

Land Retirement and Nonfarm Labor Market Participation: An Analysis of China's Sloping Land Conversion Program

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Summary. — China's Sloping Land Conversion Program pays more than 32 million households to plant trees on highly erodible cropland, and has effected major land-use changes. Farmers retire land indefinitely but receive time-limited subsidies, after which they, in principle, enter nonfarm employment. We analyze annual data we collected on over 3,000 individuals and plots from 1998–2006, which contain variation in enrollment timing and alternative measures of enrollment, and conclude enrollment has a small but significant and robust positive effect on nonfarm employment. It arises not from alleviating constraints, as recent papers have suggested, but rather from simple farm to nonfarm labor substitution.

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1. INTRODUCTION

(a) *Payments-for-environmental-services programs*

Many of the world's poor live in mountainous and other ecologically fragile regions. Whether poverty stems from geographic conditions, contributes to ecological degradation, or merely happens to exist in many fragile environments, policy-makers are attracted to programs that promise to both reduce poverty rates and improve the environment. In recent years, a number of developing countries, including Costa Rica, Mexico, and China, have implemented payments-for-environmental-services (PES) programs (see for example, [Alix-Garcia, de Janvry, Sadoulet, & Torres, 2005](#); [Hyde, Belcher, & Xu, 2003](#); [Mayrand & Paquin, 2004](#); [Xu, Bennett, & Xu, 2005](#)). Such programs aim to achieve the dual goals of poverty reduction and ecological restoration by paying farmers to adopt sustainable practices, often by planting trees to reduce soil erosion.

The long-term success of a PES program depends on whether its participants can find alternative livelihoods to growing crops. Unless governments or other sponsors extend subsidies indefinitely or farmers find alternative livelihoods, farmers will either become impoverished or resume cultivation and reverse the ecological benefits of the PES program. In China, rural landlessness was one of the causes of the 1949 revolution, and the government does not want to re-create a class of rural landless poor. The objective of this paper is to determine whether, and through which mechanisms, China's Sloping Land Conversion Program (SLCP) may cause increases in nonfarm employment.

(b) *The Sloping Land Conversion Program*¹

SLCP, formerly known as Grain for Green, is by far the largest PES program in any developing country. Although most of

this is afforestation of wasteland, the area enrolled in SLCP by the end of 2009 was reported as 28 million hectares ([Xinhua, 2010](#)), twice the 13 million hectares in the Conservation Reserve Program ([Farm Service Agency, 2011](#)). Participating households totaled 32 million. Even in a country with the population of China, SLCP represents the third most widespread rural investment project, behind roads and irrigation systems ([Zhang, Luo, Liu, & Rozelle, 2006](#)). Within the sample used in this paper, nearly 40% of farmland was enrolled in the program and mean subsidies per participating household amounted to 1,050 *yuan* per year.² This is substantial relative to the official mean income level in the sampled villages of approximately 6,000 *yuan* per household per year, or slightly less than \$1 per capita per day after adjusting for purchasing power parity.

Premier Zhu Rongji announced the SLCP in 1999 while visiting the cleanup from disastrous flooding the previous year that had left thousands dead and millions homeless. SLCP was also a response to other serious environmental threats, including the sandstorms that blanket northern China in the spring and potential siltation of the Three Gorges Dam reservoir. It represents the most recent of a series of Chinese government programs to replant marginal cropland and barren hillsides, but the first that resembles a modern PES program.³ Western China, the poorest area of the country facing the

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most serious erosion hazards, accounts for most of the enrolled area.⁴ As is common in other PES programs, the SLCP has more than one objective. It aims to reduce erosion and restore ecological balance, to support farmers' incomes, and in the longer term after the subsidies expire, to move farmers into other employment endeavors, such as growing high-value crops or taking on nonfarm employment. At this time, carbon sequestration is not an official goal of the program.

The survey upon which this paper is based was conducted in June 2007, several months before China's State Council announced a major policy change (State Council, 2007). Under the new policy, new enrollment is suspended except for a limited amount of land with a slope over 25 degrees, and subsidy payments continue an additional 5–8 years at half of the previous rates. Perhaps most relevant from an econometric point of view, the new policy encourages local governments to coordinate the program with promoting ecological out-migration and developing rural energy, and to supplement subsidy payment rates according to local conditions, introducing various potential sources of endogeneity. At the time the survey was conducted, the program was still essentially an ecological policy that did not set subsidy payment rates according to local conditions or coordinate with other development programs.

