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INTERNATIONAL MIGRATION AND THE EDUCATION OF CHILDREN: EVIDENCE FROM LIMA, PERU

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Abstract

The issue of whether emigration has consequences for the education of children who remain behind in the country of origin occupies an increasingly prominent place in the agendas of both scholars and policy makers. The conventional wisdom is that the emigration of family members may benefit children by relaxing budget constraints through remittances that can be used to cover educational expenses. However, the empirical evidence on the overall effect of migration is inconclusive. This is due in part to a substantive emphasis on remittances in the literature, as well as the inability of some studies to deal satisfactorily with the endogeneity of household migration decisions in comparing outcomes across migrant and non-migrant households. Using Peruvian data from the Latin American Migration Project (LAMP), we apply an innovative instrumental variable technique to evaluate the overall effect of migration on educational attainment and schooling disruption among the children of immigrants. In contrast to conventional wisdom, our results suggest that a higher household risk of immigration has deleterious consequences for the education of children who remain behind.

The past several decades have witnessed numerous economic, sociopolitical, and demographic changes in Peru. Various macroeconomic indicators suggest that Peru has achieved economic stability and impressive rates of economic growth in recent years, perhaps due to the implementation of neo-liberal structural reforms in 1990 (The World Bank 2009). However, the record is more mixed than it might appear from economic growth rates alone. Structural adjustments took several years to control hyperinflation and were accompanied by a recession with increases in unemployment/underemployment and a contraction of wages (Agüero and Valdivia 2009; ECLAC 1998; Massey and Capoferro 2008).

Between 1980 and 1993, Peru also suffered from strife caused by an armed conflict between the Communist Party (*Shining Path*) and the national army (Leon 2009). According to the Peruvian Truth and Reconciliation Commission, the civil war caused the death of nearly 70,000 people, which places this conflict as one of the longest and most brutal in Latin America. The war forced many families to relocate from rural to urban areas to escape violence (Escobal and Flores 2009). Once the conflict reached urban areas, international migration also intensified.

Although civil turmoil subsided after the leader of the rebel group was captured in 1992, economic difficulties have lingered. Indeed, macroeconomic progress has not resulted in

substantial reductions in inequality or poverty. In Lima, total unemployment rates stabilized over the past decade, but the unemployment rate for young men increased from 13% in 1990 to 21% in 2005 (ECLAC 2008; United Nations 2009). This was accompanied by stagnation in real wages, a persistently high poverty rate of over 50% (72% in rural areas), and a declining share of national income going to the poorest segment of the population. The poorest quintile earns less than 4% of the national income (see ECLAC 2008; United Nations 2009).

Peru has also made limited progress in providing universal access to a quality education. The World Bank claims that increasing enrollment rates at all levels of education show that Peru has “a mass education system of nearly developed-country standards, in terms of coverage” (Cotlear 2006: 4; see also UNESCO-UIS/OECD 2005). Yet, several indicators suggest that the educational system performs poorly in comparison to other Latin American countries. The low quality of primary and secondary education reduces economic competitiveness and graduates meet “frustration instead of success” in the labor market (Cotlear 2006).

This description alludes to some of the pressures that have led emigration to gain momentum (OIM 2006). Massey and Capoferro (2006) claim that the drop in wages and employment rates generated a dramatic increase in the migratory response of households that wanted to diversify their labor portfolios away from local labor markets. Moreover, the Economic Commission for Latin America and the Caribbean (2008:172) notes that “labour market conditions continue to be harsh” and this has led to “high migrant outflows.” Indeed, the stock of emigrants from Peru may comprise 10% of the population (Molina and Loveday 2006; Ratha and Xu 2008 give a lower estimate). As might be expected, the volume of remittances has increased substantially as well. From 2000 to 2007, remittances increased from 700 million to over 2 billion dollars (Banco Central de Reserva del Peru 2007). The latter figure was nearly 2% of the GDP in that year.

The education-related consequences of international migration at the household-level in Peru are poorly understood. The conventional wisdom is that migration improves household long-term welfare because private transfers from remittances relax liquidity and budget constraints. The alleviation of household budget constraints allows parents to afford school fees and other educational expenses that might otherwise prevent them from providing schooling for their children. Thus, income from remittances raises investments in education, a key determinant of long-term economic success.

This hypothesis is intuitively appealing, but it does not take into account that immigration may have negative consequences for the education of those who remain behind through other mechanisms such as information flows and changes in aspirations. Using data collected in Lima, Peru as part of the Latin American Migration Project (LAMP), our primary objective is to demonstrate the overall effect of the migration of household members on years of schooling and the probability of experiencing an educational disruption for children in the origin aged 15 to 20. Because very little is known about the characteristics of Peruvian migrants and sending households, we also provide a brief descriptive overview of international migration from Lima.

RESEARCH CONTRIBUTION

Although interest in the consequences of immigration for children in the origin country is burgeoning, our study contributes to the empirical literature in several ways. First, the geographic scope of previous studies on Latin America is limited, with research on Mexico leading the way. There is scant research on South America, in general, and Peru, in particular (Schapiro 2009). Second, we expand the substantive scope of previous studies

which focus more on the role of remittances by examining the overall effect of migration, taking into account that there are other channels through which migration may affect children's education (de Haas 2007). Lastly, prior investigations have an uneven record of addressing endogeneity issues linked to migration decisions, which casts doubts about the sign and magnitude of estimates of the effect of migration on children's educational attainment. We use an instrumental variable (IV) approach to deal with potential biases due to endogeneity problems. The IV results suggest that international migration has deleterious consequences for the education of children who remain behind. Thus, the conventional wisdom about the beneficial consequences of emigration for children's education may not apply to Peru once attention is expanded beyond remittances. This finding is important from a research and a policy standpoint.

INTERNATIONAL MIGRATION AND THE EDUCATION OF CHILDREN

Remittances and the Alleviation of Liquidity Constraints

A convenient starting point for understanding the connection between migration and children's education is the New Economics of Migration (NEM). The NEM portrays the migrant as someone ensconced in a family-based household characterized by interdependence and joint decision making (Stark and Bloom 1985). Migration decisions are frequently motivated by financial considerations, but it is the financial welfare of the family unit that is of central importance. The migration decision itself is often a joint decision that is made by the migrant and other family members. This is an important observation because it recognizes that the costs and benefits of migration are assumed not only by the migrant, but by others in the family as well. In so doing, it suggests that migration may involve both cost-sharing and benefit-sharing arrangements within the household.

From the point of view of the household, migration could be a way to diversify risks. By sending a family member to another area, the family is less dependent on the vagaries of the local economy. Indeed, family members who are in different locations can spread economic risks and thereby co-insure one another (Stark and Bloom 1985). In addition to sharing the costs of migration, the family as a whole can experience welfare improvements by sending a family member away. The migrant represents one less "mouth to feed," but also someone who can send money back to the family of origin. Such remittances are part of what Stark and Bloom (1985) characterize as an "implicit contract to share."

This approach provides a plausible description of why migration occurs and why migration *may* involve transfers to the family in the country of origin. Still, it provides an incomplete portrait of what motivates migrants to remit. Rapoport and Docquier's (2006: 1143) inventory of motives includes altruism toward family and community members in the country of origin. Also included are exchange considerations: co-insurance, repayment of expenses for education, the desire to avoid being disinherited, payment for performing services when the migrant is absent, and the purchase of assets in the home country. Additional motives include the desire to invest in social networks that provide "options" to take jobs in the future and the desire to stave off additional migration that might lower wages in the destination (Roberts and Morris 2003; Stark 1995). Needless to say, these numerous motives are difficult to empirically disentangle.

