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## Capitalizing property rights insecurity in natural resource assets <sup>☆</sup>

Corbett A. Grainger <sup>a,\*</sup>, Christopher J. Costello <sup>b,c,d</sup><sup>a</sup> Department of Agricultural & Applied Economics, University of Wisconsin, Madison, 427 Lorch St, Madison, WI 53706, United States<sup>b</sup> Bren School of Environmental Science and Management, UCSB, United States<sup>c</sup> NBER, United States<sup>d</sup> UMR1135 LAMETA, Montpellier, France

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### ABSTRACT

Property rights are commonly touted as a solution to common pool resource problems. In practice, however, the security of property rights over natural resources varies substantially; this may affect returns to ownership and asset values. We use an analytical model to examine the effects of insecure property rights to natural resources on the market value of assets. We then use a unique dataset of fisheries from three countries to examine empirically how differences in property rights affect market outcomes. We find significant asset market capitalization of insecurity arising from (1) ownership disputes, (2) illegal extraction from resource stocks, and (3) the possibility of government revocation of rights.

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To overcome problems associated with common pool resources (e.g. Gordon, 1954; Hardin, 1968), property rights approaches to management are increasingly employed globally (see e.g. Arnason, 2012). Across resources, strong evidence of increased economic and ecological performance from rights-based approaches has emerged (Grafton et al., 2000; Costello et al., 2008), and the policy debate has shifted away from the effectiveness of these approaches toward questions of design. While it seems self-evident that design elements may affect the property rights security and outcomes such as the value of assets, this link has not been empirically tested.<sup>1</sup> For example, so-called “sunset clauses” after which rights are revoked and redistributed will affect stewardship and value (Costello and Kaffine, 2008). Similarly, assignment of rights to only a portion of the resource stock may erode conservation and investment incentives (Deacon et al., 2013). Other fundamental design parameters include limits on ownership or transferability (Grafton et al., 2000), revocability, and geographic or temporal control over resource stocks. Despite their ubiquity and importance for design, to our knowledge the extent to which these limitations on property rights security affect behavior and economic value has not been empirically studied. The purpose of this paper is to develop and analyze a model linking insecure property rights to asset markets and to test that model’s predictions empirically for a globally significant common pool resource.

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\* Corresponding author. Fax: +1 608 262 4376.

E-mail address: [cagrainger@wisc.edu](mailto:cagrainger@wisc.edu) (C.A. Grainger).

<sup>1</sup> It is well documented that property rights and institutions can have a profound impact on investment and economic growth, yet it is difficult to empirically disentangle the effects of institutions on economic outcomes (e.g. Eggertsson, 1990). In considering economic development, there is wide acknowledgment of the critical role of institutions (see, e.g. Acemoglu and Johnson, 2005; Besley and Burgess, 2000; Alston et al., 1996; Alston and Mueller, 2010; Banerjee et al., 2002; Besley, 1995; Goldstein and Udry, 2008; Jacoby et al., 2002).

**Table 1**  
Examples of natural resource property rights and sources of insecurity.

Natural resource	Location	Class of insecurity	Citation
Agriculture	Ghana	Expropriation risk	Besley (1995)
Forestry, Ag.	Brazil	Expropriation risk	Alston et al. (2000)
Fisheries	New Zealand	Illegal harvest	Ministry of Fisheries Plenary Reports
Ag., Deforestation	Nicaragua	Expropriation risk, ownership dispute	Liscow (in press)
Fisheries	USA	Revocation risk	Magnuson–Stevens Act
Water	Somalia, Ethiopia	Ownership dispute	Flintan and Tamrat (2002)
Grazing	American West	Revocation risk	Libecap (1981)