The SLCP is, in principle, a voluntary program similar to the Conservation Reserve Program. However, in China there is no private ownership of farmland, and executive departments have substantial leeway in implementing laws, meaning that participation is in practice mandatory for many farmers. Although farmers have limited autonomy in determining whether to participate in SLCP, most participants in the sample say that they are better off as a result of participating. Some farmers say they are worse off, but others say they would like to enroll even larger areas than they have.

Farmers in villages eligible for the program attend required village meetings in which village officials explain the program and how it is implemented in their area. At the meetings, village and township officials tell farmers which pieces of land must be enrolled, which may not be enrolled, and which they can choose whether or not to enroll. The path of least resistance for the farmer is to follow the local government's plan to enroll certain areas and not others. Those farmers who enroll sign a contract with the SFA or another designated local government unit, and agree to plant trees on land that has been rented from or allocated by the village. The online appendix contains an English translation of one version of the contract, from northern China. In southern China, subsidy payment rates are exactly 50% higher per hectare, but there are no other substantive differences in the contract. The details of the implementation vary with the type of trees to be planted, and the program has gone from an in-kind grain subsidy to a cash subsidy.⁵ The contract states that land is to remain enrolled indefinitely even though subsidies are for only 5–8 years (not including finite extensions).⁶

In the sampled villages at the time of the survey, there existed no procedure for un-enrolling a plot once it had been enrolled. The program was designed with the hope that farmers would voluntarily substitute nonfarm employment and/or high-value crops as income sources to replace their lost pre-enrollment grain production income.

(c) *Afforestation and employment*

As with other PES programs, nonfarm employment is important to the long-term sustainability of SLCP. Nationwide, nonfarm employment has played a major role in reducing rural poverty in China in recent decades (Bowlus &

Sicular, 2003; deBrauw, 2002). Within the sample, which is probably representative of the remote areas where SLCP is most important, nonfarm employment of farmers has increased substantially over the past 10 years of program implementation. The changes have been broad-based, including both local and outside work locations, part-time and full-time work, men and women, and industry and service jobs. Economists have had limited understanding of what role, if any, the afforestation program has played in these trends. Empirical evidence is mixed; Ahearn, El-Osta, and Dewbre (2006), for example, find that the Conservation Reserve Program in the US tends to keep farmers on the farm, while Groom, Grossejean, Kontoleon, Swanson, and Zhang (2010) and Uchida, Rozelle, and Xu (2009) find that SLCP enrollment tends to promote nonfarm employment.

(d) *Previous literature*

Other researchers (Groom et al., 2010; Uchida et al., 2009) have tackled the question of the effect of SLCP on nonfarm employment using difference-in-difference methods comparing participants to nonparticipants, and have found small and not especially robust effects. Both papers argue that because participation affects poor households more than rich households (a result that is found in only some specifications in this paper), SLCP is alleviating constraints. These papers have several weaknesses. First, participants differ from nonparticipants on a number of variables. Matching techniques may be unable to control for differences in unobserved variables, and cannot adequately address the problem of endogenous choice of participation (to the extent that such choices are voluntary). In addition, other researchers only use data from 2 to 3 points in time, making it impossible to determine exactly when employment changes occurred relative to enrollment.

This paper, in contrast, uses a dataset collected by the authors' collaborators that contains both more observations and more variables than those used by Groom et al. (2010) and Uchida et al. (2009) combined. The dataset contains annual observations from 1998 to 2007 on both employment and enrollment, allowing the construction of a conditional probability model in which the probability of an individual obtaining employment in a particular year is a function of the household's enrollment in that same year. (The results suggest the participants who are going to enter the nonfarm labor force as a result of the program do so in the same year as enrollment and that such entries are usually permanent.) Such a specification improves the statistical power of the estimation, allowing for a much greater variety of robustness checks, including an instrumental variable for enrollment and placebo tests to check for reverse causation or biased standard errors. The IV estimation eliminates the possibility of endogenous farmer choice biasing the results by using an interaction of the timing of village enrollment quotas and household land characteristics to predict household enrollment in particular years. The paper also uses a larger dataset, collected with more attention to recall bias and other measurement issues, than in past research.

As in Uchida et al. (2009) and Groom et al. (2010), the paper finds that SLCP enrollment has a small but statistically significant positive effect on nonfarm employment. The effect increases as the labor savings from not growing crops increase, but appears unrelated to whether farmers are made better or worse off by SLCP. The results support a simple story of labor reallocation similar to that told by farmers, and do not support any of several stories in the literature related to alleviating

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