This inventory serves as a useful reminder that remittances serve many purposes. Regardless of what they are earmarked for, younger family members who remain behind may benefit from income transfers that free up funds in the receiving household. (Stark 1991; see also McKenzie and Rapoport 2006; Rapoport and Docquier 2006). If a major limiting factor for the acquisition of education is the lack of income, then the migration of family members

should have a positive effect on the education of children who remain behind through remittances.

This “positive effects hypothesis” seems plausible given the size and importance of remittances in developing countries. Research conducted in various Latin American countries (except Peru) by the Inter-American Development Bank (Bendixen and St. Onge 2005) and in the United States by the Pew Hispanic Research Center (Suro 2003) provides an idea of the magnitude of remittances. These surveys indicate that more than 40 percent of immigrants to the U.S. send money home regularly (Suro 2003). Moreover, the share of income accounted for by remittances in the typical remittance-receiving household ranges from approximately 20 percent (Ecuador, Colombia, and Mexico) to over 35 percent (Dominican Republic, Brazil).

Direct evidence on the plausibility of the positive effects hypothesis is available from surveys of several Latin American countries. Molina and Loveday (2006) reveal a positive association between remittances and education expenditures for households in Lima, Peru. Edwards and Ureta (2003) show that remittances have a larger effect than other sources of income on school retention in El Salvador. Moreover, remittances lower the likelihood of never enrolling in school in urban areas and leaving school in rural areas. In Ecuador, school enrollment among 10–17 –year olds is positively associated with monthly per capita remittances, especially among girls, those in rural areas, and the poor (Calero, Bedi, and Sparrow 2008). This study also suggests that remittances function as an “insurance mechanism” that allows families to keep their children in school when negative events threaten family resources (see also Yang 2004 on the Philippines).

Conversely, other evidence suggests that remittances are unlikely to have a substantial aggregate effect on the schooling of children. The overwhelming majority of spending from remittances is dedicated to consumer durables and daily living expenses, rather than educational expenses (Airola 2007; Bendixen and St. Onge 2005; Suro 2003; see also Cerrutti and Parrado 2007). Additionally, in Peru (Acosta, Fajnzylber, and Lopez 2007) and Mexico (Airola 2007) less than five percent of households receive remittances. Peru also stands out among Latin American countries for having a positive association between the likelihood of receiving remittance income and non-remittance income. In other words, relatively affluent families who are less financially constrained are the most likely to receive remittances. This could explain why remittances play a minor role in poverty reduction in Peru (Acosta, Fajnzylber, and Lopez 2007).

Migration and Disincentives to Invest in Schooling: Beyond Remittances

As noted above, there are theoretical grounds for expecting either no effect or a negative effect of migration on the education of children who remain in the country-of-origin. Specifically, no effect or a negative effect would be expected if migrant remittances were insubstantial. In this situation, the migration of family members simultaneously reduces the number of mouths to feed and the number of potential earners in the household who can contribute financially. The latter is particularly pressing because migrants are frequently in the most economically productive ages and their departure may create a shortage of potential workers. This shortage could be alleviated by the child becoming economically active. Thus, children who remain behind may experience pressure within the family to leave school and enter the labor force (McKenzie and Rapoport 2006).

The migration process itself can also influence child outcomes in other ways. The migration of a parent may reduce the availability of adults who can provide supervision and monitor school performance. Migration may also affect the willingness of children to stay in school by reducing their expected returns to education. If migration is perceived as a viable strategy

to earn attractive wages and the potential destinations for migrants provide relatively flat returns to education, then the child has an incentive to substitute migration for education (McKenzie 2005). Since the marginal returns to education are lower in the future place of residence, migration may crowd out investments in education. The lesson that children learn from other family and community members is that school is not needed for economic success (Meza González and Pederzini Villarreal 2008). This situation is particularly germane to low-skilled workers and those who are likely to be unauthorized migrants (Mora and Taylor 2006).

The “negative effects” hypothesis has also received empirical support in a variety of settings. Some analyses of Mexico suggest that rural boys of all ages and girls 16–18 who live in migrant households are less likely than those in non-migrant households to attend school and have lower levels of education (McKenzie and Rapoport 2006, 2007). Similarly, the receipt of remittances among rural households in Mexico also has a negative effect on school attendance and the educational attainment of youth (Meza González and Pederzini Villarreal 2008). These findings are consistent with others which suggest that the migration of a family member reduces aspirations for higher levels of education, perhaps by fostering a family culture in which migration is viewed as an alternative pathway to economic mobility and economic security (Kandel and Kao 2001). In this sense, the migration of family members may discourage children's educational progress because of the possibility of moving abroad to find a job which neither requires nor rewards educational credentials from the origin country.

Additional evidence also challenges the claim that migration has a positive effect on children's education in Peru. Using a national survey of urban households in Peru, Acosta, Fajnzylber, and Lopez (2007) show a positive bivariate correlation between remittances and education. However, remittances have no effect on children's accumulated schooling in multivariate models that include child and household observed characteristics, as well as *predicted* pre-migration income.¹ The only evidence of a positive effect in multivariate models is for urban girls whose mothers have low levels of education. Urban girls with more educated mothers and access to remittances tend to have less accumulated schooling.

Acosta et al. (2007) provides useful information, despite data and methodological limitations that compromise inferences. Their study uses a cross-sectional survey that does not permit the identification of migrants, their individual/household pre-migration characteristics, or the timing of their moves. Therefore, decisions to migrate or to send remittances cannot be instrumented and the authors are forced to *assume* that the receipt of remittances is an exogenous treatment. This assumption is too strong and hard to support given that migrant households are likely to be non-randomly drawn from all households. In other words, Acosta et al.'s results are only valid if migrant and non-migrant households are similar both in terms of their observed and unobserved pre-migration characteristics, which is very unlikely.

In summary, the literature on the role of migration in children's education suffers from inattention to South American countries such as Peru that are not major sources of migrants to the United States or to Europe. The relative importance of this issue for Peru, however, is growing and is expected to continue to do so. Moreover, dissensus is evident in the empirical literature. Some suggest that international migration enhances education and others suggest the opposite for children who remain behind. Disparate results may be due to

¹Acosta et al. (2007) estimate per capita household income for migrant households in the counterfactual scenario of no remittances and no migration. Since they lack of data on the household's income before any migrant left, the authors obtain a predicted pre-migration income level based on a reduced-form specification for the determinants of income estimated on the sample of non-migrant households.

the different approaches undertaken to deal with methodological problems that are involved in determining the effect of migration on human capital accumulation among children.

DATA AND METHODS

This study utilizes a household survey conducted in Lima, Peru that was collected as part of the Latin American Migration Project (LAMP).² This survey provides information on 4,451 individuals in 822 households located in five communities in the Department of Lima, four of which are in the capital city. Households in four communities were surveyed during the last two months of 2001 while households in the fifth community were surveyed in 2005. The communities were purposively selected to represent areas with non-negligible levels of migration. The survey was administered to residents of two middle/lower-middle class areas, a middle/upper-middle class area, and a new settlement with a relatively high level of poverty. The remaining area is a town of 30,000 inhabitants. In each of these areas, households were randomly selected from a census of dwellings. The sample is reduced by approximately one percent after the removal of ineligible sampling units (e.g., single-person households), deceased individuals, and observations with incomplete data.

