THREE ESSAYS ON MEXICAN MIGRATION TO THE UNITED STATES

by

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This dissertation consists of three essays that empirically address aspects of three common questions posed in the Mexican immigration literature: What characteristics define migrants from Mexico? How does US border-enforcement policy affect migrant behavior? What role does foreign direct investment (FDI) into Mexico play in altering incentives for migration to the United States?

The first essay (Chapter II) examines selection patterns of Mexican migrants based on migration frequency. Studies of Mexican migrant selection have largely ignored its temporary and repeated nature. In particular, the literature has not appropriately distinguished between migrants that travel to the United States only once and those who migrate multiple times. I model the selection process of repeat migrants in two stages: selection into initial migration and selection into repeat migration. Allowing for unobservable differences between non-migrants, single-episode migrants and repeat migrants, I find negative selection of repeat migrants relative to non-migrants and no

significant differences between the unobservable attributes of repeat and single-episode migrants.

The second essay (Chapter III) addresses how border enforcement influences migrant behavior. Increases in border enforcement during the 1990s were distributed non-uniformly along the border, targeting regions believed to experience episodes of high volumes of illegal border crossings. I examine how geographic and time-series variation in annual border enforcement influences US destination choices for undocumented Mexican migrants. While increased enforcement diverts migrants to alternative crossing locations, I show that their final destinations tend to be robust to border enforcement. Thus, in terms of policy, there may be benefits to coordination in enforcement efforts across sectors.

The third essay (Chapter IV) addresses the claim that Mexico-bound FDI reduces immigration to the United States by increasing employment opportunities and raising Mexican wages. I use annual, state-level FDI from 1994 to 2004 to examine how FDI flows influence US-migration propensity. FDI flows reduce the probability of migration to the United States and increase the probability of an employment change in Mexico for non-migrants. Further, FDI is found to increase the likelihood of employment changes for household heads in Mexican states bordering the United States, but not the likelihood of employment in interior states.

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CHAPTER I

INTRODUCTION

In the last quarter century immigration to the United States, particularly Mexican migration, has found a place at the forefront of public debate, due in part to the magnitude of migration from Mexico to the United States. The US Census Bureau estimates that in 2000, roughly 8.7 million of the 31 million foreign-born residents in the United States reported their race or ethnicity as "Mexican." Not only do Mexican immigrants compose a large proportion of the stock of foreign-born residents, they are an equally large proportion of the flow of immigrants to the US each year. Perhaps most striking is the flow of illegal immigrants. In 2005, the Department of Homeland Security reported that over one million (86 percent) of the 1.2 million illegal immigrants apprehended along international borders of the United States were Mexican nationals.

Spurred by the significance of Mexican migration flows to the United States, there is an ever expanding literature that examines the determinants of Mexican migration and its effects on the US economy. This dissertation uses microdata collected in Mexico to address aspects of three common broader questions posed in the Mexican immigration literature: Who are the migrants from Mexico? How does US policy affect migrant behavior? What role does the Mexican economy play in altering incentives for migration to the United States?

The first essay (Chapter II) utilizes retrospective survey data collected in Mexico to examine selection patterns of Mexican migrants based on migration frequency. In contrast to the typical view of migration as a single, permanent event, I expand on existing selection literature by acknowledging the temporary and repeated nature of a large proportion of Mexican migration. In particular, I employ a model of selection in two stages to allow for differing patterns of selection between single-episode and repeat migrants. For repeat migrants, single-stage selection models exclude information realized on migrants' first trips; information, such as wages earned, that has the potential to influence the decision to migrate on multiple occasions. The two-stage selection model allows the inclusion of such information, highlighting important differences between single-episode and repeat migrants. I find significant observable differences between single-episode migrants and repeat migrants. Namely, higher wages realized on the first migration increase the likelihood of repeat migration, suggesting that, insofar as wages indicate success in migration, repeat migrants are more successful than single-episode migrants during first migration. Most importantly, I find that repeat migrants are negatively selected from the sample of Mexicans in the data, indicating that, on average, non-migrants would perform better in the United States than repeat migrants.

The second essay (Chapter III) uses the same dataset along with sector-level border patrol data to address the effects of geographic variation in border enforcement on migrants' location choices in the United States. In response to growing concern over widespread illegal migration from Mexico, government dramatically increased enforcement in specific sectors along the border. The literature on border enforcement generally finds weak effects, if any, of aggregate border enforcement in deterring illegal migration. There is evidence, however, that migrants cross in more remote locations.

Given the propensity for enforcement to affect migrant crossing locations, the second paper examines whether or not enforcement has broader consequences for migrant destination choices. I find mixed support for migrant deflection, but uncover evidence that alludes to the existence of common migration routes.

Exploiting concerns over the general ineffectiveness of border enforcement in deterring illegal immigration, proponents of the North American Free Trade Agreement have argued that the increased foreign direct investment (FDI) and increased economic opportunities in Mexico induced by the agreement would reduce the incentive for migration to the United States. The third essay (Chapter IV), examines the effects of FDI in Mexico on the decision to migrate to the United States, exploiting both time-series and geographic variation in FDI flows by Mexican state. FDI flows are found to reduce the probability of migration to the US as well as influence employment of non-migrants. FDI increases the likelihood of employment changes for household heads residing in border states, but does not affect employment in interior states.

