THE DEMOGRAPHY OF MEXICAN MIGRATION TO THE US

Gordon H. Hanson, UCSD and NBER, and Craig McIntosh, UCSD

The last three decades have been an exceptional period in Mexican migration to the United States. As recently as 1970, the share of Mexico's population living in the US was only 1.5%; by 2005, it had risen to 10.2%. While the flow of labor across the Mexico-US border is not a new phenomenon, with previous surges occurring in the 1920s and 1950s, persistent mass migration between the countries did not take hold until late in the 20th century.

Among the factors contributing to large scale emigration from Mexico are weak growth in the country's labor demand and strong growth in its labor supply. After enjoying sustained economic progress in the 1960s and 1970s, Mexico's economy stagnated in the 1980s. Repeated currency crises reversed the effects of short-lived expansions, leaving per capita GDP in the early 2000s more or less unchanged from two decades before. During periods of wage decline in Mexico, emigration from the country spiked (Gordon Hanson and Antonio Spilimbergo, 1999; Pia Orrenius and Madeline Zavodny, 2005).

Perhaps less appreciated is that the 1980s were also a period of accelerated growth in Mexico's relative labor supply. With the US baby boom peaking in 1960, the number of US native born individuals coming of working age actually declined in the 1980s. Adding in the secular increase in US educational attainment, the number of native born American workers with less than a high school education has dropped sharply. In Mexico, high levels of fertility in the 1960s and 1970s meant that two decades hence the country had large numbers of young adults entering the labor force. While educational attainment has also increased in Mexico, the majority of those born in the country still complete less than 12 years of schooling. The sharp increase in Mexico-US relative labor supply was concurrent with the stalling of Mexico's

economy, creating ideal conditions for an emigration surge. In previous work (Hanson and Craig McIntosh, 2008), we find that temporal variation in labor supply across Mexican states can account for 30% of the country's labor exodus between 1975 and 2000.[1]

Looking forward, the conditions behind recent emigration from Mexico are unlikely to be sustained. Whatever happens to labor demand in the country, labor supply growth is converging to US levels. Between 1965 and 2000, Mexico's total fertility rate plummeted from 7 to 2.5, close to the US rate of 2.1. In this paper, we use projections for US and Mexican population growth to simulate Mexico's future emigration rate, assuming that relative labor demand in the two countries remains constant. Labor supply pressures for emigration from Mexico peaked in the late 1990s and are likely to fall in coming years, with the projected emigration rate for labor market entrants in 2030 being only one third the level for 2000. However, while Mexico's labor force growth is slowing, Central America's is not, meaning that in coming decades Mexico may face conditions on its southern border similar to what the US has just seen.

I. An Empirical Model of Emigration

To model migration from Mexico to the US, we adopt the framework in George Borjas (2006), as extended by Hanson and McIntosh (2008). Labor moves from Mexico to the US in response to wage differences between the countries, which are determined by relative labor supply and relative labor demand. There are adjustment costs in moving labor between countries, such that a 1% wage difference between the US and Mexico induces a fraction σ of the population to emigrate. When a birth cohort in Mexico comes of working age, the share that emigrates is an increasing function of the US-Mexico wage differential. As long as a wage gap

[1] For cross-country evidence on the relationship between demographic structure and international migration, see Hatton and Williamson (2005).

between the countries persists, the total emigration rate for a Mexican cohort will rise over time, and may accelerate if there are network effects in US migration.

