Emigration, Remittances, and Labor Force Participation in Mexico

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Abstract. In this paper, I examine emigration, remittances, and labor-force participation in Mexico during the 1990s. I use two samples of households for the analysis: (a) rural households in Mexico in 2000, which vary according to whether they have sent migrants to the United States or received remittances from the United States, and (b) individuals in Mexico in 1990 and 2000 born in states with either high-exposure or low-exposure to U.S. emigration.   In the first sample, controlling for observable characteristics, individuals are less likely to participate in the labor force if their household either has sent migrants abroad or received remittances from abroad. Surprisingly, this result holds for both women and men. These cross-sectional results are potentially contaminated by unobserved household characteristics that may be correlated with both household migration behavior and household labor supply. In the second sample, which is less subject to concerns about self-selection into migration, I find that over the 1990s women (but not men) from high-migration states become less likely to work outside the home (relative to women from low-migration states). These results are consistent with migration abroad, and the accompanying return flow of remittances, leading to greater intra-household specialization. Results for labor hours are similar.

1. Introduction

Migration to the United States is having dramatic consequences on the supply of labor in Mexico. In 2000, 10% of individuals born in Mexico resided in the United States, up from 2% in 1970 (see Figure 1).[1] As is the case in many countries, rates of emigration are highest for young adults. During the 1990s alone, 9% of Mexicans 16 to 25 years old (based on age in 1990) migrated to the United States (see Table 1).

Migrant outflows of this magnitude affect labor markets in myriad ways. A growing literature examines the impact of Mexico's outmigration on labor-market outcomes in the country.[2] Chief among the effects, emigration appears to have put upward pressure on wages in Mexico, particularly in regions that historically have sent large numbers of migrants to the United States. Mishra (2004) estimates that over the period 1970-2000 emigration raised average wages in Mexico by 8%. Wage increases are even larger in Mexico's high-emigration states, which over the 1990s experienced 9% higher wage growth than low-emigration states (Hanson, 2005).

The outflow of labor from Mexico does more than raise incomes for migrants. Once in the United States, migrants remit a portion of their income to family members who remain in Mexico. In 2003, remittances from Mexican migrants in the United States equaled 2% of Mexico's GDP (IADB, 2004). These inflows appear to considerably larger than the loss in Mexico's GDP due to emigration.[3] Remittances also appear to

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[1] I take the total population of Mexicans to be the sum of individuals born in Mexico who reside in either Mexico or the United States (thus ignoring the small number of Mexicans residing in third countries).
[2] Comparatively, the literature on the consequences of immigration in the United States is much larger. See Borjas (2005) for a collection of recent work on the Mexican immigration and the U.S. economy.
[3] Based on Mishra's (2004) estimates, the emigration loss in Mexico for 2000 would be 0.5% of GDP (0.5 times the change in wages due to emigration of 8% times the loss in labor supply due to emigration of 16% times a labor share of income of 0.7). In that year, remittances were 1% of Mexican GDP.

have encouraged capital accumulation in Mexico, contributing to higher investment in small businesses (Woodruff and Zenteno, 2001).

An unexplored issue is whether remittances condition how emigration affects labor-market outcomes. In the absence of remittances, emigration would be likely to increase labor-force participation among adults, due both to the upward pressure that labor outflows put on wages and to the need to replace income lost to the exodus of wage earners from households. With remittances, however, migrant families may feel less need to have non-migrating adults work outside the home. For women, in particular, remittances may decrease incentives to spend time in the labor force and increase incentives to invest in home production. Thus, emigration may increase intra-household specialization, with migrants, who are often fathers, devoting more time to working abroad, and non-migrants, who are often mothers, devoting time to working at home.[4]

In this paper, I examine the impact of emigration on labor-supply decisions in Mexico. I use data from the 1990 and 2000 Mexico Census of Population and Housing to examine differences in labor-force participation and labor hours worked across individuals according to their exposure to opportunities to emigrate.

Complicating the empirical analysis, migration is not a random event. Households choose to send migrants abroad based on the perceived gains from doing so. Most emigrants from Mexico appear to enter the United States illegally. Illegal immigration is costly, given the need to hire the services of a smuggler to evade ever stricter enforcement of the U.S.-Mexico border by U.S. immigration authorities. In the presence of imperfect credit markets, migration costs may preclude the poorest

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[4] Of course, this outcome depends on households sending some but not all members abroad. If the entire household migrates, then migration might reduce intra-household specialization (as would be the case if all members of the household end up working outside the home).

households from sending migrants abroad. Individuals in richer households, in turn, may feel working legally in Mexico is preferable to working illegally in the United States. Thus, household income, wealth, and willingness to tolerate the vagaries of illegal migration are all likely to influence the migration decision. Since these characteristics are measured imperfectly (or not at all), households are likely to self-select into sending migrants abroad based in part on their unobserved characteristics.

To gauge the consequences of self-selection into migration for the analysis, I report results using two samples of individuals. The first sample contains individuals living in rural areas of Mexico in 2000. The 2000 Mexico Census reports whether households had sent a migrant to the United States in the last five years or received remittances from migrants abroad in the last month. I see whether labor-supply decisions vary across individuals, according to the migration status of their household. I focus on rural households, since they appear to be the units most likely to send individual migrants abroad. Urban dwellers, if they migrate, may be likely to move the entire household (since the cost of maintaining a household in Mexico is higher in urban areas than in rural areas). Without a valid instrument for the household migration decision, the analysis using this first sample is subject to concerns about the correlation between household migration status and unobserved household characteristics.

The second sample I use includes individuals from high-migration states and low-migration states in Mexico. Due partly to historical accident, central and western Mexico have long had the country's highest labor flows abroad (Cardoso, 1980; Durand, Massey, and Zenteno, 2001). In Figure 2, which shows the fraction of households that sent migrants to the United States over 1995-2000 by Mexican state, emigration rates are

relatively low in states along the U.S. border, sharply higher in states 600-1200 kilometers from the United States, and lowest in distant southern states. Most states that have high current emigration rates also had relatively high emigration rates 50 or more years ago (see Figure 3). I compare individual labor-supply decisions in 1990 and 2000 for two groups of states, those that had high emigration rates in the 1950s and those that had low emigration rates in the 1950s. In this approach, I use historical migration rates as a reduced-form determinant of current migration opportunities.[5] Since high emigration in the past could have altered regions in a manner that affects current labor-market conditions, a reduced-form approach is more appropriate than using past migration behavior as an instrument for current migration.[6] To control for internal migration, I use the 1950s emigration rate in an individual's *birth state*, rather than his or her current state of residence. Historical migration rates in an individual's birth state are thus meant to capture current opportunities to migrate abroad.

An additional challenge for the estimation is that there may be other, unobserved shocks that have affected high and low migration states differently. Candidate shocks include the North American Free Trade Agreement, the privation and deregulation of industry, the reform of Mexico's land-tenure system, and the 1994-1995 peso crisis.[7]

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[5] This approach depends on the assumptions that (a) labor is sufficiently immobile across Mexican regions for region-specific labor-supply shocks to affect regional earnings differentials (see Robertson 2000, Chiquiar 2004, and Hanson 2004 for evidence consistent with this assumption), and (b) current opportunities to migrate to the United States depend on regional historical migration patterns (see Munshi 2003 and Orrenius and Zavodny 2004 for recent work on migration networks).

[6] For instance, states with higher emigration rates in the past could have attracted less investment over time, affecting the demand for labor in these states today.

[7] See Chiquiar (2003) on recent policy changes in Mexico. For work on the labor-market implications of globalization in Mexico, see Cragg and Epelbaum (1996), Feenstra and Hanson (1997), Revenga (1997), Hanson and Harrison (1999), Robertson (2000, 2004), Feliciano (2001), Farris (2003), Ariola and Juhn (2003), Chiquiar (2004), and Hanson (2004).

Obviously, the potential for these shocks to contaminate the analysis is an important concern, which I address in discussing interpretations of the results.

In the next section, I document how migration behavior varies across regions of Mexico and discuss criterion for selecting which Mexican households and states to include in my sample. In sections 3 and 4, I examine the impact of emigration on labor supply and labor-force participation in Mexico. In section 4, I discuss interpretations of the results and limitations of the estimation strategy.

2. Regional Patterns of Emigration in Mexico
2.1 Data Sources

Data for the analysis come from two sources. In 1990, I use the 1% microsample of the *XII Censo General de Poblacion y Vivienda, 1990,* and in 2000 I use a 10% random sample of the 10% microsample of the *XIII Censo General de Poblacion y Vivienda, 2000*. Unfortunately, the 1990 census contains no information about household emigration behavior. The 2000 census includes two questions about migration abroad: (i) whether in the last five years anyone from the household migrated to the United States or another foreign country, and (ii) whether in the previous month anyone in the household received remittances from migrants located abroad. These questions have obvious shortcomings. They provide no indication of migrant schooling, migration histories, annual remittances, or in-kind transfers from migrants. Still, the 2000 census is useful in that it is the only nationally representative sample available for Mexico that contains information about migration to the United States.[8]

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[8] Many studies on Mexican migration to the U.S. use data from the Mexican Migration Project (MMP),a household survey in several dozen rural Mexican communities over the period 1987-1997 where emigration tends to be high (Durand et al., 1996; Massey et al., 1994). The MMP is not suitable for my

For data on historical migration patterns, I use estimates of state emigration rates from Woodruff and Zenteno (2001). They calculate the fraction of each Mexican state's population that migrated to the United States over 1955-59 by combining data on Mexican state populations with data on annual U.S. immigration of temporary legal workers from each Mexican state under the U.S. Bracero Program. The Bracero Program, which lasted from 1942 to 1964, allowed U.S. employers to import workers from Mexico (and the Caribbean) to fulfill short-term labor contracts (of less than a year). The vast majority of temporary migrants admitted under the program worked in agriculture (Calavita, 1992). Woodruff and Zenteno (2001) also provide data on state emigration rates in 1924, which I use in some exercises.

