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Decoupling Migration Effects from Income Effects on Reproduction in Central American Migrant-sending Households

Abstract
International migrants are subjected to numerous influences that may alter their fertility. The act of migration is disruptive to reproduction while exposure to different societal norms in addition to the transfer of remittance income can generate ideas and opportunities for household family planning. Contemporary data for three Central American countries (Costa Rica, Guatemala, and Nicaragua) surveyed by the Latin American Migration Project were analyzed to determine if migration length and remittance transfers had an influence on the instantaneous odds of a woman giving birth in given year. The analysis was structured to separate sociological influences on fertility attributable to migration from the income effects that accompany an increase in household wealth through remittance transfers. At the household level, the instantaneous odds that a birth would occur were negatively associated with an increase in cumulative U.S. remittance receipts and a cumulative increase in a wife's migration duration. However, a correlation between cumulative length of male migration and household fertility was not found.

Introduction

Since the dawn of humanity, people have migrated varying distances and durations to improve their economic and social conditions. The intensity of these migrations—their distance and frequency—has increased exponentially over time, undoubtedly facilitated by rapid population growth and improvements in transportation and knowledge transfer technologies (Ravenstein 1889). A large body of literature discusses the impacts of in-migration on migrant-receiving communities (Borjas 1987, 2003; Borjas et al. 1996; Altionji and Card 1991; Card 2001, 2005; Card and DiNardo 2000). However, migrant-sending communities also experience significant changes due to the loss and often, eventual return, of migrants. Such changes include shifts in the local population structure, substantial losses of able-bodied laborers, and changes in levels of knowledge and income due to a constant circulation of migrants leaving and returning to their native communities (Bilsborrow et al. 1984, 1987; Jokisch 2002; Taylor et al. 2006). This study strives to describe one aspect of modern human migration—how fertility differs in developing countries among households who send migrants to more-developed countries for differing amounts of time and in return receive varying amounts of remittance income.

To assess the influence of international migration and the infusion of money attributable to remittances on fertility, differences in birth hazards—the proportional odds that a woman will have a birth in a given life-year—are investigated for migrant-sending households who have and have not received remittance income. This paper shows, for the three countries studied (Costa Rica, Guatemala, and Nicaragua), that cumulative length of migration by the husband has no relationship to the odds that a birth will occur in a given life-year. However, a rise in cumulative remittance receipts or an increase in cumulative months abroad by female migrants leads to a decrease in the odds that a birth will occur in a given life-year.

Background

Remittance income represents a powerful economic and social force that is changing the structure of everyday life in many parts of the developing world. Latin America received $63 billion in remittance income in 2006—more than direct foreign investment to the region (IFAD 2007). Because it is disproportionally channeled to poorer members of developing countries, from family members who migrated for this express purpose, remittances represent a unique causative agent of social change (Durand et al. 1996). They are "self-help" mechanisms that provide the economic security and flexibility for millions of individuals to make major lifestyle changes in education, employment, health care, living conditions, and conspicuous consumption (De Janvry and Sadoulet 1989; Russell 1992; Durand *et al*.1996; Cohen 2001; Orozco 2002; Binford 2003).

This investigation uses data supplied by the Latin American Migration Project[1] (LAMP) to assess fertility differences under varying migration and remittance scenarios for three Central American countries. With the exception of Costa Rica, 2006 remittance income represented a substantial portion of most Central American GDPs; Nicaragua (14.9%), Guatemala (10.1%), and Costa Rica (2.0%) (IFAD 2007). These three countries were also chosen as suitable study sites because they represent the range of current (2007) Latin American fertility, with Guatemala expressing the highest total fertility rate (TFR) in the region (4.4); while Nicaragua trends closer to the mean (3.2) and Costa Rica lies at the low end of the range (1.9) (PRB 2007).

A source of work on the effect of migration on household and community-level fertility comes from Lindstrom and Saucedo (2002). Their study of short and long-term Mexican migration to the U.S. found fertility declines in households where wives migrate for any length of time or when husbands migrate—without their wives—for 8 months or longer. Their study also found that when husbands migrate and return after being separated from their wives for 1-7 months, fertility was elevated compared with non-migrant households. The authors postulate that temporary male migrates are selected for having large families, which is facilitated by a stronger financial state attributable to remittances.

