Kate H. Choi
PAA Abstract
9.20.09

WOMEN'S EDUCATION, INTERNATIONAL MIGRATION AND THE EDUCATIONAL ATTAINMENT OF THE NEXT GENERATION: THE TALE OF TWO COUNTRIES

Numerous studies have examined the effects of parents' migration on their children's educational attainment (Grogger and Trejo 2002; Huntington 2004; Perlmann and Waldinger 1997; Wojtkiewicz and Donato 1995). Among Mexican Americans, children of migrants to the U.S. attain much higher levels of education than their parents. Despite this increase, second generation Mexican Americans continue to have lower levels of education than the non-Hispanic U.S.-born, owing to their disadvantaged backgrounds, including their parent's lower levels of human capital (Wojtkiewicz and Donato 1995). Between second and third generation Mexican Americans, the rate of upward educational mobility is markedly lower than between first and second. This results in a persistent educational gap between Mexican Americans and the non-Hispanic U.S. population (Grogger and Trejo 2002; Telles and Ortiz 2008). For families that remain in Mexico, evidence on the effect of parental migration on children's education is mixed. Parental migration may benefit children's education because remittances improve family resources (Antman 2007; Hanson and Woodruff 2003). Alternatively, parental migration may hinder children's educational progress because absences by migrant parents may deprive children of the care and attention that are provided to children of non-migrants. Furthermore, families in which a parent is a migrant may view migration and work as better avenues than schooling for economic success (Kandel and Kao 2001).

Based on these findings, many observers in the U.S. fear that Mexican migration depresses aggregate levels of education by introducing large numbers of lesser-educated individuals who experience limited upward educational mobility across generations (Telles and Ortiz 2008). In Mexico, researchers and policymakers offer mixed opinions about the aggregate effects of Mexican migration. Some argue that migration generates economic and social development, including improvements in education. Others argue that migration gives rise to "brain drain" by selectively removing highly educated and motivated migrants (Ozden 2005). Yet, these conclusions are premature because they rest on research that focuses on simple regression models estimating the effects of parental migration on the educational mobility between parents and their offspring. This approach, however, ignores the complex set of demographic processes that are interdependent with parents' decisions to migrate. To accurately estimate the impact of Mexican migration on educational mobility, one should also take into

account the effects of migration on patterns of marriage, assortative mating, and fertility, as well as the impact of these demographic characteristics on the distribution of children's schooling (Mare and Maralani 2006).

The proposed paper will examine the role of migration in the reproduction of education in Mexico and the U.S. To accomplish this goal, I will document how women's education influences their decision to migrate and how migration alters marriage, fertility, and offspring's education. Based on the information obtained, I will construct a demographic model that takes into account the combined effects of intergenerational transmission of education, migration, marriage, and fertility. I will then use the constructed demographic models to simulate the effects of hypothetical changes in the educational characteristics of Mexican women and estimate their effects on the distribution of schooling in the next generation in Mexico and the U.S. Lastly, I will examine how the effect of increases in women's education varies depending on the accompanying changes in men's education. I estimate the distribution of schooling for (1) U.S. resident offspring born to Mexican mothers; (2) adult offspring born to Mexican mothers who remain in Mexico; and (3) U.S. resident offspring with mothers born to non-Mexican migrant mothers. When conducting these analyses, I assume that women in Mexico and the U.S. "interact" with one another by altering each other's marriage markets, which has implications for their fertility and their offspring's education.

A demographic model is a promising way to study the effects of migration on the intergenerational transmission of education because it reveals how migration affects family formation and its implications for the well-being of children. This provides a more accurate estimate on the aggregate effects of Mexican migration. Furthermore, it can isolate the specific demographic mechanisms that facilitate or impede educational mobility for Mexicans and Mexican Americans. This may help inform policies for facilitating the educational mobility and socioeconomic achievement of children on both sides of the border. Another innovative feature of this project is that it considers migration as a process. It examines how populations move in and out of two countries; interact with one another; introduce changes to social institutions and demographic makeup[1]; and affect each other's socioeconomic composition.

[1] I combine the U.S. and Mexican Census based on the historical trend in international migration from Mexico and the author's calculations using the 10.6% sample of the Mexican Census where over 95 percent of Mexican migrants list the United States as their country of destination.

