Published in final edited form as:
Popul Stud (Camb). 2013 ; 67(1): 83–95. doi:10.1080/00324728.2012.721518.

The impact of outmigration of men on fertility and marriage in the migrant-sending states of Mexico, 1995–2000

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Abstract

Using the 2000 Mexican Census, we examined whether the level of migration was associated with total fertility and the proportion of women married in 314 municipalities from seven traditional sending states. Across these municipalities, we observe lower fertility in higher-migration areas. Municipalities in the quartile with the highest levels of migration have total fertility more than half a child lower than municipalities in the lowest migration quartile. However, there are no differences in marital fertility by level of migration, indicating that lower proportions of women married account for lower total fertility in high-migration municipalities. In municipal-level regression models, lower sex ratios are associated with a lower proportion of women married, while there is an inverse association between education and marriage. The level of migration also has an independent association with marriage, suggesting that there may be changing ideas surrounding family formation in high-migration areas.

Keywords

international migration; fertility; marriage; Mexico; fertility determinants

Introduction

There has been a wealth of research on the process of outmigration from rural Mexican communities to the USA and the impact migration has had on these areas. The subjects of this research have included economic changes attributable to migration in sending communities, the effect of international migration on disability in old age, and the relationship between international migration and infant health and mortality (Durand et al.

1996; Kanaiaupuni and Donato 1999; Frank and Hummer 2002; Frank 2005; Wong and Gonzalez-Gonzalez 2010). In addition, several studies have examined the link between patterns of individual migratory moves and women's childbearing (Massey and Mullan 1984; Lindstrom and Giorguli Saucedo 2002, 2007). These studies have also assessed community-level factors in analyses of individual fertility outcomes, but they have not specifically examined the relationship between these factors and community-level fertility.

Although some of the same relationships that are found at the individual level may also be observed at the community level, others may no longer be apparent as a result of several countervailing individual-level processes. Moreover, individual-level and community-level studies differ in the metric of interest. At the individual level, the main outcome is the number of children a woman bears over her reproductive life course, while at the community level, the focus is on period fertility as measured by the total fertility rate (TFR). In this analysis, we explored the following questions: does the level of fertility in a community vary with the level of migration, and if so, how and why?

The level of migration in a community could influence local fertility rates through an effect on fertility within marriage, on non-marital fertility, or on the proportion of women who are married. Migration may alter fertility within marriage as a result of partner absences that may lower women's exposure to the risk of childbearing within marriage (Van de Walle 1975; Massey and Mullan 1984; Lindstrom and Giorguli Saucedo 2002). Married women in high-migration communities may also change their childbearing behaviour by having fewer children in order to migrate with their spouse and offset the costs of relocation (Lindstrom and Giorguli Saucedo 2007). Finally, married women in sending communities may adopt values and norms about family size and contraception that are disseminated by return migrants (Lindstrom and Giorguli Saucedo 2002). Overall, the literature suggests we would find lower marital fertility in higher-migration areas.

With regard to non-marital fertility, imbalances in the sex composition in communities in other settings have been associated with higher rates of illegitimate births, a result that has been attributed to women having lower bargaining power to encourage marriage in areas where women outnumber men (South and Lloyd 1992). However, shortages of men owing to migration might not lead to a sizeable increase in childbearing outside of unions in high-migration areas of Mexico. In rural areas, which are a major source of international migrants, pregnancies occurring outside marriage typically result in the formation of a consensual union before the child is born (Quilodrán 1991; Castro-Martin 2002).

Finally, the level of migration in a community has the potential to affect fertility by its impact on the proportion of women of reproductive age in marital unions. Given that most births in Mexico occur in marital unions, understanding any variation in marriage resulting from migration is key to understanding the relationship between migration and fertility. One way migration may affect marriage is by changing the local sex ratio. If migratory flows are dominated by men, as is the case for Mexico, the sex composition in the community is disrupted as men of marriageable age with whom women can form stable partnerships are regularly absent (Massey et al. 1987). A lower proportion of men in the community implies a worse marriage market for women, a rise in age at first marriage, and possibly changes in the proportion ever marrying (South and Lloyd 1992; Vanlandingham and Hirschman 2001; Angrist 2002; Guzzo 2006).

Research to date on Mexican sending communities has not found consistent evidence that an unbalanced marriage market brought about by migration affects marriage. In one analysis of marriage in Mexico (Parrado and Zenteno 2002), the sex ratio in the municipality was not associated with an increased age at marriage for men or women, although the insufficiency of marriage partners of acceptable quality (measured by educational attainment and occupational status) did increase age at marriage among women. In a later analysis, Parrado (2004) found that an increase in the proportion of a municipality's single men living in the USA was associated with significantly lower odds of first marriage among men, although a history of migration at the individual level accelerated the timing of marriage. He attributes the latter finding to the fact that migration increases the certainty of a man's economic potential, thereby making him a more attractive marriage partner.

Migration may also affect marriage through its impact on educational attainment. In high-migration communities, opportunities to migrate may lead to changes in incentives to invest in education; people living in these areas may perceive few economic advantages to achieving higher levels of education in Mexico since they plan to participate in the US immigrant labour market eventually (Massey et al. 1987; Kandel and Kao 2000). Indeed, in a recent analysis using data from the 2000 census, higher levels of migration in a municipality were found to be associated with lower levels of education (Giorguli Saucedo et al. 2010). Other things being equal, in an environment in which the majority of individuals leave school early, one would expect to see younger ages at marriage and, subsequently, higher fertility (Caldwell 1980).