Given this set up, the equilibrium emigration rate for birth cohort *i* from Mexican state *s* in the *t*th year after it comes of working age (assumed to be 16) can be shown to be:

$$(1) \qquad m_{ist} = \beta_0 + \ln \frac{L_{is}^{mx}}{L_i^{us}} \left[\beta_1 + \beta_2 \left(t - 1 \right) \right] + \ln \frac{X_{is}^{mx}}{X_i^{us}} \left[\beta_3 + \beta_4 \left(t - 1 \right) \right] + \beta_5 Z_{ist} ,$$

where m_{ist} is the fraction of the cohort that migrates to the US, L_i^c is the size of birth cohort *i* in country *c*, X_i^c is the position of the labor demand curve facing birth cohort *i* in country *c* at age 16, and Z_{ist} controls for other labor market shocks. Interactions between initial labor market conditions and time since a cohort entered the labor force reflect the dynamics of wage adjustment in the two countries in response to migration and the effects of migration networks. Because the estimated interactions are small, in our simulation exercises we focus on the main effects of initial labor market conditions on emigration. Since the relevant US labor market for most Mexican migrants is low skilled work, it would be natural to measure L_i^{us} as the number of US native born in cohort *i* that have not completed high school. In Hanson and McIntosh (2008) we take this approach, instrumenting for the number of US high school dropouts with the total size of the relevant US birth cohort. The estimated value of β_1 is 0.14 (and highly statistically significant), implying that for every 10% increase in the relative size of a Mexican birth cohort, an extra 1.4% of the cohort would emigrate each decade.[2]

We use estimation results for equation (1) to simulate the effects of projected population growth in the US and Mexico on future Mexican emigration. Because our focus is on how labor

[2] The regression is run using data on emigration rates for three-year birth cohorts by Mexican state at ten year intervals for the period 1960 to 2000. Other controls in the regression include log state per capita GDP relative to US per capita GDP in the year the cohort turned 16, the log change in state per capita GDP relative to US per capita GDP in the most recent ten year period, and dummies for gender, age group, 10-year birth cohort, and year.

supply affects emigration, we shut down the effects of labor demand (and any feedback effects from labor supply to labor demand that would occur if population growth affects capital accumulation or technological progress). The simulations are thus not a forecast of the future emigration rate. Rather, they allow relative comparisons across time of the effect of the U.S.-Mexican labor supply ratio on migration, holding relative labor demand constant across periods.

II. Projecting Labor Supply Growth in Mexico and the US

To perform the simulations, we need projections for future population growth in the US and Mexico. For the US, we use projections from the US Bureau of the Census (2008), which predicts the number of births in the US, accounting for how immigration affects the population of mothers of birthing age. For Mexico, we combine demographic projections for fertility with our own projections of the number of women of birthing age that remain in the country. Mexican fertility rates are from Rodolfo Tuiran, Virgilio Partida, Octavio Mojarro, and Elena Zuniga (2002), who forecast age-specific fertility in Mexico, disaggregated by state, birth cohort, and year through 2030. Their projections imply Mexican fertility will continue to fall, dipping below the replacement level needed to keep population stable by 2020. Below, we discuss how emigration could affect fertility trends by changing the incentive of mothers to have children.

To project the number of women of birthing age in Mexico, we begin by counting the number of women of each age and state in the 2000 Mexican census and then apply age-specific annual female emigration rates over the 1960 to 2000 period to obtain the number of women of each age remaining in Mexico through 2030. For our purposes, using emigration rates averaged over 1960-2000 is a conservative approach, as it implies a higher labor supply in Mexico (and therefore a smaller change in future emigration rates) than would obtain were we to use emigration rates for a more recent period, such as 1990-2000. Combining the Tuiran et al.

(2002) fertility forecasts with our population projections, we predict the number of children that will be born in each Mexican state and each year to women who were in Mexico as of 2000. As of 2016, girls whose births were simulated become fertile and so begin themselves to add to birth cohort sizes. We assume a commensurate fraction of these girls will emigrate, taking them out of the pool of prospective birth mothers in Mexico.[3]