MODEL FOR INTERGENERATIONAL EFFECTS OF EDUCATION IN CONTEXTS WITH HIGH LEVELS OF INTERNATIONAL MIGRATION

I construct a demographic model that describes how the population of women living in Mexico and the U.S. with varying levels of education and migration statuses produce a generation of children with varying levels of education. My model takes into account the combined effects of four processes: (1) intergenerational transmission of education; (2) differential fertility; (3) marriage; and (4) migration. Most research examining the educational mobility of immigrants focuses on (1) and (3), but (2) and (4) also are essential parts of the reproduction process. This approach extends previous work by Mare and Maralani (2006), which examines how demographic mechanisms contribute to the intergenerational effect of women's educational attainments on the education of their offspring, by adding migration status as a dimension to the analysis.

In initial, simplified versions, the model operates under the following assumptions about causal order: (1) a woman's education is the only truly exogenous independent variable; (2) a woman's education affects whether she migrates; (3) a woman's education and migration status affect whether and whom she marries, measured by her husband's education and migration experience; (4) a woman's education, her marital status, her husband's characteristics, and her migration affect her fertility behavior; and (5) parent's education, parent's migration status, and number of siblings affect each offspring's education. As the research progresses, efforts will be made to relax these assumptions. The combined initial model depicting the reproduction of education for Mexican women can be written formally as:

$$r_{jfmgk|i} = p^{G}_{m|i}\, p^{H}_{kg|mi}\, r^{F}_{f|gkmi}\, p^{J}_{j|fgkmi} \qquad \textit{Eq. 1}$$

where $r_{jfmgk|i}$ is the number of children with education *j* whose mother has migration experience *m*, fertility level *f*, and education level *i*, and is married to a man with migration status g and education level *k*:; $p^{G}_{m|i}$ denotes the probability that a woman with education *i* has migration status *m*; $p^{H}_{kg|mi}$ denotes the probability that a woman with education *i* and migration status *m* marries a man with level of education *k* and migration status *g*; $r^{F}_{f|gkim}$ denotes the number of offspring *f* that a woman who has migration experience *m*, education level *i,* and a husband with education level *k* and migration experience g*;* and $p^{J}_{j|fgkmi}$ denotes the probability

that a child whose mother has education level *i,* migration experience *m,* husband with education level *k* and migration status *g,* and fertility level *f* achieves educational attainment *j* . In initial versions of the paper, models that predict each component of the demographic assume additive effects of its determinants.

Women who are not born in Mexico are not at risk of migrating from Mexico to the U.S. Therefore, for non-migrant women in the U.S., I exclude women's migration status as a determinant of the distribution of schooling in the next generation. Women in Mexico and the U.S. affect each other in the local marriage markets, which in turn, alters the number of offspring ever born to these women and the educational characteristics of the offspring.

Although this model incorporates many facets of the link between women's schooling, migration, and the educational attainment of children, it also makes simplifying assumptions. In addition to the assumption about the simple one way direction of causality between marriage, migration, and fertility mentioned above, it ignores divorce and separation; it focuses on the behavior of women while treating men's characteristics as aspects of women's marriage choices; it ignores the timing of events within women's and children's lives; and it assumes that the separate processes are conditionally independent given the variables included in the model. As the research progresses, some effort will be made to relax these assumptions and to explore the robustness of conclusions to alternative assumptions.

DATA AND METHODS

To construct the demographic model, I need information about women's education, women's marital status, women's migration experiences, the number of children they have, and adult offspring's education. Because one dataset does not provide information on all these characteristics, I use several nationally representative datasets including the Mexican Family Life Survey (MxFLS), National Longitudinal Survey of Youth 1997 (NLSY97), a 5% sample of the 1990 and 2000 U.S. Census, the 10% sample of the 1990 Mexican Census, the 10.6% sample of the 2000 Mexican Census, and the Mexican Migration Project (MMP).

The MxFLS is a longitudinal, nationally-representative survey of 35,000 individuals who are in 8,400 households located in 150 communities in Mexico. It collected detailed information on the socio-demographic characteristics and histories of marriage and migration for all household members over the age of 15. It also collected a retrospective fertility history for all

women over the age of 15. I use data from Waves 1 and 2. 437 Mexican offspring had parents who had migrated from Mexico to the U.S. between the two waves.

The NLSY97 is a nationally representative survey of 8,984 American youth born between 1980 and 1984. Sampled individuals were interviewed yearly since 1997. The NLSY97 includes information about the social and demographic characteristics of the sampled individual as well as the respondent's parents including their place of birth, levels of education, age, and whether they co-reside with the respondent. The sampled individuals in this cohort provide information on U.S. resident offspring for the proposed analyses. It includes approximately 800 respondent offspring of Mexican immigrants.

