The Environmental Insurance Trap

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JEL Codes: Q20, Q54, Q57
Keywords: Environmental externality, common pool resources, poverty trap

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Abstract

Common pool resources can provide backstop livelihoods and insure individuals against collapse of private endeavors. When private and common pool endeavors are interconnected, investment in one may put the other asset at risk. We model Senegalese farmers choosing whether to grow crops, a private activity, and or raise livestock on common pool pastureland. In much of the western Sahel, including Senegal, common-property grazing institutions have evolved to facilitate long-distance transhumant migration. Local farmers are also increasingly engaging in livestock husbandry and utilize the local commons in similar ways so that the dominant institutional arrangement is common property pasture and private cash crops.

Locust outbreaks damage the crops, but not livestock, which are used as savings and insurance. Livestock can increase the likelihood of locust outbreaks via ecological processes related to grassland degradation. Individuals self-insure against catastrophe by holding livestock, which increases overall risk by degrading pasture. We show in an analytical model how the incentive to self-protect or self-insure changes with various property rights schemes and economic arrangements. We also demonstrate in a numerical exercise how the common pool nature of pasture causes individuals to over invest in livestock, regardless of access to crop insurance. This involves solving the dynamic programming problem to find optimal livestock harvest schedules and performing a welfare analysis from the perspective of a Senegalese farmer. This work provides insight into how the human adaptive response to risk and ecological externalities interact in response to environmental risk in places lacking efficient insurance markets.