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Indigenous migration dynamics in the Ecuadorian Amazon: a longitudinal and hierarchical analysis

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Abstract

Amazonian indigenous populations are approaching a critical stage in their history in which increasing education and market integration, rapid population growth and degradation of natural resources threaten the survival of their traditions and livelihoods. A topic that has hardly been touched upon in this context is migration and population mobility. We address this by analysing a unique longitudinal dataset from the Ecuadorian Amazon on the spatial mobility of five indigenous groups and mestizo co-residents. Analyses reveal traditional and new forms of population mobility and migrant selectivity, including gendered forms of marriage migration and rural-urban moves driven by education. These results illustrate a dynamic present and an uncertain future for indigenous populations in which rural, natural-resource-based lifeways may well be sustained but with increasing links to urban areas.

Keywords

indigenous; migration; household longitudinal survey; livelihoods; Ecuador; Amazon

1. Introduction

Prior to the arrival of Europeans to the Americas, Amazonian Amerindian populations had livelihoods varying from seminomadic (Lu, 2001; Tritsch, Marmoex, Davy, Thibaut, & Gond, 2015) to settled civilizations based on extensive agricultural systems (Erickson, 2006; Heckenberger, 2013; Walker, 2008). However, these livelihoods were permanently disrupted by European colonization, with imported diseases and slavery causing massive population declines (Cook, 1998; Crosby, 1976; Verano & Ubelaker, 1992; Whitmore, 1991). While original European contact caused the most disruption, subsequent influences reconstituted indigenous livelihoods numerous times. For example, the penetration and colonization of the Amazon basin by European descendants led to major redistributions of indigenous peoples, pushing them to more remote areas of the Amazon (Lu & Bilsborrow, 2011) and co-opting their cultures through religious conversion (Rubenstein, 2001) or subjugation (Anderson, 1999). In summary, European colonization thoroughly disrupted Amerindian life to such an extent that traditional livelihoods were reconstituted with concomitant changes in the types and frequencies of population movements (Alexiades, 2013).

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Today, indigenous peoples continue to be influenced, coerced and occasionally uprooted for non-indigenous interests. The extent of Euro-American cultural effects on Amazonian Amerindians is highly variable, ranging from near full integration to continuing isolation. Most Amerindian groups by now have at least occasional contact with external markets, to acquire goods (Alexiades & Peluso, 2015), while for most who are educated in state-sponsored schools, the lure of urban education and employment opportunities can be a strong migration pull factor (Holt, Bilsborrow, & Oña, 2004; Lu & Bilsborrow, 2011; McSweeney & Jokisch, 2007). Additionally, the construction of new infrastructure and the growth of Amazonian cities can encourage rural-urban migration as individuals seek better livelihood opportunities (Alexiades & Peluso, 2015; McSweeney & Jokisch, 2007), while short-term employment with natural resource extraction firms exploring and extracting near indigenous communities can have a retention effect on indigenous wage earners (Bremner, 2013; Valdivia, 2005). Other factors that may tie indigenous peoples to their native communities include the provision of land titles recently provided by national governments (Nasuti, Eloy, Raimbert, & Le Tourneau, 2015; Peluso, 2015; Reyes-García et al., 2014; Richards, 1997), as well as the establishment of basic education and health infrastructure in communities (Lu & Bilsborrow, 2011).

Thus, there are numerous external factors, largely attributable to the continuing expansion of non-indigenous society and economy into the Amazon that influence indigenous livelihoods and migration. Given this backdrop, our investigation aims to understand how Amerindians located in the Northern Ecuadorian Amazon (NEA) are using migration as one of their responses to these pressures. Do NEA indigenous populations use migration as an economic livelihood strategy similar to non-indigenous Amazonian colonists or other agricultural smallholders throughout Latin America? Or, is it used largely for non-economic purposes that conform more to their traditional population movements or to further cultural survival? To address these questions, we analyse data on migration flows from two waves of a unique dataset on indigenous households in the NEA. The longitudinal data structure enables us to make causal arguments about migration to rural vs. urban destinations as well as about return migration between the two dates of data collection in 2001 and 2012. The results can shed light on the migration dynamics of these indigenous peoples, including assimilation into Ecuador's mestizo-dominated culture and the environmental consequences for the highly biodiverse Amazonian forests.

2. Background

2.1 Amazonian Indigenous Migration

As described above, Amazonian Amerindian populations have been subjected to numerous historic and contemporary externalities that have influenced their mobility. However, it has only been in recent decades that they have embraced rural to urban migration (McSweeney & Jokisch, 2007; Perz, Warren, & Kennedy, 2008). The scope of rural to urban relocation extends throughout the Amazon Basin with indigenous peoples moving to Amazonian towns and cities, larger national cities outside the Amazon, and in some cases migrating internationally (McSweeney & Jokisch, 2007, 2015; Perz et al., 2008). The large regional capital of Manaus in northern Brazil, for example, has seen a large influx of indigenous

people in recent decades (Chernela, 2015). Additionally, we have witnessed large rural to urban indigenous moves in the Amazon in north-western Brazil (Eloy & Le Tourneau, 2009), Peru (Peluso & Alexiades, 2005) and Venezuela (Urrea-Giraldo, 1994). There are also examples, such as the Wayapi and Teko in French Guyana, where indigenous groups have settled and formed largely indigenous cities within the Amazon (Tritsch et al., 2015). These examples demonstrate a slow embrace of urban livelihoods for numerous indigenous individuals and groups.