In a study of rural to urban migration in Guatemala, Lindstrom (2003) found rural migrants demonstrated lower fertility than their non-migrating rural counterparts but not as low as their non-migrating urban counterparts. This lower fertility was attributed to migrants adapting and/or assimilating to the lifestyle conditions and fertility norms found in urban environments. Bean et al. (1984) and Stephen and Bean (1992), argue that migration between Mexico and the U.S. disrupts fertility patterns to such an extent that female migrants have fewer children over their lifetimes than native born, non-Mexicanas. Follow-up work by Bean et al. (2000), identify fertility disruption in "20-24"

[1] This study uses data collected by the Latin American Migration Project (LAMP: lamp.opr.princeton.edu) in Costa Rica, Guatemala, and Nicaragua. The surveys in Nicaragua and Costa Rica were conducted in association with the Central American Population Center of the University of Costa Rica (CCP: http://ccp.ucr.ac.cr), with support from the Mellon Foundation. The LAMP is funded by the National Institute of Child Health and Human Development (NICHD).

year old adult Mexican immigrants to the U.S. However, the reduction in younger life fertility is "made up" in later years.

Additionally, inherent in its definition, spousal fertility is decreased by spousal separation. A comparison of head of household (HOH) returning migrants for the three countries included in this study shows a range of separation norms. At the low end, the average Guatemalan migrant who returns to Guatemala spends 4.91 years in the U.S. over his/her lifetime while, at the high end, Nicaraguans spend an average of 10.57 years abroad (Table 1). The (national) mean number of trips to the U.S. is nearly as broad: ranging from 1.24 (Nicaragua) to 1.99 (Guatemala) for HOH migrants and 0.51 (Costa Rica) to 0.68 (Nicaragua) for spouses. The low number of trips to the U.S. by HOHs suggests that, in many cases, migrants spend their entire time abroad in one trip. This, in combination with a lower number of trips by spouses to the U.S., further suggests that partners are probably separated for long periods of time while HOHs are abroad.

Table 1. Characteristics of Migrants for Three Central American Nations

Country	Costa Rica	Guatemala	Nicaragua
Total migrants surveyed	197	74	613
Per capita years spent in the U.S.	5.3	4.9	10.6
(Mean/Median) trips to U.S. by head of household	1.8/1	2.0/1	1.2/1
(Mean/Median) trips to the U.S. by spouse of head of household	0.4/0	0.2/0	0.5/1

Source: Latin American Migration Project 2000-2004.

Research Hypotheses

In contrast to prior investigations (Massey and Mullan 1984; Rundquist and Brown 1989; Lindstrom and Saucedo 2002, 2007) that have lumped the sociological effects of the act of migration with the economic effects of wage transfer on sending-community fertility, this investigation takes measures to separate the two. The two classes of potential effects are outlined below and tested in this investigation.

Summary of Migration/Fertility Hypotheses

Socialization Under the socialization hypothesis, migrants are engrained with a set of fertility beliefs that are comparable to their native households and communities (Goldstein and Goldstein 1983; Stephen and Bean 1992; Kulu 2005). Native household and community influences shape migrant fertility, thus overriding migration destination influences. This hypothesis further argues that fertility behavior does not change within the migrating generation only in subsequent generations that remain at the destination.

Assimilation The assimilation hypothesis counters the socialization hypothesis. This hypothesis argues that migrant fertility is influenced by the fertility of receiving communities (in this case the U.S. with a 2007 TFR of 2.1) (Bean and Swicegood 1985; Bean et al. 1981; Stephen and Bean 1992; Lindstrom and Saucedo 2002). The dynamic extends in both directions; migrants increase their fertility if the place of destination has higher fertility than the place of origin or fertility declines if destination fertility is lower than the place of origin. In the case of Central American migrations to the U.S., fertility changes may be attributable to a desire to conform to the fertility norms of their new

neighbors, gaining access to contraceptives, becoming better educated, or a combination of these factors which empowers women to take command of household family-planning decisions

Disruption/Separation This hypothesis argues that during the act of migration and the intervening time required to settle in a new location, fertility behavior is disrupted (Stephen and Bean 1992; Lindstrom and Saucedo 2002; Kulu 2005). Furthermore, spousal separation, which hampers procreation opportunities, is captured under this category.

