Analysis

# Environmental and market determinants of economic orientation among rain forest communities: Evidence from a large-scale survey in western Amazonia

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## ABSTRACT

Large scale surveys of rain forest livelihoods open up new possibilities for understanding the role of forest resources in the well-being of forest peoples but often overlook the factors that influence the diverse economic foci of forest-based communities. In this paper we describe the Peruvian Amazon Rural Livelihoods and Poverty (PARLAP) Project which seeks to identify the factors that contribute to rural poverty among indigenous and folk peoples through the first large scale survey conducted in this data poor region. Our paper draws upon a community census undertaken in four major river sub-basins in eastern Peru (n = 919 communities) and asks the question, how do environmental and market factors influence the economic orientation of rain forest communities? Recognizing that standard approaches that explain activity choice by current conditions are problematic because of potential endogeneity, we propose a new analytical framework that examines how historical (initial) conditions determine current conditions and thus current economic activities. Our approach produces a rich array of results that point to the importance of initial environmental endowments and market access of communities in shaping their economic orientation, interacting in different ways depending on the key natural resource upon which they rely.

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## 1. Introduction

Studies of rain forest economies over the past 20 years have contributed significantly to our understanding of how forest people mobilize resources to sustain themselves, earn cash income and insure themselves against adversity (Wunder, 2001; Ambrose-Oji, 2003; Shackleton and Shackleton, 2004; Belcher et al., 2005; Sunderlin et al., 2005; Vedeld et al., 2007; Babulo et al., 2008; Kamanga et al., 2009; Nasi et al., 2011; Kar and Jacobson, 2012; Angelsen et al., 2014; Wunder et al., 2014a, 2014b). Biodiverse tropical forests provide a wide spectrum of potential economic opportunities for forest peoples, from agriculture and fishing to forest product extraction and hunting. A recent global study found that about 22% of rural household income in developing countries comes from forests as environmental income (Angelsen et al., 2014). Forests also play an important role as a safety net for rural households (Pattanayak and Sills, 2001; McSweeney, 2004; Shackleton and Shackleton, 2004; Takasaki et al., 2004; Liswanti et al., 2011; cf.:

Wunder et al., 2014b) and, more broadly, in poverty alleviation (Ambrose-Oji, 2003; Coomes et al., 2004; Belcher et al., 2005; Sunderlin et al., 2005; Sunderlin, 2006; Shackleton et al., 2007; Vedeld et al., 2007; Mukul et al., 2015). An impressive quantity and diversity of products flow from forest to local, regional and global markets (e.g., Cavendish, 2000; Moreau and Coomes, 2007; FAO, 2010; Mahapatra and Shackleton, 2012; Dawson et al., 2014; Angelsen et al., 2014). Forest-based activities are vital to economic development, poverty alleviation and forest conservation policy (Wunder et al., 2014a).

To date, however, studies of forest peasant economies have been limited in three important ways. First, many studies are based upon small samples of households and communities which may not always be representative of the broader population or region of interest. The reasons for focussing on small samples are both practical and historical: researchers typically are working in relatively remote areas, where population densities are low and transportation infrastructure is sparse, and with limited funds and previous studies to build upon. Studies of forest-based economies also spring from an ethnographic tradition that favors in-depth descriptive study of a single community or group. As a result, sample sizes are often small and few generalizations can be made about spatial or social variations in forest economies or forest

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populations in general. An important and promising exception is the recent Poverty and Environment Network (PEN) initiative that brings a global sample of some 333 communities in 58 sites and 8000 households for study (Angelsen et al., 2014; Wunder et al., 2014a).

Second, although large scale surveys of forest peasant households open up exciting new possibilities for understanding the role of forest resources in the well-being of forest peoples, they often overlook the factors that broadly influence the economic character of forest communities. The focus on the household level is entirely appropriate given that is where livelihood decisions are typically made, but the context in which decisions are made often can shape the range of economic possibilities and constraints faced by households. When 'community' has been incorporated in statistical analyses of forest livelihoods, a set of dummy variables for communities typically capture community fixed effects, and a growing number of studies find that they often are key variables in explaining household livelihood choices (see Takasaki et al., 2001; Coomes et al., 2004, 2010; Belcher et al., 2015; Dokken and Angelsen, 2015). Since such studies cover a small number of communities (e.g., 5.7 communities per site on average in the PEN study), they cannot statistically examine the potential roles of community-level factors. Recent research in the Bolivian Amazon by Zenteno et al. (2014) points to the utility of community-level analyses in understanding recent trends in economic activity of forest-based communities. Just why and how 'community' matters remains to be more fully explored.

A third challenge relates to rural livelihood studies (Ellis, 2000) in general, and that is the problem of endogeneity. The choices made by forest peoples regarding livelihood activities are often endogenously related to prevailing circumstances and conditions. At the household level, for example, the choice of farming over non-timber forest product (NTFP) extraction may be correlated with land holding or the abundance of NTFPs, just as the opposite may be true. One may expect similar problems of endogeneity arising when examining the relationship between a community's economic orientation and its characteristics. Fishing communities may be larger than hunting communities, but is community size an exogenous determinant of activity patterns? Untangling 'what drives what' is perhaps the most formidable and pressing challenge currently facing forest-based community and livelihood studies.