2.2 Indigenous Communities in the NEA

Published migration research on the NEA has focused on colonist settlers, leaving unaddressed the migration dynamics of indigenous communities. Our study is based on the five major indigenous ethnic groups—along with co-resident mestizos—in the NEA: Kichwa, Shuar, Huaorani, Cofán, and Secoya (Figure 1). These indigenous groups have recently entered the fertility transition, with exceptionally high fertility rates that are just beginning to fall—total fertility rates declined from 7.9 to 7.0 between 2001 and 2012 (J. Davis, Bilsborrow, & Gray, 2015). Despite this decline, relatively high fertility, combined with an earlier drop in mortality mainly attributable to child vaccination programs (Pan, Erlie, & Bilsborrow, 2010), continues to spur high population growth.

One response to population growth can be migration. Work by Lu and Bilsborrow (2011) describes the five NEA ethnic groups as having been highly mobile in recent years with numerous instances of individuals moving to other communities of the same ethnicity. Of note, the Shuar and some Kichwa communities are relative newcomers to the NEA—the latter moving in from areas west and south, while the Shuar—in response to declining per capita land holdings attributable to population growth (Rudel, Bates, & Machinguiashi, 2002)—migrated north from their historic homelands in the southern Ecuadorian Amazon (Bremner & Lu, 2006; INEC, 2001). In contrast to several investigations of non-indigenous colonization into the NEA (summarized below), the only thorough study of indigenous migration in the area was by Bremner (2013). Based on retrospective reports for the 1991 to 2001 time period, he found that relative to non-migrants, migrants were more likely to be young, daughters of household heads, with relatively high education, from households with previous migration experience, and moving to rural Amazonian destinations.

While the ethnic groups in this investigation have overlapping livelihood and demographic profiles, they also have notable differences (Lu, Bilsborrow, & Ona, 2012). In addition to major linguistic differences, the ethnicities differ in history, including the timing of their contact with outsiders (viz., Spanish colonists, and later the rest of the Ecuadorian population and government). The Kichwa, Cofán and Secoya had early contact with Catholic missionaries and were exploited during the rubber boom of the late 19th-early 20th centuries, while the Huaorani were initially contacted by missionaries from the Summer Linguistic Institute in 1958. This history corresponds with relative levels of market integration with Shuar and Kichwa being the most integrated, followed by the Secoya, Cofán and Waorani (Lu & Bilsborrow, 2011). In the last half century, the Ecuadorian government has pushed indigenous groups to settle in stable communities and to stop warfare in order to make available basic social infrastructure, including primary schools. In some cases,

indigenous communities were pushed from lands to make way for oil companies and their roads and pipelines, and/or for migrant colonization. Finally, in the early 1990's, indigenous communities received secure communal land titles to large areas of rainforest, primarily on a community by community basis (Zeppel, 2006).

Since the 1990's, changes have occurred in all five ethnic groups, as many study communities have become more integrated in the larger market economy of Ecuador, although these changes have been gradual, not revolutionary. During this time, modest ecotourism operations sprung up to generate income and to prevent outside encroachment for logging and oil exploration by four of the five ethnic groups—Shuar being the exception (Zeppel, 2006). Additionally, government development programs have financed road extensions and paving, reducing mean travel time between study households and the nearest major towns from 3.5 hours in 2001 to 2.5 hours in 2012 (Gray, Bozigar, & Bilsborrow, 2015). These programs have also expanded public sector employment in the region, especially during the Ecuadorian economic boom when world (OPEC) oil prices averaged over US\$90/barrel in 2008–2014. This led also to expansion of schools, benefitting especially the Kichwa, who have sought jobs in urban areas and as school teachers in indigenous communities of all ethnicities (Vasco Pérez, Bilsborrow, & Torres, 2015). Household assets also increased during this time with increased access to electricity and possession of consumer durables and cell phones (Salinas, Bilsborrow, & Gray, 2015).

Infrastructure investment in the NEA has influenced indigenous migration dynamics in many ways. First, the increase in employment opportunities in towns has attracted migrants (Barbieri & Pan, 2013). Second, the powerful desire to educate children has led adolescents to move to urban areas to attend secondary schools (Lu & Bilsborrow, 2011; Lu et al., 2012). A third factor is the effect of increased television and cell phone access on increasing information about urban life and employment opportunities, enticing indigenous youth moves. Finally, the possible out-migration effect of the increase in population and population density on perceptions of parents on whether there will be enough land for their children to continue their resource-based way of life in the future (Salinas et al., 2015).

2.3 Non-Indigenous Colonist Migration in the NEA

While not a lot has been written on the characteristics of non-indigenous mestizos that reside within indigenous communities, more information is known about mestizo colonists in the NEA in general. The discovery of oil in 1967 in the NEA led to the development of urban areas and infrastructure that have helped to spur in-migration of mestizo colonists from other parts of Ecuador (Bilsborrow, Barbieri, & Pan, 2004; Laurian, Bilsborrow, & Murphy, 1997). These colonists have taken advantage of transportation networks—constructed to facilitate petroleum extraction—to seek agricultural land and a better quality of life in the Amazon. Compared with indigenous groups, Amazonian mestizos in general have lower fertility (Bilsborrow et al., 2004; J. Davis et al., 2015) and smaller family sizes (Pan et al., 2010). Furthermore, Amazonian mestizo communities are typically more oriented toward the dominant Ecuadorian society and better connected through transportation infrastructure to greater Ecuador than their indigenous counterparts (Pan et al., 2010).

The migration patterns of non-indigenous colonists in the NEA provide interesting points for comparison. Specifically, out-migrants are more selected from larger households (Barbieri, Carr, & Bilsborrow, 2009). Additionally, males out-migrants tend to venture to rural NEA destinations, while females, especially aged 12–19 years, are more likely to seek urban destinations (Barbieri & Carr, 2005; Barbieri et al., 2009; Laurian et al., 1997). Land fragmentation has also been associated with higher second-generation settler out-migration (Bilsborrow et al., 2004). Specifically, individuals were more likely to out-migrate to rural or urban destinations when household farms were subdivided. Return migration patterns were also shaped by livelihood strategies in the NEA. Return migration has been associated with off-farm employment, where individuals moved to other farms or urban areas for several months of work before returning to their households (Barbieri & Pan, 2013). Furthermore, return migrants tended to be younger reflecting their lack of work experience and higher community fealty (Barbieri & Carr, 2005).

