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Parks versus PES: Evaluating direct and incentive-based land conservation in Mexico

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ABSTRACT

Protected areas (PAs) and payments for ecosystem services (PES) are the top two mechanisms available for countries to achieve international REDD agreements, yet there are few empirical comparisons of their effects. We estimate the impacts of PAs and PES on forest conservation, poverty reduction, and population change at the locality level in Mexico in the 2000s. Both policies conserved forest, generating an approximately 20–25% reduction in expected forest cover loss. PES created statistically significant but small poverty alleviation while PAs had overall neutral impacts on livelihoods. Estimates by individual policy type for the same level of deforestation risk indicate that biosphere reserves and PES balanced conservation and livelihood goals better than strict protected areas or mixed-use areas. This suggests that both direct and incentive-based instruments can be effective, and that policies combining sustainable financing, flexible zoning, and recognition of local economic goals are more likely to achieve conservation without harming livelihoods.

Introduction

Forest loss due to agricultural and pastoral expansion, logging, and urban development remains a persistent global environmental problem despite decades of experimentation with different policy solutions. Protected areas ("PAs") and payments for ecosystem services ("PES") head the list of land conservation policies that countries will rely on as they seek to reduce greenhouse gas emissions from land-use change under international climate agreements (IPCC, 2013; Kerr, 2013; Pfaff et al., 2013; REDD Desk, 2016). Yet in a majority of countries, people also live on the lands important for efforts to reduce emissions from deforestation and forest degradation ("REDD" initiatives). Policymakers working to reduce emissions thus confront a choice not just about which mechanism will be most environmentally effective, but how to achieve conservation without compromising other social goals such as poverty alleviation.

In this paper, we provide the first explicit national-scale comparison of direct and incentive-based land conservation instruments across both environmental and social outcomes. Specifically, we estimate the impacts of protected areas and

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payments for ecosystem services in Mexico on forest conservation, poverty reduction, and population change in the most recent decade (the 2000s) at the locality level. We measure changes over time by combining global forest cover change data from 2000–2012 (Hansen et al., 2013) with measures of poverty and population density from 2000–2010 for each locality (Mexican census; CONAPO). We evaluate the impacts of all protected area types in Mexico, both as a group and broken into categories of strict PAs, mixed-use PAs, and biosphere reserves. We compare these estimates to the impacts of Mexico's Federal Payments for Ecosystem Services program, a voluntary conditional cash transfer program that provides payments to selected private and community landowners in exchange for their maintenance of existing land cover.

Our central goal is to compare the performance of all PA types versus PES in the most recent decade, when both policies were key conservation measures. Our identification strategy compares localities with a higher share of land protected by PAs or PES by 2010 with similar localities that did not have these policies during this period. We use differenced outcomes to eliminate level effects and include controls for pre-trends in each outcome, state fixed effects, and multiple geographic and social criteria that determined selection into PAs or PES and could influence outcomes. While this strategy facilitates direct comparison of the two policies, it may still leave out possible unobserved confounders. Because data limitations preclude using a panel analysis that exploits years prior to 2000, we check for parallel trends in the pre-period and demonstrate robustness to a variety of specification checks, including matching before estimation and re-calculating treatment effects using bounding methods. In order to separate the effects of conservation policy type from potential differences in outcomes due to the geographic distribution of the policies, we also estimate marginal impacts across comparable levels of deforestation risk. Finally, we test for possible complementarity of the policies and compare their cost-effectiveness using data on production revenues to proxy for the opportunity cost of land.

Overall, we find that both PAs and PES were environmentally effective across this time period, with full locality protection resulting in an estimated 20–25% reduction in the predicted loss of forest cover in a locality. With respect to development goals, the data show that PES led to small but statistically significant poverty alleviation—a 10–12% increase in the locality poverty alleviation index. Parks as a group had no effect on locality poverty trends, although strict protected areas showed significantly less poverty alleviation than the counterfactual trend. Importantly, none of the park types or PES increased poverty according to absolute measures: localities with conservation policies showed improvements on average across all basic poverty indicators.

Comparing the park types—biosphere reserves, strict PAs and mixed-use PAs—with each other and with PES yields three lessons. First, there are apparent tradeoffs across the individual policies with respect to achieving different social goals. Biosphere reserves, which combine strictly protected core areas with mixed-use buffer zones, generated the most avoided deforestation while PES resulted in the most poverty alleviation. This tradeoff matches theoretical expectations, outlined in the next section, that PAs can offer more complete environmental protection while PES is more likely to alleviate poverty. Second, we find that PES and the biosphere reserves were more successful than strict or mixed-use PAs in achieving environmental conservation without harming livelihoods. Both PES and the biosphere reserves differ from other PA designations because they provide a flexible but still well-defined and enforced approach to conservation. Both also received more substantial financial support during this period. Third, we find that all policies generated avoided deforestation from a mix of low and high cost land. This indicates that there was no clear winner between PAs vs. PES with respect to cost-effectiveness. Overall, our findings suggest that both direct and incentive-based mechanisms can succeed, but are more likely to balance environmental and poverty alleviation goals when they combine flexible zoning with sustained funding and efforts to support local livelihoods.

Parks versus PES: background and existing evidence

Expected impacts of PAs and PES

Protected areas currently cover 12.7% of global land area (Bertzky et al., 2012), with much of the increase in the past three decades coming from new parks in developing or middle income countries. Protected areas are a form of direct, involuntary regulation: they work by prohibiting specific agricultural or extractive activities. Backlash against protected areas due to restrictions that may conflict with local livelihood goals (e.g. Adams et al., 2004; West et al., 2006; Brockington et al., 2006) has led conservationists and governments to explore alternative policies. These include more flexibly zoned protected area types and payments for ecosystem services (Ferraro 2001; Ferraro and Simpson 2002; Jack et al., 2008; Wunder et al., 2008, 2014; Pechacek et al., 2013). In contrast to PAs, payments for ecosystem services are incentive-based and generally voluntary: they provide compensation to willing landowners conditional on maintaining a defined land use or fulfilling specific management activities. In addition to being more politically feasible, payments for ecosystem services are an incentive-based mechanism. A central theoretical and empirical finding in the literature on pollution control is that incentive-based mechanisms are likely to meet abatement goals in a more cost-effective way than command and control regulations by solving the regulator's information problem and allocating more of the control burden to low-cost providers (e.g., Tietenberg, 1990; Stavins, 2003).

This result does not necessarily generalize to the land conservation context, however. The relative cost-effectiveness of

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