More generally, the opportunity structure associated with higher levels of migration in a community may change attitudes towards marriage and other life-course goals (Massey et al. 1987; Moreno 1992). Women may, for example, decide to delay marriage in order to migrate (Moreno 1992; Singley and Landale 1998; Kanaiaupuni 2000). In addition, they may postpone marriage until they find a partner with a stable migration pattern or a certain level of economic security that frequent migratory trips provide (Parrado 2004). Under these circumstances, we would see a lower proportion of married women in high-migration areas in Mexico.

Of course, a challenge when interpreting any cross-sectional association between migration and fertility at the community level is the possible confounding influence of the reciprocal relations that probably exist between migration and the level of development. Communities that are the primary source of international migrants from Mexico often lack economic opportunities, and this would limit women's participation in the labour force and contribute to earlier ages at marriage and higher levels of fertility within marriage (Massey and Espinosa 1997; Parrado and Zenteno 2002; Parrado 2004; Lindstrom and Giorguli Saucedo 2007; Riosmena 2009). On the other hand, in high-migration areas, remittances and transfers made by migrants are often channelled into investments in agriculture and small-scale production, which in some settings could lead to greater opportunities for women, and in turn later marriage and lower fertility within marriage (Durand et al. 1996; Fussell and Massey 2004).

In the study presented in this paper, we used multiple methods to decompose and isolate these potential influences of migration on fertility at the sending-community level. We began by comparing age-specific fertility rates and age-specific marital fertility rates across municipalities with different levels of international migration. Finding differences in age-specific fertility rates but not marital fertility or non-marital fertility, we then used several regression models, each allowing us a greater degree of control over differences between municipalities, to assess the effect of the sex ratio, educational adaptation, and other influences of migration on women's marriage in migrant-sending municipalities. Finally, using the estimated influence of these variables on the proportion of women in a union, we examined how each factor contributed to the difference in total fertility between high-migration and low-migration areas.

Data

The data for our study came from the 2000 Mexican Census long form for the states of Colima, Guanajuato, Jalisco, Michoacán, Nayarit, San Luis Potosí, and Zacatecas. These are all traditional migrant-sending states, in which any association between migration and fertility is most likely to be apparent. We chose census data because we needed a sample large enough to construct fertility rates across a large number of communities and in which variation in both fertility and migration were sufficient to allow the detection of an association. Surveys, such as those carried out by the Mexican Migration Project, would not permit this kind of analysis.

The census long form, applied to a 10 per cent sample of households in February 2000, recorded data on both household and individual characteristics and included a module on international migration. Household characteristics gathered by the census included the number of household members, materials of household construction, household goods, access to public services, and income. Information on individual household members included age, educational attainment, marital status, current employment, and sources of income. For women of reproductive age, the census also recorded the total number of births and date of last live birth. The international migration module collected information on whether any member of the household had migrated abroad since 1995, the total number of household migrants, and the sex, age, and years of departure and return for migrating household members.

Households in the census were identified by state, municipality, and locality (*localidad*). We used the municipality as the level of aggregation in this analysis. The locality units are small and, even with a 10 per cent sample, aggregation at this level would not produce reliable estimates of fertility and migration. Aggregation at the municipality level also presents challenges as some municipalities include relatively large cities where the majority of the population lives. These municipalities are not comparable to smaller municipalities that lack a sizeable city. To avoid including larger urban areas, we restricted our analyses to the 314 municipalities in the selected migrant-sending states that did not have localities with more than 15,000 inhabitants. These municipalities account for 73 per cent of the municipalities across the seven states, 47 per cent of the population, and 61 per cent of the households with at least one member who migrated internationally in the 5 years before the census. While there was clearly a cost to leaving out the highly urbanized municipalities, the restriction yielded a more comparable sample of communities.

In each municipality, we assessed the relative intensity of migration using the percentage of households with at least one member who had migrated internationally in the 5 years before the census. Because we were interested in the effect of marriage and fertility resulting from migrants' absence, we used this measure rather than the CONAPO Intensity of Migration Index, which is a composite measure that takes into account remittances, return, and circular migration. The migration measure we used captured the majority of international migration from the household; 70 per cent of households reported only one individual migrating since 1995, while approximately 10 per cent of households reported three or more migrants. Using this measure results in a wide and roughly symmetrical distribution of the level of migration across households in the 314 municipalities (Figure 1). The percentage of households with a family member who migrated abroad in the period 1995–2000 ranges from less than 1 per cent to 43.3 per cent, with a mode between 15 and 19 per cent of households having at least one migrant.

After examining the distribution of municipalities by the percentage of households experiencing international migration, we divided the municipalities into migration quartiles: first (less than 10.8 per cent of households with migrating family members), second (10.8–16.2 per cent), third (16.3–21.7 per cent), and fourth (21.8 per cent or greater). We then used these quartiles to assess the various proximate determinants of total fertility.