3. Research Questions

The preceding review of previous research on the study region and the study population suggests several questions about the possible drivers of indigenous migration in the NEA. Are indigenous migration decisions based on a desire to improve livelihoods? Have established migration networks come to exist in indigenous communities that provide knowledge of labour conditions in other communities or towns that may entice them to move to seek better economic opportunities? Are migration-reducing factors present in communities such as off-farm employment or growing educational opportunities beyond primary school? Or, are non-economic factors more important in influencing migration decisions of indigenous persons?

In answering these questions, we are guided by the sustainable livelihoods framework (Ellis, 2000), which postulates that rural households around the world rely on a diversity of income sources to sustain themselves, including migration. We are also guided by multiphasic response theory which views out-migration as one possible response to household and community-level demographic pressure (Bilsborrow, 1987; K. Davis, 1963) and by the push and pull migration framework that considers community-level characteristics in places of origin, destination and places in between as influential factors in migration decision-making (Lee, 1966). These frameworks allow us to integrate numerous processes across different spatial scales to better understand which factors are influencing indigenous migration in the NEA. First, recent infrastructure development in the NEA may reduce obstacles to migration in the spaces between migration origin and destination, thus facilitating movements of indigenous peoples historically isolated from the formal economy. Second, large households created by lower mortality and continuing high fertility may incentivize/push out-migration as a means to reduce pressures on subsistence resources. Third, the continuing growth of employment with petroleum companies or in ecotourism may provide non-traditional local income-generating opportunities that reduce incentives to out-migrate. Finally, migration to seek work outside the community may complement the array of natural resource-based diversification strategies that NEA indigenous households traditionally depend upon, including hunting, fishing, small-scale timber harvesting, and forest product collection, as well as subsistence and commercial agriculture (Gray et al., 2015).

4. Research Design

We use two waves of a household panel survey conducted in 2001 and 2012 to analyse migration dynamics in NEA indigenous communities. Household surveys are useful for collecting demographic and land use information and have been shown to be an appropriate approach for gathering these data in the Amazon region (Bilsborrow et al., 2004; Perz, 2001; VanWey, D'Antona, & Brondizio, 2007). A total of 33 communities were selected to broadly represent the spectrum of indigenous community ethnicity, population size, location/isolation—ranging from peri-urban to very remote—and proximity to the region's two large national parks (Cuyabeno Nature Reserve and Yasuni National Park). A small number of households with mestizo (mixed-race) heads were also encountered in these communities.

The original 2001 sample included 22 households selected at random in each community, or all households in communities with 22 or fewer households. Enumeration was carried out by trained Ecuadorian interviewers. Interviews were conducted predominantly in Spanish, or in an indigenous language when required with the assistance of a local interpreter. As seen in Table 1, Kichwa households represent nearly half of the sample, reflecting the fact that they vastly outnumber the other indigenous groups in the region (Bremner, Bilsborrow, Feldacker, & Holt, 2009; Lu et al., 2012), followed by the Shuar. The less populous ethnicities—Cofán, Huaorani and Secoya—were thus oversampled to provide enough data to permit interethnic comparisons. In 2012, the 498 households that provided information on household composition in 2001 were targeted for follow-up. Among these, 474 were either successfully interviewed (399) or had information collected from a proxy respondent due to the permanent departure or death of the household's members (75), providing longitudinal information for 2,862 individuals who were present in 2001. In each sample household, both the male and female heads were interviewed separately to collect a wide range of information on household demography, human capital, physical assets, agricultural resources, and livelihood activities. Additionally, in 2012, female household heads were asked to specifically identify the reason for each household member migration event. Responses ranged from the pursuit of economic or educational opportunities, for marriage, to fulfil military requirements, or for health reasons or intracommunity conflict.

4.1 Dependent Variables

Using three-level hierarchical (individual, household and community) multinomial logistic models, we analyse the odds that (1) individuals do not migrate vs. permanently migrate vs. migrate and return to their home communities during the 2001 to 2012 time period, and (2) individuals do not migrate (permanently) vs. permanently migrate to a rural destination vs. permanently migrate to an urban destination. The use of a hierarchical framework is premised on the fact that individual migration propensity is influenced by a number of factors, such as exposure to migration networks, that vary across households and communities, and directly addresses the non-independence of observations within communities (Rabe-Hesketh & Skrondal, 2008). Thus, the hierarchical multinomial logistic modelling structure is superior to the basic multinomial logistic modelling structure by parsing out the many different sources of modelling error into their respective individual, household and community components instead of lumping them into one error term.

As shown in Table 1, approximately 63 per cent of all individuals are non-migrants, 19 per cent are permanent-rural migrants, 12 per cent are permanent-urban migrants, and 6 per cent migrated and returned to their communities between 2001 and 2012. We define migration as a change in residence out of the study community for six months or more between 2001 and 2012, with permanent migrants still outside of the community in 2012. Because the destination is only observed in our data for non-return migrants, we use this approach to first examine the permanence of moves and then, among those migrants that have not returned, the destination of moves.

Our migration analyses are thus partitioned into a permanence outcome (none/permanent/return) and destination outcome (permanent rural/permanent urban). The combination of permanence and destination migration components allows us to better understand the motivations for changing one's location. For example, permanent moves to urban areas are consistent with economic motivations to migrate while permanent rural relocations might indicate more traditional uses of migration for marriage and/or to colonize new areas within the Amazon for agricultural pursuits. Return migration, in contrast, might indicate that migration is being used to access educational opportunities, for temporary labour migration, to obtain healthcare or to fulfil military obligations.