2.2 Regional Patterns in Mexican Migration to the United States

Large scale migration from Mexico to the United States began in the early 20th century. Railroad construction in the late 19th century linked interior Mexico to the U.S.-Mexico border, giving U.S. employers improved access to Mexico labor (Cardoso, 1980). Just after the turn of the last century, farmers in Texas began to recruit laborers in Mexico. To find workers, recruiters followed the main rail line to the relatively densely populated states in the central and western regions of the country. The early migrants from Mexico came primarily from nine states in this region (Durand, Massey, and Zenteno, 2001).[9] Mexican migration to the United States increased in the 1920s, after the U.S. Congress lowered quotas on U.S. legal immigration. Recruitment expanded again in

purposes. The MMP sample of migrants is selected both in terms of the communities included, which are poor, rural, and in high-migration states (and so very far from being nationally representative), and in terms of its focus on return migrants (rather than on migrants currently residing in the United States).
[9] These nine states are Aguascalientes, Colima, Durango, Guanajuato, Jalisco, Michoacán, Nayarit, San Luis Potosí, and Zacatecas.

the 1940s, after Congress enacted the Bracero Program (Calavita, 1992). From the 1920s to the 1960s, the nine west-central states accounted for 44% to 56% of Mexican migration to the United States (but only 27% to 32% of Mexico's total population) (Durand, Massey, and Zenteno, 2001).

After a stint working in the United States, migrants often return to Mexico and help later generations go abroad. Migrants staying in the United States have created home-town associations that assist other individuals from their home communities in Mexico (Cano, 2004). There are also many informal networks through which current migrants help prospective migrants settle in the United States. These networks tend to be related to family or community of birth, giving them a strong regional component. They also appear to affect migrant outcomes. Munshi (2003) finds that Mexican migrants in the United States are more likely to be employed the larger is the U.S. population of residents from their home towns in Mexico.

Figure 3 gives evidence of strong persistence in regional migration behavior. The states that had high migration rates in the 1950s, during the height of the Bracero Program, continue to be high migration states today. The correlation between state emigration rates in the 1995-2000 and the 1955-59 is 0.73. The correlation between state migration rates in the 1995-2000 and 1924 is 0.48 (Woodruff and Zenteno, 2001). Figure 4 shows a similar strong positive correlation between the share of remittances in state GDP in 1995 and the 1955-59 state emigration rate.

Table 2 reports regressions using as a dependent variable either the fraction of households sending migrants abroad or of the fraction of households receiving remittances from abroad over the 1995-2000 period. High migration states are not simply

the poorest states or those closest to the United States. In columns 1 and 5, there is a negative correlation between emigration rates or remittances and state per capita income, but the explanatory power of income is not very strong. Adding distance to the United States, in columns 2 and 6, doubles the R^2 of the regressions. Adding the state emigration rate in 1924, in columns 3 and 7, also raises the R-squared substantially. There appears, however, to be little covariation between 1995-2000 and 1924 state emigration rates that is independent of the 1950s state emigration rate. In columns 4 and 8, once the 1955-59 emigration rate is added as a regressor the R^2 rises further and the 1924 migration rate becomes statistically insignificant.

If states with relatively high emigration rates are also more exposed to other aspects of globalization, the empirical analysis might confound the effects of migration with the effects of trade or capital flows. During the 1980s and 1990s, Mexico lowered its barriers to foreign trade and investment. See Chiquiar (2004) and Hanson (2004, 2005) for evidence that high-emigration states are not those that have benefited disproportionately from investment and trade reform (not surprisingly, the states that have benefited disproportionately are those close to the U.S.-Mexico border).

2.3 Sample Design

The goal of this paper is to examine the consequences of emigration on labor supply in Mexico. The first approach I take is to utilize data on migration to the United States in Mexico's 2000 population census and to compare labor-market outcomes in households with emigrants to outcomes in households without emigrants. One concern with this approach is that household migration behavior is endogenous. The unobserved

characteristics of households that affect labor supply are also likely to affect whether households choose to send migrants abroad.

One might consider historical state emigration rates as potential instruments for current migration opportunities. Based on data from the 2000 census, the likelihood a household either has sent a migrant to the United States in the last five years or has received remittances from abroad in the last month is strongly positively correlated with the 1955-59 emigration rate in the household head's birth state (Hanson, 2005). However, historical state emigration rates are unlikely to be a valid instrument for current migration rates. Emigration opportunities in an individual's birth state may have affected an individual's labor market experience or the quality of education the individual obtained. Thus, past emigration opportunities are likely to affect current labor-market outcomes both directly, through their impact on current emigration, and indirectly, through their impact on an individual's human capital.

Given these concerns, I also employ a second approach in which I compare changes in cross-section labor-market outcomes, where I categorize individuals according to the emigration rate in their birth state. In so doing, I capture both the direct and indirect effects of historical emigration opportunities on current labor-market outcomes. This strategy is thus to compare labor-market outcomes in regions that have been more or less exposed to opportunities to migrate to the United States.

Table 3 describes the sample of states. I drop the six border states from the sample, since these states appear to have benefited disproportionately from trade and investment liberalization. Most border states had above average emigration rates in the 1950s and including them in the sample would potentially confound the effects of

emigration with those of other aspects of globalization. To help isolate the effects of emigration, I limit high-migration states to those with emigration rates in the top three deciles of non-border states and low-migration states to those with emigration rates in the bottom three deciles of non-border states.[10] In 2000, 11% of households in the six high-migration states had sent a migrant to the United States in the previous five years, compared with only 2% of households in the six low-migration states.

3. Summary Statistics on Wages and Labor-Force Participation

The most direct effect of foreign labor outflows has been to reduce the population of young adults born in high-migration states. Figures 5 and 6 show cohort sizes based on age in 2000 for males and females born in high-migration or low-migration states. In the absence of measurement error, changes in population size are due to either net migration abroad or to death. Cohort sizes decline for all age-sex groups, except 10-19 year olds. Population declines are largest for 20-29 year-old men (men born between 1971 and 1980) in high-migration states, whose number declines by a whopping 37 log points. For those born in low-migration states, the number of 20-29 year-old men drops by the smaller-yet-still-impressive value of 14 log points, such that the relative decline of the 20-29 year-old male population in high-migration states over 1990-2000 is 23 log points. Overall, the population of 20-59 year-old men declines by 9 log points for high-migration relative to low-migration birth states.

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[10] From this group, I drop the Federal District (Mexico City) from low-migration states (since this state has the highest per capita income in Mexico and is highly exposed to globalization; other low-migration states are poor, located in southern Mexico, and little exposed to globalization); and I drop Jalisco from high-migration states (since this state has Mexico's second largest city, which has also been highly exposed to globalization). The results are unchanged when these two states are added to the sample.

Absolute and relative changes for female cohorts are smaller. The cohort of 20-29 year-old women declines by 18 log points in high-migration states and 5 log points in low-migration states. Overall, the population of 20-59 year-old women declines by 7 log points in high-migration relative to log-migration states. Larger declines in the male population are consistent with the relatively high emigration rates for men in Table 1. Since we lack data on households with migrants abroad in 1990, we cannot perform the same analysis, comparing 1990 and 2000, at the household level.

One might expect the educational profile of individuals to differ according to the migration status of their households. Chiquiar and Hanson (2005) show that in Mexico individuals with moderately high education levels are those most likely to migrate to the United States. If schooling is correlated across individuals within households, then individuals living in migrant households may tend to have relatively high education levels. On the other hand, if households tend to send their more-educated members abroad, those remaining in migrant households may tend to have lower education levels than individuals in households without foreign migrants.

Table 4 shows the distribution of schooling by age cohort in 2000 for individuals in rural areas, who live in households either with or without migrants in the United States. Individuals who live in households that receive remittances from abroad are moderately over-represented in the 1-to-5-year-of-schooling group and under-represented in higher-schooling other groups. Among 30-39 year-old men in 2000, 34% had completed nine or more years of schooling in households without migrants abroad, versus 31% in households with migrants abroad. For women, these figures are 26% and 23%,

respectively. A similar pattern is revealed when separating households by whether they have sent a migrant to the United States in the last five years.

Repeating the analysis for high-migration and low-migration states, Table 5 shows the distribution of schooling by age cohort in 2000 for individuals born in these two groups of Mexican states. For men, average schooling is similar in low-migration and high-migration states. Among 30-39 year-old men in 2000, 47% had completed nine or more years of schooling in low-migration states, versus 46% in high-migration states. For women, these figures are 40% and 41%, respectively.