The MxFLS and the NLSY97 are well-suited for the present analyses because they include detailed information on the socio-demographic characteristics of the respondents as well as their parents. The detailed information in both datasets allow a more accurate description of the association between parents' and child's schooling as well as the demographic mechanisms that contribute to educational reproduction, including marriage and fertility. These data provide large enough samples of return migrants in Mexico and Mexican Americans in the U.S. to permit a study about the educational reproduction these groups.

I use a combination of the 1990 and 2000 U.S. and Mexican Censuses to obtain information on the generation of women who are at risk of giving birth to a NLSY1997 youth including those who are childless. Specifically, I use these datasets to ascertain information about women's marital status, the characteristics of their husbands, their own migration statuses, and their completed levels of fertility. Mexican Migration Project (MMP), a bi-national survey designed to describe the migration process from Mexico to the U.S., is used to ascertain the educational characteristics and migration statuses for the spouses of women living in Mexico with absent spouses. The construction of the samples and variables are described in greater detail below. Table 1 describes the 3 interdependent subsamples constructed using these datasets.

ESTIMATION AND SIMULATION

I estimate statistical models for marriage, migration, fertility, and offspring's education by maximum likelihood, applied to each equation separately. I use the parameter estimates obtained from these models in a series of simulations to predict the expected distributions of adult offspring's education implied by alternative assumptions about the educational composition of women and the ways in which changes in the educational composition of women affect

marriage, migration, fertility, and their children's education. I compute the predicted probabilities of women' migration, probabilities of women marrying husbands at each category of education and migration status, predicted number of offspring ever born, and predicted probabilities of offspring achieving each level of education implied by the parameters and actual or hypothetical values of observed characteristics of women and their husbands. That is,

$$\hat{r}_{jfmgk|i} = \hat{p}^{M}_{m|i}\,\hat{p}^{H}_{kg|im}\,\hat{r}^{F}_{f|gkim}\,\hat{p}^{J}_{j|fmgki} \qquad \textit{Equation 2}$$

where ^ denotes predicted values and all other notation is as defined above. Given $\hat{r}_{jfmgk|i}$ for each woman in the initial generation, the expected number of individuals in the children's generation who complete education *j* can be obtained by $C_j = \sum_i \sum_{kg} \sum_m \hat{r}_{jfmgk|i} \cdot W_i$ The component $\hat{r}_{jfmgk|i}$ is computed for scenarios that vary by the change in the educational composition of women in the initial generation; the partial or combined presence (or absence) of change in the four components of $\hat{r}_{jfmgk|i}$ included in Equation 2. Table 2 summarizes the relationship between each outcome variable and women's education.

Based on these equations, I compute estimates of the distribution of schooling in the next generation for three groups of adult offspring: (1) U.S. resident adult offspring born to Mexican mothers; (2) U.S. resident adult offspring born to non-Mexican mothers; and (3) adult offspring born to Mexican mothers who remain in Mexico. The distribution of schooling for the U.S. resident offspring born to Mexican and non-Mexican mothers are later combined to estimate the distribution of schooling in the next generation for the entire U.S. population. The distribution of schooling for adult offspring born to Mexican mothers who remain in Mexico yield the distribution of schooling in the next generation in Mexico.

SIMULATIONS

I evaluate the effects of increases in women's education on the education composition of the next generation through a series of simulation. Each simulation consists of three parts: (1) a hypothetical shift in the educational characteristics of women born in Mexico; (2) the accompanying change in the selected subset of transmission, marriage, migration, and fertility processes; and (3) whether men's education increases or remains fixed when women's education is improving. I conduct the simulations for three populations of adult offspring: (1) U.S. resident offspring born to Mexican mothers; (2) U.S. resident offspring born to non-Mexican mothers;

and (3) adult offspring born to Mexican mothers who remain in Mexico. I will describe the process by which I compute the distribution of schooling for the U.S. resident offspring born to Mexican mothers; however, the steps are analogous for U.S. resident offspring born to non-Mexican mothers and adult offspring born to Mexican mothers who remain in Mexico.

I first draw a random subsample of 10 percent of women born in Mexico and alter their eduaction in accordance to the hypothetical changes in women's education that we consider. The remaining 90 percent of women retain their observed educational attainments. Changing the educational attainment of these women alters the educational attainment of the offspring of 10 percent of women born in Mexico whose education improved. In analyses conducted on existing families, this equals a maximum of exactly 10 percent of the offspring born to Mexican mothers. For the analyses presented here where fertility, marriage, and assortative mating are assumed to be endogenous, this may be somewhat more or less than exactly 10 percent of the offspring born to Mexican mothers due to educational differentials in fertility, marriage, and assortative mating. This yields the "simulated" distribution of women's education.