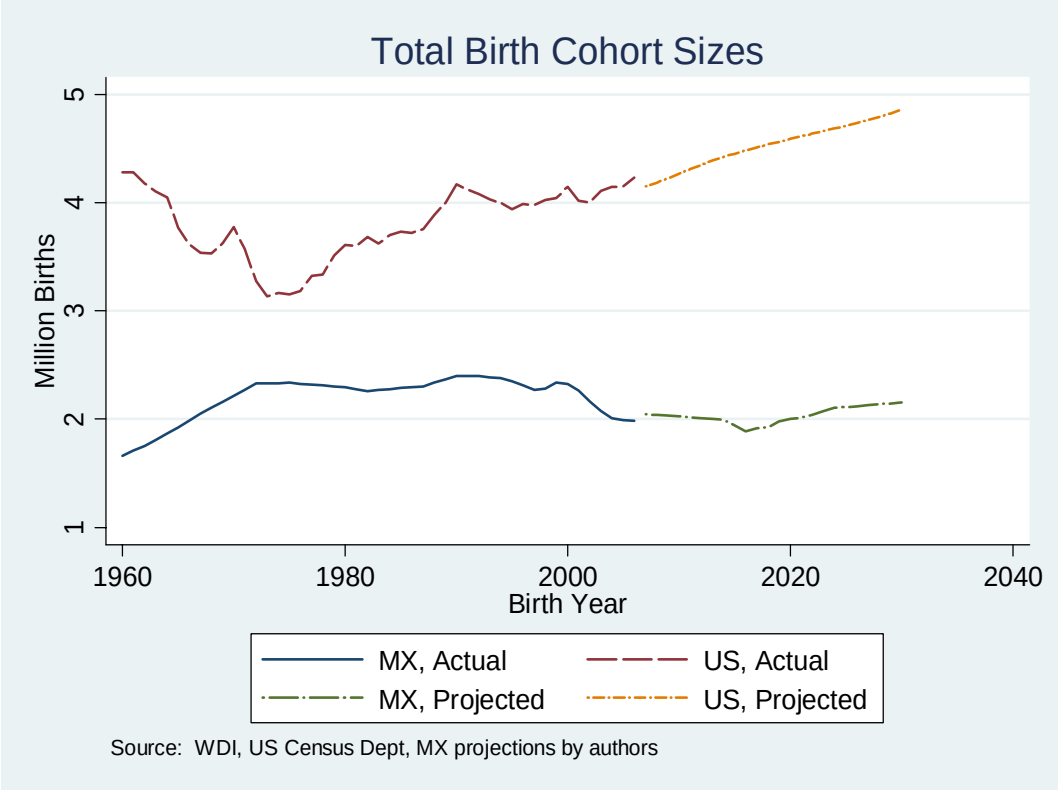
The resulting forecasts of births in the US and Mexico are in Figure 1. The series until 2006 reflect actual births, as reported in World Development Indicators. Over 1960-1980, it is evident that the Mexico-US ratio of number of births increased dramatically, rising from 0.35 to 0.66. This surge in relative Mexican births in the 1960s and 1970s contributed to a sharp increase in the relative number of individuals coming of working age in Mexico in the 1980s and 1990s. These are the generations of Mexicans that have migrated to the US in large numbers.

The era of rising relative Mexican labor supply has already come to an end. By1980, the relative number of births in Mexico had stopped rising. The combination of falling fertility in Mexico, emigration from Mexico, and immigration in the US (from Mexico and elsewhere), has caused the number of births to flatten out in Mexico and to rise in the US. After 2010, this process accelerates. The number of births in the US continues to grow (as future immigration contributes to population growth) and the number of births in Mexico stays relatively constant. Of course, what matters for the incentive to migrate to the US is not Mexico's relative total labor supply but its relative supply of comparably skilled workers. Here, too, we see a reversal in the growth in relative Mexican supply. The ratio of 20 year olds born in Mexico to 20 year old

[3] In order to simulate these children of children, we first divide the number of children born in each state/year by two to get the number of girls of each age, and then adjust for emigration by these girls' mothers since the girls were born. This gives the number of children born in each state from 2016-2030 to children of those who were in the country as of 2000. We sum the number of girls for each year 2001-2030 (both observed in 2000 and simulated after 2015) within each age category and then multiply this female population times the year- and age-specific fertility rates. This gives the number of children born to women of each age category for each year. Finally, we sum across age categories to get the number of children born in each state/year (where we smooth state-level cohort sizes across birthyear to adjust for lumpiness resulting from the five-year fertility bins used by Tuiran et al. (2002)).

native born high school dropouts in the US rose from 1.2 in 1960 to 3.8 in 1980 and to 5.1 in 1990 but then fell to 5.0 in 2000.

