Evaluating Heterogeneous Effects of Forest Conservation and Forest Leakage in Indonesia

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Abstract

Establishing legal protection for forest areas is the most common policy used to limit forest loss. However, protected areas often have mixed success in preserving forest, and it is important for conservationists to understand where they work and where they do not. We use a difference-in-differences approach comparing treated observations and matched controls to estimate the effect of seven newly established protected areas in Indonesia. Additionally, we explore how the effectiveness of these parks varies over space. Observed differences in the estimated treatment effect of protection may be driven by several factors, including spurious variation arising from differing degrees of bias in the estimated treatment effect over space. We distinguish between true variation in protected area effectiveness from spurious variation driven by several sources of estimation bias. Based on our most flexible method that allows the data generating process to vary across space, we find that the national average effect of protection preserves an additional 1.1% of forest cover; however the effect of individual parks range from a decrease of 3.4% to an increase of 5.3% and the effect of most parks differ from the national average.

Apart from the direct effect of protected area on land inside the protected area boundary, setting aside forested land for protection can also lead to deforestation elsewhere, defined as "leakage". Under some conditions, it can induce more forest cover near the protected area ("negative leakage"). We develop an analytical general equilibrium model to solve for leakage as a function of key economic variables, and we use it to generate testable hypotheses. We test these hypotheses for Indonesia using landsat data from 2000 and 2012 – before and after eight new national parks were protected in 1999-2004. We estimate deforestation near these parks compared to other unaffected areas, and how it depends on local economic characteristics. To take the spatial nature of deforestation into account, we generate our counterfactual by matching over characteristics of the parcel itself and of its neighbors further away. Conservation agents and social planners can use these results to choose locations of protected areas to help maximize total tree cover.