Diffusion Under this hypothesis, differential attitudes about procreation that are adopted while abroad are returned with migrants to their sending communities and diffused through the population starting with sending-household (Lindstrom and Saucedo 2002; Lindstrom and Munoz-Franco 2005, 2006).

Value of Time Economic Models of Fertility Change

Value of time economic models assume that household fertility decisions are made to maximize household utility by carefully balancing the number of children born without compromising personal consumption.

Income Effect Much of classic economic theory developed by Becker (1960) and Mincer (1963) to explain household fertility decision-making in response to changes in household income revolves around the opportunity costs of the secondary breadwinner – often the wife. These economists posit that a division of labor exists in the household with one partner (the primary breadwinner) devoting a substantial amount of time to wage labor while the other partner (the secondary breadwinner) primarily devoting time to household maintenance and not contributing much to household income. Under this scenario, an infusion of wealth to the household from a source other than the secondary breadwinner, such as a rise in the primary breadwinner's wage, receipt of inheritance money, or winning the lottery, is expected to increase childbearing. Thus, an increase in income not attributable to the secondary breadwinner provides the resources necessary for her to rear more children since children are relatively inexpensive as long as her potential wage as the secondary breadwinner remains low.

Substitution Effect Contrary to the income effect is the substitution effect, where the secondary breadwinner's time is worth more in the labor market than at home raising children (Becker 1960). Under this scenario children are expensive so more time is devoted to wage labor by both spouses and less time to child rearing resulting in lower lifetime household fertility.

Quantity/Quality Hypothesis Following the development of the income and substitution effects, Gary Becker added a new theory to the economic/fertility lexicon: the quantity/quality tradeoff (Becker and Lewis 1973; Willis 1973; Becker and Tomes 1976; Rosenzweig and Wolpin 1980; Becker and Barro 1988; Becker 1992). Under this theory, parents carefully balance the quantity of children they raise with the amount of resources they devote to their children (quality) and to their own personal consumption. As income

rises, parents use some of this increase in wealth to consume more and some is devoted to improve the quality of their children by investing in education and health care. Furthermore, the model assumes that parents choose to invest the same amount in each child's quality. Thus, a rise in income results in an increase in the cost of each child. As children become more expensive, parents tend to lower their fertility, as they also want to use some of the income surplus to increase their own personal consumption.

Methods

Longitudinal data collected by the LAMP between 2000 and 2004 were pulled for three Central American nations (Costa Rica, Guatemala, and Nicaragua) to assess the hypotheses described above on the proportional odds of having a birth in a life-year. The LAMP administered ethnographic survey questionnaires to HOHs and other family members to collect information on household characteristics in the three migrant-sending countries. The LAMP selected communities that span the range of urbanization—from rural to metropolitan—that also support some level of international migration. Once representative communities were selected, a randomized survey protocol was administered to a high number of households—200 households per community—to ensure that a substantial number of migrant-sending households would be captured by the survey and to maintained statistical representativeness to the community level. With the ethnographic survey, a retrospective accounting of annual events since the HOH's year of birth was made. The accuracy of recall information can be a concern when using retrospective surveys to document time-sensitive events such as the date of birth of children. This becomes more problematic when men are the primary informants as they are more apt to not report children born out of wedlock or from previous marriages (Rendall et al. 1999). The LAMP took steps to mitigate these potential data deficiencies by interviewing family units as a whole rather than just the male HOH and to cross-reference dated events such as timing of migrations with births (Durand et al. 2005).

Remittance income reported by the LAMP comes in response to the question, "How much money did you remit last month?" These reported amounts were extrapolated to the annual level and imputed for previous life-years when migrants were abroad. Therefore, cumulative remittance results reflect a relative difference—not an exact difference—in received remittances among households.

The first year a woman represented in the survey reached reproductive age was 1941 but the average year a woman in the survey was of reproductive age (between the ages of 15 and 49) was 1988 with a standard deviation of 10.4 years. The data were filtered to capture life-years when the HOH was married or in a consensual union and when the wife was between 15 and 49 years of age.