Differences in fertility across migration quartiles

As a first step, we examined several characteristics of the municipalities in the migration quartiles to determine if there was a detectable gradient in economic development across the quartiles. The indicators we assessed were community size (i.e., the proportion of municipalities with fewer than 2,500 residents), proportion of women aged 15–64 who were in the labour force, mean household income, and proportion of households receiving remittances. To determine the statistical significance of linear trends in these characteristics across quartiles of migration, we used linear regression. Because the range of migration varied between quartiles, we modelled the linear trend in the respective variable as a function of the median level of migration for the different municipalities composing each quartile (Woodward 2005).

As seen in Table 1, there are no significant differences in the proportion of localities with fewer than 2,500 residents across quartiles. However, there are notable differences in the selected economic indicators. Municipalities with higher migration demonstrated somewhat lower levels of development on measures such as women's labour force participation and mean household income, indicating that these may be areas with limited economic opportunities. Not surprisingly, a larger proportion of households in the higher-migration quartiles reported receiving remittances. Overall, however, the characteristics of municipalities in the higher-migration quartiles do not uniformly correspond to those typically associated with higher fertility (small localities and less development), making it difficult to draw clear conclusions about the relationship between migration and fertility based on these factors alone.

Using information on whether a woman had a live birth in the year preceding the census, we calculated age-specific fertility rates for all women of reproductive age (ASFRs) and for women who were married or in a union (ASFMRs) for each quartile of migration. While the fertility of women in a union would provide us with evidence about any variation in marital fertility associated with the level of migration, a comparison of the differences in the ASFRs according to migration quartile with the differences in ASMFRs enabled us to make an initial assessment of how much of the difference in fertility among women of reproductive age was due to marriage (Bongaarts 1978). We considered women to be currently in a union if they reported being married by civil or religious ceremony or both, or were living in a consensual union, which is not markedly different in nature from marriage (Pebley and Goldman 1986; Quilodrán 1991; Parrado and Zenteno 2002). Women aged 15–19 were omitted from the marital fertility rates because marital fertility rates below age 20 are not considered to be reliable owing to the high level of premarital pregnancies (Coale and Trussel 1974; Bongaarts and Potter 1983). For each age group, we used linear regression to determine the statistical significance of a linear trend in fertility rates across the quartiles of migration, where the rates were modelled as a function of the median level of migration in each quartile.

Across the migration quartiles, higher levels of municipal migration are associated with lower ASFRs in the primary childbearing years (i.e., 15–34 years of age; Panel A of Table 2). Total fertility ranges from 3.92 to 3.34 across the quartiles. However, a similar pattern is not observed for total marital fertility, which shows little variation across the migration quartiles (Panel B of Table 2). Since births to women married or in a union at the time of the census account for 93 per cent of all reported births in the year preceding the census, the stability of total marital fertility across migration quartiles implies that differences in the proportion of women married accounts for the observed variation in total fertility. Although there is a significant negative trend in out-of-wedlock childbearing as the level of migration increases, this accounts for a relatively small fraction of the differential in fertility across the migration quartiles (results not shown).

Differences in marriage, sex composition, and education

Since marriage appeared to be the main proximate determinant underlying the differentials in total fertility by level of migration, we wanted to explore further the relationship between migration and marriage. The first question we examined was whether there was variation in the proportion of women in a union that corresponded to the age groups in which differences in the ASFRs were most apparent. Next, we assessed whether there were age-specific differences across quartiles in the two variables that we hypothesized might mediate the influence of migration on marriage—the average sex ratio for women of reproductive age and level of education. For this analysis, we based the construction of the sex ratio on the procedure described by Parrado and Zenteno (2002), in which the age of male partners for women in a specific 5-year age group (*j*) falls within a 10-year age range. In a municipality (*i*), the sex ratio for each of the seven 5-year age groups was constructed using the following formula:

$$R_{ij}=\frac{\sum_{j=a-2}^{a+7} M_{ij}}{\sum_{j=a-5}^{a+4} W_{ij}}$$

where *a* is the mid-point of the 5-year age group for women, and *M* and *W* are the number of men and women that fall into the specified age ranges. For example, the sex ratio in a marriage market for women aged 25–29 was computed by summing the number of men aged 25–34 in the municipality for the numerator and dividing this by the sum of the number of women aged 22–31 in the municipality.

Looking just at the age groups in which there are observable fertility differentials (between ages 15 and 34), we find a decrease in the percentage of women in a union across the migration quartiles (Figure 2(a)). The variation in the sex ratio for the four 5-year age groups also shows clear differences by migration quartile (Figure 2(b)), as does the educational attainment of women (Figure 2(c)). The differences in education by migration quartile, while not as pronounced as those in the sex ratio, are in the direction one would expect if migration reduced the incentive to attend school in Mexico. However, their probable influence on marriage would be in the opposite direction from that of the sex ratio. There are also notable differences in the level of education among younger and older women, probably reflecting the growth of primary schooling in Mexico over the preceding decades.