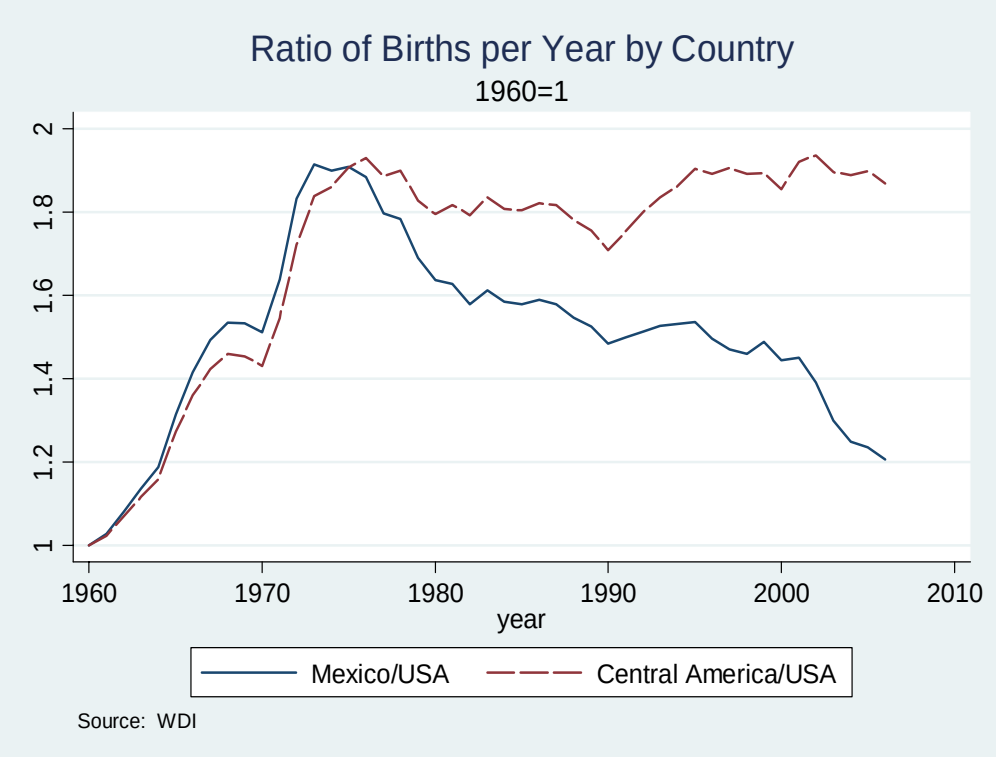
Figure 1: Projected Population Growth in the US and Mexico



Much of the slowing in the number of births in Mexico is due to the dramatic fall in the country's fertility rates. Mexico's experience is similar to other middle income countries, which have seen fertility decline as their populations have urbanized, become more educated, and incorporated women in to the labor force in larger numbers. The countries of Central America that lie just to the south of Mexico have not experienced fertility declines anywhere near as large as in Mexico and continue to have rapid population growth. Figure 2 plots the number of births in Mexico and the number of births in four Central American countries (El Salvador, Guatemala, Honduras, Nicaragua—which are the countries in the region with significant migration to the

US), each relative to the US. In both Mexico and Central America, the number of births relative to the US rose sharply in the 1960s and 1970s. Mexico reached its peak in the mid 1970s and then began its steady decline. In Central America, however, relative births increased by 80% between 1960 and 1980 and then remained flat for the next 30 years. While relative labor supply growth in Mexico has slowed, relative labor supply growth in Central America has not. Births in the region have grown sharply relative to Mexico, meaning that in ensuing years Mexico may experience demographic pressures for immigration on its southern border, as large cohorts in nearby countries come of working age. The large increases in education among poor Mexicans brought about by subsidized schooling programs (such as Progresa/Oportunidades) may further enhance Mexico's attractiveness as a destination for future Central American migrants.