In this paper we describe the Peruvian Amazon Rural Livelihoods and Poverty (PARLAP) Project which aims to address these challenges through an extensive survey of rain forest communities (n = 919 communities) in western Amazonia. Specifically the paper asks the question, how do environmental and market factors influence economic orientation at the community level? Recognizing the potential endogeneity problem inherent in standard approaches that explain activity choice by current conditions, we propose a new analytical framework that examines how historical (initial) conditions determine current conditions and thus current economic activity. In other words, the economic activities of a community today will have been influenced by the availability of resources at community inception because household livelihood decisions made through time since inception have shaped prevailing environmental conditions around the community and its current economic orientation. Although households within Amazonian communities may pursue diverse livelihoods (Coomes et al., 2004; Zenteno et al., 2013; Porro et al., 2015), communities also vary in their primary focus, from agricultural or livestock to forest product extraction, fishing or hunting. The dominant economic activity in a community – its economic orientation – is an emergent property that arises through the aggregation of household livelihood choices within the community. We illustrate the utility of this framework through empirical analyses of primary economic activity and participation across a range of activities among communities. Our approach produces a rich array of results that point to the importance of initial environmental endowments and market access in shaping economic orientation at the community level, interacting in different ways depending on the type of key resource.

## 2. PARLAP Project

PARLAP is an international collaboration aimed at advancing our understanding of rural poverty among folk and indigenous peoples in western Amazonia. Whereas the livelihoods of rain forest peoples have received growing attention within the context of conservation over the past 20 years (Escobal and Aldana, 2003; Sunderlin et al., 2005), fewer studies as yet address the link between rain forest livelihoods and poverty (Wunder, 2001; Coomes et al., 2004; Kaimowitz and Sheil, 2007; Rudel et al., 2013; Belcher et al., 2015; Dokken and Angelsen, 2015; Porro et al., 2015). Understanding poverty in biologically rich forests is important not only for informing conservation initiatives but also for social policy to improve the well-being of the poor who live in rain forests. This multi-year study is based on the most extensive rural community census and household survey as yet undertaken in Amazonia. Survey teams are working along four major rivers of the Peruvian Amazon – the Amazon, Napo, Pastaza and Ucayali – over an area of 117,681 km$^2$ or about 2.3 times the area of Costa Rica. To date, the teams have reached 919 communities and approximately 80% of the 4000 households in 239 communities identified for surveying. Data from community and household surveys are to be complemented with information derived from remote sensing, GIS, and historical sources. Of particular interest to the project is the possible existence of spatial poverty traps, their formation, determinants, and implications for poverty alleviation, rural development and conservation. In this paper we focus on the analysis only of data from the community census which is suitable to answer our primary research question. Analyses of livelihoods at the household level will be undertaken later to capture important intra-community livelihood diversity and how they are influenced by community conditions once the household survey is completed.

## 3. Study Area

The study area is located in the administrative regions of Loreto and Ucayali which together encompass an area of 471,199 km$^2$ or about 85% of the Peruvian Amazon (Fig. 1). Situated at elevations generally below 200 m asl and highly dissected by rivers and extensive wetlands, the region is more 'riverscape' than landscape with only 5% of land area being >30 km from water (Toivonen et al., 2007). The river system is dominated by the Ucayali and Marañón rivers which flow down from the Andes in Peru northward and eastward, respectively, to form the Amazon river. Several large northern tributaries flow south from the Ecuadorean Andes, including the Napo and Pastaza rivers. Intact lowland tropical forests cover much of the region: by 2013 only about 7% of the area had been deforested (MINAM, 2015a) and protected areas – the largest of which is the Pacaya Samiria National Reserve – extend over 110,915 km$^2$ or almost one-quarter of the region (MINAM, 2015b).

The estimated population of the Loreto and Ucayali regions today is about 1,534,900 (INEI, 2015a) with 71% of the population living in urban centres. Settlement – including cities, towns and villages – is highly concentrated along the rivers, typically on bluffs overlooking the river (upland or *terra firme*) or on the floodplain (lowlands) where communities are vulnerable to the annual flood. Communities remote from the main rivers are nonetheless found along tributaries or lakes, and few communities are situated on the interfluves. Few traces remain of pre-Columbian settlement, and communities founded initially as church missions in the 16th–18th centuries are few. The rubber boom of the late 19th century had a profound impact on settlement patterns with many of the largest cities, towns and rural estates being founded then (Barham and Coomes, 1996; Santos-Granero and Barclay, 2000). Since then, settlement has 'in-filled' along the Amazon river and its tributaries, with new communities being founded between older ones. Today native communities are typically found beyond the immediate orbit of the major cities and towns, along the more remote river reaches.