Our main objective is to analyze the effect of past household migration on children's years of schooling and the probability of educational disruption. Accordingly, we examine those at risk of completing or who have already completed secondary education. Because the upper age boundary used to identify children who fall in the target population has not been clearly established in the literature, we present results for 414 children who are 15–20 from 288 households and 268 children who are 15–18 from 216 households.³

Despite the fact that schooling is compulsory in Peru between the ages of 6 and 16, the lower age boundary was selected because the minimum age for employment in non-industrial agricultural work is 15 (see U.S. Department of Labor 2007). The upper age boundary of 20 recognizes that many individuals are still dependent on their parents' support by that age, as well as the fact that it may take some additional years for those who enroll at older ages to “clear” or exit the educational system. A case could also be made for 18 as the upper boundary since it is the age of majority. Thus, we present results for children aged 15–18 and 15–20.

These age ranges are generally in line with national statistics which reveal that 98% of the population 5–14 was enrolled in school in 2003. Just 56% of children aged 15 to 19 was enrolled in school (see UNESCO-UIS/OECD 2005). Additional data reveals that the severity of grade delay is greatest in the 15–18 age group. In 2000, 50% of children between 6 and 9 years old had some sort of grade delay, perhaps due to late enrollment. Among children aged 10–14 and 15–18, grade delay jumps to 64% and 74%, respectively (see Cortez 2001). These statistics show that there are dramatic changes in school enrollment and disruption after age 15.

Measurement

Two dependent variables are derived from a survey question on the number of completed years of schooling for all children in the household and children of the head who did not live in the household at the time of the survey.⁴ The measures of educational progress are the *number of completed years of schooling* and whether or not the number of completed years

²The LAMP is a collaborative research project based at Princeton University and the University of Guadalajara, supported by the National Institute of Child Health and Human Development (see <http://lamp.opr.princeton.edu>).

³The final sample of 288 households was arrived at by dropping 525 households with no children in the desired age range, 6 households with one person in the household roster, and 3 because of missing data. In addition, 37 deceased individuals from 31 households were removed from the sample (with no additional loss of households).

is indicative of some form of disruption of normal educational progress or grade delay. The latter can be determined by comparing the child's highest grade of completed schooling with the highest grade of completed schooling expected for someone of the same age who is making normal educational progress. Children whose highest completed grade is below the grade that would be expected for their age fail to achieve normal educational progress.⁵ We cannot determine whether grade delay (code as 1) stems from retention, late enrollment, or dropout.

The survey is especially rich in information on migration. It includes the destination and year of the first and last trip abroad for international migrants, the type of documentation used, and economic activities performed while living abroad. In addition, respondents indicated whether the household received money from abroad at the time of the survey, where they received it from, and whether the amount of money they received was “small,” “intermediate,” or “substantial” in comparison to their monthly income. For reasons described below, this information on remittances is of limited value for the multivariate analysis.

The multivariate analyses include several covariates that are of secondary interest. These include demographic characteristics of the child (sex, age, relationship to the household head) and the household head (children ever born, union status). Additional covariates describe the socioeconomic characteristics of the head (education and occupation) and the household (business ownership). Lastly, we also control for the age of the household.⁶

Caveats

This survey has several strengths, including its breadth of coverage and depth of information on migration. Basic migration-related questions cover all household members and the offspring of the head who lived elsewhere at the time of the survey (a group normally missed in other surveys). Those who migrated to countries besides the United States can also be identified. Event history data for the household head and the spouse/partner of the head were also collected along with information on the first and last trips taken abroad by other household members. This information is used to identify non-migrant households and to generate information about the circumstances of migrant households before they sent a family member abroad.

Some data-related constraints must also be acknowledged. First, inferences are limited by the scope conditions of the data. Like all studies that collect data from a small number of places, the LAMP sample is not nationally representative and misses households in which all members migrated. Such concerns are assuaged by the fact that Lima is the main staging area in Peru for emigration and sample selection biases are attenuated by the inclusion of areas with different socioeconomic characteristics in the sampling frame. Moreover, concerns about selection due to the “origin-only” design are not crucial given our exclusive

⁴Both groups are included because migration may have an impact through monetary and non-monetary channels. All children living in the household, irrespective of their relationship to the head, may be exposed to both monetary and non-monetary consequences of household migration (perhaps with different intensities). Needless to say, the head's children who did not live in the household at the time of the survey may also have been influenced by information flows, networks, or other migration-related factors.

⁵For example, in Peru there are 6 years of primary school and 5 years of secondary school (unlike the United States). The *minimum* ages for enrollment in the fourth and fifth years of secondary school are normally 15 and 16, respectively. The observed ages of children whose highest completed education is the fourth year of secondary school is 16–20. Given that the completion of four years of secondary school falls within the range of normal progress for 16 year olds who might have been currently enrolled in the fifth year, just 17–20 olds whose highest level of education is the fourth year would be considered as experiencing some form of educational disruption.

⁶The date of household creation is measured as the date of the most recent marriage or union of the household head. If the head is single and children live in the household, the age of the oldest child is used. For single-headed households with no children (57 cases), we used the age of the youngest member living in the household.

interest in the welfare effects in the origin. Since children and families that move abroad together participate in the destination's labor market, their outcomes are unlikely to influence average welfare gains in the origin.

Another geography-related issue stems from the inability to identify the specific communities that were sampled by name. This prevents an analysis of specific community characteristics that might play a role in the decision to migrate and the receipt of remittances (see Durand et. al. 1996; Sana and Massey 2005). Fortunately, codes were provided that allow us to include random effects at the community and household levels in our models.

A third constraint is the limited availability of event history data. We cannot determine who was sent abroad at every time point because complete migration histories are only available for the head and the spouse of the head. For other household members, information is just available for the dates of the first and last trip. The survey also did not collect event histories for various educational transitions. Thus, a conventional event history analysis of the association between migration and various educational outcomes is not possible.

The final caveat concerns the power of statistical tests. Statistical power is a function of several characteristics, especially sample size. Because the samples for some of our analyses are relatively small, we will extend the criterion for statistical significance to $p < .10$ in order to reduce the likelihood of committing a Type II error.⁷

Analysis Plan: An Instrumental Variable Approach

Analyses of the consequences of migration and remittances for children's education face several challenges. First, to determine the effect of remittances it is necessary to have information on the histories of migration and the remittances received by the household. The former can be reconstructed for key members of the household with event history data from retrospective questions on migration, but the latter cannot be determined from the LAMP data. Questions on remittances refer to their receipt at the time of the survey and utilize ordered response categories with vague quantifiers to indicate amounts (e.g., "small amount"). Current remittance receipt cannot be used to predict children's education in multivariate analyses without raising concerns about the timing of the events (current remittances may not be a good proxy for past remittances) and endogeneity (current remittances may reflect prior educational decisions).

Endogeneity is also a potential problem in analyses of the impact of *migration*. Endogeneity describes any situation in which the residual or error term for a regression equation is not statistically independent of the values of one or more covariates (Wooldridge 2002). This can occur under three scenarios (Bascle 2008). One scenario is when variables are measured with error. Measurement error introduces difficulties when it is not independent of both the true values of the variables themselves and the residual for the prediction equation. Another scenario is when the error terms for dependent and independent variables are correlated due to the failure to include common causes of each. Lastly, endogeneity is introduced is when reciprocal or simultaneous causation in non-recursive systems is not taken into account.