Modelling migration and marriage

The differences in age-specific sex ratios across quartiles suggest that migration may have influenced the proportion of women married in a municipality by creating imbalances in the marriage market. However, the negative influence of migration on educational attainment may have a countervailing effect, tending to increase the proportion married in communities with higher levels of migration. To further assess these relationships and in order to capture any other residual effects migration might have had on marriage in these communities, we wanted to model the municipal-level proportion of women in a union in the different age groups as a function of the relevant age-specific sex ratio and mean level of women's education, as well as the overall level of municipal migration. The challenge in such an analysis is that it is difficult to be sure that one has accounted for all of the relevant community-level characteristics, and that the coefficient estimates are not biased by confounding.

In a situation like this one, it is often useful to bypass the attempt to include all possible community variables in the model, and instead hold unmeasured differences constant through the use of random-effects or fixed-effects models. In most applications, the multiple observations on each community required for these methods come from repeated observations taken at different points in time. Here, however, repeated observations from earlier censuses were not available. The 1990 census had a much more limited measure of international migration that was not comparable to that in the 2000 census, and the 1980 census was destroyed in the 1985 earthquake. Without a time series, the only way we were able to generate multiple observations on each municipality was to consider each age group as a separate observation. In order to make it possible to include all age groups in the same model, we needed to transform the dependent variable (proportion of women in a union in an age group in a community) so that it would have a similar variance over the range of observations. To this end, we took the logit of the proportion in a union; the effect of this transformation on the standard deviation can be seen in Table 3. Before the transformation, the standard deviation of the proportion married increases by 60 per cent between the first and second age groups, and then falls by about 30 per cent. After the transformation, the maximum and minimum values differ by only 13 per cent.

After applying the logit transformation to the dependent variable, we ran three types of regressions that allowed us different degrees of control over possible variation in unmeasured characteristics across municipalities: separate ordinary least squares (OLS) models for each of the four selected age groups, and then random-effects and fixed-effects models that pooled all of the four selected age groups together. As our three primary predictors in these models, we included the sex ratio in the marriage market for the age group, the mean years of education of women in the age group, and the level of migration in the municipality. In the discussion below, we use the following notation: U is the proportion of women in a union in a municipality (i), R is the sex ratio for the age group in each municipality, E is the mean level of education for women in the age group in a municipality, M is the mean level of migration in a municipality, and ε is an error term.

As a first step in modelling the association between marriage and migration, we estimated the following OLS model for each of the four age groups:

$$\text{logit}\,(U_i) = \beta_0 + \gamma_i R_i + \delta_i E_i + \lambda_i M_i + \varepsilon_i.$$

This model had the advantage of permitting a separate estimate of the effect of the municipal level of migration for each age group, but the disadvantage that other municipal characteristics that might influence marriage rates were not taken into account. It was the possibility that these substantial unmeasured influences on marriage might be correlated with the sex ratio, education, and migration that motivated the use of the random-effects and fixed-effects models that include terms to capture these influences.

We next estimated a random-effects model:

$$\text{logit}\,(U_{ij}) = \sum_{j=1}^{4} \beta_j A_{ij} + \sum_{j=1}^{4} \gamma_j A_{ij} R_{ij} + \sum_{j=1}^{4} \delta_j A_{ij} E_{ij} + \lambda_i M_i + \alpha_i + \varepsilon_{ij}.$$

Instead of estimating a separate model for each age group, here there was only one regression that pooled all four age groups together, resulting in slightly different notation.

This model included *A* as an indicator variable for the four age groups, measures of the mean sex ratio and mean level of education for each of the age groups (*j*) in a municipality (*i*), but only one coefficient for the municipal level of migration, and α as a random variable for a municipality. For presentation purposes, we added the coefficient for each age group between 20 and 34 to the model constant (the coefficient for age group 15–19) to construct an age-group-specific constant term that would parallel that obtained in the stratified OLS models. In order to determine whether the random-effects model provided an improvement in model fit over the age-stratified OLS models, we used predicted estimates from the model to produce *R*-squared coefficients for each of the four age groups. We did this by squaring the error from the random-effects model, summing the squared errors for each age group, and dividing the sum by the variance in the logit proportion married in the age group.

Finally, we estimated a fixed-effects model:

$$\text{logit}\ (U_{ij})=\sum_{j=1}^{4}\beta_j A_{ij}+\sum_{j=1}^{4}\gamma_j A_{ij}R_{ij}+\sum_{j=1}^{4}\delta_j A_{ij}E_{ij}+\alpha_i+\varepsilon_{ij}.$$

This model is similar to that for the random-effects model, however, here α serves as a fixed effect for the municipality. It is no longer possible to include the municipal migration variable since its influence is already fully captured in the estimated fixed effect. We computed the constants and *R*-squared coefficients for each of the four age groups, following the approach described above for the random-effects model.

In order to evaluate whether there was a similar effect for the level of migration on the logit proportion of women in a union in the fixed-effects model compared to the other models, we used an indirect approach. After estimating the model, we used OLS regression to assess the association between the estimated fixed effects and the municipal level of migration. The coefficient in this single variable regression over the 314 municipalities was on the same logit scale used in the other regressions, and addressed the same relationship estimated in the OLS and random-effects models.

