Septiembre 2019

ART3_A1_2020_2
N° de serie

Artículo Científico

Communal Property Rights and Deforestation

Autores

Mauricio Romero

Santiago Saavedra

COLOMBIA CIENTÍFICA
Conocimiento Global para el Desarrollo

ALIANZAEFI
Economía Formal e Inclusiva

The Journal of Development Studies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/fjds20

Communal Property Rights and Deforestation

Mauricio Romero & Santiago Saavedra

To cite this article: Mauricio Romero & Santiago Saavedra (2021) Communal Property Rights and Deforestation, The Journal of Development Studies, 57:6, 1038-1052, DOI: 10.1080/00220388.2020.1817394

To link to this article: https://doi.org/10.1080/00220388.2020.1817394

The Journal of Development Studies, 2021
Vol. 57, No. 6, 1038–1052, https://doi.org/10.1080/00220388.2020.1817394

Communal Property Rights and Deforestation

MAURICIO ROMERO * & SANTIAGO SAAVEDRA **
*Centro de Investigación Económica, ITAM, Mexico City, Mexico, **Facultad de Economía, Universidad del Rosario, Bogotá, Colombia

(Original version submitted January 2020; final version accepted August 2020)

ABSTRACT *Almost a third of the world's forest area is communally managed. In principle, this arrangement could lead to a 'tragedy of the commons' and therefore more deforestation. But it may be easier to monitor outsiders' deforestation of land owned by a community rather than an individual. We present a theoretical framework to examine these trade-offs and empirically study the effect of communal titling on deforestation in Colombia. Our empirical approach uses a differences-in-discontinuities strategy that compares areas just outside and inside a title, before and after titling. We find that deforestation decreased in communal areas after titling, especially in small communities, which is consistent with the model's predictions. We also find evidence of positive spillovers: titling reduced deforestation in nearby areas outside the title (and thus our estimates are a lower bound of the total effects of communal titling on deforestation).*

1. Introduction

Under standard economic assumptions, common-pool resources like fisheries, forests, and water basins are subject to the 'tragedy of the commons', in which a shared-resource is over exploited by individuals pursuing their own interest. Yet, communal property rights may also induce conservation when the owners can overcome their short-term self-interests and exclude outsiders (Ostrom, 1990, 1998). It may also be easier for communities than individuals to prevent outsiders from exploiting the resource due to economies of scale (De Janvry, Sadoulet, & Wolford, 2001). While almost a third of the world's forest area is communally managed (Gilmour, 2016), there are few well identified impact evaluations of the effects of communal titling on deforestation. In this paper, we study the effect of communal titling on forest resources in Colombia using a differences-in-discontinuities strategy.

First, we introduce a simple theoretical framework to understand how communal titling affects the use of forest resources. Similar to the case of territorial use rights in fisheries (Chávez, Murphy, & Stranlund, 2019), communal forest members must allocate time to manage the resource and coordinate monitoring of outsiders' exploitation. The model highlights a relationship between the size of the communal title and deforestation. Intuitively, each individual owner free-rides on his co-owners' monitoring. Thus, the larger the community, the more free-riding that takes place. As a result, titling reduces deforestation more for smaller communities. Our theoretical model is similar to the one developed by Dasgupta and Heal (1979) to study the tragedy of the commons, but we add two features. First, our model allows for the possibility of deforestation by non-owners. Second, it takes into account each owner's decision about whether to allocate time to exploit the forest or monitor deforestation undertaken by non-owners. The results of the model align with previous empirical and

Correspondence Address: Santiago Saavedra, Universidad del Rosario Facultad de Economía, Universidad del Rosario, Calle 12C#4-69, Bogotá, Colombia. Email: santisaap@gmail.com
This article has been republished with minor changes. These changes do not impact the academic content of the article.
Supplementary Materials are available for this article which can be accessed via the online version of this journal available at https://doi.org/10.1080/00220388.2020.1817394.

theoretical findings which show that group size affects common resource management (Agrawal & Goyal, 2001; Barcelo & Capraro, 2015; Yang et al., 2013).