Our empirical application concerns the movement to property rights-based management for global fisheries, which are of particular interest due to concerns about the long-run health of the resource and an increase in the reliance on fisheries as a source of protein. However, this story is not unique to marine resources. Attention is increasingly being drawn to negative consequences of common pool management of resources such as timber, air, water and biodiversity. These declines along with rent dissipation have arguably helped motivate the establishment of property rights over these resources. In doing so, governments inevitably wrestle with equity–efficiency tradeoffs in determining how much control to cede to private resource owners, where more control typically confers a stronger property right to its owner.<sup>2</sup>

We explore three general classes of property right insecurity that are chosen to capture a large set of the real-world circumstances under which property rights are weakened. The first concerns uncertainty over future ownership and is modeled as an ownership dispute that will be resolved once-and-for-all at a known date in the future; the second involves illegal harvest activity; and the third examines the effects of a perpetual threat that the property right will be revoked. Table 1 provides several real-world examples of natural resources managed by property rights that are subject to one or more of these sources of asset insecurity.

While the structure of property rights surely differs across natural resources, a common model is the so-called “cap and trade” model where the level of extraction from resource stocks is set by a regulator, extraction rights are owned by individual firms, and those firms divide, buy, sell, and lease those rights as assets. These quota markets offer an ideal opportunity to study the effects of property right security on asset values because the relationship between lease price and sales price of asset, in theory, is dictated by market fundamentals.

The details of quota markets and property right security for natural resources are described in the literature, but few papers examine directly the effects of property right security on asset values. A notable exception is Arnason (2007) who examines how different property right characteristics (security, exclusivity, permanence, and transferability) affect quota markets and the value of the resource. Our focus is different, examining the impact of property right characteristics on the ratio of lease-to-sales prices, which is an important distinction and allows us to test our propositions using data across fisheries. Moreover, focusing on the ratio of lease-to-sales prices allows us to uncover nontrivial predictions that we can test empirically. Previous empirical studies include Batstone and Sharp (2003), who study the market capitalization of stock changes as an alternative to biological stock assessments in New Zealand. Newell et al. (2005) study individual transferable quota (ITQ) markets in New Zealand and find that markets are sufficiently thick to operate well; the relationship between lease and sales prices approximately follows market interest rates, and asset values in fisheries that experienced significant rebuilding showed large gains. In a related study, Newell et al. (2007) extend this analysis to a more formal model of asset pricing for created markets. They find that asset prices are higher when interest rates are lower, and asset values are lower for stocks with higher biological fluctuation. They also find that stocks that had large decreases in costs or high growth rates in output prices have higher quota asset prices. These papers contribute significantly to our understanding of quota markets and asset pricing, though they do not directly address the issue of property rights security or institutional design. We contribute to this broader literature by examining the pecuniary market effect of stronger property rights.

We begin by developing an analytical model of a natural resource managed with property rights. Harvest rights are owned and can be divided, bought, sold, and leased among a competitive set of resource users. Because many forms of property right insecurity involve uncertainty over future rent capture, we use the ratio of lease price to sales price of quota (i.e. the *dividend price ratio*) to capture future expectations. Focusing on this lease-to-sales price ratio accomplishes two goals. First, it measures the market’s capitalized beliefs about the future returns on the asset (this is the denominator or “price”). Second, it controls for a whole suite of potentially unobservable resource-specific characteristics by incorporating the current period return on the asset (via the numerator, or “dividend”). We study the extent to which it can be relied upon to reflect changes in property rights security for natural resources. We demonstrate that some changes in property rights may affect both the current returns (the dividend) and future expectations (the price) which may dampen, or even cancel out completely, any measurable effect on the dividend price ratio. We derive a number of concrete theoretical predictions that directly link capitalized asset values and dividend price ratios to property right insecurity.

<sup>2</sup> Property rights can be described as a “bundle of sticks” or a “bundle of rights,” where each “stick” corresponds to a characteristic of the underlying rights, such as use, transferability, enforcement, and a right to income. See Barzel (1997) for a general discussion, or Arnason (2007) for a description in the context of fisheries.

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