I then use the estimated parameters and remaining assumptions of the scenario to compute the predicted probabilities, rates, and numbers for each component of the demographic model. I combine these components as dictated in Equation 2 to obtain the distribution of schooling in the next generation. The distribution of schooling obtained without changes to the distribution of women's education or the subset of rates, probabilities, and numbers serve as the *baseline* distribution of schooling for the adult offspring born to Mexican mothers. The distribution obtained after changing women's education and the subset of rates, probabilities, and numbers as directed by a specific scenario serve as the *simulated* distribution of schooling. I divide the simulated distribution of adult offspring's education by the baseline distribution to compute the *proportionate changes* in each of the educational categories.

To obtain estimates of the effects of changes in women's education on the distribution of schooling for the entire population of U.S. resident offspring, I combine the predicted distribution of schooling of the offspring born to Mexican mothers with those of the offspring born to non-migrant mothers living in the U.S. When combining the two subpopulations, I use the appropriate weights so that they are representative of the mothers in Mexico and the U.S. as well as their offspring. The educational composition estimated for adult offspring born to Mexican mothers who remain in Mexico

CHANGES IN WOMEN'S EDUCATION DISTRIBUTION

The expected distribution of offspring's education is computed under 8 scenarios of hypothetical changes in the educational characteristics of women born in Mexico. Scenario 1 uses the education distribution of women born in Mexico as reported in Table 1. This scenario provides us with the baseline distribution. In Scenarios 2 to 5, I redistribute 10 percent of women from the lowest education category ("0 to 4") to each higher education category while retaining the original values for the remaining 90% of Mexican women. In Scenarios 6 to 8, I redistribute 10 percent of women from the second lowest education category ("5 to 8") to each higher education category while retaining the original values for the remaining 90% of Mexican women. Scenarios 2 to 8 provide us with the simulated distributions.

COMBINATION OF EFFECTS

Each scenario is carried out while taking into account different combinations of the components of our demographic model as described in Equation 1. I conduct the simulation model taking into account the following combinations of the components of the demographic model: (1) transmission only, (2) transmission plus migration; (3) transmission plus marriage; (4) transmission plus differential fertility, (5) transmission plus migration plus fertility; (6) transmission plus migration plus marriage; (7) transmission plus migration plus fertility; and (8) transmission plus migration plus fertility plus marriage. Combination (1) garners estimates akin to those from conventional studies examining the effects of mother's on offspring's education. Effects estimated from combinations (2) through (8) modify conventional estimates of transmission by considering fertility, migration, marriage, or a combination of these characteristics.

ALTERNATIVE MARRIAGE MARKETS

How a change in women's education affect the distribution of schooling in the next generation depends on the rate of change in men's education because the distribution of men's education determines the pool of potential spouses with whom women marry, migrate, and bear children (Mare and Maralani 2006). The paper considers two extreme possibilities to examine how changes in men's education influence the effects of changes in women's education. At one extreme, men's education is entirely endogenous and increases at the same pace as women's education. Under this scenario, the education specific probabilities of marriage and distribution of husband's education do not change as result of shifts in women's education. This scenario is

possible only when men are exposed to the same incentives and opportunities to increase their schooling as women (Mare and Maralani 2006). Consistent with the terms used in the study by Mare and Maralani (2006), this marriage market is called "unconstrained marriage market".

At the other extreme, the distribution of men's schooling is unaffected by changes in women's education and remains fixed. Under this scenario, women's marriage behavior is constrained by men's education. Therefore, improvements in the educational characteristics of women in a certain educational group will make less favorable the marriage choices of women who remain in the same or lower educational category than the women whose education improved. This scenario is possible only if the incentives and costs that determine women's educational attainment have no effect on men's educational attainment. This market is called the "constrained marriage market" consistent with the terms used by Mare and Maralani (2006). In this marriage market, women with higher levels of education have "first pick" of the most educated men. Therefore, shifts in women's education do not affect the predicted probabilities of marrying a husband with certain educational characteristics for women with higher levels of education than the group of women whose education improved. Women whose education improves form matches that reflect their newly acquired educational status. However, if the predicted number of marriages within a category of men's schooling exceeds the number of men in that education category, a portion of the women whose education improved marry the men as predicted, but the remaining women marry men with lower levels of education. Overall, women will marry men with lower levels of education than they would have in an unconstrained market.