Despite comparable education levels in high and low-migration states, wages appear to be higher in high-migration states.[11] Figure 7 shows kernel densities for log average hourly wages. In 1990, wages have lower dispersion and a higher mean in high-migration states when compared to low-migration states. In 2000, these features are more pronounced. Relative to low-migration states, the wage density in high-migration states shows a distinct rightward shift, indicating positive relative wage growth.

The reported wage densities do not control for differences in the distribution of characteristics across regions. Hanson (2005) finds that after controlling for differences in age, education, and other observable characteristics, wages are higher in high-migration states and over the 1990s increase in high-migration states relative to low-migration states. Between 1990 and 2000, wages grow by 9% more on average for men in high-migration states, relative to low-migration states. Relative wage gains are even larger among male workers with higher education levels (9 to 15 years of schooling).

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[11] Average hourly wages are calculated as monthly labor income/(4.5*hours worked last week). I need to assume individuals work all weeks of a month, which could bias wage estimates downwards. To avoid measurement error associated with implausibly low wage values or with top coding of earnings, I restrict the sample to be individuals with hourly wages between $0.05 and $20 in Mexico (in 2000 U.S. dollars). This restriction is nearly identical to dropping the largest and smallest 0.5% of wage values.

The increase in relative wages in high-migration states is consistent with the decrease in the supply of labor in high-migration states relative to low-migration states, which is evident in Figures 5 and 6.

Table 6 shows the fraction of 30-49 year old men and women with positive labor earnings by schooling group in rural households with and without migrants in the United States. Individuals have uniformly lower labor-force participation rates in households that either receive remittances (relative to households that don't) or that have sent migrants to the United States (relative to households that haven't). This is suggestive evidence that incentives to participate in the labor force are lower in households that have sent migrants to the United States, which would be consistent with greater intra-household specialization in migrant-sending households. However, this interpretation is subject to the caveat that differences in unobserved characteristics between households with and without migrants may contribute to differences in their labor-supply behavior.

Table 7 shows the fraction of 30-49 year old men and women with positive labor earnings by schooling group in high-migration and low-migration states. Among individuals with low schooling levels, men tend to have slightly lower labor-force participation in high-migration states. This pattern is evident in both 1990 and 2000. Among individuals with high schooling levels, labor-force participation is very similar in the two groups of states. For women, labor-force participation is much lower overall. Labor-force participation appears to be modestly lower in high-migration states in 2000, but not in 1990. Given sharply higher wages in high-migration states, similar labor-force participation rates in high-migration and low-migration states are perhaps surprising. This is additional suggestive evidence that households in migrant-sending regions may

tend to be more specialized in home production than households in other regions. In the next section, we examine differences in labor-force participation across households and between regions in more detail.

4. Emigration and Labor-Force Participation

4.1 Rural Households in 2000

Emigration may affect the labor-supply decision through several channels. For men and women, higher emigration may put upward pressure on wages, making it more likely that they supply labor outside the home. Within the household, sending migrants abroad may increase remittances to the household, raising incomes among family members in Mexico. Previous research has shown that higher household income is often associated with lower female labor supply (Altonji and Blank, 1999). For women, then, the impact of emigration on the labor-supply decision is ambiguous, depending in part on whether they substitute for emigrant labor in the Mexican labor market and on whether emigration increases household income through remittances.

To examine these channels, I estimate the labor-force participation and the labor-hours decisions as functions of individual characteristics, household characteristics, and regional characteristics. Following a large academic literature, I model the labor-supply decision in reduced-form. Coefficients indicate which types of individual, household, or regional characteristics tend to be associated with higher returns in the labor-market (which would tend to increase labor supply, as long as substitution effects dominate income effects in the labor-leisure choice) or higher family income (which would tend to decrease labor supply, particularly for women).

In one exercise, I use cross-section data on household migration behavior from the 2000 population census to estimate the following regression for labor hours,

$$y_{hs} = \alpha_s + X_{hs}\beta_1 + \beta_2 \, \text{Remitt}_{hs} + \varepsilon_{hst} \qquad (15)$$

where y is labor hours worked last week, X is a vector of observed characteristics, and Remit is a dummy variable indicating whether or not the household receives remittances from migrants in the United States (which is replaced in some regressions with the variable Has Migrant in U.S., to indicate whether a household has sent a migrant abroad in the last five years). The regression includes controls for state-of-birth fixed effects and adjusts standard errors for correlation across observations associated with the same birth state. I estimate equation (15) as a tobit, given that hours worked are zero for many individuals. In a second exercise, I estimate an analogous probit regression in which the dependent variable is a dichotomous outcome on whether or not an individual participates in the labor force. The sample is individuals living in rural households in 2000.

Table 8 shows regressions for whether an individual supplies labor outside the home. Labor-force participation is measured by whether the individual earns positive labor income; labor hours are measured by the reported number of hours an individual supplied for remunerated work in the previous week. The regressors are a quartic in age, dummy variables for schooling, dummy variables for the number of children in the household, dummy variables for state of birth, and an indicator of whether the household has sent a migrant to the United States in the last five years or whether the household has received remittances from migrants abroad in the last month.

In households that have sent migrants to the United States, the coefficient estimates indicate that men are 11% less likely and women are 2.5% less likely to supply

labor outside the home, with both effects precisely estimated.[12] It is surprising that the estimated effects are so much larger for men than for women. For women, the results are consistent with sending migrants abroad leading to higher family income and lower female labor supply. Since a relatively large fraction of the migrants households send abroad are men, the results for them are harder to interpret. It could be that higher household income associated with remittances lowers male labor supply. It could also be that the members households choose to finance to go abroad or those most likely to work outside the home. The men remaining in Mexico could be individuals whose unobserved characteristics make them less likely to work for a wage (where this effect may operate for women, as well). Given these concerns, one may suspect the results are telling us more about the correlation between unobservables and labor supply than about the impact of migration behavior on labor supply.

The results for remittances are quite similar, indicating that in households that receive remittances from abroad men are 11% less likely to work outside the home and women are 2.2% less likely to work outside the home, with both effects precisely estimated. Again, it is surprising that the effects are so much larger for men.

Turning to labor hours, the second panel of Table 8 shows tobit regression results for hours worked in the previous week. Individuals in households that either have sent migrants abroad or received remittances from migrants abroad tend to supply fewer labor hours than individuals in non-migrant households. These effects are precisely estimated both for the Has Migrant in U.S. variable and for the Received Remittances variable. The coefficient magnitudes are larger for women, consistent with previous literature.

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[12] These probabilities are based on mean values for the other regressors.

One might be concerned that the results are driven by unobserved differences in household wealth. In rural households, wealth is likely to be correlated with the education of household members. To continue beyond primary school (six years of education), individuals in many rural areas may have to relocate to a small or medium size town in order to gain access to a secondary school. In the second four columns of Table 8, I restrict the sample to individuals with 6 or fewer years of education. For both labor-force participation and labor hours, these results are very similar to those in the first four columns. One might also be concerned that the migration variables are picking up unobserved differences in household access to migration networks, rather than with the impact of migration itself. In the third four columns of Table 8, I restrict the sample to rural households in high-migration states. Presumably, there is less variation across households in access to migration networks in this sample. Again, the results are very similar to those in the first four columns of Table 8.

To return to the earlier discussion, the cross-section results in Table 8 are subject to concerns about the unobserved determinants of household migration behavior. The problem is that the unobserved characteristics of households that are correlated with labor supply may also be correlated with the household decision to send migrants abroad. For instance, households with higher unobserved sources of income may be more likely to have sent migrants to the United States (since higher income makes it easier to finance migration costs) and less likely to have mothers in the household work outside the home (since higher income may lower the shadow value of female earnings for the household). As an attempt to deal with selection into migration by households, I redo the analysis for

individuals from high-migration or low-migration birth states, where birth state serves as a reduced-form determinant of access to migration networks.

4.2 High-Migration and Low-Migration States in 1990 and 2000

In my alternative estimation strategy, I pool data across households in 1990 and 2000 and limit the sample to individuals living in rural areas who were born in either a high-migration state or a low-migration state. I then see whether labor-supply behavior changes differentially between high-migration and low-migration states over the 1990s. For hours worked, I estimate the following regression,

$$y_{hst} = \alpha_s + X_{hst}(\beta_1 + \beta_2 Y2000_{ht} + \beta_3 High_{hs}) + \phi * Y2000_{ht} * High_{hs} + \varepsilon_{hst}$$

(15)

where y is hours worked last week, X is a vector of observed characteristics, Y2000 is a dummy variable for the year 2000, and High is a dummy variable for whether an individual was born in a high-migration state. The regression includes controls for state-of-birth fixed effects and allows returns to observable characteristics to vary across regions and time. The coefficient, φ, captures the mean differential 1990-to-2000 change in earnings between high and low-migration states. I also estimate an analogous probit regression in which the dependent variable is a dichotomous outcome on whether or not an individual participates in the labor force. Standard errors are adjusted for correlation across observations associated with the same birth state.

One important estimation issue is that shocks other than emigration may have had differential impacts on high and low-migration states. I've already discussed the shock associated with NAFTA and trade reform more generally. Other shocks in the 1990's

include a currency crisis in 1995, a reform of the land-tenure system, privatization of state-owned enterprises, and industry deregulation. The existence of these shocks leaves the results subject to the caveat that factors other than emigration may have contributed to differential regional changes in earnings.