The LAMP team identified a variety of U.S. citizenship statuses, including legal residents, citizens, temporary workers, and undocumented during their surveys. Since this investigation is most interested in changes in migrant origin fertility rates, U.S. citizens and permanent residents were excluded to prevent potential bias that might exist within these households since there is a high probability that they have no intention of returning to their countries of birth. There is a concern that permanently resettled migrant populations might express different fertility patterns—more consistent with the assimilation fertility theory—than temporary migrant households.

***Statistical Analysis*:**

Originally, a three-level random-intercept logistic discrete-time odds model—with life-year, household and community representing the three level of analysis—was used to determine the effect of cumulative migration length and cumulative remittance amounts received by a household on the likelihood of a birth in a life-year. However, a comparison of a three-level model to a two-level model with just life-year and household found not statistically significant difference between the two. Therefore, a two-level model was settled upon.

Two-level random intercept logistic discrete time odds model:

$$\text{logit}\{\Pr(y_{ij}=1|x_{2i},x_{3ij},\varsigma_j)\}=\beta_1+\beta_2 x_{2j}+\beta_3 x_{3ij}+\varsigma_j$$

$$\beta_2 x_{2j}=\beta_4 \text{Country}_{4j}$$

$$\beta_3 x_{3ij}=\beta_5 \text{CumulativeRemittances}_{5ij}+\beta_6 \text{HusbandCumulativeMigration}_{6ij}+\beta_7 \text{WifeCumulativeMigration}_{7ij}+$$

$$\beta_8 \text{ChildrenBornToDate}_{8ij}+\beta_9 \text{ChildBornYrBefore}_{9ij}+\beta_{10} \text{WifeAge}_{10ij}+\beta_{11} \text{WifeAge}^{\wedge 2}{}_{11ij}+$$

$$\beta_{12} \text{WifeEducation}_{12ij}+\beta_{13} \text{HusbandEducation}_{13ij}+\beta_{14} \text{Year}_{14ij}$$

y_{ij} is the discrete time birth hazard on occasion i for the j^{th} household; x_{2j} is a time-invariant characteristic for j^{th} households; x_{3ij} are time varying characteristics of i^{th} birth years for j^{th} households. The ς_j term is the random intercept of the proportional odds of having a birth varying over households. Instead of assuming that the regression line for each household passes through the same intercept, a random intercept formulation allows this higher level variable to conform to different regression intercepts to more accurately model the situation of interest.

Table 2. Definitions of Variables Used in Birth Hazards Analysis

Variable	Definition
Country	**Costa Rica, Guatemala or Nicaragua**
Cumulative Remittances (logged)	**Cumulative U.S. remittances received in U.S. dollars (logged)**
Husband's Cumulative Migration (logged)	**Cumulative months spent in the U.S. by the husband (logged)**
Wife's Cumulative Migration (logged)	**Cumulative months spent in the U.S. by the wife (logged)**
Children Born to Date	**Number of children born prior to this year**
Child Born Year Before	**Was a child born in the previous life-year (yes/no)?**
Wife's Age	**Wife's age in given life-year**
Wife's Age^2	**Wife's age squared in given life-year**
Wife's Education	**Years of completed education by the wife**
Husband's Education	**Years of completed education by the husband**
Year	**Life-year**

Level 1 data: The dichotomous dependent variable used to test the two hypotheses described above was whether or not a birth occurred in a given life-year, lagged by one year to best account for a 9-month gestation period. The key level-one variables of interest were cumulative migration length of the husband and the wife and cumulative remittances income. Several level one control variables were included in the model:

children born to date, child born the year before (this variable should address the fact that there is a very small chance that a woman who has just given birth will have another birth within the 12-month period that follows), husband and wife's age, year, and interval since the wife's last gave birth. A quadratic term was also included for wife's age. Many other variables[2] were initially included in the model but dropped due their insignificance.

Level 2 data: The only second-level variable included in the model was migrant's country of origin.

Descriptive Statistics

The dataset used for this analysis incorporates over 5,500 life years; approximately 15 per cent of which included a birth outcome. Table 3 provides cross-sectional summary statistics for the survey year for the entire combined LAMP dataset for Costa Rica, Guatemala and Nicaragua, including non-migrant households, migrant non-remittance receiving households, and migrant remittance receiving households.

