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Analysis

Governance and deforestation — a meta-analysis in economics

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ABSTRACT

Understanding which aspects of forest governance have the potential to effectively reduce deforestation is central to reversing trends in global deforestation. There is a multitude of empirical studies examining this relationship using various measures of governance and study designs, coming to diverse conclusions. In order to identify the source of variation across studies, this article conducts a meta-analysis of 32 empirical cross-country studies in the field of economics, containing 227 estimates of the impact of different governance measures on deforestation. Using an ordered probit model, we find that the choice of the governance measure is the main factor in explaining variations in the outcomes of the studies. In particular, studies using environmental policy, ownership rights, presence of environmental NGOs, and rule of law as measures of governance, are more likely to find that better governance reduces deforestation. In contrast, studies using democracy and rights as a measure of governance are more likely to find that deforestation increases, when governance is improved. The finding that not all aspects of governance improvements are equally supportive of forest conservation suggests that more nuanced analyses of specific aspects of environmental governance are required to guide evidence-based policy making.

1. Introduction

In an effort to reduce emissions from deforestation, growing attention is being paid to the role of political institutions in national forest conservation strategies: out of 70 countries planning to roll out national REDD+ (Reducing Emissions from Deforestation and Forest Degradation) programs, 54 explicitly state in their national REDD+ documents that governance issues are a concern for forest conservation, or that they want to address such issues in order to reduce deforestation (UN-REDD, 2016; FCPF, 2016).

There is a rapidly growing empirical literature examining deforestation drivers (Busch and Ferretti-Gallon, 2017; Choumert et al., 2013) and the effect of the quality of governance on deforestation (Deacon, 1994; Bhattarai and Hammig, 2001; Arvin and Lew, 2011; Ehrhardt-Martinez et al., 2002). Studies in the latter strand of the literature come to fundamentally diverging conclusions on the central question whether better governance leads to a reduction in deforestation, hereafter referred to as the governance hypothesis. While a number of studies support the hypothesis, others yield inconclusive results, or reject it.

Taking stock of the literature is hampered by substantial heterogeneity in terms of study design. Most notably, a broad spectrum of governance measures is used to operationalize the quality of governance. These various governance measures can reflect very different components of political institutions. Learning from previous studies is further complicated by significant variations in the methodology employed. Indeed, studies that use the very same governance measure in some cases still come to contradicting conclusions, which suggests that other study design choices, such as the estimation technique, also influence the results. For example, while Li and Reuveny (2006) or Buitenzorgy and Mol (2011) find that more democracy is likely to reduce deforestation, Midlarsky (1998), Marquart-Pyatt (2004), and Ehrhardt-Martinez (1998) find that it can actually increase deforestation.

In this study, we conduct a meta-analysis of the literature in the field of economics to provide a systematic analysis of the relationship between deforestation and the quality of governance. The analysis is based on a sample of 227 estimates originating from 32 studies conducted between 1994 and 2016. We classify the estimates by direction and statistical significance and use an ordered probit to draw systematic comparisons across studies. The analysis provides a quantitative insight into which factors explain the variation in the multitude of study outcomes. In particular, we seek to identify which aspects (general or specific environmental) and levels (decision process, rules, or enforcement) of governance tend to have a robust deforestation-reducing effect across different study designs. Theory guides us in hypothesizing that

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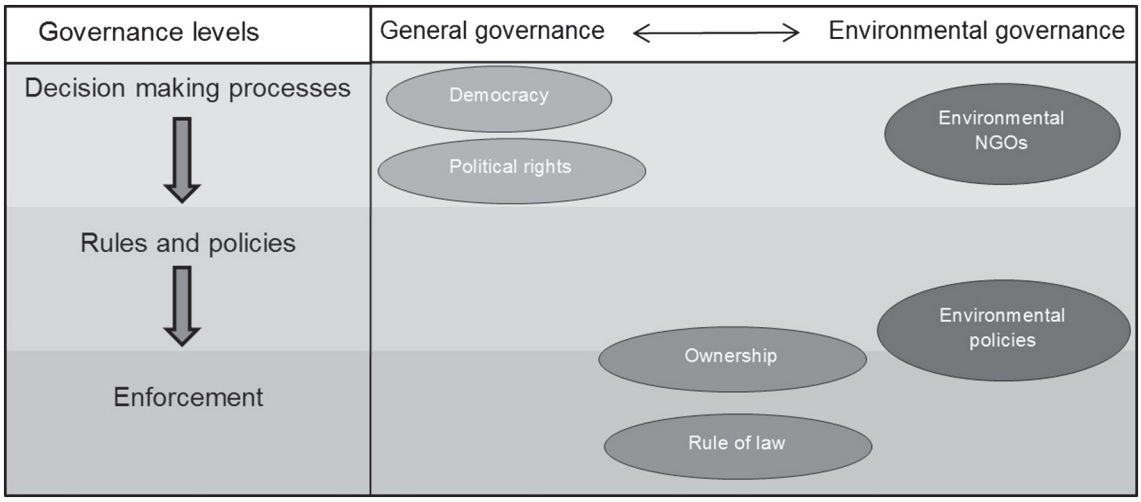

Fig. 1. Two-dimensional framework of governance.

studies using an environmental governance measure (e.g. environmental expenditures) are more likely to be supportive of the governance hypothesis than those using a general governance measure (such as liberal democratic institutions). Furthermore, emphasis is placed on the role of control variables, model specification and estimation technique, as well as the spatial context and study period.

