



# Do forest producers benefit from the forest disaster insurance program? Empirical evidence in Fujian Province of China



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## ABSTRACT

Disaster insurance programs have been recognized as an effective strategy to reduce agricultural production risk. Although a considerable body of literature has focused on natural disaster insurance programs for agricultural producers, not much is known about forest disaster insurance. This paper contributes to this knowledge gap by looking at the Fujian Forest Disaster Insurance (FFDI) program in China. In particular, we examine the extent to which the socio-demographic characteristics and production practice of forest producers, along with other factors, are associated with their participation decision to the program. Moreover, we assess the impact of the FFDI program on household income. Using a household survey of 950 forest producers in Fujian Province in China, it is evident that the education of forest producers, participation in producers' organizations in the local area, and the incidence of forest fires in the local counties are significant determinants of participation in the FFDI program. With respect to the welfare effect, we found that the FFDI program significantly increased household income by approximately 10%.

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## 1. Introduction

Forests provide ecological, economic, social, and aesthetic services to natural systems and humankind (Bonan, 2008). However, forestry production is typically a risky business. Throughout the long production cycle, forests may be destroyed by various natural hazards such as fires, hurricanes, blizzards, earthquakes, floods, and droughts. For instance, when hurricane "Lothar" occurred in December 1999, it caused storm damage covering more than 190 million m<sup>3</sup> of timber production in Western Europe, of which 30 million m<sup>3</sup> were damaged in Germany, amounting to financial loss of € 1.4 billion in Germany (Holec and Hanewinkel, 2006; Brunette and Couture, 2008). On average, approximately 35 million ha of forests are damaged by outbreaks of forest insect pests annually, and 1% of all forests are significantly affected annually by forest fires throughout the world (FAO, 2010). Compared with other countries, China experiences more frequent occurrences of natural disasters. In 2011, direct economic losses resulting from various natural disasters in China accounted for RMB \$ 310 billion (approximately US\$ 50 billion). In particular, 26,950 ha of forest land are affected by 5500 forest fires, and 11.68 million ha of forest land are damaged

by forest diseases, forest pest plague, and forest rat plague in China (National Bureau of Statistics, 2012).

Natural disasters can be devastating, particularly when they affect vulnerable and low-income households. Disaster insurance program can be seen as an important risk management strategy for insurants to cope with uncertain risky environments because it could offer insurants a way to deal with the damage of disaster shocks (Mechler et al., 2006). Similar to other farm-related insurance programs (e.g., crop insurance program in the United States), forest disaster insurance program can be considered as an effective risk-sharing policy tool to reduce the burden of risk for the forest producers. Compared with the developed countries, there is a large potential for forest disaster insurance in China due to the high frequency of natural disasters that occur in the country.

The primary objective of this study is two-fold. We first investigate the determinants of the participation of producers in the forest disaster insurance program in Fujian Province of China. In what follows, we assess the impact of program participation on household income. Similar to the crop insurance program in the United States, participation in the forest insurance program generates benefits and costs. Although insurants can be compensated for their loss resulting from natural disaster shocks, they have to pay an insurance premium (see Section 3 below). How does participation in the forest disaster insurance program influence forest producers' wellbeing? First, this program can have direct and indirect positive effects on producers' household income.

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Although forest disaster insurance does not immediately alleviate the impacts of disaster shocks, it provides indemnification against possible losses by pooling risks in exchange for a premium payment. By providing producers the right to post-disaster liquidity, the insurance program lessens the burdens brought about by disasters by securing livelihood for the insureds and expediting the recovery process (Bayer et al., 2011). Second, this program may change forest production practices among the insureds. For instance, insureds may be more likely to engage in higher-risk, higher profit forestry activities (e.g., adoption of new technologies and introduction of new varieties). Third, this program can provide a prerequisite to applications for forest property mortgage loan.

Similar to the insurance programs for other commodities, participation in the forest insurance program also comes with costs. Although the program provides a risk reduction instrument to the forest producers to cope with uncertain disaster shocks, insureds have to pay an insurance premium. In addition, it has been documented that the availability of the agricultural insurance programs may influence the allocation of farmers' labor supply. Taking the crop insurance program in the United States for instance, Chang and Mishra (2012) found that the participation in the Federal crop insurance program increases the off-farm labor supply of the crop farmers in the United States. The changes in farmers' labor supply between on-farm and off-farm work then influence total household income. Since the participation in the forest insurance program generates not only benefits but also costs, how does the participation in the forest insurance program affect forest producers' income then becomes an empirical question. In this paper, we empirically assess the effect of the participation in the forest insurance program on household income using a survey dataset of forest producers in Fujian Province of China. To the best of our knowledge, this issue has not been studied yet.