Table 3. Summary Statistics for Three Household Types at Year of Survey

	Non-migrant	Migrant, non-remittance receiving	Migrant, remittance-receiving
N	**2199**	**163**	**135**
Total children ever born	**3.3**	**2.7**	**2.9**
Husband's age	**46.4**	**40.0**	**41.6**
Wife's age	**42.6**	**35.8**	**36.9**
Husband's years of education	**7.8**	**8.7**	**8.6**
Wife's years of education	**7.6**	**8.6**	**8.4**
Husband's years of US experience	**0**	**2.6**	**5.5**
Wife's years of US experience	**0**	**1.2**	**2.0**

These statistics suggest that the two migrant populations are similar in many respects; husbands and wives are of similar ages and educational levels. While fertility to date is similar for the two migrant groups, their migration experience is quite different. The migrant, remittance-sending population had 0.2 more children to date than their migrant, non-remittance receiving counterparts and 2.9 and 0.8 years more of migration experience for husbands and wives respectively at the date of the survey.

Table 4 compares differences in key model variables between migrant-sending households during their first and last years of migration to provide an indication of how migration may influence fertility decisions. It shows that migrant-sending households bear, on average, 0.84 children (2.68-1.84) over an approximate 8.4 year time span (difference in average wife's age before and after migration). This compares with 1.84 children born by the time the average mother has reached the age of 28.3—prior to a household migration event. Assuming a typical woman starts childbearing at age 15 and

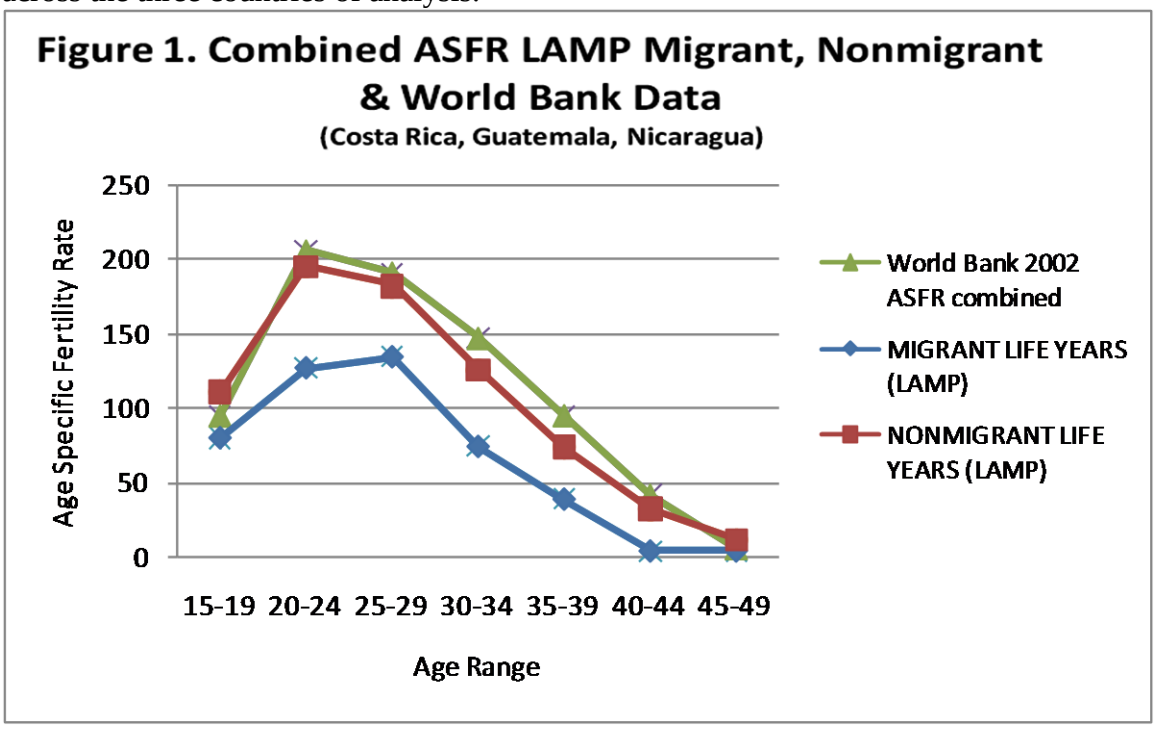
[2] Variables dropped due to their insignificance and failure to create a more powerful model include: annual remittance receipts, husband's age, comigrating spouses, migrant's gender, number of marriages to date, level of community development, birth interval, and cumulative length of domestic migration. Several country-specific interactions were also tested. None of these interactions improved the model's power and were subsequently dropped from further inclusion.