Table 9 reports the results. The results for women are quite similar to those in Table 8 but the results for men differ sharply. For women, there is an increase in the differential between high-migration and low-migration states in labor-force participation over the 1990-2000 period. The coefficient estimates indicate (based on mean values for the other regressors) that over the 1990s women in high-migration states become 2.2% less likely to work outside the home, where this change is precisely estimated. For men, there is no statistically significant change in their labor-force participation behavior between 1990 and 2000 in high-migration versus low-migration states. Limiting the sample to individuals with six or fewer years of education, the results are unchanged. This is additional evidence that, despite wage increases in high-migration states, women in these states became less likely to work outside the home. Consistent with the cross-sectional results for 2000, it appears migration abroad contributes to greater within-household specialization, with women devoting less time to work outside the home.

For labor hours, the results for women in Table 9 are also consistent with those in Table 8. Over the 1990s, women born in high-migration states reduce labor hours relative to women born in low-migration states, with this effect precisely estimated both in the full sample and in the sample of individuals with a primary education or less. For men, there is also a reduction in labor supply in high-migration states relative to low-migration states, but the effect is much smaller than that for women. As with the 2000

cross-section results, this finding is surprising. Relative to low-migration states, we would expect to see male relative labor supply increase in high-migration states in response to the observed increase in high-migration state relative wages.

Overall, there is some evidence that emigration is associated with lower household labor supply. Women are less likely to work outside the home in households with migrants abroad and show a decrease in the likelihood of working outside the home in high-migration states relative to low-migration states. If remittances raise household income, then these results are to be expected. In effect, households may be using their extra income to buy back labor time of women remaining in Mexico. However, we also see indication that emigration is associated with lower male labor supply. This is surprising and counterintuitive. Since male wages are rising in relative terms in high-migration states, we would expect to see increases rather than decreases in relative male labor supply. The results for men may indicate that neither regression approach I employ sufficiently accounts for correlation between unobservables and migration behavior.

5. Discussion

In this paper, I examine how emigration may have affected adult labor force participation in Mexico. To investigate the issue, I employ two estimation strategies, one of which exploits data on household migration behavior in Mexico's 2000 population census and the other of which exploits strong persistence of regional differences within Mexico in the likelihood of emigrating to the United States. A key concern in the empirical analysis is how to account for unobserved characteristics of households that may influence both labor-supply and migration behavior.

As in earlier decades, during the 1990s individuals born in Mexico's high-migration states appear to have a high propensity to migrate abroad. Between 1990 and 2000, the population of 20-59 year-old men born in high-migration states declined by 9 log points relative to similarly aged men born in low-migration states. For women, the corresponding relative regional change in population was 7 log points. Most of these population changes appear due to emigration. Mishra (2004) and Hanson (2005) find that emigration-induced reductions in labor supply have raised wages in Mexico.

In cross-section results for 2000, women in households either with migrants abroad or receiving remittances from abroad are less likely to work outside the home and supply fewer labor hours overall. Comparing 1990 and 2000, women from high-migration states in Mexico become less likely to work outside the home and reduce their total labor hours (relative to women from low-migration states). This pattern of behavior is consistent with households choosing to reduce female labor supply in response to emigration-induced increases in family income or regional income. That is, emigration appears to be associated with greater intra-household specialization.

What casts some doubt on this interpretation is that, at least in the cross-section regressions for 2000, the results for men and women are similar. This is surprising since previous literature would suggest that higher wages associated with emigration would increase male labor supply. One interpretation of the results for men (and possibly for women) is that they reveal information about self-selection into migration. In households that send migrants abroad, the men that remain in Mexico may be individuals whose unobserved characteristics make them less able or less willing to work outside the home. Similarly, in states that send large numbers of migrants to the United States, the men that

choose not to migrate abroad may be those whose labor-market opportunities, either in Mexico or the United States, are relatively unattractive.

Concerns about self-selection into migration make it necessary to qualify the empirical results in this paper. We can say that I find suggestive evidence of a relationship between emigration and within-household specialization. To remove the qualification, we would need longitudinal data on households that would allow us to examine changes in within-household migration behavior over time.

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Table 1: Share of U.S. Immigrants from Mexico in the Population of Mexico (%)

Age Cohort		Males % Residing in U.S.			Females % Residing in U.S.		
Age in 1990	Age in 2000	1990	2000	Change	1990	2000	Change
--	16 to 25	--	11.99	--	--	7.68	--
16 to 25	26 to 35	7.57	17.53	9.96	4.89	12.62	7.73
26 to 35	36 to 45	10.87	15.49	4.62	7.69	11.90	4.21
36 to45	46 to 55	9.18	12.21	3.03	7.47	10.44	2.97
46 to 55	56 to 65	7.00	8.64	1.64	6.44	8.36	1.92
56 to 65	--	5.70	--	--	5.84	--	--

This table shows Mexican immigrants in the U.S. as a percentage of the population of individuals born in Mexico (equal to the sum of the Mexico-born population residing in Mexico and the Mexico-born population residing in the United States) by age and sex categories. The sample is individuals 16-65 years old (in the U.S., excluding those in group quarters; in Mexico, excluding those not born in the country). Residents of Mexico in 1990 are the 1% microsample of the *XII Censo General de Poblacion y Vivienda, 1990,* and in 2000 are a 10% random sample of the 10% microsample of the *XIII Censo General de Poblacion y Vivienda, 2000*. Mexican immigrants are from the 1990 and 2000 5% U.S. Public Use Microsample. Source: Chiquiar and Hanson (2005).

Table 2: Emigration and Characteristics of Mexican States

	Migration to U.S. 1995-2000				Households Receiving Remittances 2000			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.231	0.169	0.211	0.175	0.069	0.064	0.082	0.071
	(0.085)	(0.085)	(0.098)	(0.077)	(0.032)	(0.031)	(0.035)	(0.028)
Log Per Capita GDP in 1995	-0.025	-0.036	-0.03	-0.017	-0.007	-0.012	-0.010	-0.006
	(0.011)	(0.011)	(0.011)	(0.009)	(0.004)	(0.004)	(0.004)	(0.003)
Log Distance to U.S.		0.070	0.006	-0.025		0.024	-0.003	-0.013
		(0.027)	(0.029)	(0.026)		(0.009)	(0.010)	(0.009)
Log Distance to U.S.^{2}		-0.007	0.000	0.003		-0.003	0.000	0.001
		(0.003)	(0.003)	(0.003)		(0.001)	(0.001)	(0.001)
Migration Rate 1924			32.813	4.295			13.835	4.653
			(10.210)	(10.210)			(3.435)	(4.116)
Migration Rate 1955-59				1.919				0.618
				(0.386)				(0.128)
Adjusted R^2	0.116	0.252	0.456	0.667	0.072	0.228	0.504	0.670
N	32	32	32	32	32	32	32	32

The sample is the 31 states of Mexico plus the Federal District. In columns 1-4, the dependent variable is the average share of households in a state that had sent a migrant to the United States in the 1995-2000 period; in columns 5-8, the dependent variable is the share households in a state in 2000 that had reported receiving remittances from migrants located abroad in the previous month. Standard errors are in parentheses.

Table 3: Ranking Mexican States by Historical Emigration Rates

	State	Migration Rate 1995-2000	Migration Rate 1955-1959	Per Capita GDP 1995	Pop. 2000 ('000s)
High Migration	Aguascalientes	0.090	0.032	1,728	952
	Durango	0.093	0.055	1,329	1,440
	Guanajuato	0.114	0.041	1,062	4,604
	Michoacán	0.130	0.031	901	3,921
	San Luis Potosí	0.087	0.025	1,094	2,362
	Zacatecas	0.151	0.059	878	1,348
	Mean	0.114	0.038	1,077	2,438
Low Migration	Campeche	0.011	0.000	2,341	680
	Chiapas	0.009	0.000	678	3,877
	Quintana Roo	0.009	0.000	2,437	876
	Tabasco	0.007	0.002	951	1,911
	Veracruz	0.037	0.000	912	6,923
	Yucatán	0.013	0.002	1,159	1,646
	Mean	0.021	0.001	1,030	2,652
Other Non-Border States		0.049	0.007	1,096	2,925
Border States		0.032	0.020	2,054	2,759

This table shows rates of migration to the United States, per capita GDP, and population for Mexican states. Means are weighted by the 2000 population of the subgroup.

