Ecological Economics 117 (2015) 203–211

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

Forest reliance across poverty groups in Tanzania

Therese Dokken [a,*], Arild Angelsen [a,b]

[a] School of Economics and Business, Norwegian University of Life Sciences, PB 5003, 1432 Ås, Norway
[b] Center for International Forestry Research (CIFOR), PB 0113 BOCBD, Bogor 16000, Indonesia

ARTICLE INFO

Article history:
Received 5 June 2014
Received in revised form 22 May 2015
Accepted 7 June 2015
Available online 25 July 2015

Keywords:
Forest dependence
Poverty categories
Asset poverty
Cross-sectional data

ABSTRACT

An emerging body of knowledge has established that poorer households in forest adjacent communities in developing countries are generally more forest reliant (higher forest income share) while richer households tend to extract more and generate higher absolute forest income. These studies commonly categorize households based on observed income in cross-section data, presenting a snap-shot reflecting both inter-household and inter-annual income variation. In this paper we introduce a new approach to categorize households based on a combination of the observed one-year income and predicted income by an augmented asset approach. Applying this approach on household data from Tanzania, we find forest reliance to be high among structurally poor households (low observed income and assets). The highest forest reliance is found among the stochastically non-poor households (high income and low assets), and this group also has the highest absolute forest income.

1. Introduction

Quantifying the contribution of forest income in rural economies in developing countries is important to understand the welfare implications of deforestation and forest degradation and to design effective development and conservation strategies (Cavendish, 2002; Angelsen and Wunder, 2003; Vedeld et al., 2004; Angelsen et al., 2014). Forest income includes cash and subsistence incomes from products harvested in forested areas, such as firewood, timber, and non-timber forest products (NTFPs). We distinguish between three potential functions of forest income in rural livelihoods (Angelsen and Wunder, 2003; Cavendish, 2002). First, forest income supports current consumption and subsistence needs in terms of providing sources of energy, nutrition, construction material and medicinal plants. Second, forest income can serve as a safety net to overcome an unexpected income loss or high expenditure. Third, forest incomes may provide a pathway out of poverty by providing regular cash income.

In a global-comparative analysis of environmental income in 58 sites in 24 developing countries, Angelsen et al. (2014) find that forest income on average account for 22% of total household income. This figure is similar to that reported in an earlier meta-analysis of 51 case studies (Vedeld et al., 2007). A well-established pattern is that the poorer households obtain a higher share of their total income from the forest while richer households extract more forest resources and generate a higher absolute value of forest income (Cavendish, 2000; Adhikari et al., 2004; Fisher, 2004; Mamo et al., 2007; Vedeld et al., 2007; Babulo et al., 2009; Kamanga et al., 2009; Nielsen et al., 2012; Rayamajhi et al., 2012; Angelsen et al., 2014). Further, many studies find that forest income mainly supports current consumption, such as the study by Kamanga et al. (2009) in Malawi, Nielsen et al. (2012) in the Democratic Republic of Congo, Heubach et al. (2011) in Benin and by Rayamajhi et al. (2012) in Nepal. These studies also recognize that forest income may serve as a safety net in case of a negative income shock. This is supported by Debela et al. (2012) in their study from Uganda, where large shocks were associated with a higher use of forest resources in subsequent periods, particularly among the asset poor households. However, Wunder et al. (2014) question the importance of the forest safety net function.

Although some households are able to accumulate cash from forest use, the role of forest income as a pathway out of poverty is even more contested (Angelsen and Wunder, 2003). This partly reflects the subsistence nature of most forest uses, and that profitable opportunities – where they exist – tend to be captured by the elites (Dove, 1993). But there are a few positive case studies, such as Shackleton et al. (2007), who find that forest products offer a pathway out of poverty for some households in South Africa. Ainembabazi et al. (2013) reported similar findings for charcoal in Western Uganda and Duchelle et al. (2014) for Amazon (Brazil) nut in Northern Bolivia.

Most forest-poverty studies use observed one-year income from cross-sectional data to categorize households into poverty groups. Typically, they do not take into account that incomes fluctuate greatly from year to year and therefore provide a static analysis of the forest-poverty nexus. The conventional approach therefore fails to distinguish between inter-household and inter-annual income variation. Panel data studies have found that households that are categorized as poor in one period may not be poor in the next period (and

* Corresponding author.
E-mail addresses: theresedokken@gmail.com (T. Dokken), arild.angelsen@nmbu.no (A. Angelsen).

http://dx.doi.org/10.1016/j.ecolecon.2015.06.006
0921-8009/

vice versa) due to random fluctuations in crop yields and prices, and irregular earnings from casual labor, remittances etc. (Carter and Barrett, 2006). Similarly, some of the households with high observed income might have been lucky in one survey year, but will again be among the low-income households next year. In a study from Ethiopia, Dercon and Krishnan (2000) found that one third of the households identified as poor in the first year in a two-year panel data set was different from the households identified as poor the second year. The snapshot provided by cross-sectional data might therefore be misleading.

Carter and May (2001), among others, have highlighted the importance of assets in poverty analysis, and distinguish between stochastic and structural poverty. The definition of poverty groups matters for policy makers because it can improve the targeting of households and identify structurally vulnerable households (not just temporarily misfortuned ones) when designing conservation policies.