CHAPTER II

UNOBSERVABLE ATTRIBUTES AND SELF-SELECTION IN REPEAT MIGRATION: EVIDENCE FROM MALE HOUSEHOLD HEADS IN MEXICO

II.1. Introduction

Mexico is the single largest source country for US migrants, accounting for 27 percent of the foreign-born US population in 2000. Yet, Mexican emigration patterns are in conflict with the assumptions of traditional models where it is more common to assume a single and permanent move from a country of origin. Empirically, a large proportion of Mexican migration is temporary in nature, with many migrants making more than one trip to the US during their lifetimes. Accordingly, several studies have examined aspects of temporary migration, such as the propensity to return to Mexico (e.g., Ranney and Kossoudji, 1983; Massey, Alarcon, Durand & Gonzalez,1987; Dustmann, 2003; Mesnard, 2004) and duration of stay in the US (e.g., Lindstrom, 1996; Reyes, 1997; DaVanzo, 1983).

It remains an open question, however, whether the selection patterns of repeat Mexican migrants differ from those who migrate from Mexico only a single time. Even with the general documentation of migration patterns in the literature suggesting that Mexican migration is more complex than would be implied by a single, permanent migration to the US, the recent literature on migrant selection has largely consisted of documenting where migrants fall within the human capital and earnings distributions of home and host countries and whether one-time migrants to the US are randomly selected from their home-country population (e.g., Borjas, 1987; Chiquiar & Hanson, 2005; Ibarraran & Lubotsky, 2007). Thus, there is an apparent mismatch between actual Mexican migration patterns and the migration patterns modeled in existing studies of Mexican migrant selection.

Given the potential for migrants to learn valuable information about the US market or acquire human capital while in the US, selection may differ substantially for such a population. In fact, selection models that exploit a cross section of Mexican migrants without explicitly modeling the repeating nature of a large portion of Mexican migration may mischaracterize the selection process altogether. In this paper, I explore previously ignored differences in selection between single-episode and repeat migrants, allowing information realized on migrants' initial trips to the US to factor into the repeat migration decision.

Borjas (1987) describes a theoretical model of immigrant selection with the prediction that migrants whose home-country variance in earnings is high relative to the US (such as those from Mexico) will be negatively selected on unobservable characteristics such as ability or motivation. That is, after accounting for observable attributes such as age and education, a non-migrant is predicted to have higher earnings in the host-country than the average migrant. However, immigration in this model is permanent in nature – agents base their migration decision on the first and second moments of the earnings distributions in the home- and host-country and on the cost of migration. Agents do not consider either the timing of the decision to migrate or the potential each immigrant has in choosing a particular pattern of repeated migration.

Immigration to the US through the mid-20th century, which consisted largely of western European immigration, may appropriately be characterized as permanent. In contrast, evidence suggests that a large proportion of Mexican migration is temporary. For example, Reyes (1997) estimates that roughly 70 percent of Mexican migrants return to Mexico within ten years of their arrival in the US. In addition, Mexican migrants may also make several trips to the US in their lifetimes. In their study of migrants from Western Mexico, Massey and Espinoza (1997) estimate that a 25-year-old male migrant with one previous US trip and 10 years of labor market experience has a 32 percent probability of making an additional trip.

The importance of temporary migration in Mexican migration could reflect a number of alternative migration decisions. For instance, a migrant who enters the US may migrate from Mexico to the US and back several times before settling. Alternatively, and in starker contrast to the model, a significant portion of migrants may not settle in the US at all, but include temporary migration to the US as part of a considered life-time strategy. The motivation for these temporary migration decisions could be to finance the one-time purchase of durable goods, automobiles, homes, or businesses in Mexico. Others may rely on US employment for regular income – as in the case of agricultural workers – and adopt a transitory, seasonal pattern of migration in which frequent trips are made across the border. Of course, important differences between one-time and repeat migrants may also arise as responses to information acquired on migrants' earlier trips. First-time migrants enter the US with relatively less information regarding their potential for success. On the other hand, migrants contemplating additional trips to the US have previous experience to draw on in formulating their migration decisions. Whether due to period-by-period learning or to longer-term strategy, such differences in migration frequency highlight one important dimension upon which migrants may differ.

The existing migrant selection literature ignores the potential for these differences to affect migrant wages in the US. Indeed, studies that address migrant selection at all do so only in the course of exploring other issues in the migration literature. Massey (1987) uses data on migrants from four Mexican communities to determine the extent to which undocumented migrants earn less than legal migrants. In a later study, Massey and Donato (1993) use similar data on migrants from 13 Mexican communities in their study of the impacts of the Immigration Reform and Control Act on Mexican migrant wages. They estimate a log-wage equation for migrants on their most recent trip to the US. In both of these studies, the authors find no evidence of selection bias in estimates of migrants' wages, implying that any unobservable differences between migrants and non-migrants in the Mexican communities studied do not affect migrant wages.

These studies, however, assume that the selection process for one-time and repeat migrants is the same. Aside from including previous migration in the selection equation, they make no distinction between one-time and repeat migrants. Thus, any potentially valuable information realized on migrants' first-trips is included in the model only indirectly through a single migration experience variable.

