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urbanization and development in the Amazon**

Alisson F. Barbieri,  
Roberto L.M. Monte-Mór  
Center for Regional Development and Planning (CEDEPLAR), Federal  
University of  
Minas Gerais (UFMG), Brazil,  
and  
Richard E. Bilsborrow  
University of North Carolina at Chapel Hill, USA

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*Center for Regional Development and Planning (CEDEPLAR), Federal University of  
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*University of North Carolina at Chapel Hill, USA*

## **Introduction**

Recent evidence indicates profound changes in population mobility in the Amazon frontier. Following the earlier large-scale migration influxes from long-settled regions, the most dramatic forms of population mobility under way are currently within the frontier. In particular, more and more rural households see temporary or permanent out-migration of one or more family members to urban areas as a way of earning cash income and diversifying risk. This strategy helps alleviate dependence on dwindling forest resources, and at the same time has engendered an increasing process of urbanization in the Amazon, with drastic impacts for regional development and rural and urban environments.

While very significant in its effects on deforestation and urbanization, population mobility as a major catalyst of regional change in the Amazon has hardly been studied. In this regard, the main objective of this paper is to analyze how the changing nature of population mobility flows in the Amazon, from the large-scale, inter-state or inter-province rural-rural flows during initial settlement times, until the more complex, rural-urban and urban-urban flows in more recent times, have shaped a specific type of urbanization in the Amazon, with its impacts on regional development and on the environment. Related to this, it is the argument in this paper that it is not sufficient to discuss “urbanization” in these frontier areas without an assessment of rural changes, and of how these two are articulated through the flows of people (the *foci* of his paper) and of economic activities. Thus, it is necessary to overcome the simple dichotomy between “rural” and “urban”, especially those provided by political or administrative definitions, and think about urbanization and its development and environmental consequences in a regional perspective.

The first part of the paper provides a brief historical overview of the initial stages of massive colonist occupation of the Amazon, with examples from Ecuador and Brazil. The second part describes, from a conceptual point of view, the key linkages between population mobility, urbanization and their environmental and development impacts in frontier areas in more recent decades. Next, the paper describes how such linkages can be observed empirically in the Amazon, from a macro and micro perspective, and using the Northern Ecuadorian Amazon as a case study.

## **The occupation by non-indigenous populations: colonist settlement in the Amazon**

One of the features of the recent Amazon history is the heterogeneity of its occupation by colonist, non-indigenous populations since the second half of the twentieth century. This section describes examples of two of these occupation processes: the colonization of the Northern Ecuadorian Amazon, and the colonization of the Brazilian Amazon.

The Northern Ecuadorian Amazon (Figure 1), an area comprising the provinces of Sucumbios and Orellana, began to be occupied by agricultural settler families after the discovery of oil in 1967. This was followed by the laying of pipelines and a road network for the exploitation of oil, and by the establishment of the new town of Lago Agrio next to the first oil camp of Texaco. Petroleum has since provided over half of the value of Ecuador's export revenues and also over half of government revenues (from royalties) virtually every year since the early 1970's. There are now four main towns (or *parroquias*) in the study area: Lago Agrio or Nueva Loja (the largest, with 34,000 people, according to the 2001 census), Francisco de Orellana or Coca, Joya de los Sachas and Sushufindi. More recently, migrants continue to move to the Amazon from the Sierra and Coast (and recently from Colombia, including several thousand refugees).

Virtually all colonization in the Ecuadorian Amazon has been spontaneous, facilitated by the opening of roads by oil companies, which greatly improved physical accessibility. Most colonists were poor and arrived without capital to invest in their plots. They also faced a lack of infrastructure or governmental assistance, in contrast to some of the early colonists in the Brazilian Amazon which had some, even precarious, infrastructure (e.g., in the Brazilian state of Rondônia). Moreover, in Brazil the widespread availability of land has made possible the use of very extensive land use practices, also stimulated by the poor soils. This has led to high land turnover and increasing concentration of landholdings – with small farmers' land increasingly losing fertility and being bought up and consolidated by cattle ranchers and loggers. In contrast, in Ecuador Amazon soils vary in fertility, some being of volcanic origin and high fertility, and land in the Amazon is no longer plentiful relative to population. Indeed, due to rising population pressures on the land, the Amazon region of Ecuador is experiencing land subdivision and intensification, as we will see below.

In the Ecuadorian Amazon, most farms are semi-commercial, growing annual crops for own-consumption (mainly corn, rice, and plantains) as well as coffee and cattle for cash. Thus, these farm households are neither purely subsistence (per Thorner et al., 1986, di Chayanov) nor purely market-oriented but rather a combination, usually producing for both the market and their own consumption, as mixed (economy) households (Walker et al., 2002). Settler colonists have generally a strong market-orientation and aspiration to raise cattle (Pichón, 1997; Murphy, 1998). Investment in cattle is a way of storing wealth and acquiring "liquid assets", but it may also reflect imperfect credit markets or other types of institutional failure. Nonetheless, cattle (as well as land title) is often a collateral to receive bank or public loans, and may be a response to institutional failures.

One final important contrast with the Brazilian Amazon is the urbanization process. According to the 2000 Brazilian census, the Brazilian Amazon has two cities with more than a million inhabitants (Belém and Manaus) and ten more cities with over 100,000 people. And of the 12 million inhabitants in the Brazilian Amazon in 2000 (7% of the total Brazilian population), 69.4% were living in urban areas. In Ecuador in contrast, the largest city in the Amazon, Lago Agrio, had only 34,000 inhabitants in 2001 at the time of the last census, and the urbanization level was only 36%, though considerably higher than the 26% level of 1990 (INEC, 1992, 2001). The high population growth rates due to both high fertility and the continuing influx of migrants, and the expectation of further expansion of the oil industry (recent discoveries of large new deposits and the completion of a second trans-Andean oil pipeline in late 2003) suggest that urbanization will play an increasingly important role in the spatial reconfiguration of the Ecuadorian Amazon. The rural population is also increasingly employed in off-farm work, pointing to the growing importance of

urban labor markets.

Brazil's urbanization and industrialization gained momentum only in the second half of the 20<sup>th</sup> Century when the urban-industrial economy began to restructure the country. In 1950, only 36% of the Brazilian population lived in urban areas; in the Amazon, or *Amazonia* (Figure 2), that percentage was even lower: 30%. The process of urbanization intensified throughout the 1950s and 1960s maintaining an average annual urban population growth rate around 5.2%, and in 1960 Brazil's urban population represented 45% of the total population reaching 56% in 1970, while in Amazonia it reached respectively 35.5% and 42.6%<sup>1</sup>.

An average annual urban growth rate of 4.5% in the 1970s led to a national urban population of 68%, in 1980, mostly concentrated in large industrial and regional cities. The nine metropolitan regions created in 1974 concentrated 27% of Brazil's total population, but the other municipalities in those regions began to grow faster than the metropolises themselves, as also did several middle size cities throughout the country. By 1991, the country's urban population reached 76% and despite its lower annual growth rates (around 2.5%), it continued to increase to reach 81.2% in 2000<sup>2</sup>.

Amazonia showed a different pattern, though. While the country had declining total population growth rates since 1960 (from 2.99 in 1950/60, to 2.48 in 1970/80, and 1.61 in 1991/2000), the Northern Region saw a population increase due to frontier migration, with average annual total population growth rates varying from 3.34 in 1950/60 to 5.02 in 1970/80, then dropping to 3.85 in 1980/1991, and 2.57 in 1991/2000. Despite intense rural-rural migration, urban growth dominated the scenario throughout the decades in Amazonia: 5.44 in 1960/70; 6.44 in 1970/80; 5.37 in 1980/91; 4.75 in 1991/2000.