This paper introduces a new approach to analyze forest–poverty interaction from cross-sectional household data. We use a wide range of household assets and characteristics in a regression model to predict income, in what we label an augmented asset approach. We take this predicted income to be the normal or expected income of the households. We then combine households' observed and predicted incomes and obtain four different poverty categories (structural/stochastic poor/non-poor). By distinguishing between stochastic and structural poverty, we demonstrate how certain dynamic aspects of forest reliance and poverty can be analyzed even without panel data. We do this by first testing the commonly observed relationship: are poor households more forest reliant (high relative forest income) while better-off households have higher absolute income from the forest? Second, we explore how the answer to this question is sensitive to the method used to categorize households. Third, we show how the distinction between structurally and stochastically poor can yield new insights into the role for forests in rural livelihoods.

A key insight of this paper comes from separating between the structurally and stochastically poor/non-poor households. We confirm the commonly found pattern that the poor households are the most forest reliant. When differentiating between categories of poor households, we find forest reliance to be high among households that are poor in both assets and observed income (structurally poor), but it is even higher among households that are categorized as stochastically non-poor. Households in this category have high incomes in the survey year, but we do not expect them to be able to sustain this high level of income due to low levels of productive and human assets. In fact, this last group, the stochastically non-poor, are the ones expected to be the most forest reliant in the longer term, because they are not only forest reliant, but also derive high absolute values of income from forest resources.

The rest of the paper is organized as follows. In Section 2, we provide an overview of the study context, design and the data collection. We define the key terms and describe the methods used for data analyses in Section 3, while the results of the analyses are presented and discussed in Section 4. In Section 5, we conclude the paper and provide some policy recommendations.

2. Study Context and Data Collection

We conducted the study in Kilosa District in the Morogoro region in Tanzania in 2010. The district has an area of 14 245 km^2 and had a population of 488,191 in the latest (2002) census. Agriculture is the main income generating activity, employing about 85% of the labor force (URT, 2007).

Forests cover approximately 52%[1] of the land in Kilosa district (URT, 1997). According to the statutory tenure system in Tanzania, the state is the *de jure* owner of all land. Although the state has retained the right to alienate property rights, approximately 10% of all forest is under some form of participatory forest management, meaning that some rights are decentralized to communities (Sunderlin et al., 2008). All villages in our sample have community rights to at least parts of the forested areas within the village boundaries, and households have the rights to harvest forest resources, either by statutory or customary laws. User rules and regulations exist; both commercial and subsistence uses of timber are regulated, as well as commercial use of NTFPs. Harvesting of NTFPs for subsistence use is permitted in all villages, except within state forest reserves.[2]

Our data set is part of the Global Comparative Study on REDD+ (GCS-REDD) conducted by the Center for International Forestry Research (CIFOR) and its partners. Kilosa is one of the six study sites in Tanzania.[3] Three of the villages are included as pilot projects of the global effort aimed at Reducing Emissions from Deforestation and forest Degradation (REDD+), implemented by a national NGO. These villages were selected randomly from all villages included in the project. The last two villages were selected as controls from a pool of other villages in the district, based on how well they matched on a set of village level variables, including market access, population pressure and tenure rights, such as some level of community rights to the forest within the village boundaries (Sunderlin et al., 2010).

We use data from a sample of 149 randomly selected households in the five villages. Detailed information on household characteristics, asset holdings and incomes was recorded through household surveys in July and August 2010. If possible, both the head of household and the spouse were present if the head of household was married. While several surveys throughout the year might give more precise income estimates (Angelsen et al., 2011), this was not feasible within the large, multi-country GCS-REDD project that this survey was part of. We did, however, train enumerators in techniques to facilitate more exact recall during the interview, for example, by decomposing income calculations by asking questions for each agricultural season.

3. Methods

3.1. Income and Assets Calculations

Total income is defined as the sum of cash income, subsistence income (i.e. value of household consumption of self-produced or self-collected goods), and net (cash or in-kind) gifts and transfers. The accounting methods from different sources of incomes draw on Cavendish (2002) and the PEN survey (Angelsen et al., 2011). We use local market prices when available. Some goods, particularly environmental goods, are for self-consumption and not traded. We then used own reported values to get a more realistic estimate of the real price (value to the household) rather than inflated prices in a faraway regional market (Wunder et al., 2011). To calculate income from each source we deduced the cash costs of purchased inputs (e.g., hired labor, seeds and fertilizer for crops and medicine for livestock) from the product value (price * quantity collected or produced). The value of family labor is *not* deducted, and should not either, based on the standard definition of household income.

For all agricultural, forest and livestock products, we checked total values and prices. We reviewed outliers in collaboration with the enumerators in the field and compared with village mean price after data entry. In the case of a missing price, we used the mean village price.

[1] The exact number is unknown (URT, 2007), and different estimates are reported in the literature. Our estimate is based on 1997 figures (URT, 1997).

[2] For an overview of forest tenure rights in Tanzania, see Blomley and Ramadhani (2006).

[3] For more details about the project, see http://www.cifor.org/gcs/global-comparative-study-on-redd.html.