Exploiting the fullest set of data available on Mexican migrants to the US, I allow the selection patterns of first-time and repeat migrants to differ, modeling wages for repeat migrants while accounting for two types of selection. The first selection stage allows for systematic differences across migrant and non-migrant groups. The second selection stage models migrants' decisions to engage in multiple trips to the US. This procedure facilitates the straightforward determination of the type of repeat-migrant selection. After allowing for differences across single-episode and repeat migrants, repeat migrants are found to be negatively selected from the Mexican population. That is, relative to the average non-migrant, repeat migrants are of lower ability. I also find significant observable differences between single-episode migrants and repeat migrants. Namely, higher wages realized on the first migration increase the likelihood of repeat migration, suggesting that, insofar as wages are a measure of success in migration, repeat migrants are more successful than single-episode migrants during first migration. Furthermore, there is no evidence that any potential differences in the unobservable attributes of repeat and single-episode migrants affect wages of repeat migrants.

The paper proceeds with an outline of a basic single-selection model in the following section. After discussing the data and sample selection in Section II.3, I present estimates of a series of log-wage equations with a single selection stage in Section II.4. These estimates provide cursory evidence of a pattern of behavior in the underlying data that is overlooked in previous literature (e.g., Massey, 1987; Massey & Donato, 1993). I introduce the double-selection framework in Section II.5, where estimates from the double-selection model are also presented with discussion. I offer some concluding remarks in Section II.6.

II.2. Single-Selection: Empirical Framework

Existing studies of migrant selection estimate log-wage equations that include Heckman's (1974) correction for non-random sample selection. These models acknowledge that an individual's wage in the US is only observed if he has migrated to the US, but they may be inadequate in modeling the complexities of Mexican migration. In particular, they use a single selection equation to model the migration decision, implicitly restricting the migration-influencing factors to be identical for all types of migrants. It will be helpful to outline this model briefly to provide a backdrop for the more involved model I propose later.

An individual chooses to migrate only if the present value of the expected net benefit from migration is positive. The expected net benefit from migration depends on expected wage differentials and costs of migration. The expected net benefit from migration can be written in reduced form for the i^{th} migrant as:

$$y_i = \gamma z_i + u_i, \tag{1}$$

where y_i represents the i^{th} migrant's expected net benefit from migration and z_i is a vector of factors that influence the expected costs and benefits from migration. Likewise, the migrant's log-wage can be expressed as a function of personal, occupational and destination-specific attributes, represented by the vector, x_i:

$$\ln w_i = \beta x_i + e_i. \tag{2}$$

The u_i and e_i assume a bivariate normal distribution with zero means and correlation coefficient rho (ρ). Under these conditions, the migrant's expected log-wage can be rewritten, contingent on selection into the sample, as:

$$E(\ln w_i \mid y_i > 0) = \beta x_i + \rho \sigma_u \lambda_i(\alpha_u), \tag{3}$$

where $\alpha_u = -\gamma z_i / \sigma_u$, $\lambda(\alpha_u) = \phi(\gamma z_i / \sigma_u) / \Phi(\gamma z_i / \sigma_u)$, and σ_u is the standard error from the migration equation. $\phi(\cdot)$ and $\Phi(\cdot)$ are the pdf and cdf of the normal distribution, respectively. The selection correction term of equation (3) can loosely be interpreted as the probability of being in the observed sample. Wage equations that lack this correction when sample selection is an issue are often said to be subject to a sort of omitted variable bias.

The inclusion of the selection correction term, $\lambda_i(\alpha_u)$, is also convenient in the current context of determining the type of selection on unobservable attributes. Since the standard error of the migration equation is always positive, the estimated coefficient on the correction term and the correlation coefficient, ρ, share the same sign. A positive estimate of the correction coefficient indicates that the unobservable attributes that tend to increase the likelihood that an individual becomes a migrant also tend to increase migrant wages – positive migrant selection. Conversely, a negative estimate indicates that individuals possessing a greater unobserved propensity for migration will tend to have lower wages – negative migrant selection. Thus, the sign of the coefficient on the selection correction term is of particular interest.

Identification in the log-wage model with a single selection equation requires an exclusion restriction in the wage equation. That is, a variable that is correlated with the individual's decision to migrate must be excluded from the wage equation. Thus, an appropriate identifying variable is correlated with the migration decision but uncorrelated with the individual's wages.[1]

II.3. Data

Determining the nature of unobserved differences between migrants and non-migrants (and later, unobserved differences between repeat migrants and one-time migrants) requires data on the attributes of both groups of individuals as well as information on the wages of migrants in the United States. The most expansive collection of individual-level data that meets these criteria are provided by the Mexican Migration Project (MMP), a collaboration of Princeton University and the University of Guadalajara.[2] The MMP surveys began in 1982, and have been conducted annually from 1987 through 2004. Each survey year, interviewers randomly select approximately 200 households from each of two to five Mexican communities. Though households within communities are selected at random, the communities are located in Mexican states whose residents have historically had high propensities for migration to the United States. As no community is surveyed twice, the collective data represent repeated cross-sections

[1] Strictly speaking, the model is identified without such a restriction in the wage equation, however, identification in the unrestricted model is arises from nonlinearities in the probit model.

