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# Role of income diversification in reducing forest reliance: Evidence from 1838 rural households in China

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### ABSTRACT

Among a number of households worldwide, forest use and income diversification have been seen as substitute livelihood strategies: farmers with more diverse income sources face a higher opportunity cost in harvesting forests and so tend to rely less on forestry resources. The current study uses rural household survey data captured in the Chinese provinces of Fujian, Shaanxi, Hunan, and Jiangxi. It applies a Heckman regression model and a quantile regression model to determine the effect of income diversification on forest dependence. The three main findings of this study are as follows. (1) The mean income diversification index values in Fujian, Shaanxi, Hunan, and Jiangxi are 1.81, 1.46, 1.63, and 2.00, respectively; this indicates that livelihood activities within the study areas are limited. (2) When the income diversification index increases by 10%, the proportion of forest income to total income within the study areas decreases by 4–8%; this indicates that income diversification can significantly reduce a household's dependence on forest resources, especially among the poorest households. (3) For the top 20% of high-income households, the effect of income diversification on forest dependence is insignificant, but for the bottom 20% of low-income households, income diversification has a major impact in terms of reducing their forest reliance (6–10%). The findings of this

*Abbreviations:* CPI, consumer price index; OLS, ordinary least squares.

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study will help inform the design of alternative policies that could alleviate pressure relating to forest-resource protection.

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## Introduction

As critical components of the ecosystem, forests and the livelihoods of indigenous people have gained worldwide attention (Illukpitiya and Yanagida, 2008). Households living in villages on the periphery of forests rely on forest resources, either directly or indirectly. Excessive exploitation and high levels of dependence on forest resources have negative effects on forest protection and sustainability (Vedeld et al., 2004). Hence, understanding rural households' dependence on forest income is important to any understanding of rural livelihoods and of the reasons behind forest degradation, and to designing effective development and conservation strategies (Angelsen and Wunder, 2003; Jagger et al., 2012).

China, the study area of this research, is a unique case. The Chinese government initiated nationwide forest tenure reforms (collective forest tenure reforms<sup>2</sup>) in 2002, based on family contract management. By the end of 2012, 115 million ha of collective forests nationwide had been contracted to farmers—an area that represents 99.05% of all collective forestland (He and Zhu, 2014). Hence, managing the use of small-scale forestry owned by rural households is crucial to realizing national forest conservation goals. Especially in remote mountainous areas in China – where 70 million people live below the poverty line – forests serve as important economic buffers and safety nets (Gao et al., 2012). Dependence on forest resources has been generating continuous pressure on those resources, leading to their over-exploitation and depletion (Li et al., 2012). To mitigate the dependence of local forest users on local forest resources, the government of China has implemented special forest policies, such as public welfare forest projects<sup>1</sup> and a harvesting quota system<sup>2</sup>. However, there is a need for incentives that reduce households' forest reliance and balance the relationship between rural livelihoods and forest protection.

Income diversification among rural households in forest peripheries is considered an efficient means of alleviating the stress associated with forest-resource exploitation, and of maintaining sustainable incomes (Ellis and Freeman, 2000; Illukpitiya and Yanagida, 2008). The motivations behind farmers' drive to diversify their income sources include capital security, insurance, consumption support, income maximization, and capital accumulation (Vedeld et al., 2004). Farmers who have a greater diversity of income sources have a comparative advantage over those with lower diversity (Illukpitiya and Yanagida, 2008). For farmers who live in the periphery of forest areas, two basic factors have led to labor-allocation diversification. First, the marginal productivity of a forest is lower than that of nonfarm sectors; hence, labor has been allocated from low marginal productivity sectors to high marginal productivity ones. Second, family members tend to diversify livelihood strategies in order to mitigate the risk that comes with forest-income fluctuations (Du, 2001). Livelihood diversification based on nonfarm activities can reduce the vulnerability and risk that accompany single-livelihood activities, and thus concurrently ensure income increases and improvements in living standards (Block and Webb, 2001; Glavovic and Boonzaier, 2007; Shackleton et al., 2007).

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<sup>1</sup> The goals in creating public welfare forests are to maintain and improve the ecological environment, maintain ecological balance, and maintain biodiversity. Most of the welfare forests are given priority in terms of protection, and logging there is forbidden. The government compensates households that own public welfare forest for their inability to harvest forest resources (Zhou et al., 2011).

<sup>2</sup> Annual forest-harvesting quotas have been controlled by the government, based on the principle that timber consumption must not exceed regeneration. Anyone who wishes to log trees needs to apply for a harvesting quota. The total national forest harvesting quota during the 11th five-year plan (2005–2010) was 248.155 million m<sup>3</sup> per year (mao bamboo harvesting quota excluded). Harvesting quotas are revised every five years.

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