4.2 Independent Variables

Table 1 displays means and definitions of the independent variables separated into individual, household and community characteristics. All independent variables were measured in 2001 prior to the migration period. Individual demographic and human capital characteristics constitute first-level analytical variables. These variables include standard demographic and human capital characteristics common to most migration studies, including age, gender, marital status, education and relationship to the household head. In this investigation, both male and female household heads exist, but it should be noted that in 95% of households, the head is male. Additionally, being born in the community is included to control for community fealty (reducing one's likelihood of leaving or increasing one's likelihood of returning if they had left).

Household-level measures include ethnicity of the household head, household size, assets, previous migration of a household member, agricultural participation (area of crops in cultivation and cattle ownership) and off-farm employment of a household member. Ethnicity, measured as ethnicity of the household head, is included to capture the fact that the five ethnic groups are integrated into Ecuador's mestizo-dominated culture in varying degrees and are likely to have differential migration dynamics. Household size is included under the assumption that larger households are more likely to have excess labour that can be devoted to economic migration and/or may be experiencing resource stress (Barbieri et al., 2009; K. Davis, 1963; Ellis, 2000). The household asset index is included as a measure of relative wealth. We hypothesize that greater relative wealth can affect migration by providing the start-up capital to fund urban migration and settlement while lower wealth may encourage out-migration only to rural areas. Following Filmer and Scott (2012) and Kolenikov and Angeles (2009), an asset index variable was created by employing principal components analysis to assign each household a wealth value between 0 and 10 based on

housing quality and assets. Household migration captures the possible effects of previous household departures on creating migration networks that could facilitate future migration by other household members (Curran, Garip, Chung, & Tangchonlatip, 2005; J. Davis & Eakin, 2013; Lindstrom & Lauster, 2001; Massey et al., 1993). The two agricultural variables (hectares in cultivation and cattle ownership) are theorized as migration-reducing factors—households that are more engaged in agricultural production, especially labour-intensive crops, will have less labour to spare. Off-farm employment is hypothesized to be both a migration-reducing variable and a return migration pull variable. In essence, households with more off-farm employment opportunities are more likely to retain people, but also to incentivize the return of those who do move away.

Community-level variables, constituting third-level analytical variables, include travel time to the nearest urban area, community migration propensity, and the existence of a secondary school in the community. Time to nearest urban centre (the closest being Francisco de Orellana (Coca), Nueva Loja (Lago Agrio), Shushufindi and Joya de los Sachas) from the indigenous community provides a control for both ease of access to urban destinations and exposure to urban life. Both dynamics argue for a lower likelihood of out-migration when travel time increases due to greater isolation. Community migration propensity, like household migration history, is a proxy for community migration networks. The inclusion of a variable representing whether the community has a secondary school is included to test whether such a school reduces the out-migration of young persons who seek post-primary educational opportunities. Such an effect was found in earlier research on the out-migration of sons and daughters of colonist households in the NEA by Barbieri et al. (2009). However, having such a school in the community may also lead youths to seek more education or change their aspirations towards seeking employment elsewhere (especially in urban areas), while at the same time providing them with the human capital to earn more.

5. Results

5.1 Descriptive Statistics

Prior to discussing the regression results, we review descriptive characteristics of indigenous migration flows. Migrant characteristics disaggregated by ethnicity are presented in Table 2, while reasons for migration are in Table 3. Of the 544 individuals that migrated after 2001 and did not return by 2012, approximately 62 per cent remained in their native Amazonian provinces. Furthermore, approximately 40 per cent of all migrants moved to urban destinations either within or outside their native provinces. Among permanent urban migrants, 43 and 23 per cent, respectively, travelled to towns in Orellana and Sucumbíos provinces—mostly to the two largest cities in the NEA, Coca and Lago Agrio. An additional 11 per cent travelled to urban areas within provinces that contain Ecuador's two largest cities (Guayaquil and Quito).

Table 2 identifies a range of migration characteristics separated by ethnicity. Reflecting their recent entrance into the NEA, higher percentages of Shuar household heads and their spouses have resided in urban areas and areas outside the surveyed province in their lifetimes compared to the other ethnic groups. For out-migrants, about half are female but this fraction is lower in Secoya and Cofán households. Additionally, less than half of Shuar

migrants were born in the surveyed communities compared with over 60 per cent of Kichwa and Secoya. Examining permanent migrants between 2001 and 2012 by ethnicity, Huaorani (25%) and then Shuar (34%) sent the lowest percentages of migrants to urban areas compared with rural destinations while the Secoya sent the highest percentage (65%). Interestingly, even though low percentages of Huaorani migrated to urban destinations, high percentages crossed provincial boundaries to reach migration destinations (63.5%)—presumably to another rural locale in the Amazon. In contrast, a low percentage of the Shuar (30%) migrated inter-provincially between 2001 and 2012. Finally, few migrants transferred remittances, ranging from 22 per cent of Huaorani migrants to zero remittances sent by Secoya migrants.

The survey also gathered information on reasons for migrating. This is broken down by gender and 2001 age (the initial time period prior to migration) in Table 3. Reasons for migration are derived from the survey question, ‘Why did s/he leave?’ As shown in Table 3, answers differ according to gender and age. While some results appear surprising (for example, 0–11 year olds participating in military service), it is important to remember that these were the migrants’ ages in 2001. The migration event occurred up to 11 years later. In general, migrants are concentrated in the youngest age group (0–11 years in 2001) and are more likely to be female than male. While fewer in number, older migrants aged 20+ (in 2001) tend to be male. The primary reason for moving given by females across all age groups is to accompany a spouse, while education and employment are the second and third most common responses in the 0–11 and 12–19 (2001) age groups. For males, the primary motivation was for education in the 0–11 age group with significant numbers also moving for military service, to accompany a spouse, to look for work, and for other personal reasons. At older ages, diminishing numbers of males migrated to seek employment, to accompany spouses and for other personal reasons.