To a certain extent, the latter problem is handled nicely in much demographic research that adopts an event history approach with careful attention to the timing of events on both the left and right-hand side of an equation. As noted, the LAMP survey does not allow us to use this approach. The lack of historical data on children's educational outcomes precludes the

⁷In evaluating the study in light of these limitations, one should not lose sight of the fact that household-level migration data for Peru is scarce. The LAMP data remains the best available to achieve our primary objective. Thus, our results provide an important "first analysis" of the welfare effects of migration in Peru. Future data collection efforts should be designed to overcome these limitations.

possibility of analyzing the impact of migration on accumulated schooling and the probability of disruption using an event history approach. Regardless, the availability of this data would not alleviate concerns about measurement error and omitted variables as sources of endogeneity.

In our specific case, omitted variable bias would be introduced by excluded observable or unobservable variables that simultaneously affect migration, the receipt of remittances, and children's education (Acosta, Fahnzyber and Lopez 2007). Given that migrant households are non-randomly selected from the population, the possibility of omitted variable bias is potentially serious in any migration study. Ignoring potential omitted variable bias could lead to erroneous inferences.⁸ Thus, endogeneity must be formally taken into account to provide robust evidence on the relationship between migration and education.

This can be accomplished with instrumental variable techniques. To clarify, we illustrate the problem mentioned above and its solution with a simple model of children's educational outcomes. Define the educational outcome of interest for child i , in household j , living in community k as E_{ijk} . Educational progress (E) is determined by child characteristics (X_{ijk}) household characteristics (Z_{jk}), and community characteristics (C_k):

$$E_{ijk} = f(X_{ijk}, Z_{jk}, C_k) + \varepsilon_{ijk} \quad (1)$$

In this setting, Z_{jk} refers to a collection of characteristics such as age of the household, head's occupation, number of children living in the household, remittances receipts, and additional factors such as information available to the household. Of course, remittances and other migration effects are interrelated because both change with the migration decision. Thus, we can express Z_{jk} as a set of household demographic and socioeconomic characteristics (H_{jk}), remittance receipts (R_{jk}), and migration effects, exclusive of remittances (L_{jk}):

$$Z_{jk} = [H_{jk}, R_{jk}, L_{jk}]$$

Measuring the impact of migration on years of schooling using remittances as the treatment variable and H_{jk} as controls ignores the contribution of L_{jk} . In this case, the error term ε_{ijk} in equation (1) would capture omitted variables such as information flows and expectations of migration. Consequently, ε_{ijk} would be correlated with both remittances and years of schooling.

This difficulty in examining the effects of remittances has led some investigators to advocate focusing on the aggregate effect of migration instead (McKenzie 2005; McKenzie and Rapoport 2007). In keeping with this position, the overall impact of past migration in the household can be determined using past migration as a global measure of both R_{jk} and L_{jk} . Yet, an additional problem is that assignment to the "treatment group" (i.e. migrant) is not random. Households that send migrants and receive remittances are likely to differ in terms of motivation, ability, concern for their children, and other characteristics that are usually unobservable by the researcher (McKenzie 2005). Such unobserved or omitted

⁸For example, imagine that households with authoritarian heads tend to send more migrants abroad and have more educated children. If we do not observe the authoritarianism of the head and fail to control for it, we will erroneously infer that there is a positive correlation between migration and child's educational attainment when looking at the coefficient of migration on a reduced-form equation. Additional omitted variable problems are introduced if one tries to measure the impact of migration using household remittance receipts as the only treatment variable. If migration has effects on children's education through channels besides remittances, estimates from an education equation with remittances as the treatment variable will be biased.

characteristics may also affect children's educational attainment. In addition, the decision to migrate or remit may be affected by the children's level of education, rather than the reverse.

One solution to the endogeneity problem is the use of an instrumental variable (IV). The value of the IV approach can be demonstrated by revising the empirical model for educational attainment first suggested in (1) to include past migration from the household, M_{jk} , instead of R_{jk} (remittance receipts) and L_{jk} (other non-remittance migration effects):

$$E_{ijk} = \beta_0 + X'_{ijk}\beta_1 + H'_{jk}\beta_2 + \beta_3 M_{jk} + \beta_4 C_k + \varepsilon_{ijk} \quad (2)$$

To deal with the potential endogeneity of M_{jk} (migration) using an IV approach, it is necessary to identify an observable variable, W_{jk} , not in (2) that satisfies two conditions. Specifically, W_{jk} must be uncorrelated with ε_{ijk} and W_{jk} must be partially correlated with M_{jk} once the other exogenous variables in the model have been netted out (Wooldridge, 2002). In other words, a set of variables is required that includes good predictors of past household migration and that do directly not affect educational outcomes of the children. If a good instrument is available for M_{jk} , a unique solution for β_3 can then be identified.

Previous efforts to identify valid instruments in this literature have been met with limited success due to the difficulty of identifying exogenous instruments that do not have a direct effect on the outcomes of interest (see Acosta, Fajnzylber and Lopez 2007 for a study on Peru; Mora and Taylor 2006; Rapoport and Docquier 2006). Some studies of Mexico rely on historic state-level migration rates as an instrument for current migration shocks, based on the argument that state-level rates in the past are indicative of the relative extensiveness of individuals' migration networks and are a good predictor of their current migration behavior (e.g., McKenzie and Rapoport 2006, 2007; Woodruff and Zenteno 2007). The identification assumption in this case is that historic migration rates from 60 or 70 years ago do not affect current education outcomes independently of their effect on migration.

Such an approach cannot be adopted here because our sample is drawn from a single department in Peru and equivalent historical information is unavailable. Our identification assumption is that previous migration experience of the head's family before his/her current household was formed influences the current household's migration decisions, but it is unlikely to *directly* affect children's educational outcomes because of the passage of time. Specifically, our instrument is the past migration experience of the head or head's nuclear family before the child's household was created. This is a good instrument for the new household's migration decision since it is a proxy for both family networks abroad and “know how” that reduce the costs of emigration. Given that the instrument is measured in a different household and at least 15 years before the new household was created, it is also not likely to influence *current* educational outcomes apart from its influence through current migration.

Of course, we must acknowledge the possibility that our instrument is correlated with children's educational outcomes; that is, the migration of the head or his/her nuclear family before the surveyed household was created could affect schooling decisions directly, rather than indirectly through past migration of the child's household. *There is no evidence of this in our data.* The instrument is not associated with years of schooling or disruption once the observed migration status of the child's household is included as an independent variable along with other covariates. This satisfies the main assumption of the IV approach.

A two-stage estimation procedure that is inspired by the NEM's emphasis on the household as the decision-making unit is employed. The first stage predicts the risk of migration for each household based on migration event histories. To estimate the household risk of

migration, we take advantage of the event history data and conduct a survival analysis for the first migration observed from the surveyed household. In the model, failure occurs when someone leaves the household for the first time since the household was created. This methodology is superior to traditional approaches that try to predict the probability of migration based on static individual or household characteristics because it uses information on the evolution of these characteristics over time and their effect on the risk of migration. We estimate a Weibull survival model to obtain the predicted cumulative hazard of migration for each household.⁹ The second stage uses this estimate of the risk of “household” migration to predict educational attainment.

