



# Households' Decisions to Participate in China's Sloping Land Conversion Program and Reallocate Their Labour Times: Is There Endogeneity Bias?



Runsheng Yin<sup>a,b,\*</sup>, Hao Liu<sup>c</sup>, Can Liu<sup>c</sup>, Gang Lu<sup>b</sup>

<sup>a</sup> College of Economics and Management, Zhejiang A&F University, Lin'an 311300, China

<sup>b</sup> Department of Forestry, Michigan State University, East Lansing, MI 48824, USA

<sup>c</sup> China National Forestry Economics and Development Research Center, No. 18 East Heping Street, Beijing, 100714, China

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## ABSTRACT

Past impact evaluations of China's largest ecological restoration program have assumed the absence of self-selection (endogeneity) in the likelihood and extent of participation. Using appropriate testing procedures and a panel dataset of > 1000 households over 11 years in two primary provinces, we found evidence of self-selection in household behavior of generating off-farm income. But the hypothesis was rejected that there was a significant self-selection component in households' decision to participate in the program and generate farming income. Evaluations ignoring the self-selection for off-farm labor were found to be biased and overly positive on program income impact. Self-selection should thus be explicitly included, unless there is counter evidence, in any study of this kind.

## 1. Introduction

Following a brief phase of piloting, China launched the Sloping Land Conversion Program (SLCP) in 2001 (Xu et al. 2006; Yin 2009). As a nationwide initiative of payments for ecosystem services (PES), the SLCP has subsidized tens of millions of farmers in mostly poor rural areas to retire marginal cropland and to restore them and other degraded fields to forest or grass covers (Uchida et al. 2009; Cao et al. 2009; Yin and Yin 2010). Because of the huge financial investment and broad geographical extent, it has been ranked as the largest PES program in the developing world (Liu et al. 2008; Bennett 2008). While the first round of its implementation ended in 2008, a scaled-back, second phase has still been ongoing and related activities have been undertaken elsewhere as well (Zhen and Zhang 2011).

A number of studies have been conducted to evaluate the socio-economic impacts of the SLCP over the last decade (e.g., Uchida et al. 2009; Grosjean and Kontoleon, 2009; and Xu et al. 2010). Nonetheless, these studies have rarely addressed the fundamental question of whether there is self-selection in farmers' decisions to participate in the SLCP. By self-selection, we mean that farmers, recognizing the potentially greater benefits to be derived from participating (via receiving subsidies and/or incomes from non-farming jobs) than from continued farming on marginal cropland, intentionally get enrolled into it or with a larger amount of land, or seek more off-farm employment. In the literature, these possibilities are also referred to as endogenous

participation, which can upset the randomness of the sample and cause it to be less representative of the population to be analyzed (Angrist and Pischke, 2008), leading to likely biased estimate of the program impact and thus inaccurate prescription of policy changes (Khandker et al., 2010).

The goal of this paper is, by explicitly taking into account of the possible self-selection in farmers' decisions to participate, to fill this salient knowledge gap and thus contribute to a more rigorous assessment of the impacts of the Chinese PES and other similar programs worldwide. To that end, of course, other forms of possible selection bias, which may result from such sources as the baseline choice or attrition of the sampling, must be considered as well (Angrist and Pischke, 2008; Woodridge, 2010). With an inappropriately chosen baseline or base period of time, the treated and control groups of the sample will not be comparable even before the program's initiation. Similarly, with attrition, or loss of certain units under observation, the sample can get skewed one way or another. In this study, we will test for these possible forms of selection bias in our efforts of detecting farmers' endogenous participation in the SLCP.

It is expected that, coupled with more careful and rigorous testing procedures, the large panel dataset that we have assembled, covering over 1000 households in six counties of the two representative provinces (Shaanxi and Sichuan) over a period of 11 consecutive years (1998–2008), will enable us to address this question more systematically and convincingly. The rest of this paper is organized as follows.

\* Corresponding author at: College of Economics and Management, Zhejiang A&F University, Lin'an 311300, China.  
E-mail address: [yinr@msu.edu](mailto:yinr@msu.edu) (R. Yin).

In the next section, we will review the literature and highlight the critical need for tackling self-selection in evaluating the SLCP's socioeconomic impacts. In Sections 3 and 4, we will introduce our study sites and data, and then describe the observed changes in labor allocation and income growth to provide a clear context for understanding the potential program impact and possible endogeneity in farmers' decisions of participation. Next, we present our testing procedures and outcomes, as well as the estimated impacts on land-based and off-farm incomes, in Sections 5 and 6. Finally, some closing remarks follow in Section 7.

## 2. Literature Review

The SLCP is one of several large ecological restoration programs that the Chinese government initiated in the late 1990s in response to a series of environmental disasters, including flooding in the Yangtze River basin in the southwest and the Songhua River basin in the northeast, and soil erosion and land sliding across the west (Yin 2009). Also, most of the regions of heavily degraded ecosystems in China happened to have a higher concentration of poverty incidence and slower economic growth (Uchida et al. 2009). The SLCP and other programs have thus been aimed at both environmental improvement and poverty alleviation (Xu et al. 2006).