Table 4: Schooling by Age, Gender, and Household Migration Status, 2000

Sex	Age	Receives Remittances	Years of Schooling
			0	1-5	6-8	9-11	12-15	16+
Men	3039	No	0.082	0.284	0.294	0.207	0.087	0.047
	4049	No	0.145	0.411	0.267	0.091	0.047	0.039
	5059	No	0.254	0.488	0.174	0.048	0.019	0.018
	3039	Yes	0.106	0.322	0.263	0.22	0.062	0.026
	4049	Yes	0.138	0.534	0.209	0.075	0.032	0.012
	5059	Yes	0.254	0.558	0.141	0.033	0.011	0.004
Women	3039	No	0.119	0.32	0.298	0.156	0.074	0.034
	4049	No	0.22	0.442	0.225	0.067	0.032	0.015
	5059	No	0.356	0.461	0.13	0.033	0.013	0.006
	3039	Yes	0.065	0.38	0.326	0.165	0.052	0.012
	4049	Yes	0.14	0.554	0.25	0.035	0.016	0.005
	5059	Yes	0.243	0.571	0.154	0.017	0.005	0.01

Sex	Age	Has US Migrant	Years of Schooling
			0	1-5	6-8	9-11	12-15	16+
Men	3039	No	0.083	0.283	0.293	0.206	0.086	0.048
	4049	No	0.145	0.406	0.267	0.094	0.049	0.041
	5059	No	0.256	0.486	0.173	0.048	0.018	0.019
	3039	Yes	0.069	0.306	0.3	0.212	0.091	0.022
	4049	Yes	0.139	0.514	0.256	0.053	0.024	0.014
	5059	Yes	0.235	0.534	0.159	0.041	0.024	0.007
Women	3039	No	0.12	0.318	0.297	0.158	0.075	0.033
	4049	No	0.222	0.435	0.225	0.068	0.033	0.016
	5059	No	0.362	0.455	0.129	0.033	0.014	0.006
	3039	Yes	0.074	0.385	0.322	0.137	0.056	0.026
	4049	Yes	0.173	0.534	0.23	0.047	0.011	0.006
	5059	Yes	0.265	0.552	0.148	0.025	0.005	0.005

This table shows the distribution of educational attainment for individuals in rural Mexico in 2000 by age and by whether an individual's household received remittances from the United States in the last month or sent a migrant to the United States in the last five years.

Table 5: Schooling by Age Cohort in High-Migration and Low-Migration States, 2000

Sex	State Migration Rate	2000 Age Cohort	Years of Schooling					
			0	1-5	6-8	9-11	12-15	16+
Men	Low	30-39	0.072	0.220	0.238	0.218	0.147	0.104
	Low	40-49	0.108	0.307	0.253	0.127	0.089	0.116
	Low	50-59	0.182	0.404	0.213	0.075	0.056	0.070
	High	30-39	0.052	0.215	0.274	0.233	0.129	0.097
	High	40-49	0.090	0.292	0.288	0.142	0.082	0.106
	High	50-59	0.174	0.386	0.235	0.089	0.050	0.065
Women	Low	30-39	0.113	0.261	0.225	0.186	0.131	0.084
	Low	40-49	0.177	0.353	0.231	0.105	0.076	0.057
	Low	50-59	0.301	0.367	0.195	0.067	0.048	0.022
	High	30-39	0.060	0.236	0.298	0.205	0.135	0.066
	High	40-49	0.113	0.364	0.283	0.116	0.079	0.044
	High	50-59	0.218	0.414	0.216	0.083	0.052	0.017

This table shows the distribution of educational attainment by age cohort for individuals 30-59 years old in 2000 born in high-migration or low-migration Mexican states (based on 1955-1959 emigration rates).

Table 6: Labor Force Participation by Household Migration Status

Years of Schooling	Men						Women					
	Remittances			Has Migrant in US			Remittances			Has Migrant in US		
	No	Yes	Diff.	No	Yes	Diff.	No	Yes	Diff.	No	Yes	Diff.
0	0.558	0.558	**0.000**	0.561	0.508	**-0.053**	0.127	0.091	**-0.036**	0.13	0.082	**-0.048**
1-5	0.615	0.519	**-0.096**	0.62	0.522	**-0.098**	0.144	0.118	**-0.026**	0.146	0.119	**-0.027**
6-8	0.676	0.414	**-0.262**	0.679	0.553	**-0.126**	0.184	0.172	**-0.012**	0.186	0.164	**-0.022**
9-11	0.752	0.698	**-0.054**	0.757	0.635	**-0.122**	0.278	0.235	**-0.043**	0.277	0.273	**-0.004**
12-15	0.817	0.714	**-0.103**	0.827	0.594	**-0.233**	0.501	0.359	**-0.142**	0.503	0.418	**-0.085**
16+	0.88	0.901	**0.021**	0.882	0.81	**-0.072**	0.762	0.743	**-0.019**	0.765	0.715	**-0.050**
Total	0.674	0.537	**-0.137**	0.679	0.552	**-0.127**	0.205	0.157	**-0.048**	0.207	0.16	**-0.047**

This table shows the fraction of 30-49 year olds with positive labor earnings by sex, years of schooling, and whether an individual's household received remittances from the United States in the last month or sent a migrant to the United States in the last five years.

Table 7: Labor Force Participation in High-Migration and Low-Migration States

Men Years of Schooling	1990 Migration State Low	High	Diff.	2000 Migration State Low	High	Diff.
0	0.663	0.612	**-0.052**	0.625	0.596	**-0.029**
1-5	0.713	0.677	**-0.036**	0.684	0.668	**-0.016**
6-8	0.748	0.741	**-0.007**	0.777	0.775	**-0.002**
9-11	0.757	0.761	**0.004**	0.837	0.831	**-0.006**
12-15	0.666	0.686	**0.020**	0.862	0.859	**-0.003**
16+	0.784	0.823	**0.039**	0.892	0.886	**-0.005**
Total	0.722	0.714	**-0.008**	0.774	0.767	**-0.007**

Women Years of Schooling	1990 Migration State Low	High	Diff.	2000 Migration State Low	High	Diff.
0	0.058	0.092	**0.033**	0.167	0.172	**0.004**
1-5	0.079	0.095	**0.016**	0.214	0.171	**-0.044**
6-8	0.156	0.150	**-0.006**	0.268	0.254	**-0.015**
9-11	0.289	0.284	**-0.005**	0.357	0.358	**0.001**
12-15	0.427	0.450	**0.022**	0.538	0.522	**-0.015**
16+	0.589	0.594	**0.005**	0.733	0.720	**-0.013**
Total	0.183	0.199	**0.016**	0.315	0.297	**-0.018**

This table shows the fraction of 30-49 year olds (based on age in 2000) that have positive labor earnings by year, sex, years of schooling completed, and whether an individual's birth state is high-migration or a low-migration.

Table 8: Labor Supply and Household Migration Behavior

Labor Force Participation

	Full Rural Sample				Primary Education or Less				High-Migration States			
	Men		Women		Men		Women		Men		Women	
Sent Migrant to US in Last 5 Years	**-0.292** (0.020)		**-0.103** (0.019)		**-0.271** (0.019)		**-0.091** (0.031)		**-0.344** (0.027)		**-0.108** (0.030)	
Received Remittances from US in Last Month		**-0.281** (0.038)		**-0.092** (0.040)		**-0.266** (0.043)		-0.076 (0.041)		**-0.223** (0.053)		-0.065 (0.049)
R	0.064	0.062	0.103	0.103	0.051	0.05	0.042	0.042	0.066	0.061	0.119	0.118
N	117,585	117,585	126,017	126,017	82,773	82,773	94,540	94,540	25,986	25,986	30,268	30,268

Hours Worked

	Full Rural Sample				Primary Education or Less				High-Migration States			
	Men		Women		Men		Women		Men		Women	
Sent Migrant to US in Last 5 Years	**-4.999** (0.336)		**-5.827** (0.762)		**-4.171** (0.392)		**-6.709** (1.024)		**-6.943** (0.570)		**-6.480** (1.262)	
Received Remittances from US in Last Month		**-6.633** (0.598)		**-8.008** (1.236)		**-6.025** (0.652)		**-8.154** (1.606)		**-7.700** (0.927)		**-9.278** (1.968)
R	0.006	0.006	0.024	0.024	0.006	0.006	0.013	0.013	0.007	0.006	0.032	0.032
N	117,585	117,585	126,017	126,017	82,773	82,773	94,540	94,540	25,986	25,986	30,268	30,268

The sample is individuals living in rural areas of Mexico aged 20-59 in 2000. The first table shows a probit on whether an individual has positive labor earnings. The second table shows a tobit on hours worked. "Sent Migrant to US" indicates whether the individual's household sent a migrant to the United States in the last five years. "Receives Remittances" indicates whether the individual's household received remittances from migrants living abroad in the last month. Other regressors are a quartic in age, dummy variables for schooling, dummy variables for the number of children in the household, and dummy variables for state of birth. Standard errors (in parentheses) are adjusted for correlation in the errors within birth states.