Hierarchical regression models are estimated with random effects for both the household and the area of residence. Since observations are clustered in households and within communities, this estimation procedure allows us to obtain adjusted standard errors that take these potential sources of bias into account.¹⁰ An additional concern is that the effect of migration on education is likely to vary according to the educational attainment that children would have obtained in the absence of migration. This is unobservable, but we can use the household head's education when the household was created as a proxy. Because head's education is both highly correlated with household wealth and is a strong predictor of children's educational attainment, it allows us to control for potential initial differences in children's education in the absence of migration.¹¹

RESULTS

Experiences with International Migration

Table 1 provides descriptive statistics on the prevalence of migration and the destinations of migrants on their first trip abroad. Here we see that about 22% of households have at least one migrant member, which implies that the vast majority of households (78%) do not have international migration experience.¹² In about 8% of the households, the head has been abroad and in 15% of the households a member other than the head or the spouse has migrated. This is typically a child above the age of 18 (not shown). These figures indicate that children of the head and others members of the household usually undertake the migration decision.¹³

Just 12% of the households had a member who was abroad at the time of the survey. Moreover, migration appears to be a one-time decision carried out by one person in the household. Only 3.6% of the households had more than one member with past migration experience and 5% of the households in the sample had a member who made multiple trips abroad. Furthermore, the average trip by those who venture overseas lasts about 6 years (i.e. 72 months). This largely reflects the extensive periods of time that children and other family

⁹For migrant households, the cumulative hazard is estimated at the time of first migration. For non-migrant households, the cumulative hazard is calculated at the last period of observation (i.e. at the time of the survey).

¹⁰Multiple observations are available from about one-third of the households who supplied two or more children in the age ranges that we examined.

¹¹The survey does not allow us to link children to their father or mother unless they are a child of the head. Only 16.5% of the children in our sample are not offspring of the head.

¹²At first glance, this percentage may appear rather high (given national-level figures reported above). However, our estimates reflect all past migration experiences, including those of members who no longer live abroad. Our estimates may also be influenced by Lima's prominence as a port of exit for migrants and a sampling frame that excluded areas that were likely to have negligible numbers of migrants.

¹³This can also be seen in survival curves (not shown, available on request) that plot the percentage of households with heads, spouses, or other members who are non-migrants by age of the household. Each “survival” to migration curve is constructed using a non-parametric estimation of the Kaplan-Meier survivorship function. The survivor curves show that less than 5% of the households experience migration during the first 20 years after the household is created. As the household grows older, survival curves for the head and spouse remain flat. In turn, migration sharply increases for children and other members in the household: by the 50th year of life of the household, the probability of a household surviving to migration of members other than the head or the spouse is only .57.

members are gone. Among heads and spouses of heads who migrate, the average trip lasts about 2.5 years (31 and 28 months, respectively). Except for the spouse, most household members travel with proper documents.

The middle and bottom panels of Table 1 describe the diverse destinations of migrants for their first and last trip abroad, respectively. As might be expected from the low percentage of household members with multiple trips, the destinations of the first and last trips are very similar. Focusing on the first trip, the overall probability that any two migrants from this sample will go to different countries or regions is rather high at 0.76 (not shown). This reflects the fact that no single country accounts for the majority of migrants. The United States is the modal destination, accounting for 42% of first trips. This surpasses Central and South America combined (32%), with 9% of migrants first going to Argentina, 19% to other countries in South America and the Caribbean, and 4% to Central America. About 9% of first-time migrants journeyed to Spain and 10% went to other European countries. Heads and spouses are more likely to migrate to nearby countries than to the United States: one-third of heads who migrated went to the United States while almost 40% went to Argentina or another South American country.

We initially described migration as a household decision that could have numerous motivations, including the spread of risk through portfolio diversification. Motives for decisions are undoubtedly difficult to ascertain, but evidence of the importance of migration for portfolio diversification is available from information on remittances. Approximately 44% of the households that had one or more members living abroad by the time of the survey received remittances. Of those who currently receive remittances, nearly half (47%) described the amount as “substantial,” nearly a quarter (23%) described it as “intermediate,” and 30% said it was “small” (not shown). Heads and their spouses who are abroad tend to remit substantial amounts, while children and others who remit are evenly distributed across all of the response categories.

The Household Migration Decision

Our analysis of the effect of migration on children's education proceeds in two stages. The first stage consists of predicting the household risk of sending a migrant abroad using a survival analysis framework with a Weibull parameterization (see the Appendix). Table 2 presents the hazard ratios for each covariate included in the estimation of the household risk of migration. The estimates suggest that the hazard rate is increasing over time at a decreasing rate, as is indicated by the shape parameter for the Weibull distribution, p , which is between 1 and 2. The instrument is significant and increases the hazard rate of migration. In particular, the estimates imply that at each survival time (measured by household age), the hazard rate for those households whose head or head's nuclear relatives have migration experience is nearly 150% higher than the hazard rate for those without experience (hazard ratio = 2.52).

The results also indicate that there is a positive association between the head's education level and the risk of migration. This provides some support for Takenaka and Pren (2010) who show that Peruvian migrants are positively selected on education. In fact, a one year rise in head's schooling is associated with a 6.2% higher hazard rate. Having a more educated head increases the chances of sending someone abroad. The likelihood of sending someone abroad also increases with the number of children at or above age 18. This result is not surprising given that a non-trivial share of those who migrate are older children, rather than the head or spouse. Consistent with the idea that migration is associated with credit market imperfections, the chance of sending someone abroad increases by 42% when the household owns a business. Lastly, migration is negatively associated with head's union

status; the hazard rate for a household whose head is in a union is 62% of the hazard rate for a household whose head is single.

Migration and Children's Education

Table 3 sets the stage for the multivariate analysis by presenting descriptive statistics for the measures of education and the covariates. This information is presented for the total sample, and for those who can be classified as living in households with low and high-risk of migration. High risk is defined here as having an estimated cumulative hazard above 0.15, which includes 32% of the households in the children's sample.

As noted, we present results for both 15–18 and 15–20 year olds because legal adulthood is reached at age 18 and many children live at home for a few years beyond that. The analysis *suggests* that accumulated years of schooling and disruption are associated with the risk of migration regardless of which age group is examined. The typical 15–20 year old living in a household with a high risk of migration has completed 11.1 years of school, compared to 10.4 years for those in a household with a low risk of migration. Similarly, the likelihood of experiencing a disruption in schooling is lower for those in the former households. About 17% of 15–20 year olds in high-risk households have experienced disruption. This is just half the figure for those in low migration-risk household (33%). Significant differences are also evident for the younger age group (15–18), albeit slightly less impressive.

At first glance, these simple correlations suggest that households with higher risks of migration tend to have more educated children. However, these results cannot be considered as robust evidence in favor of the positive effect hypothesis. Since migrant households are not a random sample from the population, accurate estimates of the effects of migration on household welfare require the use of statistical methods that deal with potential endogeneity (see footnote 8 for an illustrative example).

As for demographic characteristics, most children are offspring of the head (84%). Yet, they are more likely to live in a household that is not headed by a parent when the risk of migration is high. This suggests the potentially disruptive effect of migration on families and the complex living arrangements of households that have greater exposure to the risk of migration. Moreover, households that are highly exposed to migration tend to be older than low-risk households, a fact which is consistent with a household strategy that consists of sending (older) children abroad. The typical child lives with a household head who is in a marital or cohabiting union and has had several children. This pattern is slightly less common among those in high-risk households.

As for socioeconomic characteristics, heads of high-risk households have almost three more years of schooling than their low-risk counterparts. High-risk migration households are also more likely to have heads in upper white collar occupations and low-risk households are more likely to be headed by blue collar workers. Once more, the evidence suggests that migration from Lima is positively selective with respect to human capital. High-risk households are more likely to own a property or a business as well.