5.2 Hierarchical multinomial logistic results

The main regression results are shown in Table 4, partitioned into the two multinomial models. To restate our analytical approach, the odds of not migrating are compared with permanently migrating or migrating and returning to one’s native community within the 2001 to 2012 timeframe. Additionally, the odds of not migrating permanently are compared with permanently migrating to a rural destination or to an urban destination.

5.2.1 Permanence of Migration

5.2.1.1 Permanent Migration: Regarding the determinants of out-migration during the 2001 to 2012 time period, several variables showed very strong statistical significance, including individual demographic, human capital, and household-level agricultural indicators. In general, out-migrants tend to be young, female, either a child or other relation of the household head (such as a sibling or niece/nephew) and with some schooling. In particular, the odds that an individual permanently out-migrates are about half as large if s/he was over age 20 in 2001.

Among the other individual-level variables, females had odds of permanent out-migration that were twice as high as those of males, while at the same time spouses of household heads

(95% female) had 54 per cent lower odds of out-migration relative to the head. The odds of children and other family members out-migrating are five and 17 times higher, respectively, than those of household heads. Additionally, out-migrants have higher levels of education than non-migrants, reflecting the usual positive selectivity found in migration studies. Specifically, persons with incomplete primary, complete primary, and secondary or higher education levels in 2001 have nearly five, six and seven times higher odds of permanently out-migrating, respectively, than individuals without formal education.

Regarding household-level variables, individuals from households headed by Shuar are the only indigenous group that permanently out-migrate at significantly higher odds (nearly six times higher) than the Kichwa reference type. Being mestizo is also associated with higher permanent out-migration, which is expected since mestizos come from different familial and cultural backgrounds and may have greater ties to family located outside of their community. Of the household agricultural resource use variables, hectares in cultivation and cattle ownership both had significant effects and in the hypothesized directions. Specifically, individuals from households with more hectares in cultivation or owning cattle in 2001 were less likely to out-migrate, reflecting the greater demand for labour for cultivation and possibly a wealth effect of having cattle reducing the need to push household members to leave to reduce consumption burdens. Finally, none of the community-level variables had a significant effect on permanent out-migration.

5.2.1.2 Return Migration: The second panel in Table 4 presents results for return migrants for determining how they differ from both non-migrants and migrants who did not return before the 2012 survey. Return migrants are different from non-migrants and permanent migrants in terms of age, gender, education, and place of birth. In particular, persons aged 12–19 in 2001 are twice as likely to out-migrate and return by 2012 relative to those aged 0–11 in 2001. In contrast to out-migrants who remained away, no significant gender differences are observed among return migrants. Education level is positively associated with return migration compared to non-migration, but the statistically significant odds ratios for each level of education are smaller than those for out-migration, suggesting that the most educated members are less likely to return. Additionally, individuals born in the community of interest have a 57 per cent greater odds of returning compared with individuals born outside the community, although the effect is marginal.

Among household- and community-level variables, ethnicity of the household head, household size and off-farm employment represent the only three variables that substantially differ from the permanent migration results. Specifically, individuals from households headed by Shuar are no more likely to migrate and return than the Kichwa reference group. However, mestizos are even more likely to return than they were to migrant permanently. Larger household size is associated with slightly lower odds of return migration as with permanent migration (10% lower odds for each additional household member—result marginally significant). In contrast, the engagement of households in off-farm employment in 2001 is linked to 1.9 times higher odds of returning to the community by 2012 (marginally significant), suggesting that most such work is intended to be only temporary. The employment factor is expected, since someone working away is more likely to want to

return if s/he anticipates having other local off-farm employment opportunities after returning.

5.2.2 Destination of Permanent Migration

The second set of statistical results in Table 4 shows the effects of independent variables on the choice of rural vs. urban migration destinations, in contrast to no permanent migration. Differences in the odds for rural and urban destinations also indicate factors that affect destination choice.

5.2.2.1 Rural migration—The results for the rural column are discussed first, and in general are similar to those for out-migration in general, albeit with some notable differences in significance of the migrant's ethnicity and household size. Thus, rural migrants, compared to non-migrants, are more likely to be female, to be a child or other relative of the head and to have some education. Among the household variables, similar to migrants to any location, rural migrants are more likely to be from households headed by a Shuar. The odds of individuals from Secoya households migrating to rural destinations are 84 per cent lower than those of the Kichwa, while the Huaorani are about four times as likely to migrate to rural destinations as the Kichwa (though both results are only marginally significant).

Household size in 2001 is not a significant predictor of rural out-migration, but other predictors of rural migration are similar in level, magnitude and significance as those predicting out-migration in general, meaning that both area in cropland and owning one or more cows reduce out-migration to rural destinations. Also, again, none of the community-level predictors is linked significantly with out-migration to rural destinations vs. non-migration.