OLS results

In the OLS models, we find that an increase in the sex ratio is associated with a higher proportion of women who are observed to be in a union (Panel A of Table 4). The direction of the association is the same across all the age groups, although the magnitude of the association varies with the largest coefficient found in the age group 30–34 and the smallest in the age group 15–19. Higher mean levels of education are associated with a lower proportion of women in a union in the municipality in each age group, but the size of the coefficient decreases as age increases, indicating that this association probably has more to do with the timing of marriage than with the proportion ever marrying. The third predictor in the models was the mean level of migration in a municipality, which, as noted above, was included to capture any remaining association between migration and marriage not mediated by the other two variables. These coefficients demonstrate a consistent negative effect of migration on marriage; additionally the size of the effect is similar across the four age groups, thereby validating the use of random-effects and fixed-effects models in which the age groups are pooled together. The four OLS models provide only a moderate fit to the data, with the *R*-squared statistics ranging from 0.18 to 0.29. Clearly, there is a lot of variation in municipal-level marriage that is not explained by the three predictor variables included in the models.

Random-effects results

The estimated coefficients for the random-effects model are presented in Panel B of Table 4. Comparing these estimates to those in the OLS models, the coefficients for the marriage market variable, overall, are slightly smaller, and the coefficient for municipal-level migration is slightly larger than the average of the four OLS estimates for this variable. The considerable role of the random effects is evident in the much larger *R*-squared statistics shown in the bottom row of the panel.

Fixed-effects results

After fully controlling for unmeasured municipal-level characteristics by estimating fixed effects for each municipality, we find a set of estimated coefficients (Panel C of Table 4) very similar to those in the random-effects model. There is a slight decline in the size of the coefficients of the marriage market variables, virtually no change in the education coefficients, and a slight improvement in the *R*-squared statistics for each age group.

We then examined the fixed effects estimated from the model to determine whether they were associated with the level of migration in the municipality. These estimates correspond to an average residual for each municipality across the four age groups. A plot of these 314 estimated fixed effects and the percentage of households in the municipality experiencing migration is shown in Figure 3. Note that the *Y*-axis on which the fixed effects are plotted is on the logit scale, with possible values ranging from plus to minus infinity. In this figure, a negative value for the fixed effect indicates that a lower proportion of women were living in a union than would be expected given the estimated coefficients and levels of the covariates. The OLS regression in which the migration variable predicted the fixed effect shows a significant negative association, indicating that as the percentage of households experiencing migration increases, there is less marriage among women aged 15–34 after adjusting for the effect of the marriage market and education. The estimated coefficient for migration (−1.185) is similar to that from both the OLS and random-effects models.

Predicting changes in fertility across migration quartiles

The last step in the analysis was to use the regression results to carry out a decomposition of the change in fertility across the migration quartiles resulting from differences in the primary predictor variables (sex ratio in the marriage market, migration, and education) across these quartiles. For this exercise, we selected the random-effects model, since it produced direct estimates for each of the predictor variables. We computed the predicted proportions of women in each age group who were in a union in the first (i.e., lowest) and fourth (highest) migration quartiles, using the mean of each predictor variable for the age group and quartile. We then weighted the age-specific marital fertility rate in each quartile by the predicted proportion of women in the age group who were in a union, and estimated how a sequential change in the mean for each of the three predictor variables from quartile one to quartile four affected total fertility.

In Figure 4 we show that the difference in the mean sex ratio for the proportion of women in a union in quartiles one and four accounts for an estimated difference of 0.18 in total fertility for women aged 15–34. The remaining influence of migration on fertility exhibits a similar effect (0.23). Changes in the mean level of education have only a small negative effect on fertility (−0.02). The remaining difference between quartiles one and four in total fertility for women aged 15–34 can be explained by non-marital fertility, which, as noted earlier, is slightly higher in the lowest migration quartile.

Discussion

In a subsample of municipalities in Mexico's traditional migrant-sending states, we find that municipalities with the highest levels of international migration have the lowest levels of fertility, and, conversely, municipalities with the lowest levels of migration have the highest fertility. For all women of reproductive age, the difference in total fertility between the lowest and highest migration quartiles is slightly more than half a child. The differences in the ASFRs across migration quartile are greatest in the first three age groups, but are also observed among women aged 30–34, although the trend across quartiles is only marginally significant for this age group. In contrast, there is no significant variation in marital fertility across migration quartiles. Given that fertility outside of marriage is quite limited in rural Mexico, we are able to conclude that marriage is the main proximate determinant of the variation in municipal fertility (Bongaarts and Potter 1983).

We then examined the relationship between migration and proportions of women in a union, focusing on the marriage market and educational attainment as two possible mediating determinants. The results from our regressions indicate that marriage is, indeed, influenced by the marriage market for the respective age groups. Additionally, in a municipality, the mean level of educational attainment of the women in an age group is inversely related to the proportion in a union. Given the negative association between educational attainment and the level of migration, this offsets the impact of the marriage market, albeit to a limited extent. We also find that the level of migration in a municipality has an independent effect on the proportion of women in a union above and beyond the availability of male partners and women's mean years of education.

We arrive at these conclusions through three separate sets of regressions. Although the OLS models did not adjust for other community-level variables besides the marriage market, education, and overall migration, the coefficients vary only slightly when random and fixed effects were estimated in pooled models that included all four age groups. We constructed these pooled models in order to address the possibility that the difference in marriage we observe between municipalities with varying levels of migration was not due to some unobservable characteristics of these communities. The consistency in the size of the estimated coefficients across these different models supports the interpretation that in contemporary Mexico, migration is, indeed, affecting one of the key proximate determinants of fertility, the proportion of women in a union.