Table 9: Labor Supply in High-Migration and Low-Migration States, 1990-2000

| | Labor-Force Participation | | | | Hours Worked | | | |
| | Full Rural Sample | | Primary Education or Less | | Full Rural Sample | | Primary Education or Less | |
	Men	Women	Men	Women	Men	Women	Men	Women
Year 2000*	0.062	**-0.145**	0.065	**-0.172**	**-2.400**	**-8.484**	**-2.729**	**-11.546**
High Migration	(0.091)	(0.065)	(0.106)	(0.069)	(0.488)	(1.787)	(0.536)	(2.304)
R	0.049	0.139	0.039	0.067	0.006	0.049	0.006	0.034
N	59,201	62,271	48,469	54,163	59,201	62,271	48,469	54,163

This table reports results for probit (tobit) regressions in which the dependent variable equals one if an individual has positive labor earnings (hours worked). The sample is men and women living in rural communities in Mexico aged 20-49 in 1990 or 30-59 in 2000 born in a high-migration or a low-migration Mexican state. The other regressors are: (a) a quartic in age, dummy variables for five categories of educational attainment (1-5 years, 6-8 years, 9-11 years, 12-15 years, or 16+ years), a dummy variable for marital status, dummy variables for presence of children in the household (ages 0-5, 6-12, or 13-18 years), dummy variables for the state of birth, and a dummy variable for the year 2000; (b) interactions between the age, education, marital status, and children variables and the year 2000 dummy; and (c) interactions between the age, education, marital status, and children variables and a dummy variable for whether the individual was born in a high-migration state. Coefficients show the change in the probability of labor-force participation (change in hours worked) associated with an individual being from a high-migration state in 2000 versus that in 1990 (evaluated at means for other regressors in probit regressions). Standard errors (corrected for correlation in the errors within birth states) are in parentheses.
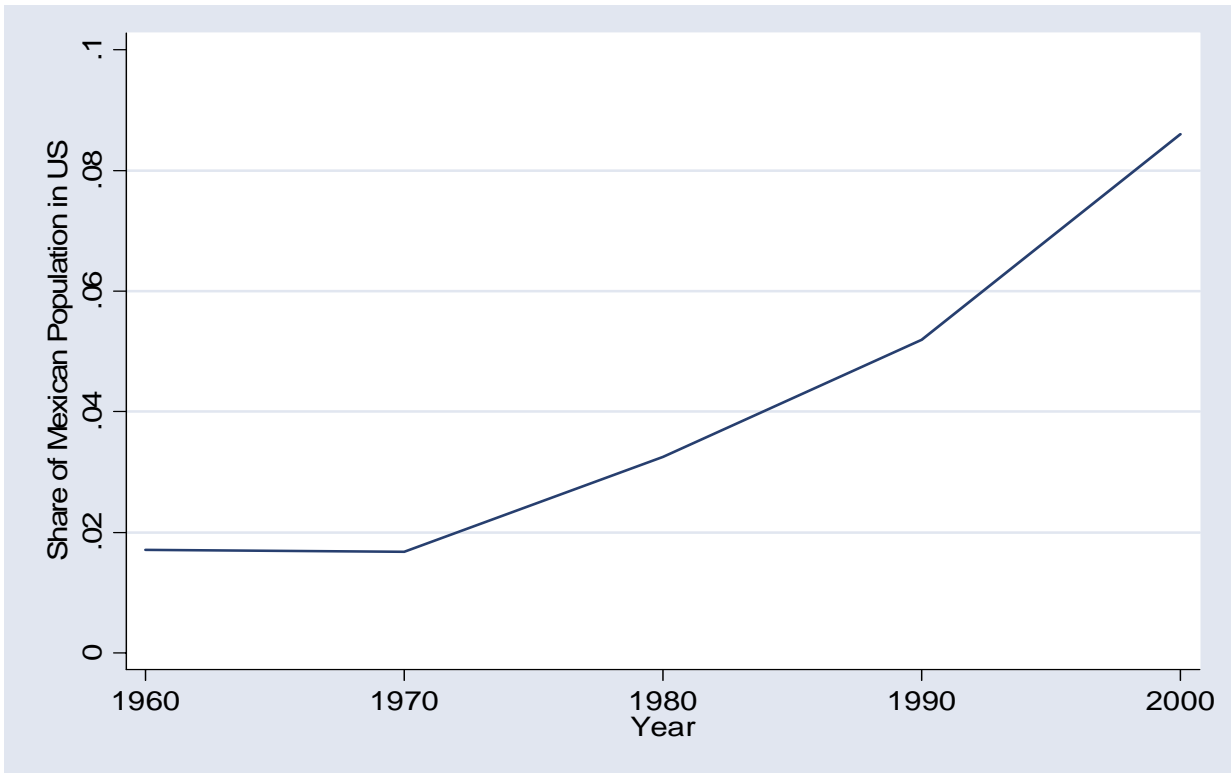
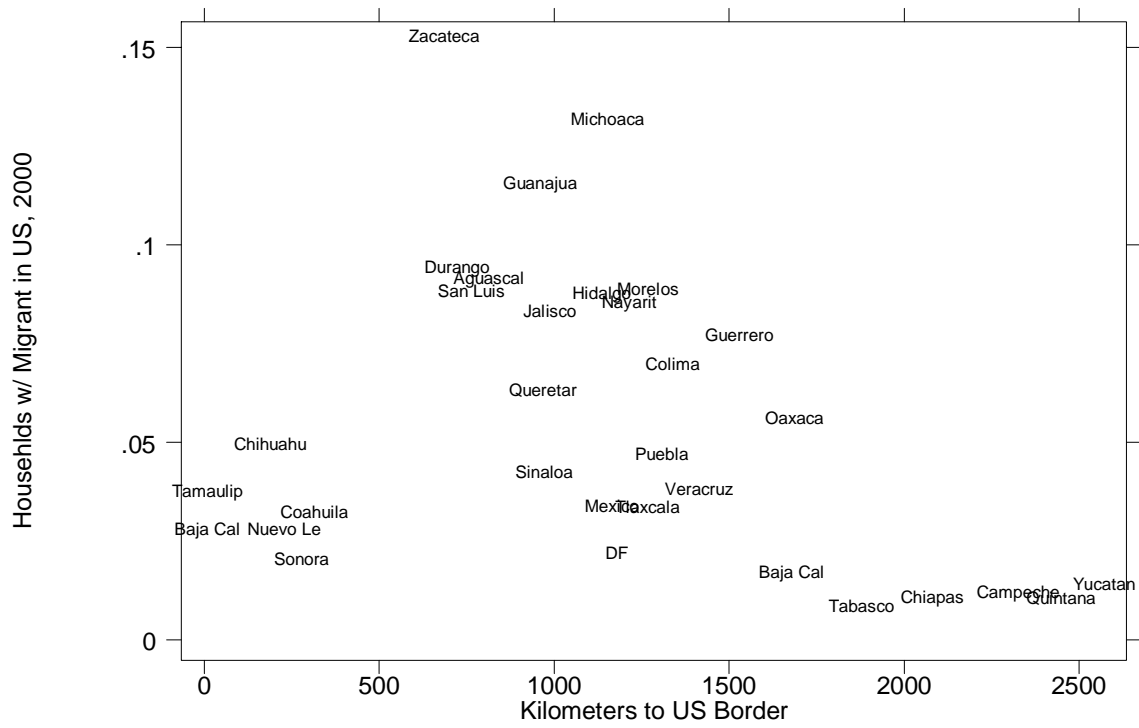**Figure 1: Share of Population Born in Mexico Residing in the U.S.**

Figure 2: Rate of Migration to the U.S. 1995-2000 by Mexican State
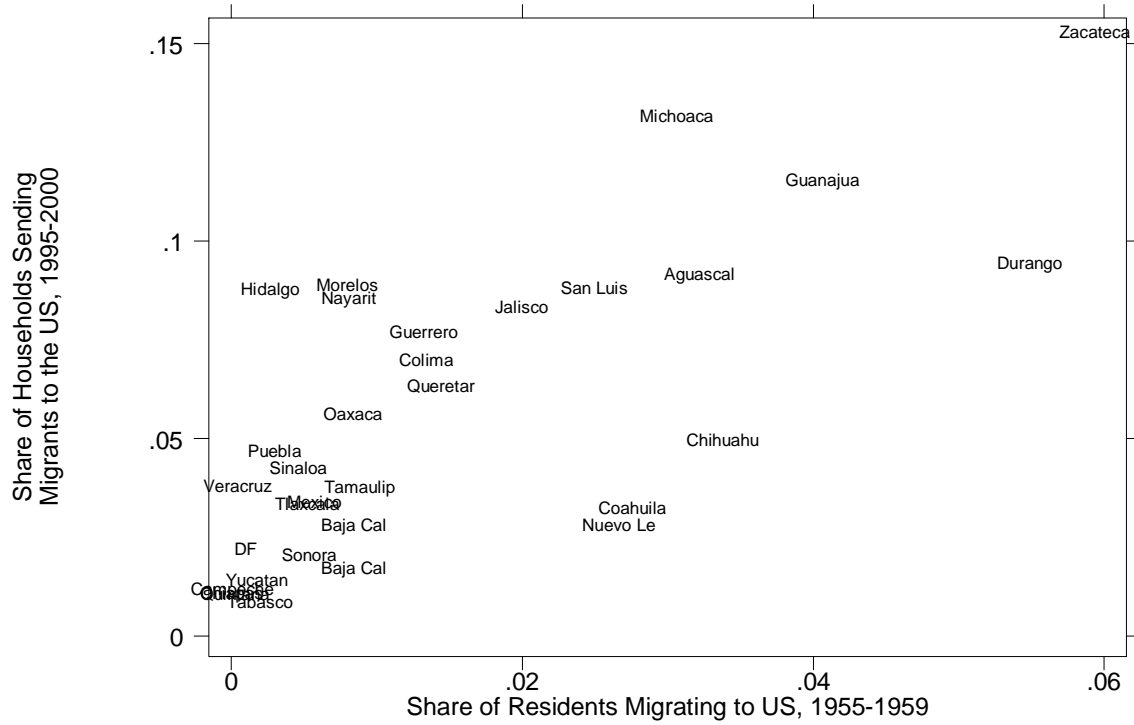
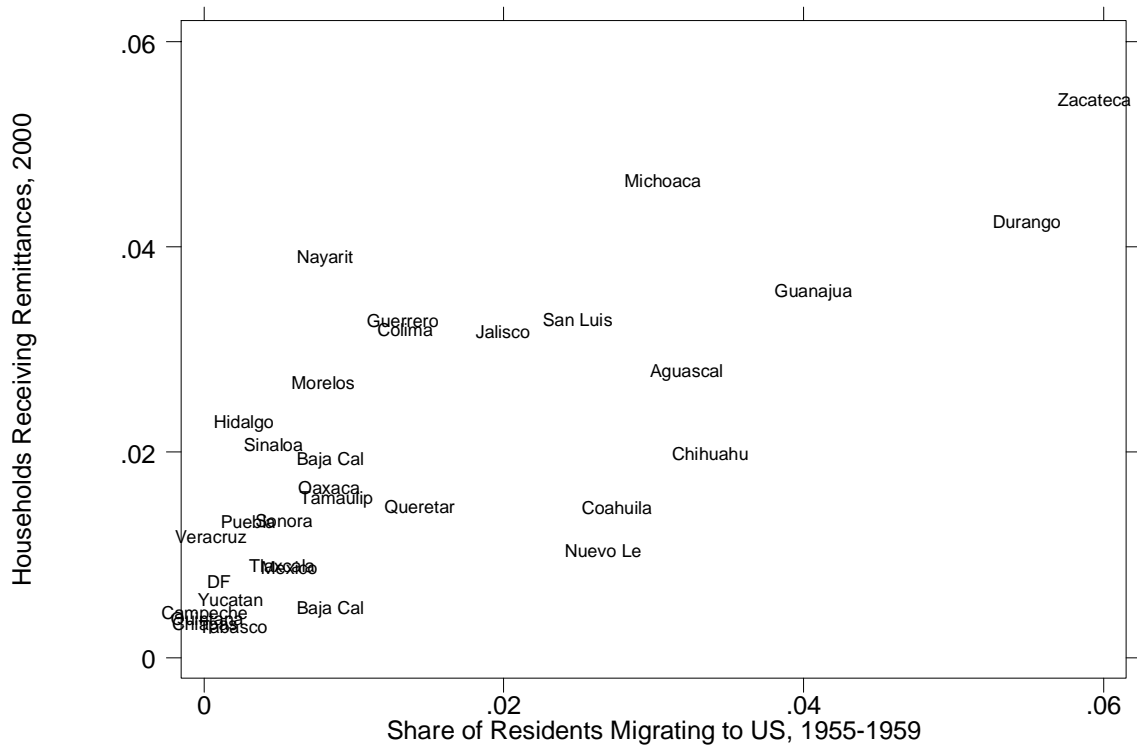**Figure 3: State Rates of Migration to the U.S. in 1990s versus 1950s**

