Population Mobility of Indigenous Peoples: An analysis of the multi-level determinants of off-farm employment in the Ecuadorian Amazon.

Jason L. Bremner[1], Clark L. Gray[2], Richard E. Bilsborrow[3], and Flora Lu-Holt[4]
[1]Department of City and Regional Planning and Carolina Population Center, University of North Carolina at Chapel Hill
[2]Department of Geography and Carolina Population Center, University of North Carolina at Chapel Hill
[3]Department of Biostatistics and Carolina Population Center, University of North Carolina at Chapel Hill
[4]Department of Anthropology and Carolina Population Center, University of North Carolina at Chapel Hill

I. Introduction

Understanding the decision process related to population mobility is essential for assessing the past and future patterns of market integration of indigenous peoples and deforestation in the Amazon. While potentially significant in its effects on the Amazon, population mobility, other than the colonization process, has received scant attention. Empirical research on the mobility of indigenous populations in particular is underrepresented in the literature perhaps due to the difficulty of studying small remote populations.

Anthropologists and others working from cultural and political ecology perspectives have noted changes in the market integration of indigenous populations and have identified market integration as a key component in changes in indigenous health, land clearing, knowledge preservation, and hunting practices (Godoy, 2001). The process of market integration itself suggests various forms of population mobility such as out-migration, temporary migration for off-farm employment, travel to markets, and commuting to job sites. Prior studies among indigenous populations, however, have neither acknowledged population mobility's diverse temporal and spatial dimensions (Bilsborrow, 1984) nor acknowledged that each type of population mobility may have a different relationship with environmental and social change in the origin and destination areas (Bilsborrow, 1998).

This paper focuses on one particular type of population mobility, off-farm employment, and uses a multi-level model to examine the individual, household, and community factors that impact the mobility decision. The study utilizes data from a 2001 survey of 500 households in 36 communities representing 5 different indigenous groups to compare cross-culturally the demographic, geographic, socio-economic, and biophysical determinants of off-farm employment. The research is an advance in that it integrates existing conceptual frameworks of mobility determinants and applies the integrated framework in a new context. In addition, the paper explores a heretofore-neglected aspect of the debate on the role of indigenous peoples in forest management (Terborgh, 1999, Redford and Sanderson, 2000) and therefore can be used to inform policy in the conservation and development communities.

II. Background and Conceptual Foundations

The major tropical wilderness areas (MTWAs) and global hotspots of the world are estimated to contain nearly 60% of global plant biodiversity and over 40% of vertebrate diversity (Myers et al, 2000). Thus, the Ecuadorian Amazon, part of the Upper Amazonia MTWA is considered to be a global priority for conservation. Agricultural expansion by small landholders, however, is rapidly depleting the remaining forests of the Ecuadorian Amazon (FAO, 2001) although areas of contiguous tropical forest remain intact. The largest remaining tracts of forest are either under the control of indigenous populations in the form of communally held reserves or are under the control of the state in two large protected areas that have been inhabited by indigenous populations for centuries. Hence, future conservation outcomes for the MTWA depend greatly upon current and future patterns of indigenous resource management

Case studies intimate that indigenous populations are enduring a complex interaction of circumscription by colonists, market integration, demographic change, and changing livelihoods. Consequently, many question the future ability of indigenous groups to sustainably manage their resources. A significant body of previous work has investigated the process of market integration (e.g. Godoy, 2001, Gross et al., 1979; Behrens 1996), however the related change in population mobility that likely accompanies market integration has garnered little attention.

Population mobility is the least studied of the demographic processes due to the complexity of its temporal and spatial dimensions and the difficulties related to data collection (Bilsborrow et al, 1984). Research on the determinants of population mobility has tended to focus on rural-urban migration. Early theories related migration decisions to an individual's expected net returns given the probability of employment in the urban area (Todaro, 1969). More recently, proponents of the "New Economics of Labor Migration" have considered population mobility as one of a set of strategies of risk diversification available to rural households (Stark and Bloom, 1985). This approach suggests that mobility decisions may be a way for households to accumulate resources for agricultural investment or minimize risks to household subsistence. Other approaches have examined demographic determinants of population mobility including population growth (Davis, 1963; Bilsborrow, 1987) and life cycle factors (Leinbach and Smith, 1994).