[2] Richter, Taylor & Yunez-Naude (2005) use data on a representative sample of rural Mexicans to examine the effects of policy reforms on migration, but information on migrations are not as detailed as in the MMP.

that cover 107 communities in 19 Mexican states. The Mexican surveys are supplemented with surveys of a non-random sample of out-migrants (i.e., migrants who settle abroad) in the United States. The surveyors determine the destinations of US migrants in each community and subsequently survey out-migrants in those areas. Typically, for these US-based surveys, 20 out-migrant households are surveyed for each Mexican community.[3]

The MMP survey collects demographic and economic characteristics of each community and each household, personal migration histories for each family member in the household, and life histories of each household head. The MMP data are particularly useful since they contain information on both migrants and non-migrants, which facilitates modeling the migration decision. In addition, the MMP survey collects detailed retrospective information on the first and most recent migration episodes. In particular, the data contain migrants' wages earned in the United States, allowing estimation of a wage equation. The type of migrant selection, if any, can then be uncovered by exploiting these two features of the data with the joint modeling of the migrant's migration decision and subsequent US wage.

In addition to data on migrants, the MMP provides data on each community's economic conditions (labor force participation rates, relative importance of manufacturing and service industries, etc.) and infrastructure as well as macroeconomic conditions in the US (national unemployment rate, cost-of-living differences).[4] I

[3] In a few survey years, only 10 to 15 out-migrant households were sampled. For three Mexican communities, budgetary and time constraints prevented the execution of the out-migrant surveys.

[4] The cost-of-living index is from the American Chamber of Commerce Research Association (ACCRA).

supplement the MMP data with unemployment rates and consumer price indices from the Bureau of Labor Statistics and US-Mexico border enforcement data from the United States Border Patrol.[5]

II.3.1 Sample Construction

The MMP survey collects basic information on each household-member's migration, but detailed information on migratory trips is available only for household heads. The empirical approach I use to determine the nature of migrant selection relies on this detailed information so I use a subset of the MMP data that consists only of household heads. Furthermore, even though the MMP collects general information regarding all of each household head's migrations, detailed information is only available for household heads' first and most recent trips to the US. As such, my sample includes non-migrants as well as migrants who experienced their first or most recent (as of the time the household was surveyed) migration to the US during one of the survey years. It is therefore possible that a migrant in the sample had more than two migrations during the survey, but only information on the first and most recent is included. Finally, migrants who experienced their most recent US migration before 1982 (the year the surveys began) are excluded from the sample. I also limit the sample to include male household heads as the household heads in the data are overwhelmingly male.[6]

[5] This is now officially the U.S. Customs and Border Protection (CBP) Border Patrol.

[6] Were female household heads included, they would comprise less than four percent of household heads. Moreover, female migration has historically been driven by family migration in which women migrate after their husbands (Donato, 1993). Results using samples including female household heads are qualitatively similar, with female household heads are less likely to migrate than male household heads.

II.4. Single-Selection: Estimation

II.4.1 Identification

In the following specifications, as identifying variables I exploit variation in the annual number of line-watch hours expended by the United States Border Patrol, number of children, marital status, family history of migration, the US unemployment rate, Mexican unemployment rate, the dollar-peso exchange rate, origin-community characteristics, and the expected Mexican-US wage differential. As identification is crucial to the empirical strategy outlined above, I consider in detail the suitability of these variables as identifying variables.

Annual line-watch hours proxy for the general level of enforcement along the US-Mexico border in a given year. Greater enforcement increases the expected costs of migration, which has a direct influence on the migration choice. Line-watch hours are possibly an attractive choice for identification, though border enforcement could affect wages to the extent that migration deterrence affects the supply of labor in immigrant dominated sectors. As for family history of migration, there is abundant evidence, both anecdotal and empirical, that indicates inertia within families in terms of migration propensity. To account for this family history, I include a binary variable that indicates whether the household head's father was a US migrant. The number of children and marital status of migrants should also affect the decision to migrate, as either has the potential to increase the opportunity costs (in the case where the migrant goes to the US without his family) or explicit costs of migration (in the case where the whole family migrates). Here again, abundant evidence suggests that Mexican migrants are young, unmarried males. The exchange rate, Mexican unemployment rate and origin-community characteristics – female labor force participation rate, proportion of adults with six or more years of education, and the population of the community – are included as proxies for economic conditions in the origin-community. These factors should theoretically affect the opportunity cost of migration, but one might also argue that the attributes of the origin-community may be systematically related to the attributes of its migrants. To the extent that migrants' personal characteristics are adequately controlled for in the wage equation, I argue that the attributes of the origin-community should not affect migrant wages. The US unemployment rate, as an indicator of the health of the US economy, should influence migrants' expected benefits from migration. Finally, existing theory of migration predicts that migration is more likely the larger the difference between home- and host-country wages. Thus, I also utilize the estimated wage differential for each household head as an identifying variable. The estimated wage differential is calculated as the difference between the log of the household head's expected US wage and the log of his expected Mexican wage (or, equivalently, the log of the ratio of his expected US wage to his expected Mexican wage). To derive the expected US wage, I estimated a Mincer-style log-wage equation for all migrants and predict each household head's expected US wage. Expected Mexican wages were derived from a similar log-wage model for all non-migrants, using the estimated coefficients to predict expected Mexican wages for all household heads. All wages are converted to real 2000 US dollars prior to estimation.[7]

[7] Specifications using nominal US dollars yielded similar results in all specifications.