5.2.2.1 Urban migration—Moving to the results for predictors of urban migration vs. no migration, the majority, with a few demographic and household variable exceptions, are again similar to those of out-migration in general (in the first column). These exceptions include age: household members between 12 and 19 years of age in 2001 are half as likely to out-migrate to an urban destination as children less than 11, and indeed all persons above age 12 are less likely to migrate to urban destinations. Approximately 80 per cent of urban migrants moved between the ages of 8 and 17. The fact that only a small percentage of the youngest (less than 8 years of age) and oldest (18–21 years of age) children migrated to urban areas strongly suggests that children moved to seek urban education rather than to accompany adults or for wage labour. Additionally, the odds that a spouse migrates to an urban area are not significantly different from those of the household head, in contrast to permanent out-migrants. The size of the highly significant odds ratios for the education variables, compared to those for migrants to rural destinations, shows that having more education—complete primary and especially secondary education—is even more important in predicting migration to an urban than a rural destination, as expected. These results show that education is a powerful predictor of out-migration, especially to urban destinations, as well as a goal of migration for youths.

Among household variable factors, only three differences affecting rural vs. urban destination choice are found. First, the Huaorani are no longer more likely to choose an

urban destination than the Kichwa. Second, individuals for households with higher value assets are slightly more likely to migrate to urban destinations, which is expected due to the higher cost of migration establishment in urban vs. rural areas. And third, being in a larger household is now seen through this disaggregation of destination types to (albeit marginally) reduce the out-migration to urban destinations vs. to rural destinations. As above, none of the community-level factors is linked to the choice of migration to an urban destination vs. non-migration.

6. Discussion and Conclusions

The results here challenge common expectations regarding the primary drivers of indigenous migration in Amazonian frontier settings. In many other contexts in the developing world, access to resources and migrant networks are key factors in explaining migration (Massey et al., 1993), and common narratives envision encroachment and isolation to be key factors driving and limiting mobility in the Amazonian context (Godoy et al., 2005; McSweeney & Jokisch, 2007). In contrast, we find that migration is primarily a lifecycle process driven by education, ethnicity and demographic factors. Consistent with other rural settings with patrilocal marriage practices (Gray & Mueller, 2012), migrants are disproportionately young women who move to join a spouse, especially to other rural indigenous communities. At the same time, there is a considerable, non-traditional flow of rural-urban migrants driven by education, both by their previous education and opportunities for additional education for themselves and their children. Ethnicity also plays a role, particularly for the Shuar who are themselves in-migrants to the study region. The effects of household assets, agricultural resources and land use, migrant networks, and even geographic accessibility are weaker than usually expected or non-significant, suggesting that most moves in this context are not pulled by economic opportunities elsewhere or pushed by social constraints at the origin.

The lack of significant relationships between rural out-migration and household size or household assets connotes non-exploitative migration goals for NEA indigenous peoples. Unlike colonist migration in the NEA, recent migration of indigenous households does not appear to be a coping mechanism in response to population-induced resource limitations—most households have far more land than they use. Similar results were found with Tsimane Amerindians in the Bolivian Amazon (Godoy et al., 2005). In the short run, these are positive findings from an environmental perspective, as Ecuadorian Amazon indigenous migrants are nowadays rarely venturing to new Amazonian areas to carve out new existences as they have become settled in stable communities with schools and communal land titles.

Taken together, the results here have important implications both for how we view indigenous communities in the present and for their future in a rapidly changing region. Narratives that portray Amazonian indigenous peoples living in splendid isolation, defending nature or as highly vulnerable to assimilation and culture loss (Lu, 2001; Redford, 1992) are outdated. Our results suggest a more nuanced reality: Indigenous peoples are so far are not rapidly changing their traditional livelihoods but they are also increasingly engaging with the outside world. That reality is visible here in high rates of traditional rural-rural migration for marriage alongside rural-urban moves driven by education. It is also visible in other analyses of these data which have revealed changing family size norms but a

slow increase in use of modern contraception (J. Davis et al., 2015) and the persistence of traditional forest resource harvesting practices even in the context of direct exposure to oil exploration (Bozigar, Gray, & Bilsborrow, 2016; Gray et al., 2015).

All empirical studies have limitations, which must be recognized in this study as well. First, it cannot be known whether migrants that had not returned by 2012 will remain permanently away or whether they will later return and be reclassified as return migrants (the open interval problem). Second, as described in the methods, the sample is not a strict probability sample of indigenous communities, so model results should not be extrapolated beyond sample communities. Nevertheless, the communities are sufficiently numerous and were selected to represent different ethnicities, population sizes and levels of isolation using controlled sampling (Goodman & Kish, 1950), so that the results can be considered of more general interest.

This research also has important implications for methodology in the study of indigenous livelihoods and demography, which to date has been characterized by small sample sizes and the use of qualitative, ethnographic approaches—quantitative work on the Tsimane of the Bolivian Amazon represents a notable exception (Leonard et al., 2015). These approaches are valuable for the depth of insights they provide and attention to process and diversity (Lu et al., 2012), but are limited in their capacity for providing a basis for generalization, or meaningful comparisons across study sites and ethnicities and over time. Complementing previous qualitative and quantitative studies (Godoy et al., 2005), we show here how survey and statistical methods can be used to provide valuable insights about regional-scale demographic and livelihood changes among indigenous peoples, while also paying attention to the role of context and history. The opportunity exists to extend this approach to other settings as well as to improve it along several dimensions, including expansion to a larger sample of communities and households, tracking of migrants to interview them directly in places of destination, as well as integration with ethnographic methods.