Since there are no differences in marital fertility across municipalities sorted by levels of migration, it is not likely that widespread permanent or circular migration prompts changes in fertility norms within marital unions through the dissemination of new ideas or information by returning migrants. Additionally, this finding is not consistent with the idea that migration significantly disrupts fertility within unions in the primary childbearing years owing to temporary absences of males. The lack of variation in marital fertility at the aggregate level is perhaps due to the net effect of offsetting individual-level factors: lower fertility among some migrant wives early in their reproductive years occurring in conjunction with the lower probability of community outmigration among higher-parity women (Lindstrom and Giorguli Saucedo 2002, 2007).

Our analysis provides evidence that increasing levels of migration are associated with fewer women living in marital unions. The regression models indicate that this is due, in part, to the lower sex ratios in high-migration areas. The imbalance in the sex composition in these communities, produced by migration streams that are predominantly made up of men, probably disrupt the local marriage market, thereby contributing to delays in women's union formation. This result lends support to earlier findings that a greater proportion of men living in the USA was associated with delays in marriage among men (Parrado 2004).

Our finding that the municipal level of migration has an influence on marriage above and beyond that yielded by the imbalance in the marriage market also suggests that there may be changing ideas about - partner selection and family formation taking place in communities. While circular migration may not totally remove men from the marriage market, women in high-migration-sending communities may postpone marriage in order to find a partner with a stable migratory pattern and more certain economic future relative to other migrant men in their community (Parrado 2004). In addition, as rates of migration increase and community members see migration as a rite of passage (Massey et al. 1987), changes may begin in norms about individual and household goals, including norms about family formation and reproductive behaviour. As a result, women may not enter into marital or consensual unions as they themselves intend to migrate out of Mexico (Singley and Landale 1998; Kanaiaupuni 2000).

The last pathway through which migration affects marriage in our models is through education. Mean educational attainment for women varies across municipalities according to the level of household migration; women in municipalities with higher levels of migration have lower levels of education. This trend most probably reflects both the limited value of schooling in Mexico for the US labour markets, as well as the competition between migration opportunities and staying in school (Massey et al. 1987; Kandel and Kao 2000; Giorguli Saucedo et al. 2010), which would contribute to lower levels of education and accelerate marriage for women. While our results indicate that lower levels of education are significantly associated with higher proportions married, the combined effect of this association and the observed variation in education yields only a negligible impact on fertility, albeit in the opposite direction from that of the other two routes of influence.

Although non-marital fertility is low in this population, it is interesting to note that variation across municipalities is inversely associated with the level of migration. That is, either the shortage of men or the incentives created by migration opportunities seem to limit childbearing by single women, in contrast to what South and Lloyd (1992) observed for the USA.

The findings of this study should be interpreted with its limitations in mind. First, we are addressing a relatively simple question focused on differences in fertility and marriage across municipalities according to the overall level of migration in the municipality. There are, of course, a wide range of questions not addressed by this study about the way that international migration from Mexico might affect or interact with union formation and fertility over the life course among individual women who migrate. Second, restricting our analyses to municipalities with localities that had no more than 15,000 residents excluded approximately 40 per cent of households with international migration experience in the 5 years before the census. Although this restriction allowed for a more homogeneous sample of municipalities within the main sending states, it limits the applicability of the results; the relationships between migration, fertility, and marriage might be different in more urban areas or in states that recently have become sources of US-bound migrants.

Another limitation of our results lies in the cross-sectional nature of the data. It is tempting to read the age-specific fertility rates and the age-specific proportions married as a cohort history in which the influence of municipal migration on fertility and marriage diminish over the life course (Thornton 2001). Our estimate of the level of international migration is assessed with respect to the 5 years preceding the census, whereas the actual level of migration at the time women in the older cohorts were in the marriage market may have been quite different, probably much lower, than it was between 1995 and 2000. Similarly, the sex ratio in the relevant age groups may have been different 10 or 15 years ago. Not only would such changes make it imprudent to `read history sideways' using these results, but they point to the limitations in the measurement and comparability of our predictors across cohorts.

Despite these limitations, the results of our analyses are surprisingly consistent, and offer initial insight into the influence of migration on municipal levels of fertility and marriage in the rural and semi-urban municipalities of Mexico. This analysis suggests that international migration may be contributing to fertility decline in sending communities, and that marriage is the main proximate determinant of this change. Future research in sending areas should assess the way in which migration shapes community norms about life-course goals, such as those surrounding union formation and childbearing.

Acknowledgments

The authors would like to thank Gordon Hanson, Fernando Riosmena, Carl Schmertmann, and Victor Agadjanian for their comments on earlier versions of this paper. This research was supported by grants from the National Institute of Health and Child Development (5 R24 HD042849 and 2 T32 HD007081-32) awarded to the Population Research Center at The University of Texas at Austin.