Among the many studies that have evaluated the socioeconomic impacts of the SLCP, Uchida et al. (2009) show that participating households are increasingly shifting their work time from the on-farm to the off-farm labor market, with the effects mainly dependent on the initial levels of human and physical capital. Similarly, Grosjean and Kontoleon (2009) obtain a mixed effect of program participation on labor being reallocated toward off-farm activities; Yao et al. (2010) find that the effects of program participation on incomes from crop production, animal husbandry, and off-farm work vary a great deal, mediated by local economic conditions and political leadership; Xu et al. (2010) detect evidence of a positive impact of the program on cropping, animal husbandry, and total income, but the results appear insufficiently strong enough to support the government claim of huge gains; and Mullan et al. (2011) report that tenure insecurity reduces rural outward migration, while participating in the SLCP does not increase the migration significantly.

Notably, these and other studies have evaded the question of whether there is self-selection in farmers' decisions of participation. Instead, they have claimed that participation in the program is of a quasi-voluntary nature, virtually initiated and implemented by administrative actions that determine which plots are to be enrolled at what time based on the households' cropland features, such as slope and ecological sensitivity as well as local planning. Thus, self-selection by households into the program, if any, is very limited given that farming households may not have the information, freedom, and time to respond to the program incentives (e.g., Xu et al. 2006; Yao et al. 2010; Xu et al. 2010; Mullan et al., 2011).

In the words of Uchida et al. (2009), “Many households did not have either the choice of whether or not to participate in the program or the choice about which plot to enroll into the program. Because of this, there is less potential for self-selection. In addition, the program officers that were in charge of selecting who got to participate and which plots were able to be enrolled based their decisions on slope and other characteristics of each household's land holdings” (p. 76).

To our knowledge, Liu et al. (2010) is the only study that has examined the possible existence of self-selection bias in farmers' SLCP participation, using the Hausman test. By rejecting the hypothesis that there is a significant endogeneity bias in household's participation in the SLCP, they concluded that “it seems that voluntarism of the SLCP participation might be a questionable thesis. That is, farmers can choose to participate in the ‘take-it-or-leave-it’ program only when their croplands are eligible for it. They will not have the option if their land is considered ‘ineligible.’”

However, the robustness of the testing outcomes of Liu et al. (2010) could be questioned from the following considerations. First, that study covered not only the SLCP but also other PES programs, including the Natural Forest Protection Program and the Desertification Combating Program, which might have confounded the testing given the differences between these programs regarding their actual targets, spatial configurations, and policy instruments. Also, it examined potential endogeneity only in program participation, without simultaneously looking into it as possibly being reflected in the associated labor transfer into off-farm sectors. Further, by focusing on the likelihood of participation, they did not even consider the same issue as reflected in the extent of participation—the amount of cropland enrolled into the program by an individual household at a given point of time. Therefore, this study is motivated by our strong desire to tackle the question we posed at the beginning—whether or not there has been selection bias in farmers' decisions of participation—in a more appropriate manner.

## 3. Study Site and Data

The data used in this paper were gathered from four rounds of household surveys based on a stratified random sampling strategy. Specifically, six counties were first selected from two provinces—Sichuan and Shaanxi, according to the geographic coverage of the program and the distribution of farmers' income as well as our prior knowledge of the general regional conditions (see Fig. 1). Notably, these two provinces were identified by the central government as primary sites for implementing the SLCP, the former being in the upper Yangtze River basin and the latter in the middle reaches of the Yellow River basin (State Forestry Administration (SFA), 2009). Because the

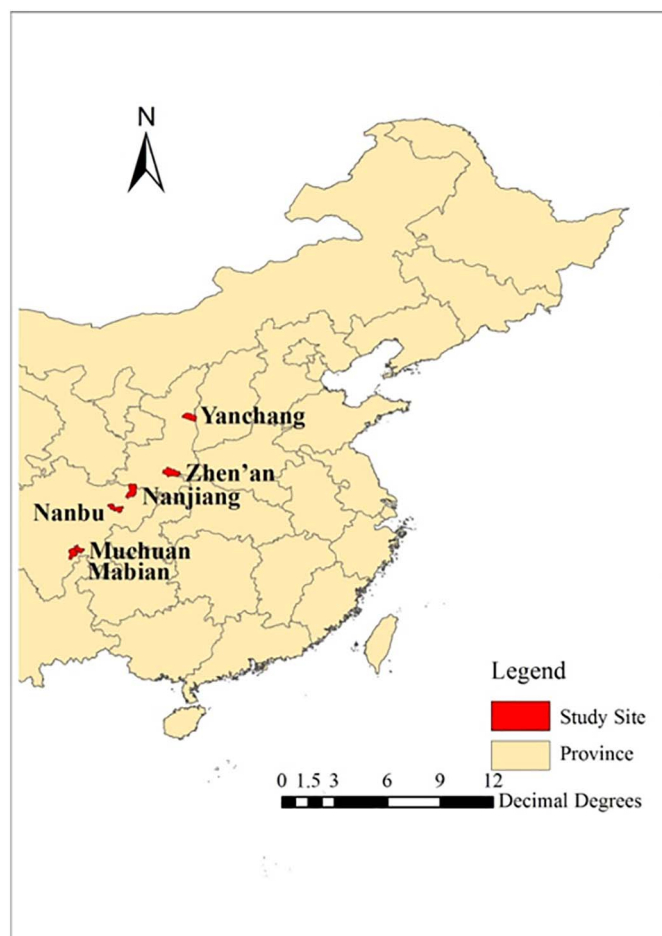


Fig. 1. Study sites (2 counties in Shaanxi and 4 in Sichuan).

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