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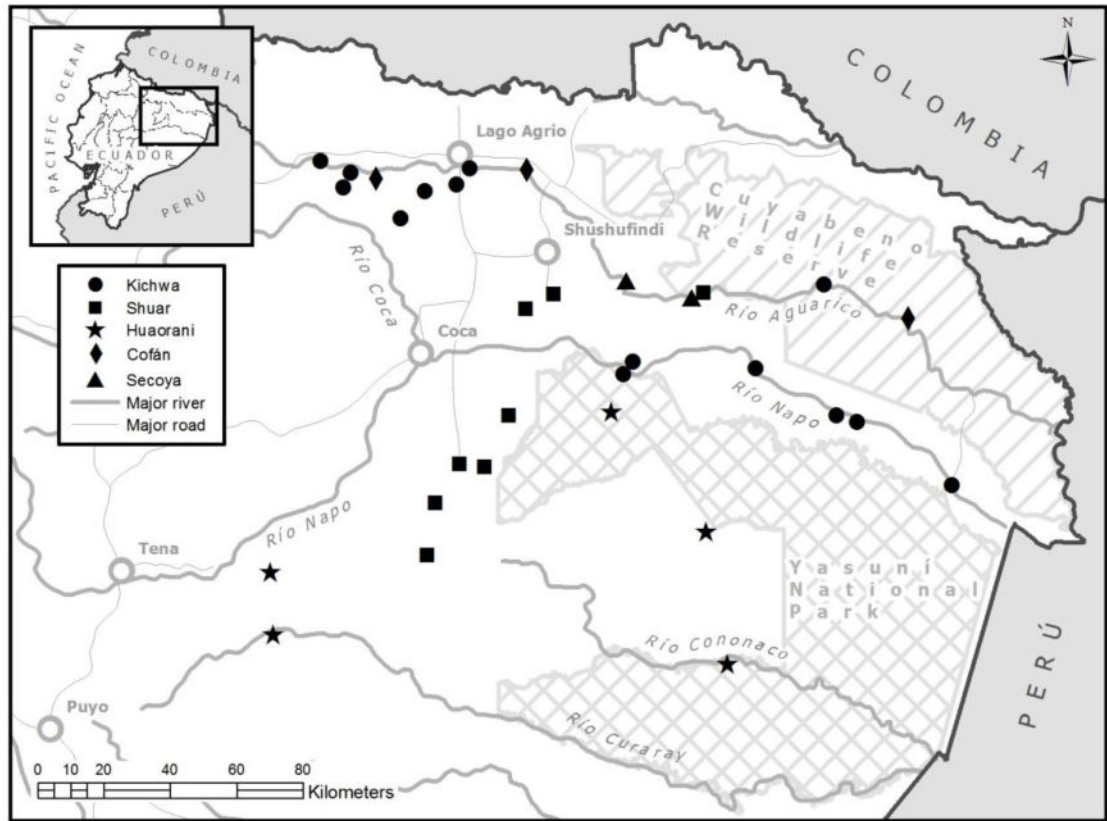


Figure 1.
Map of ethnic communities within the Northern Ecuadorian Amazon.

Table 1

Dependent and independent variable units, percentages/means and definitions.

Variable	Units	%/Mean	Definition
Dependent Variables			
Non-migrants	0/1	63.0%	Individual did not migrant between 2001 and 2012
Permanent-rural migrants	0/1	19.2%	Individual migrated permanently to a rural location between 2001 and 2012
Permanent-urban migrants	0/1	12.0%	Individual migrated permanently to an urban location between 2001 and 2012
Return migrants	0/1	5.8%	Individual migrated and returned between 2001 and 2012
Independent Variables			
<i>Individual characteristics for 2,862 study participants</i>			
Age			
0–11	Years	44.4%	Individual was 0–11 years of age in 2001
12–19	Years	18.8%	Individual was 12–19 years of age in 2001
20–34	Years	19.4%	Individual was 20–34 years of age in 2001
35+	Years	16.9%	Individual was 35+ years of age in 2001
Gender (Female)	0/1	48.0%	Individual is female (male is reference)
Relation to Household Head			
Head	0/1	15.9%	Household head in 2001
Spouse	0/1	14.8%	Spouse of household head in 2001
Child	0/1	56.7%	Child of household head in 2001
Other	0/1	12.6%	Other relationship to household head in 2001
Education Completed by 2001			
None	0/1	34.0%	Individual had no formal education in 2001
Incomplete Primary	0/1	34.3%	Individual did not complete primary school by 2001
Complete Primary	0/1	18.5%	Individual completed primary school by 2001
Secondary	0/1	13.4%	Individual completed at least some secondary school by 2001
Marital Status			
Single	0/1	65.1%	Individual was single in 2001
Married	0/1	32.6%	Individual was married in 2001
Divorced/Separated/Widowed	0/1	2.1%	Individual was divorced, separated or widowed in 2001
Born in the Community	0/1	60.3%	Individual was born in the community
<i>Household characteristics for 474 study households</i>			
Ethnicity – Household Head			
Kichwa	0/1	49.1%	Household head is Kichwa
Secoya	0/1	5.4%	Household head is Secoya
Cofán	0/1	7.4%	Household head is Cofán
Shuar	0/1	18.3%	Household head is Shuar
Huaorani	0/1	12.2%	Household head is Huaorani
Mestizo	0/1	4.3%	Household head is mestizo
Household Size	#	7.64	Household members in 2001
Asset Index	0/10	2.92	Standardized first principal component of household assets taken from all households surveyed in 2001
Household Migration Experience	0/1	30.9%	A household member migrated prior to 2001

Variable	Units	%/Mean	Definition
Cropland in Cultivation	Hectares	3.15	Hectares of cropland in cultivation in 2001
Owned Cattle	0/1	15.0%	Household owned cattle in 2001
Off-Farm Employment	0/1	59.6%	Household member engaged in off-farm employment
<i>Community characteristics for 33 study communities</i>			
Travel Time to Urban	Hours	3.30	Hours required to travel from community to nearest urban centre in 2001
Community Migration Experience	%	31.2%	Percentage of households that sent migrants prior to 2001
Secondary School in Community	0/1	26.8%	Community has a secondary school in 2001

Table 2

Characteristics of household head, spouse and out-migrants by ethnicity (%).

