Cease and Disperse: The effect of Indonesia's moratorium on the spatial distribution of deforestation

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September 28, 2012

Introduction

Deforestation accounts for roughly 15% of global carbon emission each year. Climate scientists warn that annual emissions must be quickly and drastically cut to avert severe climate change. Any viable response to climate change will have to address the deforestation rate, which is almost certainly above the social optimum. Forests provide many environmental services, including carbon sequestration, that are not incorporated into the private cost of clearing. This paper estimats the impact of Indonesia's 2011 moratorium on deforestation. We find the short-term, unintended consequences of a broad moratorium may have increased the deforestation rate, but created more clustering.

Background

In May 2010, Indonesia announced a moratorium on new deforestation, with an array of caveats. Industry has used the uncertainty in land use maps to find loopholes in the moratorium and the rate of deforestation has fallen only slightly [insert citation, time series graph]. Norway offered US$1 billion in aid contingent on a demonstrated reduction in the deforestation rate.

Model

Let $R_t = R_{1t} + R_{2t}$ be the amount of total amount of land available to a single agent, split between equal-sized plots $i \in \{1, 2\}$.

Empirical strategy

Results

Discussion

Policy acts on people with incentives, not on inanimate objects. You cannot simply legislate a reduction of deforestation. The paper indicates that there is some *leakage* associated with local (not just in space like a protected area, but in scope of policy) conservation policy. This paper suggests that measures should be taken to dampen the incentives of both plots, reduce the incentive to clear at all. Maybe that would push people to the black market, though, just as deforestation was pushed to new areas in this study. The scope is not wide enough. This also offers an argument for an overhead and comprehensive monitoring system.

References

[1] R. Burgess, M. Hansen, B. A. Olken, P. Potapov, and S. Sieber. The political economy of deforestation in the tropics. Working Paper 17417, National Bureau of Economic Research, September 2011.

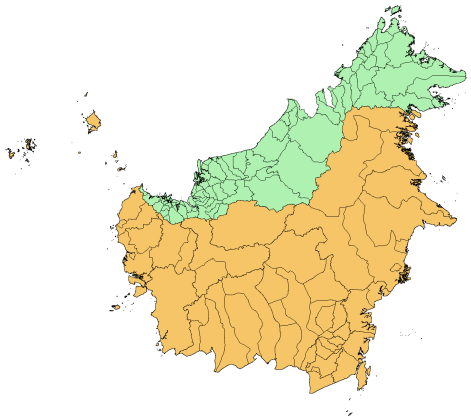
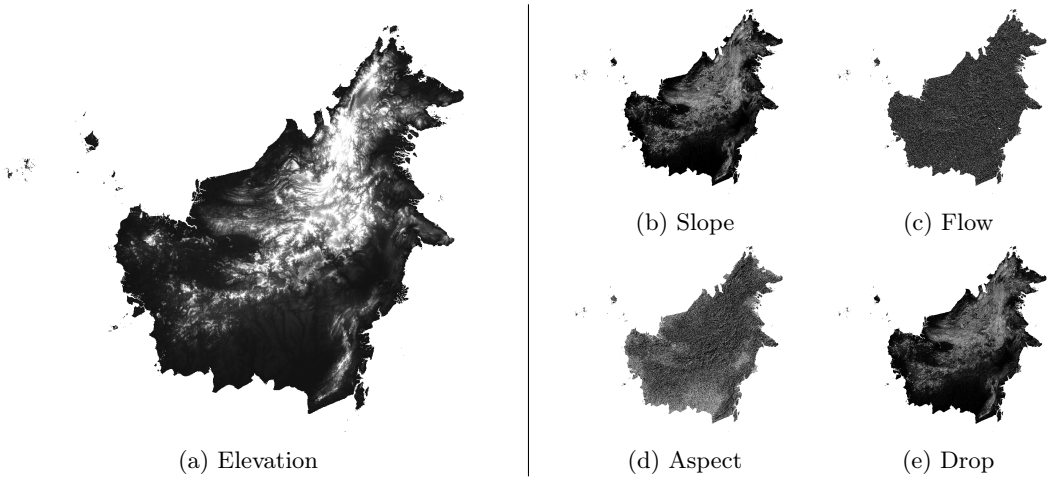


Figure 1: Sample area, Malaysia in green and Indonesia in orange. Borders indicate subprovinces.