Figure 4: Remittances and Historical Migration Rates to the U.S.
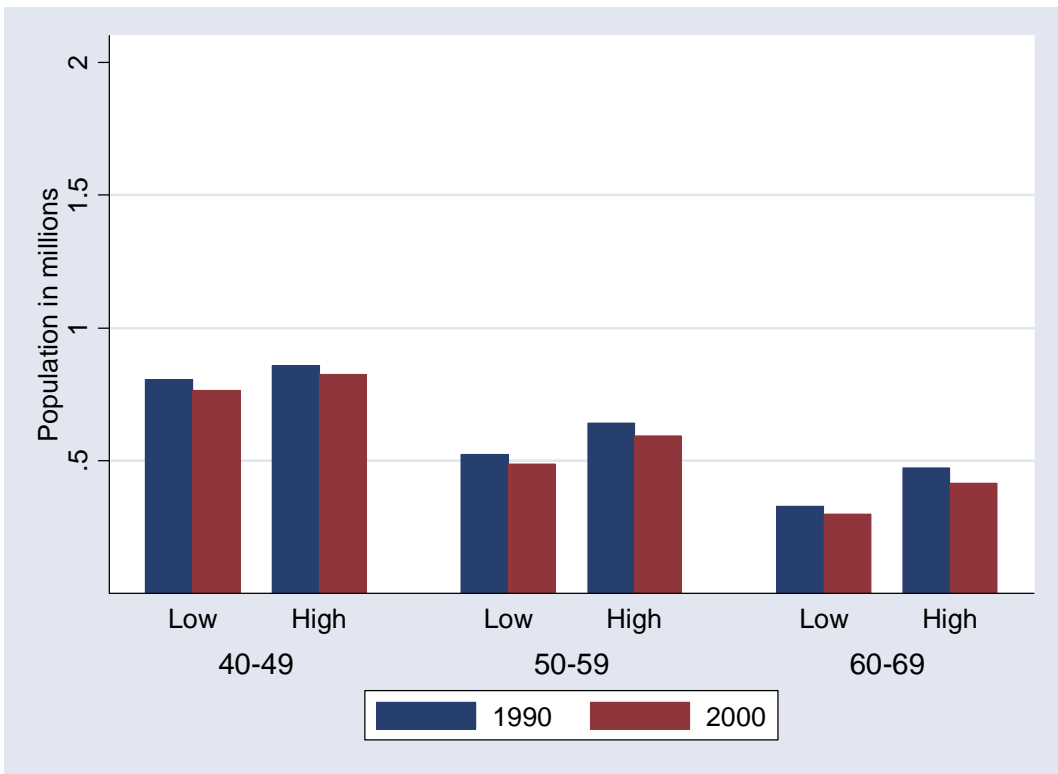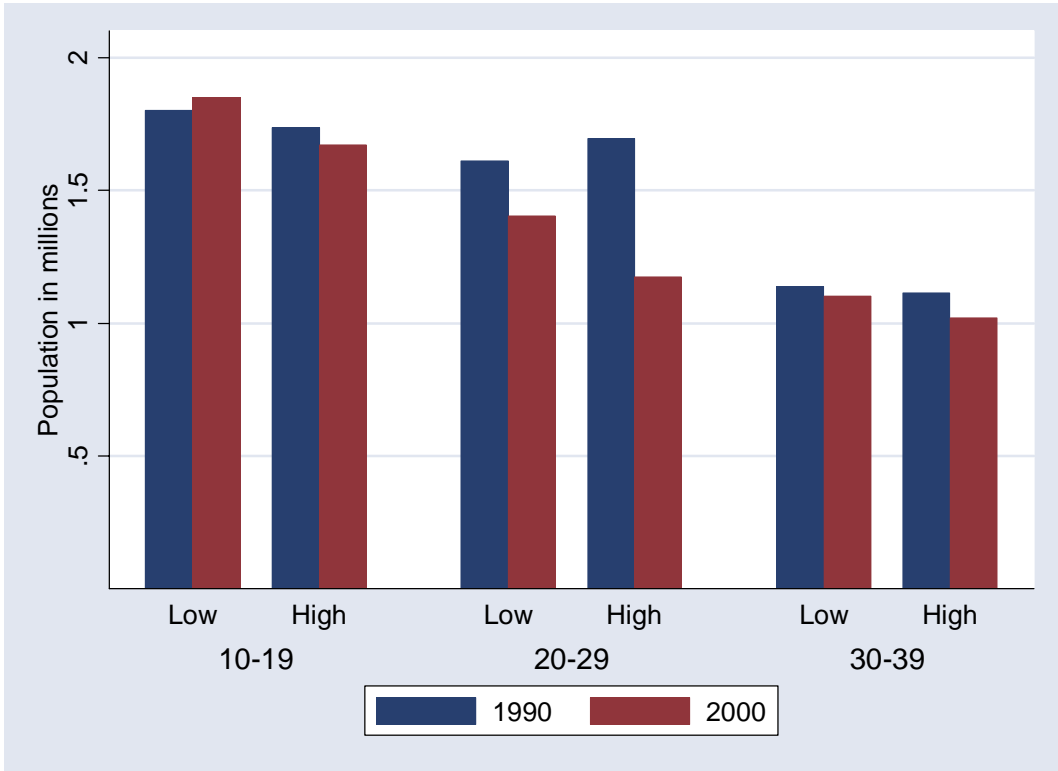
Figure 5:
Cohort Sizes for Men Born in High and Low-Migration States (Based on Age in 2000)
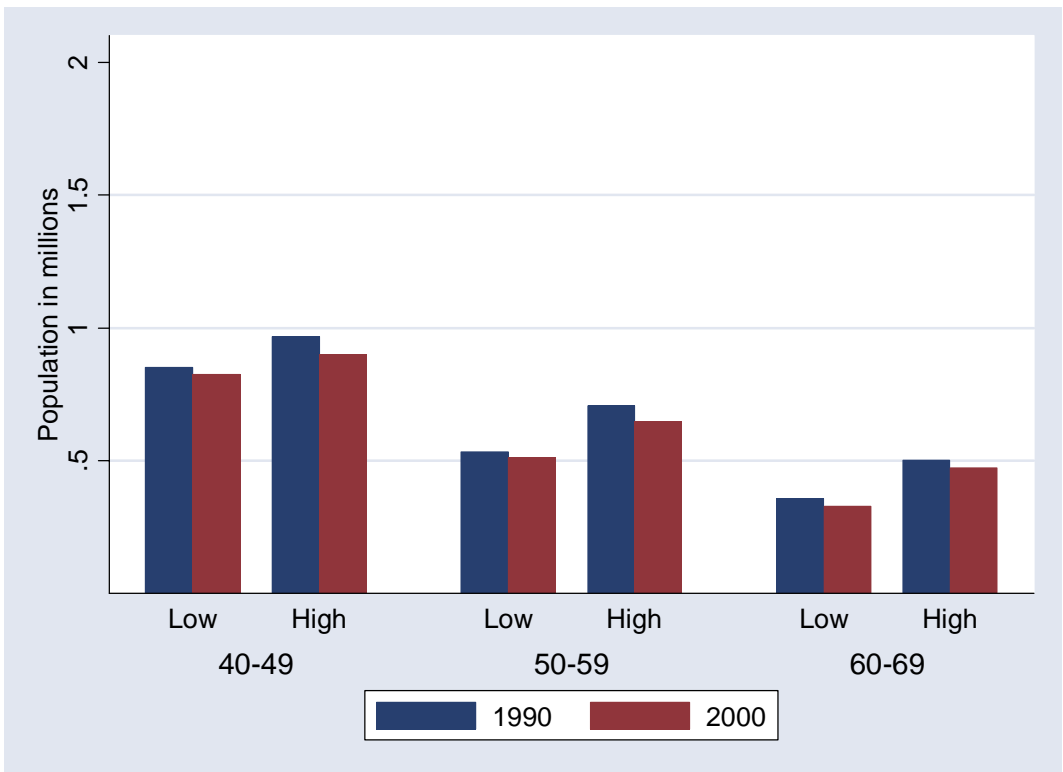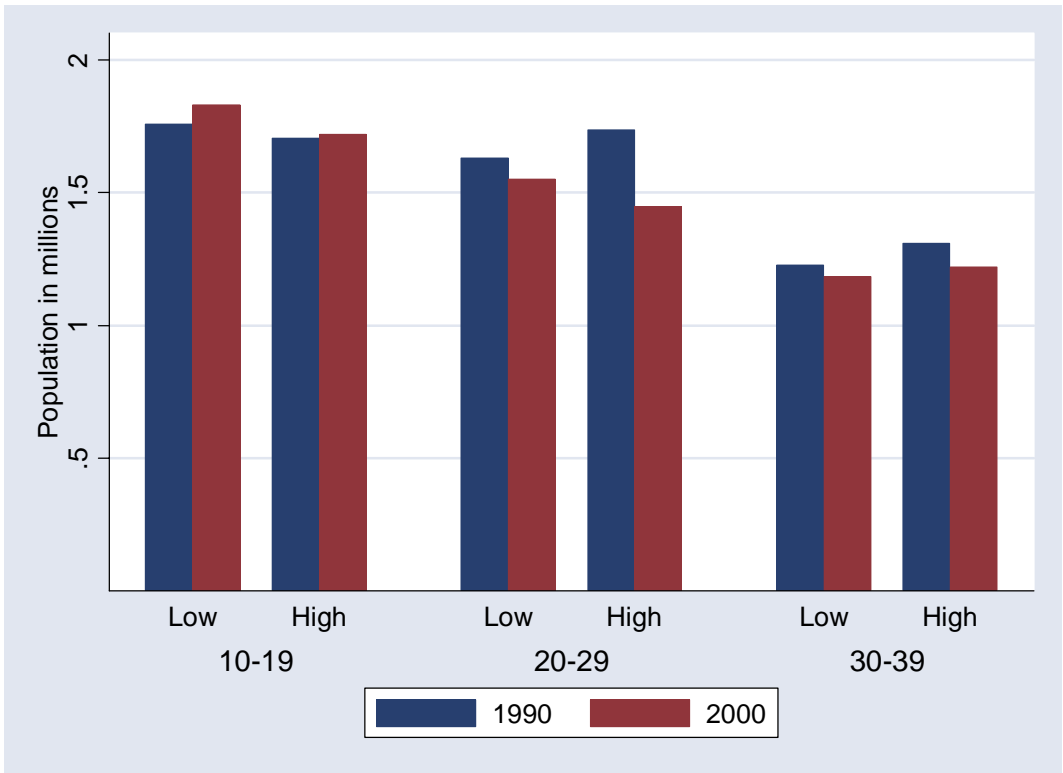
