



Analysis

How do Payments for Environmental Services Affect Land Tenure? Theory and Evidence From China



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ABSTRACT

Recent academic endeavours have questioned whether the rapidly unfolding Payments for Environmental Services (PES) may have profound influence on land tenure which would in turn impact the conservation efficacy of PES. This paper developed a game-theory model in the context of rural China, which describes the endogenous formation of land rights as a bargaining process between ordinary villagers and village leaders. This model gave rise to theoretical predictions pertaining to the implications of two PES schemes in China for land tenure, namely the Sloping Land Conversion Programme (SLCP) and the Ecological Public-Benefit Forest Compensation Programme (EPBFCP). The theoretical predictions were tested using primary data collected through large-scale field surveys. These data were analysed using the Propensity Score Matching method and panel data models. Both the theoretical analysis and the empirical results find that the SLCP has likely enhanced land tenure security by increasing the bargaining costs of village leaders' attempts to reallocate SLCP lands to other households. On the other hand, villagers tend to have less motivation to de-collectivise those forest lands enrolled in the EPBFCP, which somewhat stands in the way of the country's agenda to further de-collectivise communal forests and allocate them to individual households.

1. Introduction

The past 15 years have witnessed rampant development of land-based Payments for Environmental Services (PES) programmes, which typically compensate land holders for the environmental benefits they provide (Ferraro and Kiss, 2002; Wunder, 2005). More than 300 PES-like programmes have been implemented worldwide (Blackman and Woodward, 2010), and billions of dollars are being poured into these schemes annually (OECD, 2010). For instance, in response to recent developments in international climate change negotiations, there have been significant support for and widespread interest in Reducing Emissions from Deforestation and Forest Degradation (REDD) programmes, the total budget of which added up to 227 million USD by 2014 (The United Nations, 2014). At the 2015 climate summit in Paris, REDD was prioritised by over 60 countries in their action plans to combat climate change.

However, rigorous impact-evaluation studies have revealed a mixed picture of the conservation efficacy of PES (Pattanayak et al., 2010). There are a number of different explanations but institutional imperfections are frequently suspected to be largely responsible (Burtraw, 2013), especially in developing regions. For instance, well-defined

property rights of environmental services (ES), which are typically attached to land tenure in land-based PES, are widely accepted as an essential prerequisite for the success of PES (Engel et al., 2008). On the contrary, unclear, contested and volatile land tenure would make it difficult to identify which parties are responsible for and capable of providing the required ES in exchange for the corresponding payments. The influence of property rights on PES has been well established by conventional wisdom dating back to the Coase Theorem. Nevertheless, the reciprocal effects, namely that PES may exert a nontrivial influence on property rights, have only recently been acknowledged (Naughton-Treves and Wendland, 2014). Institutional arrangements, such as land tenure, usually represent equilibrium outcomes of interactions among multiple stakeholders pursuing their own interests (Groenewegen et al., 2010). PES, as an external shock to the pre-existing equilibrium, could thus tip the balance and drive the institutional system towards an alternative equilibrium status. If this trajectory eventually leads to even more unclear and insecure land tenure which then in turn further threatens the success of PES, then PES would be trapped in a doomed institutional spiral undermining its efficacy.

As noted above the interactive nature of the PES-property rights nexus has received increasing interest in recent literature. For instance,

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some researchers argued that national-level REDD programmes, as a PES instrument, could threaten to recentralise forest rights because the payments could incentivise powerful rent-seekers to take away forest rights from smallholders, which would (in the long run) undermine both tenure arrangements and environmental outcomes (Agrawal et al., 2010; Dressler et al., 2012; Hall, 2014; Larson, 2011; Phelps et al., 2010; Sandbrook et al., 2010). However, others contended that PES could be an opportunity for disadvantaged land holders to strengthen their property rights, since they would be officially recognised as ES suppliers and hence land holders (Arriagada et al., 2015; Palmer, 2010; Sunderlin et al., 2014; Toni, 2011; Wunder, 2010; Wunder et al., 2008).

Taken together these strands of literature suggest largely divided opinions over the interactions between PES and land tenure. It is still early days to draw clear lessons due to lack of theoretical support and rigorous empirical evidence in existing literature, except a few rare examples such as the studies by Engel et al. (2008) and Vijge and Gupta (2014). There is a necessity to construct a formalised theoretical model so as to develop the isolated arguments made by previous studies into a comprehensive and generalisable analytical framework. For one thing, this would be helpful in depicting a more complete picture of the nexus between PES and land tenure without over- or under-emphasising any facet of their interactions. For another, this would to some degree overcome the case-specific nature of previous studies and facilitate *ex-ante* diagnosis for other PES cases with different features. Further, such theoretical interpretations need to be explored using hard empirical evidence. However, existing studies on this topic have disproportionately rested their arguments on narrative evidence, which calls for further efforts to accumulate more objective quantitative data derived from reliable empirical methods.