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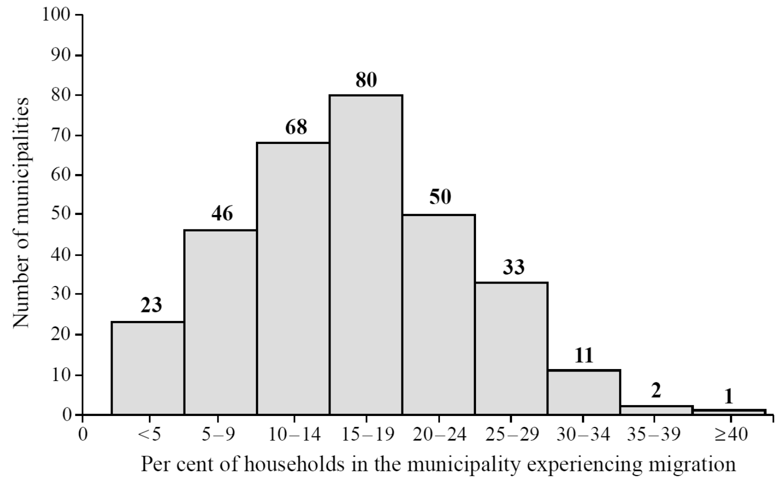

Figure 1.

Distribution of municipalities by the percentage of households experiencing migration, Mexico 1995–2000 (n = 314)

Source: 2000 Mexican Census.

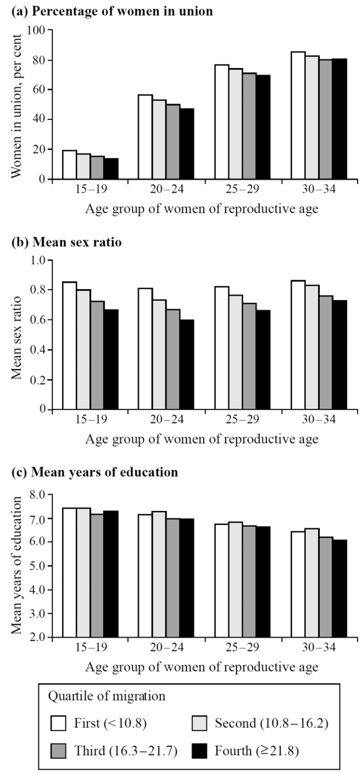

Figure 2.

Variation in the percentage of women in a union and mean sex ratio and education by quartile of migration, Mexico 1995–2000

Source: As for Figure 1.

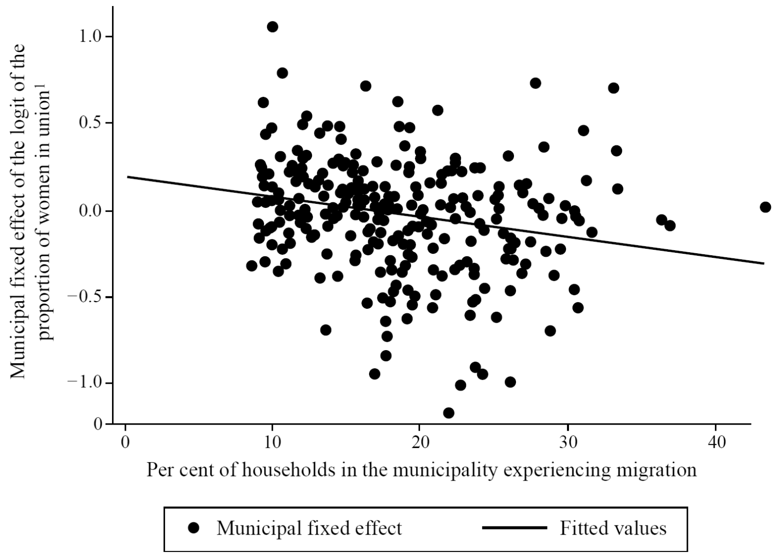

Figure 3.

Municipal fixed effect for the logit of the proportion of women in a union by the percentage of households experiencing migration, Mexico 1995–2000

[1]*Y*-axis is on the logit scale. Range is from plus infinity to minus infinity.

Source: As for Figure 1.

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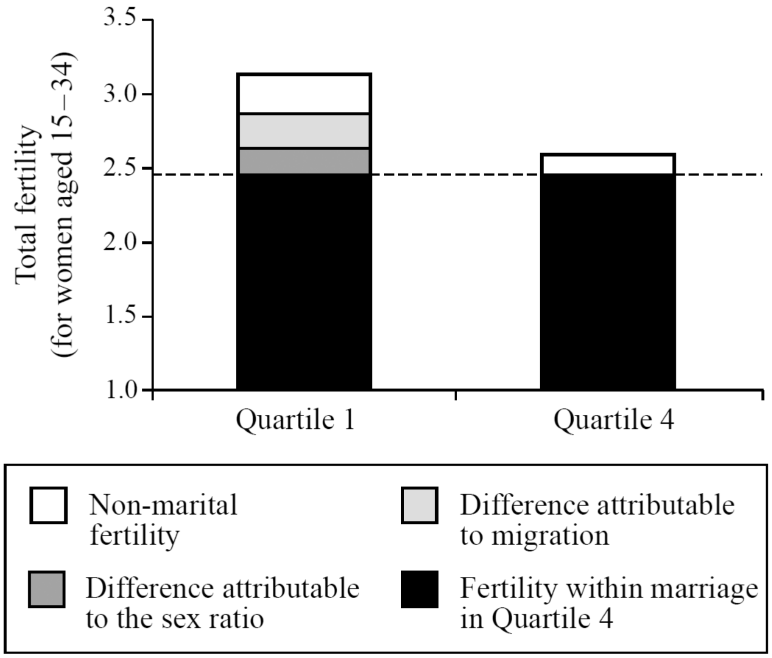

Figure 4.