(a) Elevation (b) Slope (c) Flow (d) Aspect (e) Drop

Figure 2: Map of the digital elevation model (left) with derived data sets (right) indicating slope, hydrology, and terrain roughness, 90m resolution.

[2] C. Costello and S. Polasky. Optimal harvesting of stochastic spatial resources. *Journal of Environmental Economics and Management*, 56(1):1–18, July 2008.

[3] R. S. Epanchin-Niell and J. E. Wilen. Optimal control of spatial-dynamic processes: The case of biological invasions. Discussion Papers dp-11-07, Resources For the Future, Mar. 2011.

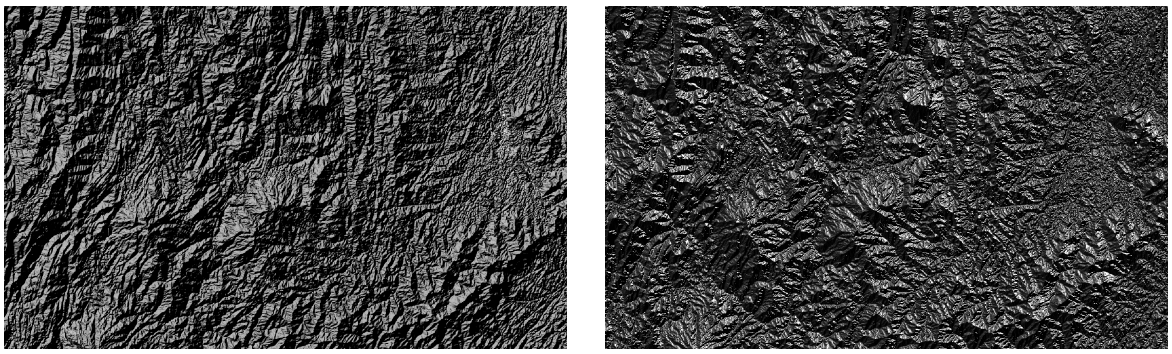
[4] M. Fujita, P. Krugman, and A. J. Venables. *The Spatial Economy: Cities, Regions, and International Trade*, volume 1 of *MIT Press Books*. The MIT Press, 2001.

[5] G. G. Judge and R. C. Mittelhammer. *An Information Theoretic Approach to Econometrics*. Cambridge University Press, 2012.

[6] A. Pfaff, J. Robalino, R. Walker, S. Aldrich, M. Caldas, E. Reis, S. Perz, C. Bohrer, E. Arima, W. Laurance, and K. Kirby. Road investments, spatial spillovers, and deforestation in the brazilian amazon. *Journal of Regional Science*, 47(1):109–123, 2007.

[7] A. S. P. Pfaff. What drives deforestation in the brazilian amazon?: Evidence from satellite and socioeconomic data. *Journal of Environmental Economics and Management*, 37(1):26–43, January 1999.

[8] J. N. Sanchirico and J. E. Wilen. Optimal spatial management of renewable resources: matching policy scope to ecosystem scale. *Journal of Environmental Economics and Management*, 50(1):23–46, July 2005.



(a) Hillshade (b) Flow direction

Figure 3: Detailed images of two derived data sets for the same area.