Figure 2: Relative Population Growth in Central America, Mexico, and the US



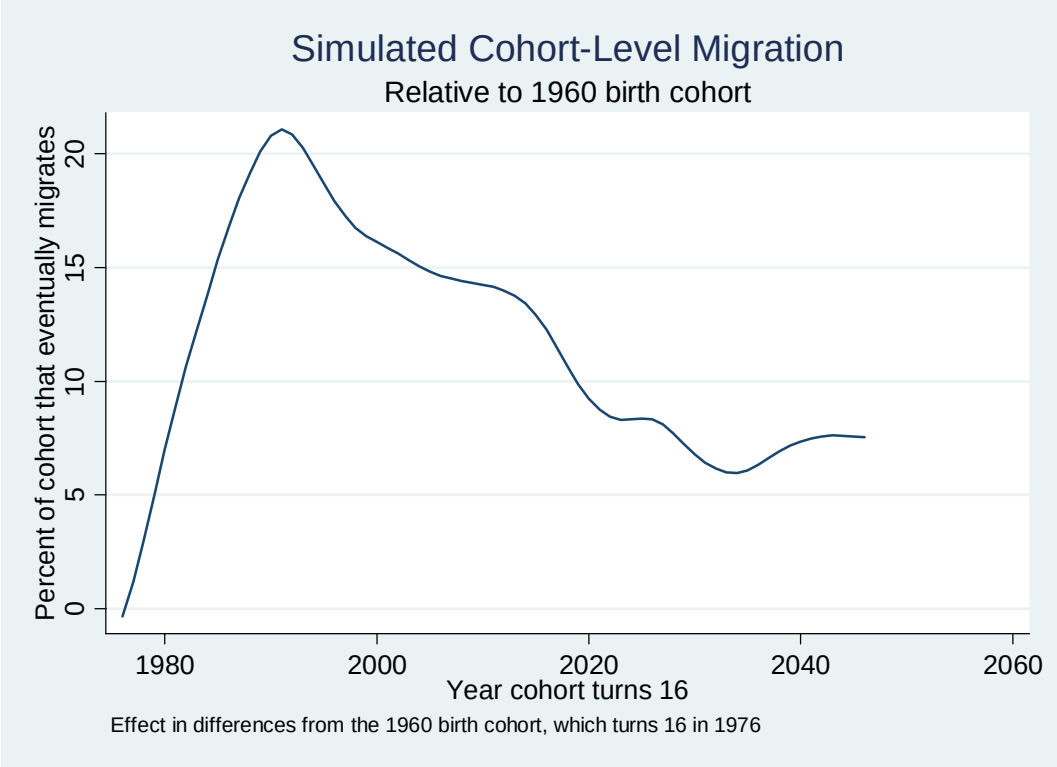
III. Projecting Migration from Mexico to the US

All else equal, the reversal in Mexico's relative labor supply growth would ease pressures for emigration from the country. To project how large the change in emigration coming from changes in labor supply is likely to be, we use our population projections to simulate the share of each birth cohort in Mexico that emigrates to the US. For the period up to 2006, we use actual births as recorded in World Development Indicators; for 2007-2030, we use our population projections. We take the series of Mexico-US relative labor supply and apply our dynamic migration model in equation (1) to calculate the total fraction of each cohort that migrates to the US over its prime migration years. Obviously, over long time periods labor demand in the two countries could change dramatically. Since there are no reliable forecasts of how labor demand is likely to evolve, we neutralize its effects by assuming that the position of the US-Mexico relative labor demand curve remains constant over time. This implies we can only simulate emigration relative to some base cohort, which we choose to be 1960.

