechanisms through which these observable impacts have been realized and allow for simulations of alternative policies. However, given the rich data sets and more sophisticated technical skills they require and the low level of current empirical knowledge, such modelling also would seem to be a lower priority. I would argue that better empirical evidence on the local impacts from protected areas is a necessary condition for maintaining and extending land-use restrictions aimed at supplying ecosystem services. Whether such evidence would be sufficient to change the opinions and actions of policymakers, local residents, and conservation practitioners remains to be seen.

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<sup>5</sup> Advantages of the Gabon approach include the opportunities to 1) track the same households over time (and examine effects of migration), 2) examine a rich mix of outcome variables, and 3) examine distributional effects across household types. Advantages of the Costa Rica approach include the opportunities to 1) run large-scale analyses over long time periods at low cost, 2) examine twentieth-century protected areas rather than only future ones, and 3) increase the likelihood of locating valid control groups for the affected communities.

## References

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## Recommended Reading

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DOI:10.1146/annurev.anthro.35.081705.123308

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<sup>+</sup> Good article that shows how non-economists view the problem.

*For more details on the empirical issues raised in the essay, see:*

Ferraro, P.J., and S.K. Pattanayak. 2006. "Money for Nothing? A Call for Empirical Evaluation of Biodiversity Conservation Investments," *PLoS Biology* 4(4): 482–88.