Rural population annual growth rates have persistently declined in Brazil since the 1950s (1.55%), becoming negative after 1980 and reaching its lowest figures in 1991/2000 (-1.37%). In Amazonia, however, rural population average annual growth rate was already high in 1950/1960 (2.37%) and it reached its peak in 1970/1980 (3.7%), reducing again in 1980/1991 (2.04%) and finally becoming negative, like the rest of the country, in 1991/2000 (-1.17%). Meanwhile, the percentage of urban population in the Region continued to grow to reach 50% in 1980, and 70% in 2000.

On the other hand, in 1950 Brazil had 1889 municipalities, but thousands of new municipalities have since been created both in very dense areas in the urban-industrial core and in low-density areas in frontier regions and that number increased to 3974 in 1980, and 5507 in 2000. The subdivision of Brazil's smallest political cell—the municipality—also tells about the country's socio-spatial and economic restructuring from a local perspective. In the Northern Region, the 99 existing municipalities in 1950 were dismembered to become 153 in 1980, 298 in 1990, and 450 in 1999. In the Brazilian state of Rondônia, the two existing municipalities in 1970 were dismembered to become 52, in 2000.

### **Linkages between population mobility, urbanization and development in the Amazon frontier: looking beyond the rural-urban dichotomy**

Throughout the decades, population rural-urban mobility can be regarded as one of the most important catalysts of regional change in the Amazon (Bilsborrow, 1998). It has implied important demographic and economic consequences for movers and their households, as well as changes in

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<sup>1</sup> Amazonia is here equated to Brazil's Northern Region as in the current federal Sustainable Action Plan for Amazonia—PAS. It includes Rondônia and Tocantins (formerly, Center-West) but excludes Mato Grosso (Center-West) and Maranhão (Northeast), both not totally comprised in the Amazon River Basin.

<sup>2</sup> All population data are from IBGE Demographic Censuses (1950, 1960, 1970, 1980, 1991, and 2000). In Brazil, urban population refers to those who live within the urban perimeter of cities, i.e., municipal headquarters, or villages (*vilas*), municipal administrative districts, regardless of their sizes.

communities of origin and destination, and the spatial distribution of labor in the region. Population mobility is also the most dynamic, and thus difficult to measure and investigate, of the three demographic components (migration, fertility, mortality), and feedbacks in the other two demographic components, often changing their pace and level after a lagged effect. For example, increasing migration to urban areas can mean a higher insertion of women in labor markets and other cultural changes which provide women a higher autonomy over their reproductive behavior, thus decreasing fertility.

Population mobility in frontier areas implies even more dramatic and rapid socioeconomic, political, and environmental consequences, as exemplified in many settlement processes in the Ecuadorian and Brazilian Amazon. These areas have faced profound changes due to population redistribution and mobility. Following the earlier large-scale migration influxes from long-settled regions during the 1960s and 1970s, the most dramatic forms of population mobility under way are currently within the frontier; some of this population mobility is to the few remaining less occupied or unoccupied areas, engendering further deforestation, while some is to urban areas, engendering increasing urbanization in the Amazon.

The intense urbanization process in recent decades has produced a myriad of urban forms beyond cities and towns that have required new definitions beyond the traditional categories of city/country and urban/rural. The expansion of metropolitan areas or national primate cities upon their hinterlands, the new ways of municipal association involving middle-size cities and towns, and the extension of urban infrastructure and social services onto rural areas, both extensively and in concentrated nuclei, have produced micro-regional organizations and hybrid city-country socio-spatial relations that do not fit the traditional classifications.

Distinguishing between rural and urban destinations is important since specific factors can influence the choice of one or another destination, for example road distance to an urban area, gender (urban areas offering more labor opportunities to women, such as domestic work), or combination of gender and marital status (women tend to migrate more to rural areas if married). However, some authors have discussed the inherent difficulties in establishing the meaning of rural and urban, especially in the context of developing countries (Skeldon, 1990; Hugo *et al.*, 2003; Brown and Cromartie, 2004; Halfacree, 2004; Pumain, 2004). One key lesson from previous studies is that a universal definition of “urban” and “rural” is problematic, and definitions should be context-specific – that is, observing the inherent characteristics of distinct locations, such as infrastructure services, patterns of human settlement and organization (social and economic) of the territory, as well as official (administrative and political) definitions. New residential developments, resort and (eco)tourism areas, services and commercial centers in the countryside, agro-industrial complexes, isolated power and industrial plants (particularly of intermediate goods such as mineral or oil extraction, steel, cellulose, cement, among others) have produced new socio-spatial configurations that cannot be easily defined as urban or rural.

Brazil is an example of the complexity that characterizes current urbanization in the Amazon, which requires new approaches and ways of inquiring and understanding the diverse socio-spatial forms and processes that are being created throughout the territory beyond the city-country dichotomy. In Brazil, urban-industrial capitalism, once concentrated only in metropolitan regions and in a few other urban areas has, in the past decades, been extended onto the countryside along roads and highways, electric power lines, communication infrastructure and services, urban, social, financial services and legal requirements, the State apparatus at its various levels (including the new municipalities), labor legislation, organization, control and social benefits, carrying beyond cities and towns those and other socio-spatial aspects of contemporary urban-industrial life.

Given this context, authors like Monte-Mór (2004; 1997) have proposed the concept of “extended urbanization” to explain the process of extension of socio-spatial relations that were proper and limited to cities and urban centers, to rural and regional space. This extension of the urban-industrial process allows us to speak of an urbanization that has been—or is being, in the case of developing regions—virtually extended upon social space as a whole. Therefore, the concept of

*extended urbanization*<sup>3</sup> expresses a particular social spatiality brought about by late capitalism and extended onto isolated areas reaching unprecedented levels of time/space/societal (re)articulation.

Through extended urbanization multiple urban centralities, from cities and towns to commercial and service centers, industrial plants, large ranches, local communities, rubber estates, and even(tually) indigenous areas combine to connect and (re)articulate local, regional, national and global forces and thus produce a variety of locales more or less linked to urban-industrial capitalism. Extended urbanization carries within it the socio-spatial processes and forms that are proper to industrial capitalism, manifested both in its earliest expression, the industrial city, and its contemporary global multiple manifestations.

A characteristic of colonization projects in the Brazilian Amazon was a clear urban bias both in the conception of the settlement projects, and in strategies of urban accumulation. This helped to explain, at least partially, the evolution of a process of *extended urbanization*. The military geo-political concerns in the 1960s and 1970s led to an orchestrated campaign to occupy the Brazilian Amazonia, supported by nationalist slogans and mottos. It included free and/or cheap land for Brazilian entrepreneurial groups and multinationals, financial incentives for export agriculture, cattle ranching, mining and forest goods extraction, and the selection of stretches of fertile soils for colonization by migrant peasants and small farmers from other regions. Rondônia, a former federal territory bordering Bolivia and with particular land tenure conditions, became one of the main target areas for agricultural colonization and, supported by national and international programs, experienced an intense and particular form of territorial occupation that is presented in the following section.

Some government-sponsored projects of colonization in the Brazilian Amazon adopted a concept of “rural urbanism” (*urbanismo rural*), in which colonist settlers were organized in communities, named *agrovilas*, comprised of about 100-300 families and projected to have some basic infrastructure. A group of 20 *agrovilas* would be related to a major community, named *agropolis*, which contains better infrastructure and services not provided in *agrovilas* (such as a radio station or post service, hotel, agricultural extension services etc). Finally, a larger community named *ruropolis*, with at least 1,000 families and even better infrastructure and services (including small industries and a hospital) would be the reference urban area for *agrovilas* and *agropolis* within a 150 Km distance. Figure 3 shows the concept of urbanismo rural and the connection between the three types of communities (*agrovila*, *agropolis* and *ruropolis*).