Figure 3 presents the simulation results, in which emigration rates are smoothed over time. The plot shows the total fraction of an age cohort that migrates to the US between ages 16 and 40. The horizontal axis indicates the year in which a cohort turns 16, such that the first year shown is 1976, when the 1960 birth cohort comes of working age. Initially, the simulated emigration rate rises sharply, peaking in 1995, for the cohort born in 1979. For the cohort entering the labor market in that year, labor supply pressures imply a life time emigration rate 22% higher than for 1976 entrants. Since relative births in Mexico peak in the late 1970s, labor supply pressures on emigration weaken for age cohorts entering the labor force after the 1990s. The decline is modest at first, such that for labor market entrants in 2010 the emigration rate is still 14% higher than for 1976 entrants. After 2010, the decline continues, falling to 9% in 2020

and 7% in 2030, one third of the level in the late 1990s.

Figure 3: Labor Supply Pressures for Mexican Migration to the US



The size of Mexican cohorts coming of working age in the 1990s and 2000s created unprecedented labor supply pressures for emigration from the country. Between the rapid decline in Mexican fertility and the immigration-induced population growth in the US, relative labor supply pressures are already easing and will likely relax considerably in coming decades. While labor supply is by no means the only factor behind labor outflows from Mexico, the US and Mexico have clearly passed through a period that is unlikely to be repeated. Given that births in the Central American region appear likely to remain high relative to the US and to rise relative to Mexico, one would expect continued migration from Central America to the US and an acceleration of migration to Mexico. Since the early days of the Spanish conquest, Mexico has not experienced a significant immigration surge. Labor inflows into the country appear

likely to increase. Substantial numbers of Central Americans already cross into southern Mexico, on their way to the US.

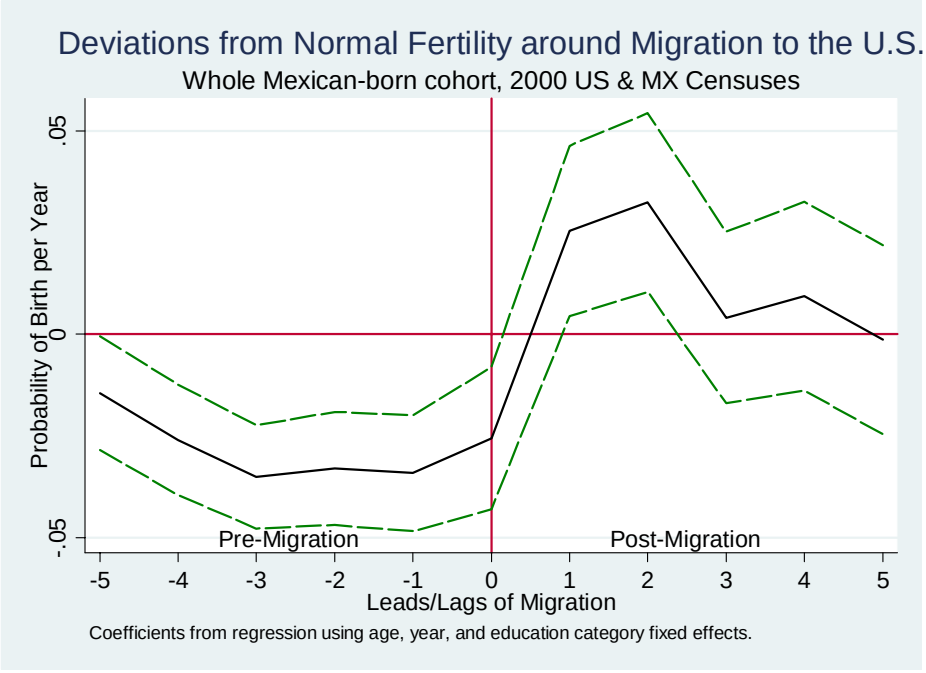
The simulation in Figure 3 only considers labor supply pressures on Mexican migration to the US. Ignoring labor demand is a serious liability in forecasting migration. Mexico's capacity to sustain high rates of economic growth matters hugely for the incentive of its citizens to leave. The simulations also ignore feedback effects from labor supply to labor demand. The size of an economy, in part determined by its population, could affect productivity and wages if scale economies are important. Consequently, the growing size of the US economy relative to Mexico could slow convergence in Mexican income levels. Our simulation also ignores cross-cohort network effects, which may similarly work to slow the decline in migration.