Theoretical approaches to population mobility have not focused solely on individual and household determinants, but have also explicitly addressed the larger context in which migration decisions are made. Labor markets (Lewis, 1954) and regional environmental conditions (Findley, 1987; Henry et al., 2004) can serve as "push and pull" factors (Lee, 1996) in the areas of origin and destination. Finally, road accessibility and distance are important intervening variables that can condition "push and pull" factors and thus impact population mobility decisions.

As mentioned, prior research has tended to focus on rural-urban migration and has not considered indigenous populations. This paper will look at a different aspect of population mobility, off-farm employment, defined as the participation of individuals in a remunerative activity away from their usual agricultural and forest resources. Off-farm employment is an important demographic process for indigenous groups. By participating in off-farm employment, individuals are able to experiment with markets and gain income while maintaining their permanent home and keeping investment costs low. Thus off-farm employment can be seen as an easily reversible and low cost way to interact with markets in comparison with commercialized agriculture or permanent out-migration.

III. Study Area

The study area is located in Northeastern Ecuador, an area that has experienced rapid population growth due to spontaneous colonization by migrants from the highlands and coastal Ecuador (Walsh et al, 2002). The beginning of oil production in the early 1970s led to road development and provided colonists with access to new lands. The government further encouraged in-migration and deforestation by adopting policies that promoted land clearing and facilitated land titling in order to ease land pressures in the densely populated regions of the highlands and coastal plains.

As a result there are now vast colonization areas and several urban population centers that encroach upon the remaining areas of intact lowland tropical forest and two large and remote protected conservation areas. Indigenous populations inhabit the largest remaining forested areas and increasingly interact with colonist populations and urban population centers.

Previous work at the University of North Carolina has focused on colonist populations and land use in the Ecuadorian Amazon. In order to complement the work on colonists, an interdisciplinary research project was developed to focus specifically on the complex changes that the indigenous populations are experiencing. The research project incorporated both quantitative

and qualitative methods. Data collection, carried out in 2001, involved two phases of fieldwork: (1) an intensive ethnographic study in eight indigenous communities, and (2) household and community surveys in 36 communities. A two-stage sample of 36 communities and 554 indigenous households was selected to be representative of the largest groups of the region including the Quichua, Shuar, Cofán, Siona-Secoya, and Huaorani. The five groups have diverse histories of interaction with outside groups and manifest a spectrum of different strategies of land use, market integration, and population mobility.

In each household interviews were conducted separately with the head of household and spouse. The male survey contained information on migration experience, land use, and off-farm employment for the household. The female questionnaire included data on household composition; out migration of household members; access to the nearest road; infrastructure; health; fertility and mortality; and household assets. In addition, Global Positioning System (GPS) receivers were used in the field to obtain geographic coordinates of urban centers, markets, communities, households, and agricultural plots.

IV. Analysis and Measurement:

The determinants of off-farm employment will be analyzed using a multi-level multinomial logistic regression model (Goldstein, 1999). Prior use of multi-level models to explore population mobility determinants has focused on binary outcomes (Zhu, 1998). This analysis, however, will explore the use of a multinomial outcome due to the different spatial scales of off-farm employment. Off-farm employment was measured as the participation of an individual in remunerative labor in the 12 months prior to the survey. The location and type of employment were recorded. A multinomial dependent variable will be created that categorizes the spatial and temporal dimensions of off-farm employment into temporary labor migration (left community for ≥ 1 night), labor commute (left community for the day), community work (worked in community area), or no off-farm employment.

Off-farm employment is a prevalent livelihood strategy for many households in the study population. Nearly 25% of households reported temporary labor migration and another 50% of households reported a labor commute. There are a diversity of types of labor; however, the majority of off-farm employment is for oil companies that require menial labor for road clearing, road repairs, and forest clearing for seismic testing. These models will not distinguish the types of labor; this is a topic for future analysis.

Independent variables will assess the importance of individual characteristics such as age, gender, education, language ability, and ethnicity. Household level variables will include household size, household assets, life cycle stage, relationship to existing migration networks, land use characteristics, biophysical conditions, and access to credit and technical assistance. The importance of community context will examine the significance of geographic accessibility, community infrastructure, community population size, and common property regimes.