The *urbanismo rural*, if not implemented in all colonization areas in the Amazon, was symbolic of a settlement process which from the beginning established the urban as the *loci* of social and economic urbanization in the Amazon. In fact, the rationale of this hierarchy of urban places reflected the idea that the creation of urban conditions, or “bringing the town to the rural”, was a central component of a strategy to effectively occupy the Amazon. On one hand, the *urbanismo rural*, associated with later processes of occupation of the Amazon (involving, for example, small-scale gold mining), contributed to consolidation of the urban as the key element of organization of the territory and economic activities. On the other hand, the results of the *urbanismo rural* as a factor of organization of the territory and of rationalization of socioeconomic development were dubious, as pointed out by Browder and Godfrey (1997) in relation to the settlement process in Rondonia:

*“Agricultural lots along the highway had five hundred meters of frontage and were two thousand meters deep. The agricultural lots of farmers settling in*

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<sup>3</sup> *Extended urbanization*, a concept inspired on Lefèbvre’s *urban tissue and urban revolution* (1968; 1972), refers to the extension of contemporary socio-spatial relations—urban-industrial forms and processes—formerly restricted to cities and towns onto regional, national, and global scales. It is the socio-spatial fabric from the dialectical unity of urban centers and the urban tissue that extends urban forms and processes—including *urban praxis*—onto the countryside and social space as a whole.

*'agrovilas' were the same hundred-hectare size, but they were located up to ten kilometers away from the official family residence in the planned village center. Since the farm lots located far away from the family house were inefficient for labor inputs and exposed untended crops to hazards of pests and poaching, many 'agrovila' colonists therefore constructed improvised shelters on their lots and returned to the service centers only occasionally. Most of the 'agrovilas' fell into a state of abandonment and disrepair, and one journalist referred to them as 'rural slums' (p. 76).*

The Northern Ecuadorian Amazon is another example of how the “urbanization” of the frontier should be thought of in a regional perspective, as a process resulting from the articulation of “rural” and urban” places through the flows of people and economic activities (Barbieri, 2006). Increasing urbanization in the Ecuadorian Amazon frontier involves recent rapid growth of some long-settled river towns, the formation of new pioneer urban areas, and the incipient transformation of many rural communities, which are acquiring urban characteristics through population growth and acquisition of basic infrastructure. Increasing economic and social articulation is also evolving between larger and smaller urban communities, constituting a *protourbanization* process characterized by an incipient but increasingly complex network of urban places. Urbanization due to rural-urban migration seems to be facilitated by governmental policies and the dynamics of international markets, which affected the economic sustainability of agricultural activities, especially by negatively impacting the price of cash crops such as coffee, and originating a boom in the oil industry and urban-based economic activities. Furthermore, there is an increasing availability of non-agricultural jobs in the Amazon, especially in oil-related activities, urban services and public employment, and even short-term employment in larger farms in the Amazon.

Figure 4 illustrates a typical land use transformation over time in the Northern Ecuadorian which, together with growth of local towns via migration, helps explaining the *protourbanization* process characterized by the formation and growth of small communities and suburbs to local towns. These land use transformations are related to both land subdivision and the formation of *solares*, which are small land plots (with less than a hectare) along roads and near towns, and which are residences and source of labor supply to local towns or farms. Considering, for example, the period 1990-1999. In 1990, a single farm household existed on a *finca* (or farm) along a road. By 1999, land subdivisions from this 1990 *finca* resulted in the pattern of land ownership and household indicated. *Finca 1* is that of a *nuclear household*, in which the household has the same head in 1990, or the head in 1999 is the spouse of the head in 1990. This *finca*, however, is smaller in 1999 due to its being subdivided into other seven additional *fincas*, numbered from 2 to 8. *Finca* number 2 is a case of an *endogenous household*, in which a relative of the head of the 1990 household - usually a son or daughter - is now managing partly the *finca* independently. This is usually the consequence of sons or daughters reaching adult ages and receiving a plot from their parents (arrow flowing from 1990 household in 1990 to household in 1999). Case 3 refers to an *exogenous household* in a subdivision of the *finca madre* after 1990, with the new head and spouse coming from outside the *finca* (new in-migrants). Cases 4 to 6 refer to *solares*; in case 4, the head of the *solar* is a former member of the 1990 nuclear household, while in cases 5 and 6 the head is a new in-migrant. Subdivisions 3, 5 and 6 reflect both the continuation of in-migration to the northern Amazon, as well as the presence of an informal land market in the region, with owners of *finca madres* selling parts of their plots and creating new subdivisions. This is done perhaps to get capital for investment, for normal consumption, for sending their children away to high school, or for medical or other emergencies. Case 7 refers to a subdivision for a non-household purpose, for example, to establish a school, a store, oil facilities such as oil pump, etc. The location of subdivided plots are usually near or along the main roads crossing a *finca*, this being especially important in the case of *solares* where the residents are usually engaged in employment on nearby towns or oil facilities, and hence need good road access.

Continuing rural-urban movements and population pressures leading to land subdivisions in the Northern Ecuadorian Amazon tend to accelerate this process of *protourbanization* and urban growth, as well as to increase pressures on public facilities and services in local towns and communities. Urban infrastructure (e.g., treated water, sewage, and garbage disposal) usually does not increase to attend to the demand of urban growth, generating negative impacts on human health and living standards. Nonetheless, while in many cases population redistribution can be regarded as an “equilibrating mechanism” which engenders a more efficient distribution of human capital and facilitating economies of scale in the provision of public services and infrastructure (Bilsborrow and DeLargy, 1990), it may also imply, given the selective nature of migration with the more educated and younger individuals moving more (in general, but not necessarily in the Amazon), that rural production is importantly affected by loss of educated manpower.

### **Recent population mobility, urbanization and development linkages in the Amazon: understanding macro and micro level trends**

This section explores a case study on the Northern Ecuadorian Amazon which helps understanding how urbanization and its development and environment implications are mediated by transformations in rural-urban linkages. It is first explored some recent macro data for the region, and then it is explored microdata from communities and households from surveys in the study area between 1990 and 1999.

#### ***Macro-level trends***

Table 1 shows that cantons (or municipalities) in the provinces of Sucumbios and Orellana, in Northern Ecuadorian Amazon, comprised a population of 216,550 people in 2001. The largest canton (municipality) was Lago Agrio, which experienced a high annual population growth rate during the decade (4,3%). Overall, all the cantons experienced high population growth, above the growth rates for the country (Bilsborrow et al, 2004). Overall, cantons achieve increasing living conditions (through betterment of infrastructure and services) over time, albeit it is very likely that a high share of population, especially those constituted of recent in-migrants, still do not have access to those improvements. In 2001, just half of population in the Amazon had access to electricity; 30% have regular water supply; 36% have some sewage collection and treatment; and only 8% have access to telephone. As will be seen in the next section, these development indicators are still worse when looking at smaller communities, especially those far from major towns in the region.

Table 2 provides a glimpse on the intensity of migration flows (those living in a canton in 2001 who lived in a different canton five years ago) in the Northern Ecuadorian Amazon. It is striking the percentage of the population in cantons in 2001 who is in-migrant - about 16%. In relative terms, smaller cantons present the highest proportions of in-migrants in 2001 (particularly in the Sucumbios province), but in absolute number of in-migrants, Lago Agrio, the largest canton in the area, had the largest volume of in-migrants in 2001 (representing 15% of its population).

Overall, tables 1 and 2 portrait a characteristic frontier area, in which a) a high percentage of the population is comprised of recent in-migrants – and thus population mobility represent one of the most powerful forces shaping rural-urban linkages – and b) underdeveloped infrastructure in urban or rural communities, what is strongly linked, among other factors, to the still high rate of population growth due to migration.

#### ***Micro level trends***

*Data and methodology of analysis.* In order to evaluate community and household data and how it helps to explain rural-urban linkages in the Northern Ecuadorian Amazon, this paper draws



upon a data set of households and communities collected from a scientifically representative sample of 767 households in 1990 and 1999 (longitudinal dataset), and from 61 communities in the region ranging from the four largest towns to tiny communities comprising little more than a primary school and a church on a main road. The 1999 household documented not only farm households and their linkages to large or small communities in the region, but also a subset of 111 “*solares*”.