This research agenda requires continuous scientific endeavours from different study sites. As a start, this study makes one of the earliest attempts towards that direction, by undertaking both a theoretical and empirical exploration of the nexus between PES-type schemes and land tenure. This is undertaken in the context of two PES programmes in rural China, namely the Sloping Land Conversion Programme (SLCP) and the Ecological Public-Benefit Forest Compensation Programme (EPBFCP). In both cases, land tenure arrangements emerged from interactions among multiple stakeholders contesting land rights, wherein PES wielded substantial influence. Similarities and differences between the two cases can be suggestive of the conditions under which PES and land tenure become mutually reinforcing. Moreover, the sheer size of the two programmes adds to the practical significance of the findings. The two cases are therefore well positioned to exemplify the reciprocal effects of PES on land tenure.

2. The Sloping Land Conversion Programme and Cropland Tenure

This section presents the first case study, which delves into the impact of China's SLCP on cropland tenure. It starts with an outline of the policy background. This is followed by a game-theory framework, which models the impact of the SLCP on cropland tenure as an outcome of strategic interactions between village leaders and ordinary villagers contesting land rights. The proposition derived from this theoretical model is empirically tested using data at the cropland-plot and household levels collected in Gansu and Yunnan provinces where the SLCP has been influential.

2.1. Policy Context of the SLCP and Cropland Tenure

In the late 1990s, China was hit by severe floods in the Yangtze River basin (as shown in Fig. 1). The severity of these floods was predominantly attributed to extensive deforestation and cultivation of sloped lands in the upper reaches of the Yangtze and Yellow Rivers. This triggered the initiation of a series of large-scale ecological restoration programmes in rural China in order to mitigate soil erosion and provide additional watershed services, chief among which was the

SLCP. This programme was intended to retire highly sloped (usually > 25°) and marginal cropland from agricultural production, and to convert such cropland to forests. By the end of 2006, this programme had set aside and afforested > 9 million hectares of cropland in 25 provinces.¹ This translates into a roughly 10% decrease in the country's cultivated land. As a reference point, the cumulative enrolment (unexpired contracts) of the world-renowned Conservation Reserve Program of the US amounted to approximately 10 million hectares by the end of 2013 (Stubbs, 2014). The SLCP thus rivals the size of its American counterpart and represents one of the most influential land-based PES schemes in the world (Uchida et al., 2007; Xu et al., 2010a).

The SLCP provides both in-kind and cash payments to enrolled land holders on an annual basis to cover the loss of cropping revenues, in addition to free tree seedlings. On account of the considerable difference between crop yields in the south and north of China, the annual in-kind compensation was 2.25 t of grain per hectare for the Yangtze River basin, and 1.50 t for the Yellow River basin.² The annual cash subsidy was set at the same level for both regions (CNY 300 per hectare). The duration of payments was initially five years if 'economic trees' (capable of providing additional incomes through fruits and nuts, etc.) were planted, and eight years if 'ecological trees' (to be managed merely for the provision of environmental services and would not directly lead to any substantial economic benefits for land holders) were planted. The compensation period was extended in 2007 for five (eight) more years for economic (ecological) trees, although the payment rate was halved. The programme requires ecological trees to be planted on a minimum of 80% of enrolled cropland in any given location (Groom et al., 2010). This ratio is even higher in Gansu and Yunnan provinces, where we collected our data (as shown by Fig. 1). The two mountainous provinces accommodate the fast-running upper courses of the Yellow River and Yangtze River. Owing to lack of flat and fertile cropland, subsistence peasants have resorted to cultivating (previously forested) mountain slopes, making terrace farming a common practice in these regions. This has considerably exacerbated loss of soil and siltation of rivers. The two provinces are thus regarded as priority areas of the SLCP, where a higher ratio of ecological trees has been mandated.

For cropland enrolled in the SLCP, the county or township government is responsible for signing contracts with land use rights holders, which are usually individual households. In the early years of the Chinese communist regime, collective farming was promoted in the early 1950s and reached its prime by the end of that decade. This collective farming system was widely accused of being responsible for the widespread famine and starvation in the late 1950s (Rozelle and Swinnen, 2009). When the SLCP was introduced in the late 1990s, the collective cropland tenure system had been replaced by the Household Responsibility System (HRS) in the vast majority of China's rural areas (Brandt et al., 2002). Under the HRS, village collectives still officially own the cropland, but individual households have fixed term contracts to use the cropland for their own agricultural production. In some places, however, village collectives occasionally redistribute their cropland among households in the same village. This practice was originally intended to improve equity and agricultural productivity by transferring uncultivated or less efficiently managed cropland to other households with insufficient land or higher productivity. Nowadays, cropland reallocation persists, although the frequency and scale have significantly decreased (Deininger and Jin, 2009; Mullan et al., 2011; Wang et al., 2015, 2011). According to our data collected from Gansu and Yunnan provinces, nearly 10% of the surveyed households experienced cropland reallocation between 1997 and 2012, which was

¹ The SLCP initially aimed to enrol some 15 million hectares of cropland, but enrolment was suspended in 2007. The programme was reopened for new enrolments in 2014 with evolved provisions. Since we collected our data in 2013, all descriptions of the SLCP in this study refer to the first round of sign-up.

² The in-kind compensation was replaced by cash in 2004 at a price of CNY 1.4 per kilogramme.

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