It is necessary that these identifying variables be uncorrelated with migrant wages. This requirement may raise some concern, especially with respect to family migration history, the US unemployment rate and the expected wage differential. I included each of the identifying variables in the log-wage equation individually. None was a significant determinant of migrant wages, nor were the variables jointly significant when included all together, suggesting that excluding them from the log-wage equation is not unreasonable.

II.4.2 Selection Equation

As outlined above, the migration decision can be modeled as a function of the observable personal (i.e., age, education, children, marital status, occupation) and community (i.e., female labor force participation rate, proportion of adults with six or more years of education, population) characteristics available in the MMP data. The migration decision is also a function of expected labor-market opportunities in the host country and the expected cost of migration.

Of course, all identifying variables are included in the migration equation. I also include in the migration equation factors which are likely to influence wages in the US, such as age and years of education. In addition to these, each household head reports his primary occupation. The skilled and agricultural worker variables are each binary indicators that assume a value of one if the household head's reported primary occupation is classified as skilled or agricultural, respectively.[8] Finally, as an additional proxy for the cost of migration, I include the average distance between the household head's community and all US locations that hosted at least one migrant in the sample during the sample period.

II.4.3 Log-Wage Equation

Migrants report their earnings in the US on their first and most recent trip to the US along with the frequency with which they were paid. Using these employment data, I calculated each migrant's real hourly US wage. In most cases, the resulting hourly wages were reasonable, but there were several clear outliers where it was likely that either the migrant's wages or payment frequency was incorrectly coded and was not consistent with the migrant's reported occupation. I eliminated these 474 observations from the sample.

I explain migrant wages using the duration (in months) of the migrant's trip to the US, the migrant's cumulative experience (in months) in the US. Migrants with more than one trip will have had previous experience in the US and this experience is likely to be valuable in securing employment with higher pay. I also include the migrant's age, years of education, marital status, number of children, and legal status (whether the migrant entered the US without documents) at the time of migration. Each migrant reports his occupation during the migration episode and I classify these occupations as skilled or agricultural in nature in the same manner as migrants' primary occupations. Finally, I

[8] This variable could be a function of experience gained in the US. I generated similar variables that were based on the household head's reported occupation in the previous year. The results were similar whether I used primary occupations or previous year's occupations to classify the household heads as skilled/agricultural workers.

include the distance (in miles) that migrants travel from their home community in Mexico to their reported US destinations.

To proxy for economic conditions in the US destination, I include the unemployment rate and cost-of-living in the destination city. To account for changes in cost-of-living over time, I adjust each region's cost-of-living using the Consumer Price Index (All-Urban). In many cases, migrants' destinations coincided with established metropolitan statistical areas (MSAs). Where MSA-level data was not available, I substituted the regional unemployment rate and CPI.

II.4.4 Empirical Results

I first estimate a log-wage model for migrants' most-recent trips to provide a baseline model against which to compare the results from the double selection model. The estimates from a partial maximum likelihood and two-step estimation of the log-wage equation for most recent trips are both shown in Table 1. As the estimates are robust to the particular estimating procedure used, I report only the two-step estimates in subsequent regressions, this being the less computationally intensive.

With one notable exception, the results are generally in accordance with existing findings. Migrants whose most recent trip to the United States was longer tend to have higher wages on their most recent trip. Additionally, migrants with more previous experience in the US tend to have higher wages, but the marginal return to previous experience is diminishing. More-educated migrants and migrants working in skilled occupations also tend to have higher wages. Agricultural workers and undocumented migrants tend to have lower wages.[9]

The migration equation suggests that potential migrants are responsive to wage differentials as theory predicts. Married household heads and household heads with more children are less likely to migrate, while household heads whose fathers are migrants are more likely to migrate. Migrants who work primarily in skilled occupations are less likely to migrate. Theoretical predictions that potential migrants are responsive to expected costs and benefits of migration also appear to be supported. Potential migrants that live further from the US, and hence have a greater cost of migration, are less likely to migrate. They are less likely to migrate in years when the Mexican unemployment rate is lower, when the US unemployment rate is higher or when line-watch hours are higher on the Mexico-US border. Finally, in unreported estimates indicate that older household heads are less likely to migrate and more educated household heads are more likely to migrate.

That migration is less likely in the face of increased border enforcement warrants some discussion, as a potential difficulty arises in distinguishing unsuccessful migration attempts from the deterrent effect of increased border enforcement. First, greater enforcement increases the costs of migration and decreases the probability of migration attempts. Second, greater enforcement increases the likelihood that an attempted migration is unsuccessful. Since only successful migration attempts are observed in the

[9] Migrants' legal status is self-reported. Migrants are classified as "illegal" if they have no immigration documents or possess false documents. Problems due to misreporting legal status will likely be smaller in the MMP surveys than in US-based surveys such as the Census since the MMP surveys are conducted primarily in Mexico and are also retrospective.

data, one might discount deterrence as an effect of increased border enforcement. Abundant anecdotal evidence suggests, however, that migrants apprehended during or following their border crossing tend to re-attempt the border crossing shortly after being returned to Mexican territory.[10] Such evidence strengthens the case for migration deterrence as the more appropriate interpretation of the effect of increased border enforcement.