In order to analyze the main determinants of rural-urban mobility and the linkages between urbanization, poverty and environmental degradation, this paper analyzes previous empirical studies and statistical models (Barbieri, 2006) which capture the multi-scale nature of factors determining population mobility in the NEA. This approach allows the investigation of socioeconomic, demographic, and biophysical factors operating at multiple scales (individual, farm household, and community) and over time on patterns of population mobility within the Amazon. Two statistical models assessed the determinants of population mobility in the Ecuadorian Amazon: (a) a discrete-time hazard model of out-migration relying on panel data from individuals and farm households between 1990 and 1999, and community information from the 2000 community survey which includes retrospective data; and (b) a cross-sectional multilevel model of off-farm work using data from individuals and farm households in 1999 and communities in 2000. Both models include binomial and multinomial outcomes (moved or not in the former, and type of destination in the later), and both control for potential problems of clustered information (individuals nested within households, and households nested within communities).

It will be considered here *out-migration* as referring to individuals who left a farm household at some point between 1990 and 1999 to live permanently elsewhere. The definition of out-migration emphasizes, thus, the definitive change of residence (being to the same community, another rural area or an urban area). *Off-farm employment* refers to individuals who engaged in off-farm work elsewhere (outside their own farm households) for at least one month in the last 12 months preceding the survey interview in 1999. It includes diverse forms of mobility (circulation, seasonal labor, commuting) that do not imply change in the usual residence.

*Results.* Tables 3 and 4 present, respectively and controlling by community size, results on community infrastructure and major reasons to leave the community. These information are controlled by distance to one of the four major towns in the region (Lago Agrio, Shushufindi, Coca or La Joya de los Sachas). As expected, it can be seen that the smaller the community, the higher the lack of basic infrastructure and services (except for elementary school, which is nearly universal in the study area). Nearly all larger communities (above 1,000 inhabitants) have electricity, piped water, church, notary’s office, health facilities, elementary and high school (albeit these results do not illustrate how is the accessibility to the services by local population, e.g. controlling by household income).

On the other hand, Table 4 shows that it is exactly in the small communities (those below 500 inhabitants), especially those up to 20 Km apart from a local town, that the lack of adaptation and health problems (related to a great extent to the poor infrastructure and services) are some of the major reasons to leave the community. As will be shown below, these reasons are greatly motivated by increasing household strategies to diversify risks and maximize income through off-farm employment and migration to urban areas. Furthermore, it can be seen that the far a community is from a local town, the greater the probability that small returns to farm labor will be a major cause to leave the community.

On the other hand, small farm returns tend to be a major reason for larger communities closer to towns. It is also important to observe that the lack of off-farm employment is a major cause of out-migration for small communities between 10 and 30 Km from a town; these probably represent distances in which transportation costs of the residence to a towns difficult commuting (which are feasible for communities less than 5 Km from a town), and then make urban off-farm employment through commuting more difficult and motivate a permanent change of residence, probably to a larger community or a local town. In the same vein, the lack of off-farm employment

opportunities is a major motivation of out-migration for larger communities far from major towns (30 to 50 Km).

Tables 5, 6 and 7 describe the out-migration and off-farm employment flows, particularly those of urban destinations, in the Northern Ecuadorian Amazon. Table 5 shows how off-farm employment is allocated among individuals according to place of destination and type of household in the origin – a farm household (587 individuals out of 3,882 total sample population in the study area, or 15%), or a *solar* (96 individuals out of 567 total sample population in the study area, or 17%). It can be seen that, while agricultural work is still the predominant type of off-farm employment source, professional and technical employment within the community and in urban areas are a second, and significant, source of off-farm employment for *solares*. It may also be recalled that most of these off-farm employment within communities may refer to communities with urban characteristics, since *solares* in the study area tend to be clustered near towns like Lago Agrio or Coca, or other larger communities. In this regard, it may not be a surprise that most of the off-farm employment by individuals living in *solares* is within the community (81%). Farm households have also the community as a major place of off-farm employment (53%), but with urban and rural places responding for an important share of employment (about 23% each). Self-employment is the third largest source of off-farm employment for *solares*, and the services sector is the second major source of off-farm employment for farm households, with professional/technical being the third.

Table 6 presents the proportion of out-migrants by type of farm households between 1990 and 1999, and by type of destination. The data represents a sub-sample of 614 farm households, being 231 nuclear (the head or his spouse was in the household in both 1990 and 1999), and 383 farm household in the study area in 1999, but created after the 1990 survey. It can be seen that most out-migrants are from nuclear farm households (corresponding to 27% of the population at risk of moving over the decade, against 8% for endogenous/exogenous farm households). This is not surprising due to their longer time of exposition (since 1990) and their later position in the farm household life cycle since they are usually constituted by older colonists. Endogenous/exogenous farm households, which are associated with younger cohorts of colonists, have proportionately more out-migrants to urban areas (38% against 32% for nuclear farm households). As possibilities of further land subdivisions in endogenous/exogenous farms are less (since these farms are already subdivisions of larger farms), out-migration to urban destinations becomes an increasingly more popular alternative. On the other hand, the still high proportion of out-migrants going to rural areas may be associated with second-generation colonists settling on endogenous farm households (e.g., land subdivisions within the same farm or community).

Table 7 presents the main reasons to out-migrate from rural areas and how they vary by age group, rural or urban destination, and type of farm household. Moving for family reasons (“accompany spouse or relative”) is the most important reason when controlling for all destinations or types of farm households. “Looking for employment” is the second main reason to move when controlling by destination and type of household. Nonetheless, when controlling by age, moving for economic reasons (looking for employment) is a more important reason for individuals in nuclear farm households in the extreme age groups – 12 to 17 and 35-59 – and for the older at ages 35-59 choosing urban destinations. For endogenous/exogenous farm households, economic reasons are the most important for those aged 12-17 and 35-59 who choose urban destinations. “Other reasons” is the third major reason to out-migrate when controlling for type of household and destination, except for those living in nuclear farm households who choose urban destinations (in which case, education is the third most important reason). “Other reasons” is the first or second most important reason when controlling by age 12-17 in rural areas for both types of households. Individuals living in nuclear farm households are more likely to move to urban areas when looking for education. However, the difference between rural and urban destinations for endogenous and exogenous farm households is small when considering education as a reason to move. This may be due both to a) the fact that these households are at earlier stages in life cycle, when children at home are either not of

school age or are in primary school in the community, and b) the increasing availability of educational opportunities in rural communities in later years of the decade (which coincides with a greater demand for secondary education in endogenous and exogenous farm households).

Table 8 provides a synthesis of longitudinal and multilevel models used to test determinants of population mobility (off-farm employment and out-migration) in the Northern Ecuadorian Amazon (Barbieri, 2006). The table shows the statistically significant variables ( $p < 0.10$ ), according to their theoretical orientation, and according to type of destination.

Migration selectivity and human capital: overall, it can be seen that migration theory is robust to explain permanent migration from rural to urban areas in what concerns human capital factors affecting mobility selectivity, except in the case of gender: if at first it could be expected a significant association between being man and rural-urban migration (albeit this relationship is usually valid for non-frontier areas in Latin American), there was a statistically strong association between being women and out-migration to urban areas, while men tend to predominate in temporary mobility to urban areas. While the results for both types of mobility also validate findings in the literature about the young age pattern of migrants leaving rural households, there is little support for the hypotheses about the effects of higher education on out-migration only for new cohorts of farm households. Higher household human capital (head's education) positively impacts migration to urban areas, which may be linked to a female bias in rural-urban migration.

New Economics of Labor Migration (NELM): contrary to expectations, access to credit is a significant factor facilitating off-farm employment in the local community, probably indicating a household strategy to acquire resources to amortize or pay credit or loans. Also contrary to expectations, land security is a significant factor facilitating out-migration from new cohorts of colonists. This may indicate that if a parent (usually the father) has title, it may free up sons and daughters to leave since the family has legal possession of the land. It is also interesting to note that the effect of hired farm labor may indicate "substitution" of off-farm labor (mostly allocated to urban areas) for on-farm labor.