We exploit a natural experiment in Colombia: In 1993, certain regions of the country became eligible for communal land titling by Afro-Colombian communities. The first titles were allocated in 1996. By 2017, 5.3 million hectares of communal land were distributed across 168 titles. We use a differences-in-discontinuities strategy that compares the forest cover just inside and outside the communal titles (the discontinuities) before and after the titles were granted (the differences). Estimates of the effect of titling on deforestation might be affected by site selection bias and spatial spillovers (Andam, Ferraro, Pfaff, Sanchez-Azofeifa, & Robalino, 2008; Robalino & Pfaff, 2012). To address the first concern, we use location fixed effects to control for time-invariant observable and unobservable sources of bias (Jones & Lewis, 2015). To address the possibility that spatial spillovers are influencing the effect of titling on deforestation, we study the sensitivity of our estimates to excluding pixels close to the border (which are more likely to receive spillovers).

We find that the probability that a pixel has no forest coverage is lower after titling, especially in small communities (less than the median number of inhabitants).[1] The probability that a pixel lacks forest coverage falls by 0.33 percentage points compared to a mean of 4.95 per cent (a 6.7% decrease) after titling. In small communities, this probability drops by 0.53 percentage points (a 10.7% decrease). In large communities (above median population), this probability decreases by 0.28 percentage points (a 5.7% decrease).[2] This is consistent with evidence that smaller groups induce higher levels of trust and cooperation (Poteete & Ostrom, 2004). We also find evidence of positive spillovers: titling reduced deforestation in nearby areas outside the title. Thus, our estimates are a lower bound of the total effects of communal titling on deforestation.

Previous research has found mixed evidence on the effect of communal land titling on deforestation in Mexico (Barsimantov & Kendall, 2012; Rueda, 2010), the Amazon region (BenYishay, Heuser, Runfola, & Trichler, 2017; Blackman, Corral, Lima, & Asner, 2017; Blackman & Veit, 2018; Pfaff, Robalino, Lima, Sandoval, & Herrera, 2014), Ethiopia (Rustagi, Engel, & Kosfeld, 2010), India (Agrawal & Goyal, 2001), and China (Yang et al., 2013). Yet, a recent meta-analysis of deforestation recommended rigorous impact evaluation methods to study the effects of community forest management on deforestation (Busch & Ferretti-Gallon, 2017). Likewise, Agrawal (2001) argues that causal research designs (as opposed to case studies) are needed to construct 'a coherent and empirically relevant theory of the commons'. Our paper adds to this literature by providing well-identified causal evidence (using panel data and quasi-experimental methods) of the effects of communal land titling on deforestation in another region.[3] Our results are aligned with previous findings which have shown that groups are more likely to be successful at avoiding the tragedy of the commons when shared resources are stationary (e.g. forests) than when they are not (e.g. fisheries) (Shin et al., 2020). In addition, we contribute to the literature showing how group size affects common resource management (e.g. Agrawal and Goyal (2001); Yang et al. (2013)).

Closely related papers by Bonilla-Mejia and Higuera-Mendieta (2019) and Velez, Robalino, Cardenas, Paz, and Pacay (2020) also find a reduction in deforestation in Colombia's communal lands. Yet our paper differs in three main respects. First, we study whether there are spillovers to nearby areas. Second, we provide a theoretical framework to formalise the trade-offs between the tragedy of the commons and the benefits of communal titling. Third, we use a differences-in-discontinuities identification strategy that exploits spatial and temporal variation. Bonilla-Mejia and Higuera-Mendieta (2019) use only spatial variation (neighbour pixels in a regression-discontinuity design). Velez et al. (2020) use a difference-in-differences design with the titling time, but only use areas that were eventually titled communally. In short, we corroborate their findings using a sharper identification strategy, provide evidence of spillovers, and show heterogeneity in treatment effects by group size.