Contrary to existing evidence, the significance of the coefficient on the selectivity correction term (inverse Mills ratio), λ, in the two-step procedure, or rho (ρ) in the partial ML procedure, indicates that unobserved attributes in the migration equation also positively influence migrant wages – positive migrant selection. This result contrasts sharply with the evidence presented by Massey and Donato (1993) and Massey (1987). It should be noted that the specification of the migration equation in Table 1 excludes the variables representing previous US experience that are included in the specifications employed in these previous studies. I exclude these variables from the current selection equation since my goal is to more explicitly model differences between non-migrants, one-time migrants and repeat migrants.

The result that migrants are positively selected on unobservable characteristics is possibly due the existence of both repeat and one-time migrants in the sample, without accounting for the learning that may occur on migrants' first trips. If greater knowledge concerning potential for success in the US causes repeat migrants to be selected

[10] See Cornelius (1978). Prior to 2004, apprehended migrants were returned to the Mexican side of the border. In 2004, the Border Patrol implemented the Interior Repatriation Program in an effort to reduce the probability that apprehended migrants re-attempted border crossings.

differently than one-time migrants, then ignoring the information gained on the first trip may confound the different types of selection. One strategy that avoids the complications inherent in modeling the learning effect but retains the single-selection framework is estimation of a model of first-trip wages. This model will uncover any selection prior to the start of migration, but cannot account for systematic differences between migrants that are due to pre-meditated strategies.

The selection equation remains the same in first-trip wage model, but there is a restriction placed on the log-wage equation. Namely, the effect of previous US experience on log-wages is restricted to be zero, since first-time migrants have no previous US experience by definition. The estimates using first trips only are presented in Table 2. Of note in columns (1) and (2) is that there appears to be no selection on unobservable characteristics in first trips. Rho is not significant for either the partial ML or two-step estimation. Out of concern that I had retained some wages that resulted from incorrect coding of payment frequency, I excluded those migrants whose log-wages were outside of the inner-quartile range of \$4.89 to \$7.69 per hour. The results when these migrants are excluded are shown in columns (3) and (4). The estimates of rho (ρ) suggest that for first-time migrants, there is negative correlation between errors in the selection equation and errors in the log-wage equation. This result implies that there is negative selection of migrants based on unobservable characteristics, though the partial ML estimate is only significant at the 10 percent level. Allowing the unexplained component of wages to be interpreted as ability or motivation, the negative correlation suggests that those migrants with lower ability are also those with greater unobserved propensity to migrate.[11] Put simply, migrants tend to be of lower ability than non-migrants. The reader should note that these results must be interpreted with some caution as the significance of ρ is sensitive to the exclusion of the outer-quartiles of wage earners.

II.5. Double-Selection: Empirical Framework

As discussed previously, a model of migrant wages (either on the migrant's first trip or most recent trip) with a single selection stage disregards the distinction between first-time and repeat migrants.[12] If migrants are non-randomly selected from the population of Mexicans then one must also acknowledge the possibility that repeat migrants are non-randomly selected from the population of migrants. For instance, if migrants differ with respect to pre-meditated strategies, a singular treatment of first-time migrants and migrants who choose multiple trips may be inappropriate, even in a specification of first-trip wages. Furthermore, migrants may differ with respect to the type of information they receive concerning their potential for success in the US during their first trip. The possibility for such differences in learning suggests that the model of selection described above is perhaps too restrictive, as individuals with prior US trips and individuals with no prior migration experience are treated the same with respect to the factors that predict migration. That is, the restrictive model excludes from the selection equation potentially important information on earnings and occupation type during

[11] The unexplained component of wages could arise from unobserved differences other than ability such as specific skills, quality of education, opportunities available in Mexico, etc.

[12] The distinction between one-time and repeat migrants has significance beyond concern for proper econometric modeling. In addition to the amount of time they stay in the US, one-time and repeat migrants are likely to differ in their impact on the US economy.

migrants' first trips. A more appropriate characterization of the selection process of repeat migrants should allow for the possibility that the re-migration decision is influenced by information realized during previous trips to the US. Accounting for both the selection into migration and the selection into subsequent migration will expose any systematic differences between the unobservable characteristics of first-time and repeat migrants. I next consider a log-wage equation for repeat migrants' most recent trips with multiple-selection, as outlined in Tunali (1986).