Push factors: as expected, a longer walking distance from the farm household to the nearest road decreases the odds of rural-urban and local community off-farm employment. The effects on urban off-farm employment may partly be due to women being as involved as men in urban off-farm employment in contrast to other off-farm employment. The effects of road distance are also negative for urban destinations of migrants (both older and new cohorts of colonists), and for local off-farm employment. Probabilities of out-migration decrease as road distance increases, in accordance with the hypothesis that towns at larger distances from the farm household difficult the interaction between places of origin and destination. As expected, environmental contamination on the farm is a factor engendering search for community or rural off-farm employment (but not to urban areas) which is a supplemental source of income and alternative to decreasing farmland productivity.

Household life cycle and theory of multiphasic responses: the hypothesis that a higher number of adults living in the household stimulate out-migration to urban areas is supported only for the new cohorts of colonists. While the number of adults facilitates out-migration, a larger number of children hinder it for both types of farm households. This may reflect the effect of being in an early position at the farm household life cycle (with a large number of children, all adult farm labor has to be used), or effects of traditional gender roles (women stay on the farm to nurture children and thus being less likely to move away). An additional child in the farm household tends to increase significantly the odds of off-farm employment to the local community or to urban areas, probably due to the needs of increasing income to sustain a larger number of consumers. Cohorts of farm households at later life cycle stages (measured by the age of household head) are also more likely to engage in rural-urban migration, as expected; this age effect is higher for new cohorts. Farm households with older heads may have accumulated capital and knowledge to invest in less labor-consuming forms of land use, thus releasing household labor for rural-urban mobility.

Contrary to expectations, however, the effect is opposite for off-farm employment: the younger the household life cycle position, the higher the odds of off-farm employment.

As expected, more land in crops/perennials (a labor demanding activity) is associated with a decrease in the odds of off-farm employment and out-migration to rural and urban destinations. More land in pasture has a much smaller association since labor needs are far lower for raising cattle, what explains the negative association with off-farm employment. However, higher shares of land in pasture are associated with an increase in the probability of out-migration to urban areas (older cohorts), and with decreasing out-migration to urban areas (endogenous/exogenous farm households). For nuclear farm households, probabilities of rural-urban migration tend to be higher for smaller farms, and decrease as the amount of farmland increases. On the other hand, for new cohorts, probabilities of rural-urban migration increase as the amount of farmland increases. Probabilities of local or urban off-farm employment also decrease as the amount of farmland increases. Investment in land intensification via use of chemical inputs seems to increase returns to labor (farm productivity) and loosens the necessity of off-farm employment (thus supporting the expectations).

Social capital: migration networks are also an important predictor of rural-urban migration in older cohorts, perhaps to reduce migration costs by providing information and social/economic support in places of destination.

Structural approaches: the larger the local community population, the lower the odds that local farms have someone in local or urban off-farm employment (as expected). Larger communities provide access to some services and infrastructure which improve livelihoods and decrease the importance of off-farm employment. A larger share of the labor force in the secondary sector has a negative effect on rural-urban migration for nuclear households, as expected, thus retaining population in the community. However, the effects of an increase in the proportion of labor force in the tertiary sector are significant only for rural-rural migrants, in both types of farm households. As rural communities diversify local markets in a way to increase the tertiary sector vis-à-vis the primary sector, those individuals in new cohorts who have a preference for rural activities (farming or in the oil industry) will move away from the farm regardless of higher labor opportunities in the tertiary sector, which may be due to the very limited diversification and attractiveness of the sector in the local community. The results for temporary mobility also show that a larger tertiary sector has a positive effect on urban and rural off-farm employment.

## ***Discussion***

The results suggest that the increasing urbanization in the Northern Ecuadorian Amazon may be explained by two simultaneous, interactive processes. First, rural plots have become much smaller over time as a consequence of population growth and resulting land fragmentation. Hence, more and more rural households see off-farm employment or migration to a nearby town or local community of one or more family members as a way of getting more cash income and diversifying risk. The declining capacity of many farms to sustain their household members is evident as farm sizes shrink due to subdivision, environmental degradation due to soil or water contamination from oil spills, and loss of soil fertility due to inherent deficiencies in soil quality and inadequate use have led to population surpluses available for employment in nearby growing local communities or urban areas.

A second major ongoing process involves the effects of local and national governmental policies and the dynamics of regional markets (credit, labor, land tenure etc), as well as national and international markets on the economic sustainability of agricultural activities in the region, especially the negative impacts of falling prices of the cash crops such as coffee and beef, and the boom in urban-based economic activities.

This combination of increasing labor opportunities in urban areas, as well as factors affecting mobility selectivity and the dynamics of farming production, are key issues explaining this

important rural-urban mobility not only in the Northern Ecuadorian Amazon, but in other places in the Amazon, such as Brazil (Monte-Mór, 2004; 1997). For example, when addressing the effects of household composition and life cycle, it is also important to discuss how gender relationships, or “gendered-hierarchical relations” in the household affect women’s marginal role in farm production and household assets or farm land titles, and how this act as a “push factor” driving female labor to urban areas - as is typical in the Ecuadorian Amazon, and Brazil in a smaller extent. The urban allocation of female labor may be an important result of the lack of balance in household gender relations. For example, household strategies to allocate female labor to urban areas or elsewhere can related to the fact that women are “more reliable” as sources of remittances, given their relative submission to the male head of household.

This paper also suggests that rural-urban mobility in the Northern Ecuadorian Amazon is an increasing strategy of risk diversification and income maximization by migrant colonist families. It is also directly linked to ongoing processes of deforestation, urbanization and changes in income and welfare. In a frontier area, families and individuals try to maximize their opportunities in accordance to local and/or regional socio-spatial conditions. Job opportunities (in urban, rural and/or mining areas), spatial and temporal differences in the agencies’ criteria for land occupation and in levels of local development and competition, social and community integration, external economic factors such as the price of oil or of cash crops, among others, may determine whether moving forward along the frontier or temporarily settling down in a colonization area or in an urban area will better respond to particular individual or group characteristics.

Moreover, population mobility and redistribution are becoming the dominant demographic factors in population growth in frontier regions such as the Northern Ecuadorian Amazon since both fertility and mortality have fallen considerably as has natural population growth. The second generation of settlers will continue to reach adulthood and seek land or jobs, at the same time as farms are experiencing a declining capacity to sustain members due to decreasing soil quality and increasing intensity of use over time, and therefore declining agricultural yields. Thus, as population grows, with second or third generation of settlers demanding more land or urban jobs and new in-migrants arriving to the Ecuadorian Amazon and with decreasing possibilities of improving agricultural outputs through agricultural extensification, land in traditional colonization areas becomes increasingly scarce over the years, and out-migration to urban areas becomes an alternative for younger household members.

The analysis of out-migration by cohorts of settler colonists (older cohorts represented by nuclear farm households, and new cohorts by new/extended farm households) are an interesting indication of how such changes in rural-urban linkages and urbanization affect both cohorts, thus going beyond simple interpretations given by intergeneration analyses. It was revealed, for example, evidence of men breaking out of rural-rural mobility cycles and consequently engendering a momentum in rural-urban mobility by the fact that men with increasing pasture on the farm, a proxy for increased wealth status, are more likely urban migrants. Furthermore, the socio-economic benefits accrued through wealth are many, including better education and different aspirations, many of which will select for urban migration.