Our analysis differs from previous literature in several aspects. First, this paper contributes to the few existing studies on forest insurance programs in China (e.g., Li et al., 2007; Xie and Liu, 2009; Liao et al., 2011) using a unique dataset of forest producers in Fujian Province of China. Second, we took advantage of the particular information contained in this survey. In our dataset, each forest household was asked whether any of the family members was involved in the forest cooperation organization in the local area. Being a part of the local cooperation organization can improve the chance of social networking, therefore, this information can capture the social networking effect on program participation. To the best of our knowledge, the role of social networking on forest insurance program has never been empirically investigated in previous studies. Finally, although earlier studies have focused on the effects of agricultural insurance programs (e.g., crop insurance) on income no study so far has focused on forest producers.

The remainder of this article is organized into sections. The next section reviews relevant studies followed by a brief introduction of the background of the forest disaster insurance program in Fujian Province of China. Supporting data is introduced in the next section. We then outline our econometric models and present the empirical results. The article ends with a brief summary and a discussion of policy implications.

## 2. Literature review

In the light of the possible impacts of natural disaster shocks on agricultural producers, a considerable body of literature has focused on disaster insurance programs. Existing research efforts have mainly concentrated on crop insurance programs (e.g., Goodwin, 1993; Young et al., 2001; Miranda and Vedenov, 2001; Sherrick et al., 2004; Coble and Barnett, 2013; Adhikari et al., 2013), and fewer studies have focused on forest disaster insurance. Compared with crop production, forest disaster insurance may be more crucial for agricultural producers living in rural mountain areas, because forest production is an important source of household income in these areas. For example, in China, more than

60% of the annual per capita income came from the forest production in major forest zones in 2010 (State Forestry Administration, 2012).

The implementation of the forest insurance program in Europe and United States is still in its beginning stage. Holec and Hanewinkel (2006) and Holec and Hanewinkel (2014) stated that unlike the risk of other natural disasters such as flood or fire that is usually covered by insurance policies, a forest risk insurance against natural disaster shocks is still an exception in Europe. They also argued that the reason for the unsuccessful implementation of the forest insurance program in Germany is due to the lack of reliable empirical investigations to quantify the main hazards such as storm or snow for large forest areas. Moreover, it may be due to the lack of a consistent theoretical insurance model for forests. To overcome this drawback, Holec and Hanewinkel (2006) and Holec and Hanewinkel (2014) proposed a forest risk management model to calculate the risk premium for forest insurance policy in Germany. In China, the forest insurance program has been implemented in 2006 and this research topic has been examined in recent studies. Among these few available articles of forest insurance program in China, the primary emphasis has been on the factors that determine the decision of the forest producers to participate in the program (e.g., Li et al., 2007; Xie and Liu, 2009; Liao et al., 2011). For instance, using a random survey of 175 forest producers from Yong'an City of Fujian Province, China, Li et al. (2007) examined the factors that determine producers' willingness to participate in a forest disaster insurance program. They found that the agricultural producers' participation decision is significantly correlated with their education, special experiences, and forest types. Liao et al. (2011) investigated the factors influencing the participation of forest producers in the insurance program using a cluster sample of 228 forest producers drawn from eight counties of Jiangxi Province in China. Their results showed that the willingness of households to participate in the program is significantly associated with the age of the producers as well as their experiences related to forest disaster shocks and their awareness of the program. We argue that it is essential to gain an understanding of the determinants influencing the decision of forest producers to join the insurance program from a policymaking point of view. Because program participation is voluntary, it is also important to know whether forest producers can benefit from such participation. Our study contributes to the knowledge gap of the existing literature on forest insurance programs by addressing the issue whether the availability of the forest insurance program can improve household income using a unique dataset of forest producers in Fujian Province of China.

## 3. Forest disaster insurance program in Fujian Province, China

In 2006, the provincial government of Fujian introduced its own version of the forestry fire insurance program in three pilot prefecture-level cities, namely, Sanming, Nanping, and Longyan. After implementing a trial of forest fire insurance program for a few years, the provincial government of Fujian launched the *Fujian Forest Disaster Insurance* (FFDI) program in 2011 in order to spread awareness of forest natural risk in all provinces. The FFDI program covers most natural hazards, such as forest fires, forest pests, rainstorm, hurricane, hail, frost, blizzard, flood, landslide, mud-rock flow, typhoon, and drought. This program provides a risk-spreading mechanism to help forest producers cope with risky production environments.

The FFDI program is a government-sponsored insurance program. The multilevel governments (central, provincial, and county) provide premium subsidies for the insureds, and forest departments provide technical and service platforms for the insureds. In 2011, the premium rate of the FFDI program was 0.2% of the insured amount, whereas the total subsidies from both central and provincial governments accounted for 60% of the premium. Subsidies from the county government vary from 1% to 15%, depending on the covered insured forest land area, and the remainder of the premium is paid by the FFDI insureds. The Forest Department assisted the insureds in carrying out FFDI

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