The wage of a repeat migrant on his most recent trip is only observed if he has first selected into migration, then selected into repeat migration, conditional on information learned during his first migration. As before, a household head chooses to migrate only if the present value of the expected net benefit from migration is positive. The expected net benefit from first migration and from most recent migration depends on expected wage differentials and costs of migration. The expected net benefit from first migration and its analog for most recent migration can be written in reduced form for the i^{th} migrant as:

$$y_{1i} = \gamma_1 z_{1i} + u_{1i} \tag{4}$$

$$y_{2i} = \gamma_2 z_{2i} + u_{2i}, \tag{5}$$

where the y's represent the i^{th} migrant's expected net benefit from first and most recent migration, respectively. The attributes that influence the decision to migrate for the first time are represented by x_{1i}, while x_{2i} represents factors that influence the decision to migrate more than once. Thus, x_{2i} should include information realized on the initial migration to the US.

A first migration is only observed when $y_{1i} \geq 0$. Likewise, a repeat migration is only observed when $y_{2i} \geq 0$. Therefore, the i^{th} migrant's log-wage is given by

$$\ln w_i = \beta x_i + e_i \quad \text{if } y_{1i} \geq 0 \text{ and } y_{2i} \geq 0 . \tag{6}$$

If repeat-migrant wages are observed for the entire population, the disturbances in equations (4), (5), and (6) are assumed to be distributed multivariate normal with zero means. The variances and covariances of these disturbances are

$$V(e_i) = \sigma^2,\ Cov(e_i, u_{1i}) = \rho_1,\ Cov(e_i, u_{2i}) = \rho_2,\ V(e_{1i}) = V(e_{2i}) = 1,\ Cov(u_{1i}, u_{2i}) = \rho .$$

Of course, this wage is only observed for repeat migrants, and the existence of possible selection implies that the mean of the disturbance in the log-wage equation is not necessarily zero. Specifically,

$$E(e_i \mid u_{1i} > -\gamma_1 z_{1i}, u_{2i} > -\gamma_2 z_{2i}) = \rho_1 \lambda_{1i} + \rho_2 \lambda_{2i}, \tag{7}$$

where $\lambda_{1i} = f(a_i)F(B_i) / G(a_i, b_i, \rho)$ and $\lambda_{2i} = f(b_i)F(A_i) / G(a_i, b_i, \rho)$ are the selectivity correction variables and $a_i = \gamma_1 z_{1i}$, $b_i = \gamma_1 z_{2i}$, $A_i = (a_i - \rho b_i) \big/ \sqrt{(1-\rho)^2}$, $B_i = (b_i - \rho a_i) \big/ \sqrt{(1-\rho)^2}$, $f(\,)$ is the univariate standard normal density function, $F(\,)$ is the univariate standard normal distribution function, and $G(\,)$ is the bivariate standard normal distribution function. The repeat migrant's expected wage can then be expressed as

$$E(\ln w_i \mid u_{1i} > -\gamma_1 z_{1i}, u_{2i} > -\gamma_2 z_{2i}) = \beta x_i + \rho_1 \lambda_{1i} + \rho_2 \lambda_{2i} . \tag{8}$$

The selectivity correction variables are calculated using consistently estimated parameters from a first stage bivariate probit model with partial observability – a probit with selection. They are then included in the log-wage equation as explanatory variables.

As discussed in detail in Tunali (1986), an additional restriction on the selection equations is required for identification of the model. In particular, at least one of the identifying variables from the first selection equation must be excluded from the second selection equation. Thus, an appropriate excluded variable would be correlated with the decision to migrate for the first time, but uncorrelated with the decision to re-migrate. In the double-selection model, I exclude the US unemployment rate from the second migration equation. To see an intuitive justification for this restriction, consider the differences in the uncertainty that individuals face with respect to employment based on possessing previous migration experience. Those who have migrated previously may have specific knowledge of employment opportunities and as such, the US unemployment rate may hold relatively little significance in influencing the migration decision. Conversely, first-time migrants will tend to have relatively less information regarding specific employment so that general measures of unemployment may factor into the decision to migrate. As further justification, tests revealed that the US unemployment rate is a significant factor in the decision to become a migrant, but is not a predictor of repeat migration.

II.5.1 Estimation

In the double-selection framework, the migration selection equation remains the same as in the single-selection approach. As this selection equation uncovers the differences between migrants and non-migrants, the variables used to describe these differences must be observed for both migrants and non-migrants. The second selection equation – the repeat migration equation – contains several variables that are observed only for migrants, namely the wage realized on the migrant's first US trip, the duration of the first trip and indicators for the type of work performed on the first trip (e.g., skilled or agricultural work). As discussed above, the repeat migration equation excludes the US unemployment rate for identification purposes.

Columns (1) and (2) of Table 3 show estimates from the first-stage of the double-selection model in which variables realized on migrants' first US trips (wage, duration, and occupation-type) are excluded from repeat-migration selection equation. This model contrasts with the estimates of the preferred model in columns (3) and (4), in which first-trip experiences are included in the repeat-migration equation. I also exclude migrants' primary occupation types from the repeat-migration equation in favor of including occupation types from the first trip, as first-trip occupations are better predictors of repeat migration than primary occupation types.