It should be noted that off-farm employment is frequently used as an explanatory variable in models of several of the determinants to be assessed including: household size and land use. This problem of endogeneity reflects the complexity of demographic and environmental change and cautions against conclusions of causality in cross-sectional models of population-environment relationships. Regardless, this research is a necessary examination of population mobility in an under-studied population and provides insight into the rapidly changing lives of indigenous peoples of the Amazon. As indigenous peoples throughout the world face circumscription and market integration a thorough understanding of the population mobility process is essential for both cultural survival and resource management.

V. References:

Behrens, A. (1996). A formal justification for the application of GIS to the cultural ecological analysis of land-use intensification and deforestation in the Amazon. In Aldenderfer, Mark and Herbert D.G. Maschener. *Anthropology, Space, and Geographic Information Systems.* New York: Oxford University Press. Pp. 55-77.

Bilsborrow, R. (1987). "Population pressures and agricultural development in developing countries: a conceptual framework and recent evidence." *World Development* 15(2): 183-203.

---------- 1998. *Migration, Urbanization, and Development: New Directions and Issues*. UNFPA.

Bilsborrow, R. E., A. Oberai, and G. Standing (1984). *Migration surveys in low-income countries: Guidelines and questionnaire design*. London, Croom-Helm.

Davis, K. (1963). "The theory of change and response in modern demographic history." *Population Index* 29(4): 345-366.

FAO. (2001). *Global Forest Resources Assessment 2000*. Food and Agriculture Adminstration.

Findley, Sally. (1994). "Does drought increase migration? A study of migration from rural Mali during the 1983-1985 drought." *International Migration Review* 28(3): 539-553.

Godoy, R. (2001). *Indians, Markets and Rainforests: Theory, Methods, Analysis*. Columbia University Press.

Goldstein, H. (2003). *Multilevel Statistical Models*. Halstead Press.

Gross, Daniel R., George Eiten, Nancy M. Flowers, Francisca M. Leoi, Madeline Lattman Ritter, and Dennis W. Werner. (1979). Ecology and acculturation among Native peoples of central Brazil. *Science* 206: 1043-1050.

Henry, S., B. Schoumaker, C. Beauchemin. (2004). "The Impact of Rainfall on the First Out-Migration: A Multi-level Event-History Analysis in Burkina Faso." *Population and Environment* 25 (5): 423-460.

Lee, Everett S. (1966). "A Theory of Migration." *Demography* 3(1): 47 – 57

Leinbach, T. R. and A. Smith. (1994). "Off-Farm Employment, Land, and Life Cycle: Transmigrant Households in South Sumatra, Indonesia." *Economic Geography*. 70(3): 273-296.

Lewis, W.A. (1954). Economic Development with Unlimited Supplies of Labor. The *Manchester School* 22: 139-91.

Mulley, Brad G. And J. D. Uhruh. (2004). "The role of off-farm employment in tropical forest conservation: labor, migration, and smallholder attitudes toward land in western Uganda." *Journal of Environmental Management* 71: 193-205.

Myers, N., R. Mittermeier, C.G. Mittermeier, G.A.B. daFoseca, and J. Kent. (2000). Biodiversity Hotspots for Conservation Priorities. *Nature* 403: 853-858.

Redford, K.H. and S. Sanderson. (2000). Extracting Humans from Nature. *Conservation Biology* 14(5): 1370-1374.

Stark, O., and D. Bloom. (1985). "The new economics of labor migration.". *American Economic Review* 75: 173-178.

Terborgh, J. (1999). The Fate of Tropical Forests: a Matter of Stewardship. *Conservation Biology* 14(5): 1370-1374.

Todaro, M. (1969). "A model of labor migration and urban unemployment in less-developed countries." *The American Economic Review* 59: 138-48.

Walsh, S., J. Messina, K. Crews-Meyer, R. Bilsborrow, and W. Pan. (2002). "Characterizing and modeling patterns of deforestation and agricultural extensification in the Ecuadorian Amazon." In: *Linking People, Place, and Policy: a GIScience Approach*. Eds. S. Walsh and K. Crews-Meyer. p187-214. Kluwer Academic Publishers.

Zhu, J. (1998). "Rural out-migration in China: a multilevel model." In: *Migration, Urbanization, and Development: New Directions and Issues*. Ed. R. Bilsborrow. UNFPA.