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**Dynamics of Household Land Use
and Economic Welfare on the
Amazon Frontier, 1996-2005,
Rondonia, Brazil**

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Data Documentation

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The Dynamics of Household Land Use and Economic Welfare on the Amazon Frontier Project Summary

Abstract:

This project contributes to understanding household land use and economic welfare in the Amazon basin, through the collection of a third round of panel data with improved spatial referencing and a new system for tracking households and individuals, in a study area typical of the “arc of deforestation” across the southern Brazilian Amazon. We use these data to model the relationship between deforestation and household well-being, thereby gaining insight on welfare outcomes that also have implications for conservation policies. While the global and local costs of deforestation are widely recognized, the benefits of deforestation for small farm households, who are among its principal agents, are less clearly understood. This is partly due to the deforestation literature’s reliance on cross-sectional or aggregate data. Household land use strategies and livelihoods are actually simultaneously determined over long time periods and reflect heterogeneity (some unobserved) across households and space. Thus, data sets and analyses that are rich in both time and space dimensions will provide the best policy guidance. Analysis that ignores these dynamics or simultaneities may misrepresent the size, significance, and even direction of the effects of land use on economic welfare and on the reverse relationship: the impact of economic well being on deforestation.

We address these gaps by building on an existing spatially referenced two-period panel of farm households. This new round of data collection adds detail to the spatial data and additional quality controls to reduce the attrition of households. Properties of surveyed households are geo-referenced, enabling comparisons with remotely sensed land cover data at the scale of the decision-maker. Our modeling approach uses the household production framework, providing a theoretical basis for understanding responses to larger-scale socioeconomic forces as played out across time and space in the study region. The empirical analysis will focus on a simultaneous model that explicitly estimates the co-evolution of land use and welfare at the household level using panel estimation techniques. A three-period panel overcomes some of the econometric limitations of cross-sectional data, particularly for modeling dynamics, by providing household-specific information from the initial period that can be used as statistical ‘instruments’. And, with geo-referencing, we can include temporally lagged spatial externalities, better define policy variables with spatial dimensions, and adjust for spatial correlation across households.

This research contributes to the body of knowledge on deforestation and development through empirical analyses within a microeconomic framework. In addition to elucidating the internal dynamics and feedbacks between household land use and economic welfare, this third round provides a window on household responses to the increasing integration of the study area into national and international markets, such as for milk and beef. This project tracks the maturation of this frontier and generational changes among households, enables the development of long-term panel in this globally important region, and contributes to a rare and publicly available database that can be used by researchers and policy makers interested in related socioeconomic issues. Broader impacts include methodological contributions, such as quantifying the costs and benefits of reducing attrition and collecting panel versus retrospective data, and opportunities for students to learn about applied research in an international setting through participation as research assistants and courses taught by the principal investigators.

Regional Information:

The Ouro Preto do Oeste region of Rondonia, established in the 1970s, is located along BR-364, the Cuiaba-Porto Velho interstate highway. This region is comprised of six municipalities: Ouro Preto do Oeste, Vale do Para, Urup Mirante da Serra, Nova Unia and Teixeir , which have a combined population of over 92,000, of which 58 percent is rural. Most of the urban population (68 percent) is concentrated in the municipality of Ouro Preto do Oeste, the only municipality in the sample located along BR-364. The main agricultural activities of the rural population include the harvesting of maize, rice, beans, cocoa, manioc, coconut, and coffee, and the production of meat and milk from cattle (Caviglia 1999). Well-developed markets exist for all of these products with the exception of maize and manioc, which primarily serve as feed for farm animals.

Sampling Method:

The data include a stratified random sample of households that reside within the 6000 km² region among the over 8000 agricultural lots.

The distance between interviews, in terms of lots, was designated in each municipality to represent the areas equally and to obtain spatial variation in topography, soil type and distance to market. If the house was unoccupied at the time of the interview or the owner of the lot was not available, the next house on the same side of the road was interviewed, and if the same occurred at the next house, the following house was interviewed on the same side of the road. This occurrence was generally uncommon since most of the farmers stay close to, or on, their lots during the time of year the surveys were conducted (September through December), which ranges from the end of the burning period to the beginning of the planting season. In the initial data collection, a random sample of 171 households, stratified by the rural population of each of the 6 municipalities in the region, were interviewed over a five-month period (September 1996 through January 1997). Jill L. Caviglia-Harris, assisted by a local farmer, conducted each of the interviews. In 2000, a Brazilian graduate student conducted interviews with these same households. In 2005 we improved on data collection in the previous years by obtaining detailed geo-referencing of the lots and relevant regional infrastructure. And, to take full advantage of panel data methods, this round of the survey maintained the same core set of questions as in the earlier rounds. These questions were expanded to include: (i) updated measures of wealth to reflect new trends, such as owning property in town; (ii) input and output quantities for any new activities, such as forest-based production; (iii) expanded measures of human capital, such as health; and (iv) indicators of current and past shocks that are not covariate across the entire region, such as deaths in the family. We increased the sample to 361 households, including 177 households from the original stratified sample (increasing due to split lots), 67 individuals (with information for their complete households) that moved from the original sample of lots and tracked to their current location, and 117 new households within the original municipalities and new settlements within these municipalities that were added according to the original random sampling methodology. Sixty percent of this supplemental sample of 117 new households was drawn from new settlements established by the land reform agency INCRA since 1996. We also added to our control group of households involved in sustainable agricultural and forestry practices. The lot attrition rate between 2000 and 2005 was actually negative, meaning that we increased the number of household lots for which we were able to interview an owner compared to 2000, and fell to 1 percent of the original sample. However, there was a significant amount of

movement for individual households and household members. In addition to considerations for population representation our survey methodology included strategies for reducing panel attrition. Our panel can be defined according to three criteria each of which requiring a different sampling approach: 1) Household properties or lots 2) households or family members on the original lots 3) households or family members associated with the original lots. The lot panel requires an interview with someone living on the lot in each of the three survey waves. In cases where the owner and lot manager are different individuals, we interviewed both households when possible, utilizing both sources of information on the lot. The lot panel includes information on owners, while the broader sample of households (including renters) provides information on a greater sample of the population. Caviglia, Jill L (1999) Sustainable Agriculture in Brazil: Economic Development and Deforestation, New Horizons in Environmental Economics series, Edward Elgar Publishing Limited, Unite.