PRELIMINARY RESULTS

Preliminary results suggest that improvements in women's education in Mexico have beneficial effects of the distribution of schooling in the next generation in Mexico and the U.S. In the U.S., the effects are quite substantial for adult offspring born to Mexican mothers and small for the entire population of adult offspring. In Mexico, the effects are also quite substantial for the population of adult offspring who remain in Mexico. The higher rates of migration among those with higher levels of education reinforce the effect of increases in women's education in Mexico and dampen the effects of increases in women's education in Mexico. The beneficial effects of increases in women's education are partially offset by the smaller number of adult offspring that better educated women contribute to the population, but reinforced by the more favorable matches that women make. The beneficial effects of increases in women's education

are much smaller when women face constrained marriage markets compared to when they face unconstrained marriage markets.

TIMELINE

The results for Mexico have been completed. I plan to complete the U.S. analyses between November 2009 and February 2010. I will then write the paper in March 2010. I am confident that the paper will finished on time by PAA.

REFERENCES

Antman, F. 2007. "The Intergenerational Effects of Paternal Migration on Schooling and Work: What Can We Learn from Children's Time Allocation". Unpublished Manuscript.

Grogger, J. and S. Trejo. 2002. *Falling Behind or Moving Up? The Intergenerational Progress of California's Mexican-Origin Population*. San Francisco: Public Policy Institute of California.

Hanson, G. & C. Woodruff. 2003. "Emigration and Educational Attainment in Mexico. Unpublished Manuscript.

Huntington, S. P. 2004. *Who Are We?: The Challenges to America's National Identity*. New York: Simon and Schuster.

Kandel, W. & G. Kao. 2000. "Shifting Orientations: How U.S. Labor Migration Affects Children's Aspirations in Mexican Migrant Communities". Social Science Quarterly 81(1): 16-32.

Mare, R. D., and V. Maralani. 2006. "The Intergenerational Effects of Changes in Women's Educational Attainments." *American Sociological Review* 71: 542-64.

Ozden, C. 2005. "Brain drain in Latin America". United Nation Population Division Working Paper. Website:http://www.un.org/esa/population/migration/turin/Symposium_Turin_files/P10_WB-DECRG.pdf

Perlmann, J. and R. Waldinger. 1997. Second Generation Decline? Children of Immigrants, Past and Present-A Reconsideration *International Migration Review* 31(4): 893-992.

Telles, E. and V. Ortiz. 2008. *Generatons of Exclusion: Mexican Americans, Assimilation and Race*. New York: Russell Sage Foundation Press.

Wojtkiewicz, R. and K. Donato. 1995. Hispanic Educational Attainment: The Effects of Family Background and Nativity *Social Forces 74(2):* 559-574.

TABLES

Table 1. Descriptions of the 3 interdependent samples in the paper

		Migration	Marriage/Fertility	Transmission	
				Mexico	U.S.
Universe	:	Women born in Mexico	Women born in Mexico and the U.S.	Adult offpring in Mexico	Adult offpring in the U.S.
Dataset	:	1990 and 2000 U.S. and Mexican Census MMP	1990 and 2000 U.S. and Mexican Census MMP	Mexican Family Life Survey (MxFLS)	NLSY97
Sample	:	Women born in 1935-1949 1950-1964	Women born in 1935-1949 1950-1964	Offspring 18 + years in 2002 with mothers born in 1935 and 1964	Adult offspring born between 1980 and 1984
Information	:	Women's education Women's migration	Women's education Women's migration Women's marital status Husband's education Husband's migration Offspring ever born*	Mother's education Women's migration Mother's marital status Father's education Father's migration Number of Siblings Adult offspring's education	

Notes: The samples of women consist of two cohorts: (1) women born between 1935 and 1949 and (2) women born between 1950 and 1964. Information about the first cohort is collected using data from the 1990 U.S. and Mexican Censuses while the second is collected using data from the 2000 U.S. and Mexican Censuses. This is because the first cohort is old enough to be affected by mortality bias in 2000 and the second cohort is too young to have completed their transitions into marriage or fertility. * Offspring ever born corresponds only to fertility sample.

Table 2. Summary association between women's education and each component of the demographic model

Variable	Women born and living in Mexico	Women born in Mexico and living in the U.S.	Women born outside of Mexico and living in the U.S.
Women's migration	Nonmonotonic pattern Rises with women's education; Peaks at 12 yrs of education Decreases for women w/ 13+		N/A
Being married	-	-	+
Husband's education	+	+	+
Husband's migration	Same pattern as women's migration	Same pattern as women's migration	-
Offspring ever born	-	-	-
Adult offspring's education	+	+	+