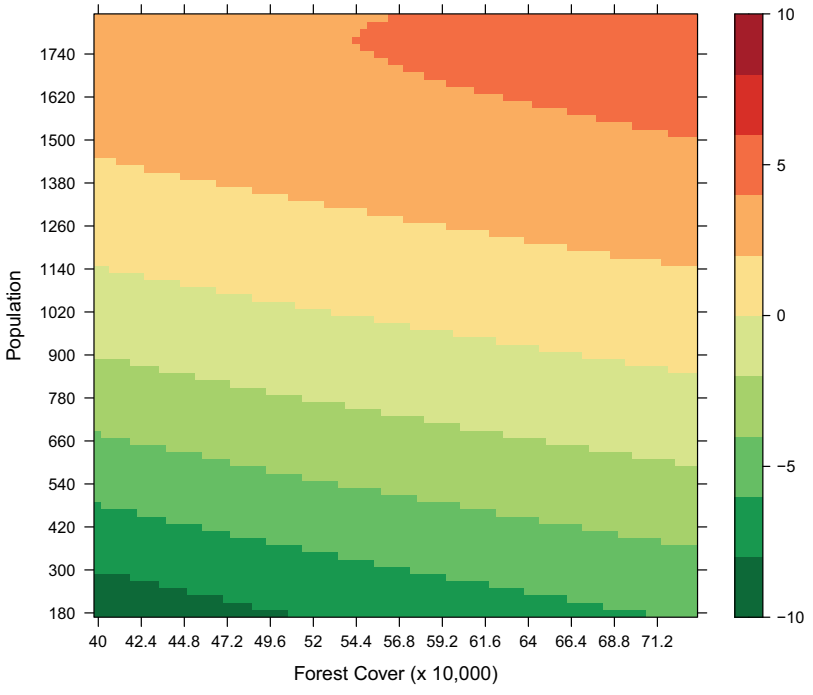

Figure 1. The effect of titling on deforestation.

Notes: Heatmap of the reduction in deforestation associated with titling. Each grid point represents the percentage reduction in deforestation after titling associated with a given number of title owners and forest area. The y-axis plots the number of owners and the y-axis the total titled forest area. The darker the green, the larger the percentage reduction in deforestation. White indicates no difference from the non-title case. Red represents an increase in deforestation.

2. Theoretical framework

We present a simple framework of how communal land titling affects the use of forest resources. The main goal of the model is to understand the effect of communal titling on deforestation, and how this effect is mediated by the number of title owners and the size of the titled area. The model is similar to the one developed by Dasgupta and Heal (1979), with identical agents and individual utility that depends on a person's own actions and those of others using the resource. However, our model has two extra features. First, it allows for the possibility that outsiders (i.e. those who do not own the title) are responsible for part of the deforestation. Second, it takes into account each owner's decision about whether to allocate time to either deforest or monitor deforestation from non-owners. In the supplementary material (Online Supplementary Materials C) we provide a formal mathematical setup.

Each agent derives utility from consuming forest goods and from the amount of remaining standing forest. In the case of a pure communal resource, this framework yields the standard tragedy of the commons result: there is more deforestation in the Nash Equilibrium than in the social optimum.

We expand the model to study the effects of introducing communal titling. Besides exploiting the forest for their own consumption, title owners can exert some effort monitoring to prevent non-owners from deforesting inside the title. Monitoring reduces the forest goods obtained by outsiders per unit of deforestation effort. As the number of title owners grows, each owner monitors for less time, as he benefits from his co-owners' monitoring efforts. This behaviour causes total monitoring effort to display an inverted U-shape pattern: it increases with more owners for small communities, but eventually declines when the free-riding effect on monitoring dominates. Figure C.2 in the Online Supplementary Materials illustrates this pattern. Since the deforestation caused by an outsider (i.e.