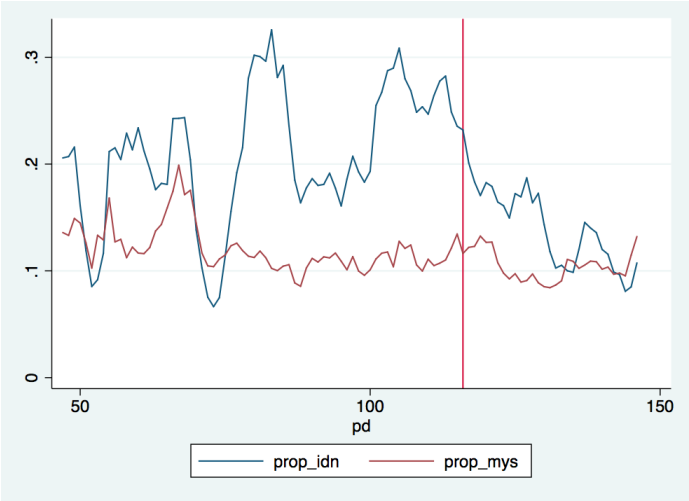


Figure 4: Proportion of new deforestation in new clusters.

[9] K. E. Schnier and C. M. Anderson. Decision making in patchy resource environments: Spatial misperception of bioeconomic models. *Journal of Economic Behavior & Organization*, 61(2):234–254, October 2006.

[10] G. R. van der Werf, J. T. Randerson, L. Giglio, G. J. Collatz, M. Mu, P. S. Kasibhatla, D. C. Morton, R. S. DeFries, Y. Jin, and T. T. van Leeuwen. Global fire emissions and the contribution of deforestation, savanna, forest, agricultural, and peat fires (1997–2009). *Atmospheric Chemistry and Physics*, 10(23):11707–11735, 2010.

Table 1

VARIABLES	(1) prop
pd	0.00137***
	(0.000213)
post	0.522***
	(0.0968)
cntry	0.0631**
	(0.0251)
i_pd_post	-0.00502***
	(0.000755)
i_pd_cntry	-0.00187***
	(0.000302)
i_post_cntry	-0.536***
	(0.137)
i_pd_cntry_post	0.00520***
	(0.00107)
Constant	0.0984***
	(0.0177)
Observations	202
R-squared	0.645

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

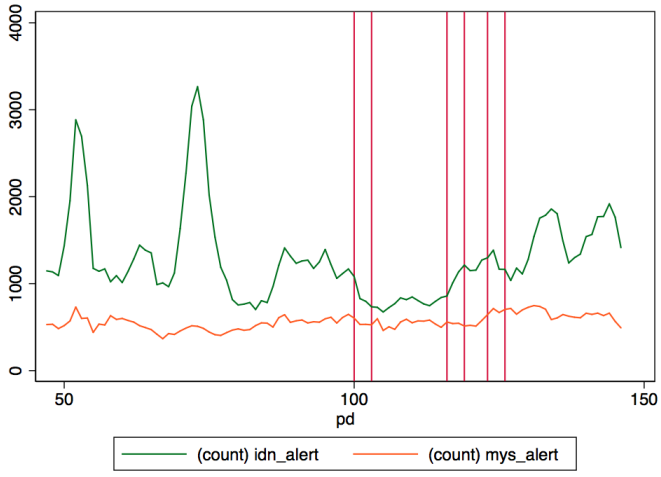


Figure 5: Deforestation alerts in Malaysia and Indonesia. Red lines indicate phases of moratorium

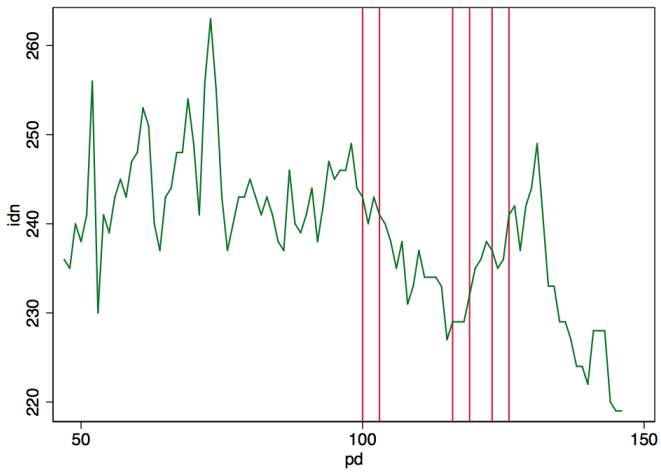


Figure 6: Number of pixels that comprise new clusters in Indonesia