Overall, given the existence of a population momentum in rural-urban mobility due to earlier high fertility, along with continuing in-migration from elsewhere in the country, there is an important momentum in the urbanization process of the Amazon. Although the neoclassical economic model sees population redistribution from rural to urban areas as an “equilibrating mechanism” engendering a more efficient distribution of human capital and facilitating economies of scale in the provision of public services and infrastructure (Bilsborrow and DeLargy, 1990), urban infrastructure (e.g., treated water, sewage, and garbage disposal) often does not increase sufficiently to attend to the increasing demands for services of growing urban populations, generating negative impacts on human health and living standards. This is particularly true for smaller urban communities, but also for larger ones in the Amazon. As a matter of fact, while the results point to an improvement in the urban supply of infrastructure and services during the 1990s,

it is likely the existence of great heterogeneity in the *access* to these services and infrastructure, particularly by the new waves of migrants and temporary workers flowing to urban areas or larger communities. Smaller communities facing incipient transformation and articulation to larger communities or urban areas may face an even worse situation of overall lack of infrastructure and services.

An important feature of this momentum in rural-urban mobility and urbanization is the pattern of spatial organization grounded on a process of *extended urbanization* and *protourbanization*, and its development and environmental correlations. For example, those with higher education and better qualification for urban jobs find more opportunities in urban areas, suggesting that they would eventually leave their rural parcels to join the urban economy. There is thus an aggregation of human capital to urban areas, and drainage of human capital from rural in the last case, with important implications on rural development and management of land use and the environment. In other words, given the selective nature of migration, rural production may also suffer from the loss of young and relatively educated manpower and natural resources management (Barbieri et al, 2005; Barbieri, 2006).

Although the main activity might determine where the family (or most of it) temporarily lives, the traditional urban-rural dichotomy also hides the real hybrid (urban) nature of contemporary rural-urban Amazonian frontier settlements. Those who live in the rural parcels may succeed due to comparative advantages in labor and/or technological resources. The ability to maximize opportunities and make a living from rural activities (staying in the assigned rural areas) resides on the capacity to guarantee both cash earnings and time and labor to work on the rural land. However, agricultural success does not imply living or working only on the rural parcels; instead, it may mean owning a house in town by a household member, and being able to maximize productive working time in the rural parcel, self-sufficiently or not; and adopting multiple strategies regarding income maximization and risk diversification, including out-migration to urban areas and urban off-farm employment. In fact, the results suggest that lack of infrastructure and services plus small opportunities for risk diversification are key factors motivating both permanent and temporary mobility in the Amazon. Evidently, and as shown by the results from statistical models, the ability to materialize aspirations or motivations to move in a mobility pattern (permanent, temporary) and thus achieve a desired rural and urban labor allocation strategy will depend, among other factors, on the levels of human capital, personal attributes, household wealth, and structure of labor markets in local communities and towns.

Likewise, many farm owners may expand their agricultural activities by hiring labor from neighbor smaller farms (especially nuclear/extended farm households of younger colonist cohorts) or from *solares*, and at the same time allocating one or more of their households' members to urban off-farm employment or migration. Given the levels of monetization of the economy and the unfavorable conditions for agricultural production many settlers (mostly skilled workers and the petty bourgeoisie) cannot bear the opportunity cost of living in the rural properties since it is their urban activity what provides them with the resources to invest in agriculture and/or cattle raising. On the other hand, and as shown by the macro and micro analysis, a relatively strong urban economy offers job opportunities, goods, services and government support on levels never before seen in the Amazon largely contributing to the growth of smaller communities or local towns. This is a pattern verified in the Northern Ecuadorian Amazon; but it may be of course a pattern in the Amazon as a whole, but with some local specifics. For example, the Brazilian experience of *extended urbanization* shows that since access to rural land remains a main motivation for the great majority of migrants (even as a merely source of welfare, investment or status), practically all urban dwellers own and exploit rural parcels, thus strengthening the land market on both urban and rural fronts.

## Conclusion

With the burgeoning interest in the environmental and development aspects of the expansion of urbanization in frontier in many areas of Latin America, Africa and Asia, one would expect there to be a growing body of literature on the characteristics of migrants or movers, as well as determinants and consequences of this mobility. This is not the case, however. A major reason for the lack of such research is the lack of appropriate data sets, which is due to the considerable effort and time required to collect, process and analyze the necessary data. Furthermore, the focus of research on tropical forest frontiers has overwhelmingly been on the ecological consequences of the destruction of the rainforest--for biodiversity, climate change and global warming, and hydrology.

This paper aimed to discuss some of the key determinants of a contemporary pattern of development and environmental change in the Amazon that has drastically changed people's livelihoods and welfare: the "urbanization" process mediated by the increasingly complex articulations between rural and urban places. From a macro and micro analysis of a case study and from a theoretical review of recent "urbanization" changes in the whole Amazon frontier, it was suggested that the traditional city/country dichotomy is to be set aside if we are to understand the dynamics of contemporary development and environmental changes in the Amazon frontier. In fact, the powerful and apparently paradoxical advancement of *extended urbanization* and/or *protourbanization* over the Amazon produces complex socio-spatial rearrangements that obfuscate the dichotomous city-country patterns to which we were accustomed. The common use of the term "urban", as related to large cities, does not easily match the idea of the tropical rainforest, except for picturesque ruins of ancient civilizations reclaimed by the jungle and thus the idea of an urbanized Amazon sounds bizarre to most people, almost a catachresis. Nevertheless, the urban character of the Amazon frontier has been stressed by many authors. In some cases, State intervention in this urbanization process is very explicit; in Brazil, for example, State intervention developed urban strategies to rapidly occupy the region using planned and spontaneous urban *nuclei* (the *urbanismo rural*) as previous bases for the economic activities. In other cases, like in the Northern Ecuadorian Amazon, even a traditional *laissez-faire* politics regarding development and environmental planning in the Amazon which have induced spontaneous colonization processes and few restrictions (especially environmental) to the expansion of the oil industry, have resulted in an increasing process of urbanization. Thus, in both Brazilian and Ecuadorian cases, urbanization, in the sense discussed in this paper, may be a typical response not only to socioeconomic, demographic and land use changes in the frontier, but also to structural changes in the national and global economy and society.

However, it cannot be claimed that the socio-spatial understanding and the design of public policies or planning actions in the Amazon should concentrate in cities and towns in accordance to what came to be known as the "urban bias" (Lipton, 1977). Given the strong articulations between "urban" and "rural" places in the Amazon – particularly given the complex livelihoods strategies involving production and labor arrangements in both places – it is important to think about regional policies for the Amazon instead of "urban" or "rural" policies. As a matter of fact, this paper shows that increasing rural-urban articulations, particularly through population movements, increasingly gives the countryside the same theoretical status of the city. On the other side, policies specifically designed in this perspective and aiming to foster development, environmental protection and the welfare of the people living in the Amazon are virtually always ignored. In particular, it has been neglected the importance of developing policies that better protect what is left of the rich tropical forests while simultaneously improving human welfare in areas of *extended urbanization*. Various policies can be considered to alleviate poverty and achieve more sustainable development; but while remedial policies such as better extension of welfare programs to the Amazon could alleviate impoverishment in the short run, long run policies are needed. One is the expansion of family planning programs, which are virtually absent in the region despite the

continuing and relatively high fertility of women and the fact that, at least in Ecuador, two-thirds of them do not want to have any more children. Second, continuing expansion of urban employment is desirable, and is likely to be effective and sustainable. Fortunately, this is already occurring spontaneously, though the expansion of infrastructure supported by the public sector could be planned better so as to contribute to town expansion in new growth poles.