the probability of giving birth is constant over time (which we know is not true), a ratio of children born per year can be calculated by dividing 1.84 births by 13.3 years (28.3-15) to equal 0.14 births/year. Therefore, the 0.84 births for migrant households over 8.4 years (0.10 births/year) are lower than a no migration scenario.

Table 4. Comparison of Migrant Household Characteristics between the First and Last Year of Migration

	First Year of Migration	Last Year of Migration
N	**322**	**265**
Children ever born	**1.84**	**2.68**
Husband age	**31.3**	**41.3**
Wife age	**28.3**	**36.7**
Husband years of education	**9.1**	**8.9**
Wife years of education	**8.8**	**9.2**
Husband years of US experience	**1.0**	**4.9**
Wife years of US experience	**0.4**	**2.2**

A final preanalysis step was preformed to show how fertility differs while migrants were abroad compared to when they were in their local communities. Figure 1 illustrates combined age specific fertility rates (ASFRs) for the three countries of interest from two sources: World Bank (2002) data and the LAMP which was further divided into life years when either the husband or wife was in the U.S. the year before and life years when neither the husband nor wife were in the U.S. the year before. This figure indicates that ASFRs for nonmigrants closely match combined ASFRs for each 5-year group while age-specific fertility was depressed for migrants in the years they spend abroad. Combined 2002 World Bank ASFRs were calculated by taking an average of each ASFR group (15-19, 20-24, etc.) weighted by the combined population for each age group across the three countries of analysis.



Results[3]

Throughout this endeavor, the outcomes of highest interest were the influence of husband's and wife's cumulative migration length and the cumulative contribution of remittances to household income on the odds of giving birth in a life-year. The analysis did not show a statistically significant effect of cumulative migration length by the husband on the odds of giving birth (Table 5). However, the results do show a statistically significant negative relationship between an increase in wives' months abroad and an increase in cumulative remittance income on the odds that a birth will occur, independently. Specifically, a one unit increase in logged wife's cumulative migration length (172% increase in cumulative months abroad) correlates with a 5 percent decline in the odds of a birth in a given life-year when all other variables are held constant. Therefore, a one percent increase in cumulative months abroad equates to a 0.029 percent decline in the odds that she will have a child in a given life-year. To put this into perspective with an example: a wife who has spent 12 month in the U.S. that spends an additional 12 months abroad and increases her cumulative time abroad by 100 percent would decrease the odds of giving birth by 2.9 percent for that life-year.

Regarding cumulative remittance receipts, a one unit increase in logged cumulative remittances results in a 3 percent decrease in the odds of giving birth in a given life-year. Thus, a 100 percent increase in cumulative remittances received would decrease the odds of giving birth by 1.74% that year with all other variables held constant. A word of caution is required when interpreting these results. Because the remittance income measure reflects a relative difference among households and since this income is not exogenous—its incorporation into overall household income will probably alter the levels of the other variables—it is impossible to accurately project changes in the odds of women giving birth with changes in cumulative remittance income. Therefore, only the direction of the influence and its significance can reasonably be inferred from these results.

Many of the control variables also provided some notable results. Firstly, a comparison among the three countries finds both Costa Rica and Guatemalan migrant households to have higher birth hazards than Nicaraguan households. Secondly, as expected, the odds of a woman giving birth in consecutive years—indicated by the *child born in previous life-year*—was much lower (60 percent) than for a woman who did not give birth in the previous life-year. Furthermore, the odds of giving birth declined by 29 percent for each child already born. The effect of wife's age on the odds of giving birth conforms to a bell-shaped pattern—initially increasing than decreasing with advanced maternal age. Finally, the educational level of wives and husbands had no statistically significant effect on the odds of giving birth.