Table 4 shows the effect of the predicted household migration risk on educational outcomes. Columns 1 and 2 present estimates for children's years of schooling from a linear model with random effects at the household and community levels. Columns 3 and 4 present the marginal effects for disruption using a probit model with the same two sources of random intercepts.¹⁴ As shown in the last two rows, this approach is necessary given substantial variation across households and areas. The variance of the household random effects is significantly different from zero in all cases while area of residence effects are only important for 15 to 20 year olds.

The multivariate results for 15–18 year olds in column 1 in Table 4 indicate that schooling is negatively associated with the risk of migration--- migration of a household member tends to inhibit children's education. A 1% increase in the household hazard ratio of migrating entails a reduction of almost 0.9 years of schooling in the younger sample. The effect of household migration on years of schooling is not significant for 15- to 20- year olds, despite a negative parameter estimate that is non-trivial in magnitude. The results also suggest that education declines with the number of children in the household and increases with union formation, the age of the household, the head's education, and business ownership. In other words, less educated households with many children tend to produce children with less education, as do households headed by single parents and households that have been formed relatively recently. Lastly, the findings collectively imply that head's education has both an indirect effect through migration (Table 2) and a direct effect on the education of offspring (Table 4).

The results for schooling disruptions are generally consistent with those for years of schooling. Most importantly, deleterious consequences of migration are evident. The marginal effect of migration on educational disruption is estimated to be 0.49 (column 3, $p > .10$) and 0.33 (column 4, $p < .05$) in each sample. These coefficients suggest that the likelihood of disruption increases with the household risk of migration. A disruption in schooling is also more likely among children living in households headed by persons with lower levels of education and households with more children. Moreover, owning a business tends to decrease the likelihood of experiencing a disruption. In contrast to the findings for years of education, disruption is unrelated to union status in multivariate models for both age groups. As will be discussed more fully in the conclusions, these findings differ from those that simply use migration status (without an IV) to predict education. Thus, endogeneity is non-ignorable.

A “non-finding” of note concerns the insignificance of gender. To investigate this further, we explored interactions between gender, the risk of migration, and the head's educational attainment for both years of schooling and disruption (Table 5). In the case of accumulated years of schooling, the only interaction term to approach significance is sex*head's education for those aged 15–18 ($-.053$, $p < .10$). Given the positive coefficient for head's education in the model with interactions (not shown), the negative sign of the interaction term reveals a stronger protective effect of the head's education for females. Similarly, the models with interactions for disruption confirm that the protective effect of head's education is stronger for females than for males. Here, the interaction term for sex and head's education is significant for both samples. Since the main effect for head's education is negative in this model, the positive coefficients for the interaction terms ($.114$, $p < .10$ in the 15–18 sample and $.160$, $p < .05$ in the sample of those aged 15–20) show that more educated parents are particularly effective in reducing the probability of educational disruption for girls. Indeed, models run separately for boys and girls reveal that that head's education is not significant for the former group ($.09$, $p = \text{n.s.}$), but the effect for girls is negative and non-trivial ($-.11$, $p < .05$).¹⁵ Additionally, the interaction term for migration and gender in the disruption model captures a significant and negative effect for the younger sample (-5.085 , $p < .10$). The detrimental effect of household migration on the probability of educational disruption tends to be less severe for boys.

¹⁴Multilevel models that control for the clustering of observations within households and communities are estimated using the command `gllamm` in STATA. Details about the estimation procedures can be found in Rabe-Hesketh et al. (2004) and <http://www.gllamm.org/>.

¹⁵We also tested for interactions between migration risk and various covariates (e.g. sex, parents' education) in the preliminary analysis but they were not significant.

Additional insights into school disruption are available from the predicted probabilities presented in Table 6. Specifically, females tend to have a higher overall probability of experiencing disruption (albeit non-significant), but the estimated probability of disruption is slightly greater within high-risk migration households irrespective of gender. Even though the interaction term between migration and gender failed to be significant for 15 to 20 year olds, the absolute difference in the probability of disruption among children in high and low-risk migration households is lower for males (.16 versus .13) than for females (.25 versus .19).

Given the evidence presented above of a protective effect of head's education on children's educational progress, Table 6 also presents the predicted probabilities of disruption by gender and years of schooling of the head. These results show that the probability of experiencing a disruption decreases for females when the head accumulates more years of schooling, irrespective of the migration risk of the household. Moreover, the gap in the probability of disruption between high and low migration households tends to decrease with the education level of the head only for females, which seems to be in line with the protective effect for girls identified above. These effects are not evident for males: the probability of disruption and the differences in predicted probabilities between high and low migration risk households change very little when education of the head increases.

CONCLUSION

The primary goal of this research was to investigate the effect of international migration on the education of children in Lima, Peru. Because the literature on international migration from Peru is underdeveloped, this research also provided a brief descriptive portrait of migrants as a secondary goal. This descriptive portrait revealed that the majority of households do not have someone who lives abroad and, among those that do, migration is less common among household heads. Migration also tends to involve trips that are of long duration with proper legal documentation, perhaps because of the distance involved to the most popular destination---the United States. At the same time, there is considerable variation in the destinations of migrants within the Western hemisphere and in the receipt of remittances. Slightly less than half of migrant households received remittances. Among those receiving remittances, over two-thirds receive an amount characterized as "substantial" or "moderate." This information suggests that even though its value for portfolio diversification may not be universal, international migration has the potential to alleviate budget constraints for a non-trivial share of migrant households.

Much of the general literature on the consequences of emigration for children and families who remain behind tends to focus on remittance-related issues, a line of inquiry that cannot be pursued with the LAMP. Yet, one should not let the current interest in remittances deflect attention away from the need to answer fundamental questions about the overall effect of migration on the children of migrants who remain behind. Our instrumental variable approach in the multivariate analysis addresses the question of whether migration has positive or negative consequences for children's education. Contrary to the expectations of those who would argue that migration has a positive effect because it loosens budget constraints, the results show that migration generally has negative consequences for the level of education attained and the likelihood of experiencing a disruption in schooling. In addition, evidence of a differential effect of migration by gender is equivocal. Results from three models suggest that the effect of past migration is not conditioned by child's gender. In one model (i.e., disruption for 15–18 year olds), migration is more disruptive for girls.

Other studies that find a positive effect of migration on children's educational attainment in Peru and other Latin American countries are often unable to consider migration as a

household decision that needs to be instrumented. The potential peril of considering migration as an exogenous treatment is evident from additional analyses of our data. If endogeneity is ignored, the effect of migration on years of schooling is positive and the effect of migration on disruption is negative (estimates available upon request). Clearly, such results are driven by the bivariate correlation between migration and education (see Table 3) but they are not evidence of a *causal* effect of migration on children's educational outcomes. Omitted variable bias, measurement error, or simultaneous causation may be driving these results. The evidence from our IV models is that the direction of the effect of the household risk of migration is inverted for both models --- migration has a negative effect on educational outcomes. This suggests that endogeneity biases are important and analyses that ignore this possibility may be misleading.

A major challenge for future research is to go beyond remittances to empirically determine the roles of other potential mechanisms in the association between migration and children's education (de Haas 2007). Indeed, there has been considerable speculation about some of the other possible mechanisms through which migration can affect children's welfare (de la Garza 2010). First, migration can have an effect through a reduced supervision of children. The absence of parents or other adult household members implies a diminished capacity to monitor school attendance, school performance, and participation in extra-curricular activities. The inability to monitor children is also implicated in claims that school performance of the children of migrants is hurt by their greater propensity to consume drugs and alcohol (Cortés 2007; Dreby 2010).