Contribution of fertility determinants to total fertility for women aged 15–34,[1] Mexico 2000

[1]Contributions of fertility within marriage and the differences in the sex ratio and level of migration to total fertility were computed by multiplying the predicted proportion of women in a union in the random-effects model by the level of marital fertility. Changes in the mean level of education exhibited a small negative effect on total fertility (−0.02), and, therefore, are not presented.

Source: As for Figure 1.

Table 1

Characteristics of municipalities by quartile of migration, Mexico 2000

	Quartile of municipal migration				
	First quartile (<10.8 per cent) *n*=78	**Second quartile (10.8–16.2 per cent) *n*=79**	**Third quartile (16.3–21.7 per cent) *n*=78**	**Fourth quartile (±21.8 per cent) *n*=79**	***p*-trend**
Localities with <2,500 residents, per cent	55.0	48.4	60.5	56.1	0.412
Women 15–64 in the labour force, per cent	22.7	24.2	22.1	20.4	0.009
Households receiving remittances, per cent	4.0	7.8	10.8	13.0	<0.001
Mean household income, pesos	3,080	4,043	2,776	2,601	0.184

Source: 2000 Mexican Census

Table 2

Age-specific fertility rate and age-specific marital fertility rate by quartile of migration, Mexico 2000

	Quartile of municipal migration				
	First quartile (<10.8 per cent)	**Second quartile (10.8–16.2 per cent)**	**Third quartile (16.3–21.7 per cent)**	**Fourth quartile (≥21.8 per cent)**	***p*-trend**
Panel A: Women of reproductive age					
Age 15–19	78	61	56	47	<0.001
Age 20–24	191	176	165	150	<0.001
Age 25–29	195	178	170	176	0.071
Age 30–34	163	145	141	148	0.122
Age 35–39	106	85	109	100	0.923
Age 40–44	43	40	45	40	0.803
Age 45–49	7	9	6	8	0.965
Total fertility	3.92	3.48	3.47	3.34	
Panel B: Married women					
Age 15–19	–	–	–	–	–
Age 20–24	307	306	310	301	0.762
Age 25–29	236	229	230	243	0.608
Age 30–34	183	169	170	179	0.714
Age 35–39	119	95	127	118	0.502
Age 40–44	48	45	51	47	0.981
Age 45–49	8	10	7	9	0.978
Total marital fertility	4.51	4.27	4.48	4.48	

Source: As for Table 1.

– = not assessed.

Table 3

Means and standard deviations for the proportion of women in union by age group before and after logit transformation, Mexico 2000

	Proportion in union		Logit-transformed proportion in union	
	Mean	Standard deviation	Mean	Standard deviation
Age 15–19	0.162	0.059	−1.717	0.480
Age 20–24	0.514	0.098	0.054	0.419
Age 25–29	0.726	0.081	1.014	0.421
Age 30–34	0.819	0.067	1.577	0.480

Source: As for Table 1.

Table 4

Adjusted regression models for the logit of the proportion of women in union, Mexico 2000

	Age 15–19		Age 20–24		Age 25–29		Age 30–34	
	B	**(SE)**	***B***	**(SE)**	***B***	**(SE)**	***B***	**(SE)**
Panel A: Ordinary least squares								
Mean sex ratio	0.795	(0.252)	1.371	(0.224)	1.475	(0.243)	1.540	(0.283)
Mean education	−0.220	(0.034)	−0.149	(0.021)	−0.117	(0.021)	−0.050	(0.023)
Mean level of migration	−1.290	(0.406)	−0.592	(0.350)	−0.849	(0.347)	−0.816	(0.391)
Constant	−0.582		0.197		0.787		0.761	
R^2	0.197		0.288		0.274		0.177	
Panel B: Random effects								
Mean sex ratio	0.916	(0.175)	0.977	(0.185)	1.236	(0.201)	1.248	(0.204)
Mean education	−0.218	(0.028)	−0.139	(0.022)	−0.116	(0.021)	−0.055	(0.020)
Mean level of migration[1]	−1.056	(0.249)						
Constant	−0.731		0.482		0.990		1.061	
R^2	0.608		0.701		0.660		0.532	
Panel C: Fixed effects								
Mean sex ratio	0.855	(0.186)	0.786	(0.198)	1.053	(0.216)	1.060	(0.216)
Mean education	−0.214	(0.037)	−0.134	(0.029)	−0.114	(0.028)	−0.055	(0.026)
Mean level of migration	–	–	–	–	–	–	–	–
Constant	−0.883		0.402		0.941		1.042	
R^2	0.667		0.725		0.681		0.562	

Source: As for Table 1.

[1] The coefficient estimate for migration in the random-effects model reflects the total effect of migration across all four age groups.

– = not estimated in model.