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Figure 1 – Location of the study area in the Northern Ecuadorian Amazon

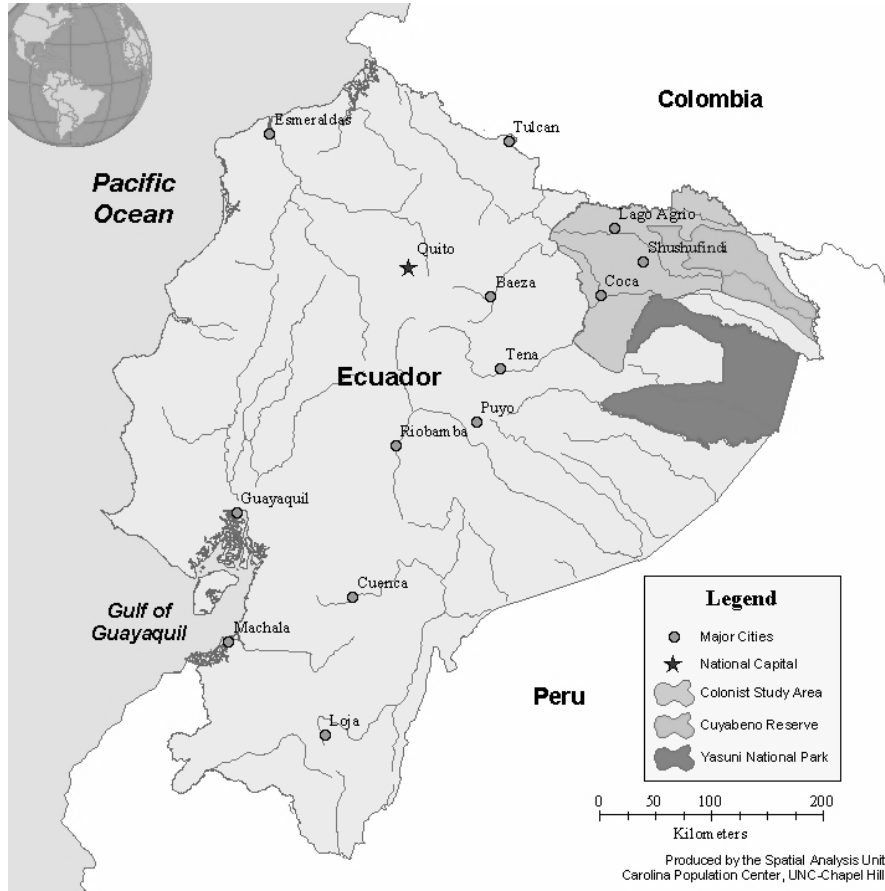


Figure 2 – Location of the Brazilian Amazon



Figure 3 – *Urbanismo rural*, a government-sponsored concept of settlement in the Brazilian Amazon

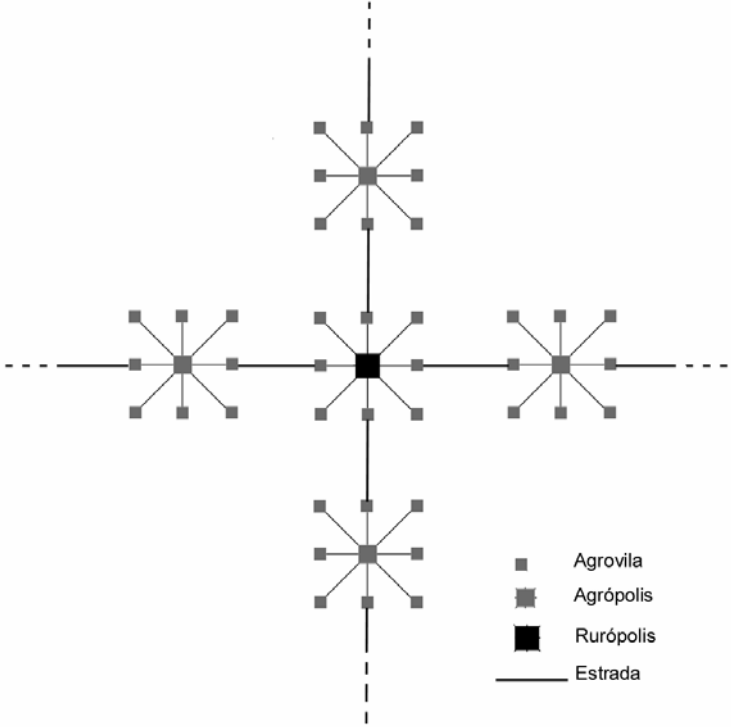


Figure 4 – Patterns of land subdivision and household constitution, Northern Ecuadorian Amazon, 1990 to 1999

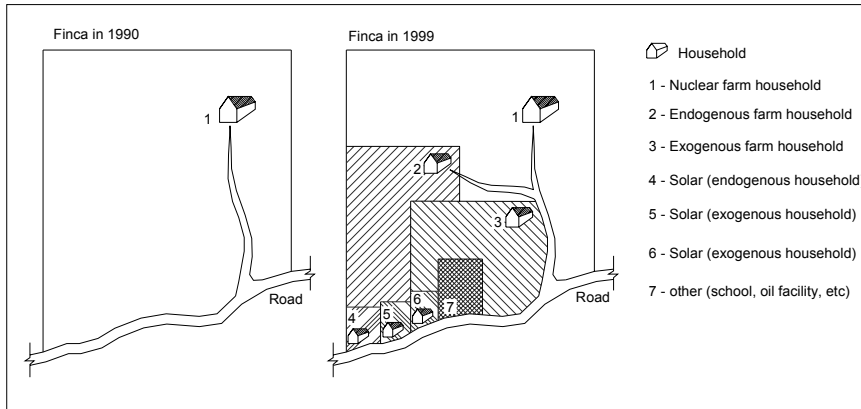


Table 1 - Availability of basic infrastructure and public services by canton size in the Northern Ecuadorian Amazon, 2000

Community size (people)	Population		Exponential annual growth rate (%)	Presence of infrastructure or services (%)							
				electricity		water supply		sewage		phone	
				1990	2001	1990	2001	1990	2001	1990	2001
Lago Agrio	41550	67010	4,3	36,6	64,3	16,0	26,9	25,6	22,5	6,0	11,6
Shushufindi	18960	32100	4,8	22,5	55,3	10,0	39,0	16,8	32,9	9,6	7,3
Cantons under 20,000 in Sucumbios	15910	31130	6,1	29,8	43,6	15,8	31,3	21,2	31,2	6,6	3,3
Orellana (Coca)	-	43490	-	51,9	-	36,7	-	38,9	-	-	12,3
Cantons under 20,000 in Orellana	-	42820	-	41,5	-	18,2	-	21,9	-	-	4,2
Total	-	216550	-	53,0	-	29,6	-	35,6	-	-	8,4

Source: microdata obtained from IPUMS (www.ipums.org)

\*Orellana was part of the province of Napo in 1990; census data does not allow disaggregation of 1990 cantons, particularly those below 20,000 habitants, in order to simulate Orellana cantons in 1990

Table 2 - Percentage of five-year in-migrants by cantons in the Northern Ecuadorian Amazon – 1990 and 2000\*

Community size (people)	Population		Percentage (%) of inmigrants	
			1990	2001
Lago Agrio	41550	67010	2,3	15,1
Shushufindi	18960	32100	23,5	13,8
Cantons under 20,000 in Sucumbios	15910	31130	21,1	19,4
Orellana (Coca)	-	43490	-	19,6
Cantons under 20,000 in Orellana	-	42820	-	13,9
Total	-	216550	-	16,2

Source: microdata obtained from IPUMS (www.ipums.org)

\*Individuals who used to live in a different canton 5 years preceding the census

Table 3 - Availability of basic infrastructure and public services by community size in the Northern Ecuadorian Amazon, 2001

Community size (people)	Number of communities	Presence of infrastructure or services (%)						
		electricity	pipewater	church	notary's office	health facilities	elementary school	high school
less than 100	24	33,3	8,3	79,2	0,0	8,3	95,8	8,3
101 - 250	12	75,0	16,7	91,7	16,7	50,0	100,0	16,7
251 - 500	8	87,5	25,0	100,0	12,5	75,0	100,0	37,5
501 - 1000	7	100,0	57,1	100,0	28,6	100,0	100,0	85,7
1001 - 5000	5	100,0	100,0	100,0	40,0	100,0	100,0	80,0
more than 5001	3	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Total	59	66,1	30,5	89,8	16,9	54,2	98,3	33,9