Figure 6:
Cohort Sizes for Women Born in High and Low-Migration States (Based on Age in 2000)
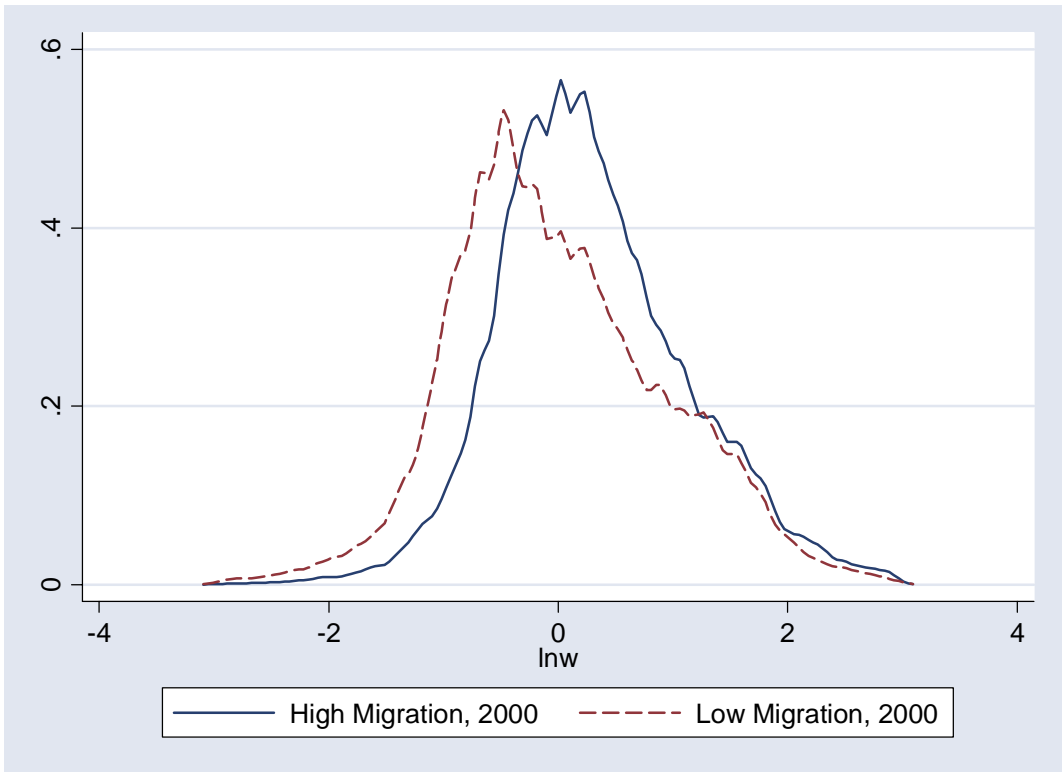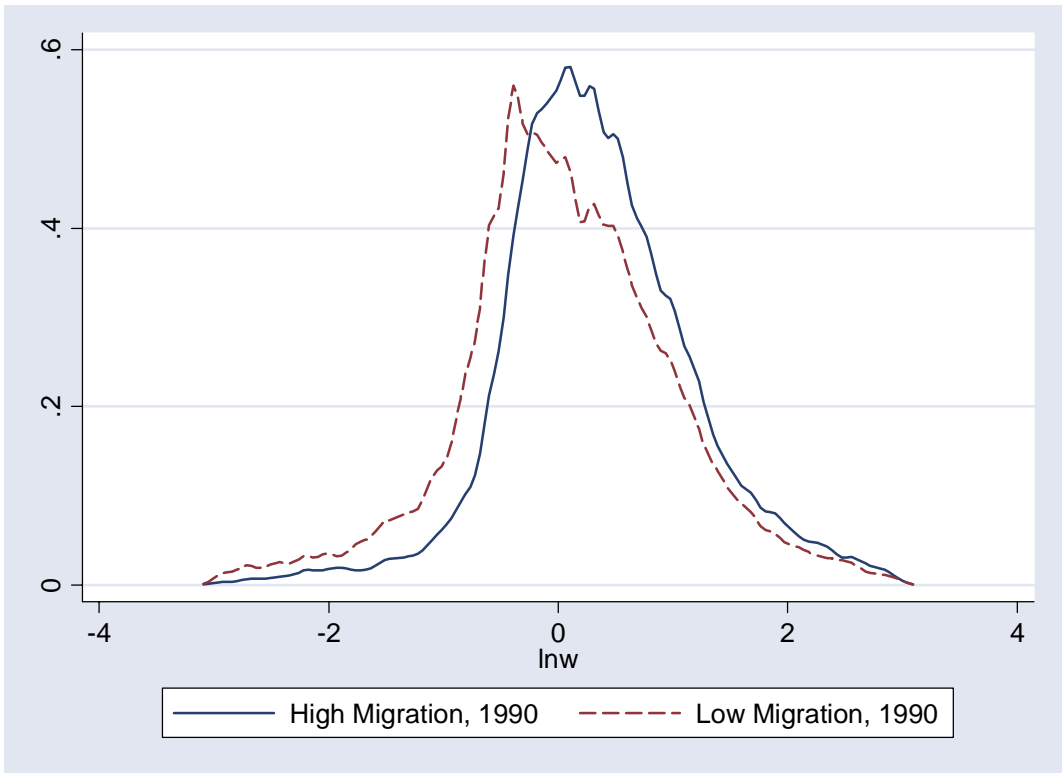
Figure 7: Kernel Densities for Log Wages in High-Migration and Low-Migration States