	Kichwa	Secoya	Cofán	Shuar	Huaorani
<u>Characteristics of household head and spouse</u>					
Lived in urban area in lifetime	9.1	6.5	3.7	11.7	6.0
Lived outside province in lifetime	41.4	27.4	8.6	65.0	29.1
Sample size	461	62	81	163	117
<u>Characteristics of out-migrants</u>					
Female migrants	51.6	41.7	45.5	52.2	51.5
Born in community	74.8	63.9	52.7	40.9	52.6
Ventured to urban destinations	43.3	65.2	38.3	33.6	24.8
Ventured outside province	35.6	53.3	32.4	29.9	63.5
Sent remittances in previous 12 months	11.6	0.0	10.8	5.2	22.2
Sample Size	465	36	55	274	171

Individual declared reasons for migration between 2001 and 2012 by gender and pre-migration age group in 2001.

Table 3

Age Group	0-11		12-19		20-34		35+	
	Male	Female	Male	Female	Male	Female	Male	Female
Lack of agricultural work	3	0	8	2	4	3	0	0
Dislikes farming	1	1	4	1	2	1	1	0
Looked for work	14	19	21	15	14	3	4	0
Did not want to move	1	1	2	2	1	0	1	0
Health reasons	0	0	0	0	0	0	1	0
To study	48	47	8	7	1	1	0	0
To accompany spouse	17	87	19	69	4	13	2	4
Other personal reasons	14	12	4	7	5	2	5	4
Community member conflict	0	0	1	1	0	0	2	0
Military service	20	1	1	0	0	0	0	0
Other reasons	1	0	4	1	1	0	0	0
Do not know	1	1	1	3	0	0	0	0
TOTAL	120	169	73	108	32	23	16	8

Table 4
 Three-level multinomial logistic models to predict NEA indigenous (Permanent/Return and Permanent Rural/Permanent Urban) migration.

	Three-level Multinomial (None/Permanent/Return)			Three-level Multinomial (No permanent move/Rural/Urban)		
	Permanent Migration Odds Ratio (SE)	Return Migration Odds Ratio (SE)	Permanent Rural Migration Odds Ratio (SE)	Permanent Rural Migration Odds Ratio (SE)	Permanent Urban Migration Odds Ratio (SE)	Permanent Urban Migration Odds Ratio (SE)
Individual Characteristics						
Age ^d						
12–19	0.97	1.98*	0.21	0.62	1.00	0.23
20–34	0.57 ⁺	1.36	0.18	0.62	0.55 ⁺	0.19
35+	0.45*	1.40	0.18	0.75	0.34*	0.15
Gender (Female)	1.97***	0.98	0.27	0.22	2.26***	0.35
Relation to Household Head ^b						
Spouse	0.46**	0.85	0.14	0.37	0.36**	0.12
Child	5.02***	6.84***	1.97	3.78	3.69**	1.58
Other	16.8***	16.43***	6.73	9.04	10.82***	4.65
Education ^c						
Incomplete Primary	4.96***	4.60***	0.85	1.25	4.23***	0.80
Complete Primary	5.76***	2.89**	1.54	1.16	4.98***	1.47
Secondary	6.68***	3.87***	1.91	1.59	4.66***	1.47
Marital Status ^d						
Married	1.03	1.66	0.36	0.81	1.35	0.51
Divorced/Separated/Widowed	0.40	0.49	0.27	0.49	0.62	0.44
Born in the Community	0.82	1.57 ⁺	0.16	0.42	0.84	0.17
Household Characteristics						
Ethnicity – Household Head ^e						
Secoya	0.36	0.41	0.34	0.41	0.16 ⁺	0.17
Cofán	0.66	0.43	0.48	0.35	0.71	0.55
						0.42
						0.62
						0.43
						0.49

	Three-level Multinomial (None/Permanent/Return)			Three-level Multinomial (No permanent move/Rural/Urban)				
	Permanent Migration Odds Ratio	(SE)	Return Migration Odds Ratio	(SE)	Permanent Rural Migration Odds Ratio	(SE)	Permanent Urban Migration Odds Ratio	(SE)
Shuar	5.78**	1.87	1.96	1.30	5.47**	3.58	5.31**	3.53
Huorani	2.92	2.07	0.68	0.53	3.93 ⁺	2.99	1.42	1.11
Mestizo	4.41*	3.22	6.48*	4.97	1.98	1.41	2.68	1.91
Household Size	0.92 ⁺	0.05	0.90 ⁺	0.05	0.99	0.05	0.91 ⁺	0.05
Asset Index	1.02	0.10	1.09	0.12	0.93	0.10	1.20 ⁺	0.13
Household Migration Experience	0.76	0.23	0.92	0.32	0.77	0.23	0.77	0.24
Cropland in Cultivation ^f	0.84*	0.06	0.90	0.08	0.86 ⁺	0.07	0.85*	0.07
Owned Cattle	0.41*	0.18	1.01	0.48	0.47 ⁺	0.21	0.32	0.15
Off-farm Employment	0.98	0.31	1.85 ⁺	0.67	0.88	0.28	0.67	0.22
Community Characteristics								
Travel Time to Urban	1.04	0.07	1.13	0.08	0.97	0.07	1.03	0.08
Community Migration Experience	1.01	0.02	0.99	0.02	1.00	0.02	1.02	0.02
Secondary School in Community	1.75	0.96	2.71 ⁺	1.55	1.42	0.86	2.13	1.29
Constant	0.03***	0.03	0.00***	0.00	0.03***	0.03	0.01***	0.01
Households		473				473		
Communities		33				33		
Sample Size		2862				2861		

⁺ p<0.10,

* p<0.05,

** p<0.01,

*** p<0.001

^a 0–11 age group is reference

^b Household head is reference

^c No education is reference

The natural log of this variable was used in the models

ρ Kichwa is reference

ρ Single is reference

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