[3] The analysis was performed with households that have never experienced a migrant event included and excluded. This second scenario was adopted to control for the possibility that migrant households may be selected for naturally differing fertility levels than their nonmigrant counterparts apart from the influences of migration. The results from both analyses were nearly identical but the reported results only reflect households who have experienced at least one migration event.

Table 5. Random Intercept Logistic Discrete Time Odds of Having a Birth for Married Women ages 15-49 from 1941 to 2004 for three Central American Countries, LAMP 1999-2004.

		Two-Level Random Intercept Model Odds Ratios = exp(β)	
		OR	(95% Confidence Interval)
Country	**Nicaragua**	1^R	
	Costa Rica	1.42**	(1.11, 1.82)
	Guatemala	1.42*	(1.04, 1.94)
Cumulative U.S. Remittances Received (logged)		0.97***	(0.96, 0.99)
Husband's Cumulative Months of Migration Experience (logged)		0.99	(0.98, 1.01)
Wife's Cumulative Months of Migration Experience (logged)		0.95***	(0.92, 0.97)
Number of Children Prior to Current Life-Year		0.71***	(0.64 0.78)
Child Born in Previous Life-Year (Yes/No)		0.40***	(0.31, 0.52)
Wife's Age		1.19***	(1.08, 1.32)
Wife's Age^2		0.996***	(0.994, 0.998)
Wife's Educational Level		1.00	(0.97, 1.03)
Husband's Educational Level		0.99	(0.96, 1.02)
Year		0.97***	(0.96, 0.99)
ψ		0.24	(0.08)
Log likelihood		-1918.81	

*significant at p<0.05, **significant at p<0.01, ***significant at p<0.001

1^R designates the reference group that results for categorical and ordinal independent variables that are compared against. The reference has a value of 1.

Discussion

The study of migration and its effects on sending community fertility change is complicated by a multitude of sociological and economic factors. Migrants depart their families and communities to take up residence in a new community that may have different ideas about optimal family size and how to achieve it—including the use and availability of contraceptives. When exposed to the fertility beliefs of a new community, how much time must pass before a migrant abandons his or her socialization fertility beliefs and adopts the fertility behaviors of the receiving community? Are new fertility attitudes transferred back to migrant sending communities when migrants return? An additional wrinkle to consider when evaluating fertility in migrant-sending households is the effect of remittance income from afar. It must be assumed that many migrants will successfully find gainful employment in the U.S. and make sufficient income to both offset the opportunity costs from income that could have been earned at home and the cost of the migration trip (e.g. rent, food, and coyote payments). Once initial costs have been covered, how does an increase in household income attributable to remittances influence household fertility over time?

In support of the many different sociological theories that argue for and against the influence of migration on fertility, this study shows that for temporary Central American male migrants, socialization instincts win out over assimilation and disruption sociological dynamics. Evidence for this derives from the fact that there is no significant change in the proportional odds of having a birth as cumulative length of migration by the husband increases. In retrospect, this finding for male migrants is not surprising. As shown by Lindstrom and Saucedo (2002), male migrants require a much longer time in the destination area to adopt differing fertility beliefs than female migrants who lower their fertility almost immediately upon arrival. Opportunities for migrant assimilation are not immediate and the location of migrant settlement is not random. Migrants are pulled to various areas through their social networks and they are often surrounded both at home and at work with individuals with similar backgrounds and attitudes toward fertility. Due to a combination of language barriers, little knowledge of the U.S. labor market, their often undocumented status, and a lack of specialized labor skills, initially and up to some point in time migrants may not substantially interact with U.S. citizens who practice different fertility behaviors from their own. A combination of language, socioeconomic, and cultural differences between migrants and U.S. citizens can represent structural barriers that impede migrant integration and exposure to individuals that practice lower fertility.

Furthermore, the migration/fertility hypotheses described in this paper were conceived to characterize fertility patterns in migrant households that remain in their destination location (i.e. the U.S.), as opposed to returning to their native communities. This study, in contrast, investigates migrants who gain exposure to a new culture for varying lengths of time but eventually return to their places of origin. When a migrant returns to his place of origin, a counter-assimilation dynamic—which essentially reinforces a migrant's socialization instincts—occurs since the fertility patterns within the community of origin are more familiar and what a migrant is likely to emulate.