Although it is difficult to determine with certainty, the “supervision” channel is unlikely to be driving our results given that the prevalence of international migration is greater among other members of the household than among heads or spouses (see Table 1).¹⁶ This would reduce the likelihood that migration may impinge on educational attainment by shifting income-generating and care-giving obligations to older children who fill the shoes of absent parents. Still, qualitative evidence provided by Dreby (2010) suggests that schooling may suffer if younger children are expected to “step up” and assume adult responsibilities of other family members who migrate. This could include filling vacancies created by the departure of older siblings.

A related possibility is that educational outcomes are linked to changes in aspirations from information that is communicated through family networks. The migration of parents can change children's aspirations to migrate and earn money to buy things (Dreby 2010). Educational aspirations may be undermined by the development of a “family culture of mobility” that views migration as a substitute for education to financially support one's family (Kandel and Massey 2002). This may be intensified if migration of household members facilitates access to networks abroad or if the child is exposed to successful stories from household migrants. Evidence for this is available from one study which indicates that children in grades 6–12 who have fathers, siblings, and other relatives who have ever worked in the United States and who want to work there themselves are less likely to aspire to go to college (Kandel and Kao 2000 on Mexico).

Our allusion to the information channel and migrant networks should be underscored. Adult migrants may serve as behavioral models for children, as well as provide information that shapes the collective understandings of family members about the value of schooling. For example, one lesson is that schooling in the origin country has little impact on labor market outcomes in receiving countries compared to one's understanding of the language spoken or

¹⁶We replicated the models estimated in the previous section and defined the first migration episode as the first time that either the head or her/his spouse moved abroad. In this case, there is no significant effect of migration on educational outcomes.

social networks abroad (Kandel 2003). This can be explained both by the difficulty in transferring educational credentials across borders as well as by flat returns in developed countries to education acquired in developing countries. As a result, family networks may diminish the incentive to go to school through the provision of inside information about labor markets abroad. Future returns to schooling are lower for children who are likely to migrate and this lowers the educational aspirations of children (McKenzie 2005) and perhaps even parents' aspirations for their children. Such changes may deter normal education progress and the completion of secondary education.

The particular substantive focus of this discussion should not obscure the fact that a nuanced understanding of the educational outcomes of children must go beyond migration. It should come as no surprise that the education of children is affected by the class background of families, as measured by parents' or heads' education. However, the effect of education is conditional on the gender of the child. The risk of educational disruption decreases with parents' education for females while it is barely affected by parents' education for males. Similarly, younger girls accumulate more years of schooling than boys in households with highly educated parents. A complete explanation of this finding would require recognition of how education shapes worldviews about the status of women in both families and the society at large. One possible explanation might involve greater receptiveness of more educated parents to expanded roles of women in society. Although the ratio of labor force participation rates of Peruvian women to men (.72) is among the highest in Latin America and gender gaps in income and returns to education have narrowed in recent years (Abramo and Valenzuela 2005; Yamada 2006), post-compulsory schooling opportunities are still biased towards males. More educated parents might care more about gender equality goals within and outside the household which can motivate them to level the playing field for their daughters while they are still at home.

In closing, the promise of science to shed light on the human condition and to inform public policy is tied to the quality of evidence that can be generated to address information needs. The quality of evidence, in turn, is directly related to the ability to overcome various methodological challenges that must be met to generate accurate inferences. We have confronted a major challenge faced by studies that examine the consequences of migration---endogeneity arising from the non-randomness of the migration decision (see Acosta, Fahnzyber and Lopez, 2007). Contrary to what might be expected, international migration has negative consequences for the education of children who remain behind despite the potential of remittances to alleviate liquidity constraints. This suggests that aggregate statistics which demonstrate increasing rates of international migration, remittances, and school enrollment may not provide insights into household-level processes. Future studies must include measures of the possible mechanisms for associations that are identified above to investigate household-level processes. Nevertheless, disentangling the different channels through which migration reduces the human capital accumulation of the children who stay behind may have limited use for policy relative to the use of identifying the direction of the aggregate effect of migration. Besides remittances, most of the mechanisms through which migration can potentially affect educational outcomes develop in the context of families and households, where policy interventions are particularly challenging. Hopefully, we have provided an initial step by measuring the direction and magnitude of the effect of migration on education.

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APPENDIX: SURVIVAL ANALYSIS

The survivorship function (S) is defined as follows:

$$S(t) = \Pr(T_m > t) \quad (A1)$$

where t denotes time and T_m denotes the time at which first migration occurs. Moreover, the hazard function or rate, denoted as λ , is defined as the rate at which migration occurs at time t conditional on survival until or later than time t :

$$\lambda(t) = \lim_{\Delta t \rightarrow 0} \frac{\Pr(t < T_m < t + \Delta t | T_m > t)}{\Delta t} = \frac{f(t)}{S(t)} = \frac{S'(t)}{S(t)}$$

where $f(t)$ is T_m 's probability density function. Related to the hazard rate is the cumulative hazard function, Λ which is obtained by integrating $\lambda(t)$ over time:

$$\Lambda(t) = -\ln S(t)$$

Parametric proportional hazard models assert that the hazard rate for the j^{th} subject is:

$$\lambda(t|x_j) = \lambda_0(t) e^{(x_j \beta_j)} \quad (A2)$$

where $\lambda_0(t)$, the baseline hazard function, is parameterized, x_j is a vector containing k characteristics of individual j , and the coefficients β_j are obtained from the data. To parameterize $\lambda_0(t)$, we need to assign a specific probability distribution to the survival function in equation (A1). To get a better idea of how the survival function for first migration behaves in our sample, we arrived at a non-parametric maximum-likelihood estimate of $S(t)$ using the Kaplan-Meier estimator, $\hat{S}(t)$:

$$\hat{S}(t) = \prod_{t_i < t} \frac{n_i - d_i}{n_i}$$

where n_i is just the number of survivors just prior to time t_i and d_i is the number of deaths at time. After analyzing the Kaplan-Meier migration survivorship function for the household (figure available on request), the Weibull distribution was best suited to describe the pattern of first migration occurrence with the survivorship function $S(t) = \exp(-t^p)$ and a hazard function which allows the hazard to grow as the household ages:

$$\lambda(t) = p t^{p-1} \quad (A3)$$

Our parameterization yields $\lambda_0(t) = p t^{p-1} \exp(a)$, where a is an extra parameter to estimate and p is the shape parameter for the Weibull distribution. The exponentiated coefficients βx in equation (A2) are the hazard ratios, which give us the relative hazard faced by a subject who has a certain characteristic denoted by x_k .