In contrast to a literature review, a meta-analysis is a systematic analysis of empirical research using objective criteria for the selection of literature and statistical tools for the identification of systematic patterns across studies that can be reproduced (Waldorf and Byun, 2005; Stanley and Doucouliagos, 2012). Existing meta-studies in the field allow conclusions to be drawn on the current scientific consensus on (i) deforestation and land tenure rights security (better land tenure rights are likely to reduce deforestation, Robinson et al., 2014), (ii) deforestation and income (more recent publications find less evidence for the hypothesis that higher income countries are likely to experience less deforestation, Choumert et al., 2013) or (iii) forest restoration (a meta-analysis reveals that forest restoration bears the potential to significantly enhance biodiversity, Crouzeilles et al., 2016). Furthermore, Busch and Ferretti-Gallon (2017), Angelsen and Kaimowitz (1999), as well as Lambin et al. (2001) provide reviews of the literature on drivers of deforestation, without identifying and quantifying systematic patterns. There is, to the best of our knowledge to date, no meta-analysis examining the relationship between governance and deforestation.

The remainder of this paper is organized as follows. We will first present the conceptual framework for the analysis in Section 2. In Section 3, we present the data selection strategy, describe the main moderator variables and provide descriptive statistics for our analysis. In Section 4 we present the meta-analytical model. In Section 5 we report the results and Section 6 concludes with a broader discussion.

2. Conceptual Framework

Guided by the conceptual literature, we present a simple framework in this section that decomposes two basic dimensions of governance, which lead to two more refined versions of the general governance hypothesis and indicate possible different underlying mechanisms (Ferraro and Hanauer, 2014; Meyfroidt, 2016).

As a vertical dimension, we distinguish between different levels of governance. We build upon the forest governance framework proposed by the FAO and PROFOR (2011) and differentiate between the three levels: (i) decision making processes, (ii) rules and policies, and (iii) enforcement. These three levels can be conceived as following a (vertical) ordering, because decision making processes (processes that are required to change the status quo, Tsebelis, 1995), produce rules, (*de jure* dimension of governance, Kaufmann et al., 2007) that are subsequently enforced (*de facto* dimension of governance, Kaufmann et al., 2007). Of course, weaknesses in the enforcement of existing rules can also trigger new decision making processes. However, we can assume that no new rules are going to be enforced without having been subject to decision making processes beforehand. We hypothesize that the use of governance measures at different levels can partly explain the inconclusive findings on the governance hypothesis across studies. We refer to this refinement as the vertical dimensions of the governance hypothesis. If good governance at a specific level was more likely to reduce deforestation, this would also allow more focused policy advice on reforming political institutions.

As a horizontal dimension, we follow Ceddia et al. (2014) and differentiate general from specific environmental measures of governance. Ceddia et al. (2014) argue that better general governance (e.g. liberal democratic institutions) is likely to increase the demand for agricultural land and thus implicitly leads to more deforestation. Such a Jevons effect (Jevons, 1866) occurs, when efficiency increases (here induced by governance improvements) for an input factor to production (here agricultural land) allow to increase output levels of production. On the other hand, specific measures of the quality of environmental governance (e.g. environmental expenditures) are predicted to reduce demand for land as an input to agricultural production. This is referred to as a landsparing Borlaug effect. A Borlaug effect (Borlaug, 2007) occurs when efficiency improvements lead to a reduced use of natural resource based input factors to production. Along these lines, we hypothesize that studies using an environmental governance (general governance) measure are more (less) likely to be supportive of the governance hypothesis. We refer to this refinement as the horizontal dimensions of the governance hypothesis.

Fig. 1 illustrates the two dimensions of governance described above that will guide the subsequent analysis. It depicts the vertical and horizontal refinement of the general governance hypothesis. For illustrative purposes, we display the six governance variables that we identify in the meta-study sample as the most frequently used governance variables (details follow in Section 3).

3. Data

3.1. Data Selection

We follow the data selection standards for meta-studies proposed by Stanley et al. (2013). We impose four study selection criteria. First, we decide to restrict the scope to peer-reviewed articles and academic working papers and exclude all other types of publications. Second, we

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