However, contrary to the non-influence of international migration tenure in the U.S. on male-sending migrant households, the odds that a woman migrant give birth declines as the length of their sojourns increases. A similar relationship is also found with increases in cumulative remittance receipts. The combination of these two relationships argues for a substitution effect or a quantity/quality tradeoff economic effect and some occurrence of fertility disruption and/or a combination of assimilation and diffusion effects. A follow-up assessment of cumulative remittance receipts and years of completed schooling of migrant children (results not displayed but available upon request) did not find a significant relationship one way or the other. This finding argues that parents who receive more remittance income do not invest more money in their children's education, counter to the quantity/quality hypothesis.

This leaves a substitution effect as the probable economic result. While there is no evidence to suggest that workplace opportunities avail themselves to return women migrants in their places of origin, U.S. migration and employment may fulfill this role in the substitution effect hypothesis. Essentially, children become more expensive as they reduce the ability of women migrants to make additional trips the U.S. and to maintain work there. The data appear to support this theory. A test of the odds that a woman resides in the U.S. is negatively associated with an increase in the number of minors in the household (results not shown but significant).

Regarding the sociological theories, the fact that increased female migration considerably reduces the odds that she will have a birth while increased male migration has no effect provides evidence that a disruption effect is not an overwhelming driver of reduced fertility. However, an assimilation and diffusion effect would nicely complement an economic substitution effect and would be compatible with the results reported by Lindstrom and Saucedo (2002) in their study of Mexican to U.S. migration and fertility outcomes. The conformity of the substitution effect with assimilation and diffusion effects derives from the fact that children become more expensive as they interfere with the secondary breadwinner's ability to seek gainful employment and empowered women may be making the conscious decision to have fewer of them. While in the U.S., woman would have better access to both family planning education and methods of birth control which they return with to their native communities (Lindstrom and Munoz-Franco 2005).

Why does increased female migration have such a decisive influence on fertility outcomes while male migration experience has no substantial effect? A strong possibility revolves around the lack of availability of family planning information and options in Central American communities and spousal power dynamics within the household. In the 1990s, the percentage of woman wishing to prevent or delay births without access to contraception was 23% in Guatemala, 15% in Nicaragua and 3% for Costa Rica (Ashford 2003; Robey et al. 1996). Furthermore, paternalistic attitudes of husbands and male healthcare providers often limit the participation of women in household contraceptive-use decision making (Diaz 1997; Blanc 2001; Hirsch 2003). However, when women venture to the U.S., they are empowered to wrestle more control of their reproductive decisions than before leaving native communities through numerous means. Firstly, facilitated by their social networks, migrant women will have greater access to contraceptive information and options in the U.S. than their native communities (Lindstrom and Munoz-Franco 2005). Additionally, household empowerment comes with active employment and the contribution of income to the household. Furthermore, having access to income allows women to purchase contraceptive services that may have eluded them when their husband's controlled household savings back at home (Blanc 2005). It is therefore probable that through an equalization of household decision-making power, women are better able to both access family planning services and overcome traditional, male-dominated control of fertility decisions and control the timing and number of births.

Conclusion

One impetus for conducting this study was to determine broadly how indicators of globalization—international migration and remittances—would influence developing world fertility rates and indirectly, future natural resource consumption. Considering the balance between resource consumption and population growth, the developed world currently consumes roughly 32 times the amount of natural and energy resources as the developing world on a per capita basis (Diamond 2008). However, countries in the developing world, with few exceptions, have substantially higher, above replacement level, fertility rates. Therefore, this study was designed to indirectly determine if globalization might assist in reducing developing world fertility and the number of future consumers to counterbalance an almost certain increase in per capita consumption that accompanies a rise in affluence. Fortunately, this study did find a negative relationship between increases in household income via remittances and increase in female migration

length and one measure of fertility. It is debatable whether increases in household remittance receipts can be used as a surrogate for development, but if so and if this discovered decrease in fertility holds for other developing areas, than future development may have some positive environmental benefits through declining fertility rates and concomitant reductions in future resource consumption. This also suggests that measures to raise local living standards and to increase employment opportunities can substantially influence fertility patterns in Central American communities, pushing them toward replacement level fertility.

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