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Table 1**Descriptive Statistics: Migration-Related Measures**

	Member of Household			
	Any	Head	Spouse	Others
<u>Prevalence of International Migration</u>				
<u>Households</u>				
% Member ever migrated	21.6	8.2	3.3	14.5
% Migration of member since household formation	18.8	5.9	2.8	14
% Member currently abroad	11.9	.7	1.1	10.8
% multiple members ever migrated	3.6	-	-	-
<u>Migrant Households</u>				
% Member_with multiple trips abroad	5.0	1.8	1.2	2.5
Mean experience abroad-migrating members (months) ^{a/}	87.1	40.8	39.9	96.2
Mean duration of trip (months) ^{a/}	71.7	30.9	28.3	96.2
% Member travelling with legal documents (first trip) ^{b/}	69.1	66.7	54.2	61.5
<u>Destinations of First Trip Abroad: Migrant Households</u>				
% United States	41.8	33.3	14.8	48.4
% Argentina	9.1	10.6	14.8	7.8
% Spain	8.8	4.6	11.1	9.9
% Japan	4.6	7.6	11.1	2.6
% Central America	4.2	6.1	3.7	3.7
% Other S. American & Caribbean	19.0	28.8	33.3	13.5
% Other European	10.2	9.1	11.1	10.4
% Other – Not specified	2.5	0	0	3.7
Total	100	100	100	100
<u>Destinations of Current/Last Trip Abroad: Migrant Households</u>				
% United States	43.5	34.9	18.5	50
% Argentina	7.7	9.1	3.7	7.8
% Spain	9.1	4.6	14.8	9.9
% Japan	4.6	7.6	11.1	2.6
% Central America	5.3	7.6	7.4	4.2
% Other S. American & Caribbean	16.5	25.8	33.3	10.9
% Other European	10.5	9.1	11.1	10.9
% Other	2.5	1.5	0	3.1
Total	100	100	100	100

Source: LAMP-PERU5.

^{a/} The average experience abroad is based on those households with any migrants (N=176).^{b/} Migrant is considered to migrate using legal documents if he or she traveled as a legal resident, temporary worker, or citizen of the destination. It does not include migrants traveling as tourists or temporary visitors without work permits.

Table 2Hazards Model: Household Migration Decision^{a/}

Independent variables	Hazard ratio
Head and/or head's nuclear family migrated before HH creation	2.517 ***
Head's years of schooling (lagged)	1.062 **
Children at and above 18 (lagged)	1.404 ***
Age of the household (lagged)	0.989
Head in a union (lagged)	0.618 **
Household has properties (lagged)	1.227
Household has a business (lagged)	1.417 *
Head's occupation (lagged)	
Not in the labor force	1.442
Lower white collar workers	0.837
Blue collar workers	1.257
Other workers	1.668
N° of households	813
N° of observations	20,656
LR χ^2	111.0
P	1.22

Source: LAMP-PERU5.

p < .01**
p < .05*
p < .1^{a/} Community dummies coefficients are not reported.

Table 3Descriptive Statistics: Children in Low and High-Risk Households^{a/}

	Total Sample	Migration Risk ^{b/}	
		Low	High
Child's accumulated years of schooling			
15–18	9.9	9.8	10.2 ^{**}
15–20	10.6	10.4	11.1 ^{***}
% Child with Disruption			
15–18	28.7	32.0	21.7 ^{**}
15–20	27.8	33.0	16.7 ^{***}
% Child is head's son/daughter	84.1	89.0	73.5 ^{***}
Sex of the child (% Male)	44.7	44.3	45.5
Mean head's initial educational attainment	11.4	10.5	13.3 ^{***}
Head's occupation			
% Not in the labor force	23.0	21.3	26.7
% Upper white collar workers	21.3	15.5	33.6 ^{***}
% Lower white collar workers	19.6	20.2	18.3
% Blue collar workers	29.2	35.4	16.0 ^{***}
% Other workers	6.9	7.6	5.3
Mean number of children in the household	3.80	4.0	3.5 ^{**}
% Head in a union or marriage	75.4	78.0	69.7 ^{**}
Mean age of the household	25.9	23.2	31.5 ^{***}
% Household owns a property	96.9	96.1	98.5 [*]
% Household owns a business	28.5	25.5	34.8 ^{**}
Number of observations		414	
Number of households		288	

Source: LAMP-PERU5.

p < .01**
p < .05*
p < .1^{a/}Significance levels were determined using a t-test for the difference between means.^{b/}We define a high-risk migration household as one with a cumulative hazard ratio of .15 or more.

Table 4Multiple Regressions: Years of Schooling (Linear Model) and Disruption (Probit)^{a/}

	<u>Years of schooling^{b/}</u>		<u>Disruption^{b/c/}</u>	
	[15–18]	[15–20]	[15–18]	[15–20]
Household risk of migration	−0.926 [*]	−0.771	0.494	0.332 ^{**}
Child is head's son/daughter	0.015	0.374	0.014	−0.055
Sex of the child	−0.026	−0.038	0.001	−0.047
Head's initial educational attainment	0.042 [*]	0.047 ^{**}	−0.012	−0.012 ^{**}
Head's occupation (lagged)				
Not in the labor force	0.416	0.208	−0.050	−0.037
Lower white collar workers	0.161	0.053	0.000	0.082
Blue collar workers	−0.193	−0.401 [*]	−0.002	0.026
Other workers	0.143	−0.307	0.049	0.161
Number of children in the household (lagged)	−0.162 ^{***}	−0.162 ^{***}	0.018	0.033 ^{**}
Head in a union or marriage (lagged)	0.399 [*]	0.402 ^{**}	−0.043	0.048
Age of the household (lagged)	0.025 ^{**}	0.030 ^{***}	−0.006	−0.005
Household owns a property (lagged)	0.414	0.120	−0.117	−0.050
Household owns a business (lagged)	0.370 [*]	0.295 [*]	−0.108 [*]	−0.134 ^{**}
Number of observations	268	414	268	414
Number of households	216	288	216	288
Log Likelihood	−433.3	−712.5	−127.504	−176.1529
Variance of household random effects	0.44 ^{***}	0.58 ^{***}	2.12 ^{***}	10.42 ^{***}
Variance of community random effects	0.03	0.05 ^{**}	0.82	4.50 ^{***}

Source: LAMP-PERU5.

^{***}
p < .01^{**}
p < .05^{*}
p < .1^{a/} Constant and child's age coefficients are not reported.^{b/} Random effects at the household and community levels included.^{c/} Marginal effects reported.

Table 5

Interaction Effects: Years of Schooling (Linear Model) and Disruption (Probit)

Interactions	Years of schooling ^{a/}		Disruption ^{a/b/}	
	[15–18]	[15–20]	[15–18]	[15–20]
Head's education * Male	–0.053 *	–0.034	0.114 *	0.160 **
Head's education * Migration	–0.038	–0.106	–0.258	–0.264
Migration * Male	1.452	1.353	–5.085 *	–2.400

Source: LAMP-PERU5.

Note: All interaction effects are estimated using the base model presented in Table 4.

p < .01**
p < .05*
p < .1^{a/} Random effects at the household and community levels included.^{b/} Marginal effects reported.

Table 6

Predicted Probability of School Disruption (Probit)^{a/}

	Males 15–20			Females 15–20		
	Total ^{b/}	Migration Risk		Total ^{b/}	Migration Risk	
		High ^{c/}	Low ^{d/}		High ^{c/}	Low ^{d/}
Total Sample	0.14	0.16	0.13	0.22	0.25	0.19
By Head's Education						
6 years	0.13	0.15	0.12	0.35	0.39	0.31
10 years	0.14	0.16	0.12	0.25	0.28	0.22
14 years	0.15	0.16	0.13	0.16	0.19	0.14
16 years	0.15	0.17	0.14	0.13	0.15	0.11

Source: LAMP-PERU5.

^{a/}Predicted probabilities are based on separate regressions for males and females. For both groups, they are estimated for a child who is the household head's son/daughter and is 17 years old, whose father has a blue collar occupation, is married, and has 11.4 years of schooling, and whose household has 3.8 children, is 24.8 years old, has no business, and has at least one property.

^{b/}The risk of migration varies from 0.0001 to 2.4. These estimates assume the mean household risk of migration (0.13).

^{c/}We define a high-risk migration household as one with a hazard ratio of 0.24.

^{d/}We define a low-risk migration household as one with a hazard ratio of 0.04.