Source: LBA-NASA project, dataset on the Northern Ecuadorian Amazon

Table 4 - Distance from community to nearest town and predominant reasons to leave - Northern Ecuadorian Amazon, 2000\*

Community size (people)	Number of communities	Distance, in KM, to nearest town (N %) and predominant reasons to leave the community**																							
		less than 5 Km		Reason		from 5.01 to 10 Km		Reason		from 10.01 to 20 Km		Reason		from 20.01 to 30 Km		Reason		from 30.01 to 50 Km		Reason		more than 50 Km		Reason	
		N	%			N	%			N	%			N	%			N	%			N	%		
less than 100	17	1	5,9	3	3	17,6	2,5	5	29,4	1,3,4,5,	3	17,6	2,3,5	0	-	-	5	29,4	1,3						
101 - 250	10	2	20,0	5	1	10,0	4	3	30,0	3,4,5,	3	30,0	2,3	0	-	-	1	10,0	4						
251 - 500	8	2	25,0	1,4	1	12,5	4	3	37,5	2,3,5	1	12,5	5	1	12,5	1	0	-	-						
501 - 1000	7	0	-	-	1	14,3	5	3	42,9	1,5	1	14,3	3	2	28,6	1,2	0	-	-						
1001 - 5000	5	0	-	-	1	20,0	1	0	-	-	0	-	-	2	40,0	2,4	2	40,0	3,5						
more than 5001	3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	3	100,0	4						

Source: LBA-NASA project, dataset on the Northern Ecuadorian Amazon

\* Responses from 50 communities (9 missing information)

\*\*Reasons to emigrate:

1=small returns from farming activities; 2=lack of off-farm employment activities; 3=lack of adaptation; 4=health problems; 5=other reasons

Table 5 - Individuals engaged in off-farm employment in the Northern Ecuadorian Amazon, by type and place of work and type of household – 1999

Type of off-farm employment	Place of work (farm household)								Place of work (solar)							
	Within the community		Other rural areas		Other urban areas		Total		Within the community		Other rural areas		Other urban areas		Total	
Agricultural labor	257	43,8	53	9,0	25	4,3	335	57,1	35	36,5	8	8,3	0	0,0	43	44,8
Manual work in oil company	4	0,7	18	3,1	2	0,3	24	4,1	2	2,1	0	0,0	0	0,0	2	2,1
Professional/technical in technical in	8	1,4	19	3,2	27	4,6	54	9,2	24	25,0	0	0,0	6	6,3	30	31,3
Services**	22	3,8	19	3,2	42	7,2	83	14,1	1	1,0	2	2,1	1	1,0	4	4,2
Other self-employment	21	3,6	11	1,9	22	3,8	54	9,2	14	14,6	0	0,0	0	0,0	14	14,6
Other	4	0,7	14	2,4	19	3,2	37	6,3	2	2,1	0	0,0	1	1,0	3	3,1
Total	316	53,8	134	22,8	137	23,3	587	100,0	78	81,3	10	10,4	8	8,3	96	100,0

Source: LBA-NASA project, dataset on the Northern Ecuadorian Amazon

\* For individuals in the range 12-59 years of age; mean size of households: 5,9 (farm households), and 5,2 (solares)

\*\* Includes employment in restaurants, shops, hotels, commercial establishments etc; individuals running taxi or transportation service; individuals who buy/sell products (agricultural or not)



Table 6 – Number of out-migrants from the study area in the Ecuadorian Amazon between 1990 and 1999, according to place of destination and type of household\*

Farm Household	Total		Rural		Urban	
	Out-migrants N	% of Total Population**	Out-migrants N	Out-migrants % of Total	Out-migrants N	Out-migrants % of Total
Nuclear	398	27.3	266	66.8	132	33.2
Endogenous/ Exogenous	100	7.8	62	62.0	38	38.0

\* For individuals in the ages 12-59

\*\* Based on the total population (migrants during the decade plus non-migrants in 1999): 1,458 individuals in nuclear farm households, and 1,296 individuals in endogenous and exogenous farm households

Table 7 – Reasons to out-migrate to rural and urban areas, according to type of household and age group – Northern Ecuadorian Amazon, 1990-1999

Reason to Out-migrate (%)	Nuclear farm households (N=398)									
	Rural Destinations (N=266)					Urban Destinations (N=132)				
	age 12-17	age 18-24	age 25-34	age 35-59	% in total of reason	age 12-17	age 18-24	age 25-34	age 35-59	% in total of reason
Accompany spouse or relative	1.9	11.3	20.3	9.8	43.2	1.5	10.6	19.7	10.6	42.4
Looking for employment	6.4	2.3	15.4	14.3	38.3	0.8	2.3	15.9	13.6	32.6
Education	0.0	0.0	2.6	0.8	3.4	0.8	4.5	6.8	1.5	13.6
Other reasons*	2.3	3.8	4.5	4.5	15.0	0.8	2.3	6.8	1.5	11.4
Reason to Out-migrate (%)	Endogenous/Exogenous farm households (N=100)									
	Rural Destinations (N=62)					Urban Destinations (N=38)				
	age 12-17	age 18-24	age 25-34	age 35-59	% in total of reason	age 12-17	age 18-24	age 25-34	age 35-59	% in total of reason
Accompany spouse or relative	1.6	4.8	35.5	6.5	48.4	0.0	13.2	15.8	13.2	42.1
Looking for employment	1.6	0.0	9.7	14.5	25.8	2.6	2.6	13.2	10.5	28.9
Education	0.0	6.5	1.6	0.0	8.1	0.0	2.6	7.9	0.0	10.5
Other reasons*	4.8	1.6	4.8	6.5	17.7	0.0	2.6	7.9	7.9	18.4

\* Include, for example, answers like "health reasons", "military service", "didn't like the place".

Table 8 - Test of theories of population mobility by type of destination, and effects of significant variables tested on type of mobility - Northern Ecuadorian Amazon

Major Theoretical Orientation	Variables tested / level of variable	Validation of theoretical orientation by type of mobility*							Effect of variable on type of mobility: positive (+) or negative (-)	
		Temporary Mobility			Permanent Mobility:					
		Local	Urban	Rural	Nuclear**	Urban	Extended/New**	Rural		Urban
Migration selectivity; human capital;	younger age	Y	Y	Y	Y	Y	Y	Y	Y	+
	high head's education							Y		+
Lee, Ravenstein (effect of age); education (NELM)	gender (male)		Y	Y			C		C	+ (Y); - (C)
	high education	C	Y							- (C); + (Y)
	just farm work experience	Y	C		Y					+ (C); - (Y)
	marital status (married)	C								-
New Economics of Labor Migration (NELM)	market: hire labor		Y							+
	market: has credit	C		C						+
	institution: has tenure		C				C	C		+
Ravenstein; Lee; environment as push factor	long road distance to town	Y		Y		Y	Y	Y		-
	long walk distance to road	Y	Y		Y					-
	environment: has pollution	Y		Y						+
Household life cycle; theory of multiphasic response (household size, land area)	high number of adults	Y					Y	Y		+
	high number of children	C	C	C		Y		Y		+ (C); - (Y)
	older age of the head	C	C	C		Y		Y		- (C); + (Y)
	more land in crops		Y	Y	Y		Y	Y		-
	more land in pasture	C				Y		C		- (C); + (Y)
	more land (hectars)	Y	Y		Y	Y		C		+ (C); - (Y)
Theory of Multiphasic Responses	use land intensification	Y	Y							-
Social capital theory (migration networks)	has previous migrants				Y	Y	Y			+
	access to education				Y		Y			-
Political economy/ structural approaches	large community size	Y	Y	Y						-
	large secondary sector			Y		Y				-
	large tertiary sector		Y	Y	Y		Y			+

Source: based on the test of several statistical models; see Barbieri (2006)

\* Considering: Y = results according to theory; C = results contrary to expectations, given theory; blank = no statistically significant results