Other qualifications of the simulation relate to the behavior of fertility. It appears that fertility in Mexico is following the pattern of Catholic countries in southern Europe, which have seen precipitous declines in birth rates to below replacement levels. Reasons for this decline are not fully understood. Obviously, if this fertility decline in Mexico reverses itself the easing of emigration pressures in the country could be more modest. Another issue is whether migration itself affects fertility. Part of the fall in Mexican birth rates could be a result of increased opportunities for young women to move to the US. The prospect of living in the US may induce women to have fewer children, as a result of Becker type effects in which expected higher future income induces women to choose to have fewer children but invest more in each one. Additionally, moving from one country to another is disruptive, possibly causing women to delay fertility until they complete their move abroad.

To examine the correlation between migration and fertility, Figure 4 uses data from the 2000 US and Mexican censuses to plot fertility for migrant women before and after they move to

the US, relative to the fertility for women who do not migrate. The figure is constructed from a regression of the 0-1 outcome of giving birth in a given year for a sample of migrant and nonmigrant women (where fertility panels are based on the age of own children in a woman's household). The regressors include age, education, year, and leads and lags on dummies for whether a women migrates to the US in a given year. In the years leading up to migration, fertility is depressed for future migrants, reflecting the disruptive effects of migration on fertility and long-run differences in fertility associated with being a migrant. Migrant fertility spikes in the second year following the move to the US, as women make up for delayed fertility in the pre-migration period.[4] The post-migration fertility spike could also reflect the desire to have a child in the United States. While Figure 4 is purely descriptive, it does suggest that fertility and migration are related. The subject merits further study.

Figure 4: Fertility of Migrant Women from Mexico before and after Migration



[4] Using fixed effects to control for age, year, and education, women who migrate to the U.S. have only very slightly lower overall fertility than their counterparts who remain in Mexico (the lifetime probability of a birth in any given year is .7% lower for migrants, relative to a sample average of 7.55%). This relatively small decrease is a composite of fertility which 1.8% per year lower than the counterfactual prior to arrival in the U.S. and 2.7% higher thereafter.

IV. Discussion

The flow of individuals from Mexico to the US over the last three decades ranks among the most significant migration episodes in the histories of the two countries. The exodus from Mexico appears to have had a strong demographic component. Mexico's delayed fertility decline, combined with the US baby bust, amounted to a large positive shock to Mexico's relative labor supply. That shock appears to be subsiding. In the future it is Central America and not Mexico whose demographic structure makes an emigration surge most likely.

References

Borjas, George J. "Native Internal Migration and the Labor Market Impact of Immigration," *Journal of Human Resources* 41 (Spring 2006): 221-258.

Hanson, Gordon H., and Craig McIntosh. 2008. "The Great Mexican Emigration." *Review of Economics and Statistics*, forthcoming.

Hanson, Gordon H., and Antonio Spilimbergo. 1999. "Illegal Immigration, Border Enforcement and Relative Wages: Evidence from Apprehensions at the U.S.-Mexico Border," *American Economic Review*, 89: 1337-57.

Hatton, Timothy J. and Jeffrey G. Williamson. 2005. "What Fundamentals Drive World Migration?" In. George J. Borjas and Jeff Crisp, eds., *Poverty, International Migration, and Asylum*, New York: MacMillan.

Orrenius, Pia M. and Madeline Zavodny. 2005. "Self-Selection among Undocumented Immigrants from Mexico." *Journal of Development Economics*, 78(1): 215-240.

Tuiran, Rodolfo, Virgilio Partida, Octavio Mojarro, and Elena Zuniga. 2002. "Fertility in Mexico: Trends and Forecast.". Report of the United Nations Population Division.

US Bureau of the Census. 2008. "Projected Births by Sex, Race, and Hispanic Origin for the United States: July 1, 2000 to June 30, 2050," http://www.census.gov/population/www/projections/downloadablefiles.html.