The results from the preferred first-stage procedure are shown in Table 3 in columns (3) and (4). Focusing on the repeat-migration equation estimates in column (3), estimated coefficients imply that migrants who earn more on their first trips are more likely to migrate again. Migrants who worked in skilled occupations during their first trip are less likely to be repeat migrants. In contrast, migrants who work in agriculture are more likely to migrate multiple times. Given the seasonality of agricultural work, this tendency is not surprising. Interestingly, the differential between migrants' expected wages in Mexico and expected wages in the United States has a negative effect on the probability of observing a repeat migration. Additionally, the correlation between the errors in the migration and repeat-migration equations is insignificant, implying that the unobserved propensity to migrate for the first time is not related to the unobserved propensity to be a repeat migrant.[13]

Turning now to the log-wage equation estimates for repeat migrants, the implications are largely similar to those in the single-selection framework. Table 4 shows results from three different models. The first is a naïve model of repeat-migrant wages shown in column (1), included here simply as a basis for comparison. The second column show results from a single-selection model of repeat migrant wages, the selection stage modeling the selection into migration. Finally, the model that accounts for both selection stages – selection into migration and selection into repeat migration – is shown in column (3) of Table 4. The positive and significant coefficient on first-trip wages supports the hypothesis that positive selection in the single-selection log-wage approach is driven at least partially by the positive correlation of first-trip wages with both the decision to migrate on multiple occasions as well as wages on migrants' most recent trips to the US. In addition, undocumented migrants and agricultural workers tend to earn less

[13] There is significant heterogeneity in the number of previous trips experienced by repeat migrants, with some migrants in the sample reporting more than 40 trips to the US in their lifetimes. To verify that such outliers were not driving the results, I excluded repeat migrants who were in the top quartile of US trips (those with more than 8 trips to the US). Both the first-stage and log-wage estimates were qualitatively similar when this group of repeat migrants was excluded.

during their most recent trips.[14] Most importantly, the coefficient estimate for the first selectivity correction terms suggests that the single-selection approach to estimating log-wages may be misleading. In particular, the estimates suggest negative selection into migration based on unobservable characteristics, but no selection on unobservable attributes for repeat migrants compared to single-time migrants. That is, insofar as the unobservable component of wages can be interpreted as ability, as a general sub-population of survey respondents, repeat migrants are toward the lower end of the unobserved ability distribution.

The selection results indicate that there are systematic unobservable differences between migrants based on migration frequency. This analysis, of course, does not speak explicitly to differences in selection based on permanency of migration. In particular, the double-selection framework in its current incarnation cannot uncover unobserved differences between repeat migrants that maintain a household in Mexico and repeat migrants that eventually settle in the US. Likewise, it cannot distinguish one-time migrants who return to Mexico and one-time migrants who remain in the US indefinitely. Thus, the result that repeat-migrants are negatively selected on unobserved ability cannot be interpreted as a direct verification of the theoretical predictions of permanent migration described by Borjas (1987), though it is not inconsistent with the theory.

[14] Given the seasonality of agricultural work, the rather parsimonious treatment of agricultural workers employed here could be viewed as overly restrictive. In particular, the effect of previous US experience on wages could be expected to differ significantly between agricultural and non-agricultural workers. Estimates were robust to more flexible wage specifications wherein the effect of previous US experience was allowed to differ by occupation-type.

II.6. Conclusion

Migration is most typically modeled in the literature as a permanent, single event. While this type of model is appropriate for many migrants, it may not be appropriate for a significant proportion of migrants to the US. Temporary trips and repeated trips to the US are both key characteristics of Mexican migration; characteristics overlooked by traditional models of migration. Likewise, empirical studies of selection based on unobservable characteristics also fail to acknowledge the variation in Mexican migration patterns, opting instead for simpler models of migrant selection. These studies have found that migrants are not selected based on unobservable attributes. I attempt to uncover differences between migrants on one dimension, namely, migration frequency. To account for differences between one-time and repeat migrants, I estimate a Heckman-style double-selection model of migrant wages. The estimates from this model indicate significant observable differences between repeat and single-episode migrants in that higher first-trip wages increase the likelihood of repeat migration. Additionally, I find that repeat migrants are negatively selected on unobservable attributes relative to non-migrants. They also indicate that any unobservable differences between repeat and single-time migrants do not significantly affect migrant wages. Interpreting the unexplained portion of migrant wages as migrant ability, these findings suggest that repeat migrants are of lower ability than non-migrants and that there is no significant difference in ability between repeat and single-episode migrants. This highlights the shortcomings of single-selection specifications in modeling Mexican migration. It also suggests that one may draw misleading conclusions regarding Mexican migrant selection from models that ignore differences in Mexican migration patterns.

CHAPTER III

BORDER ENFORCEMENT AND MIGRANT DIVERSION

III.1. Introduction

In the last quarter century immigration to the United States, particularly Mexican migration, has found a place at the forefront of public debate. The U.S. Census Bureau estimates that in 2000, there were over 31 million foreign-born residents in the United States. Of these, roughly 8.7 million reported their race or ethnicity as "Mexican." Not only do Mexican immigrants compose a large proportion of the stock of foreign-born residents, they are an equally large proportion of the flow of immigrants to the US each year. In 2005, the Department of Homeland Security (DHS) estimated that of the 1.1 million immigrants admitted to the United States, over 160,000 were born in Mexico. For 21 of 50 states, the inflow of Mexican-born immigrants was larger than that from any other country. Even more striking is the flow of illegal immigrants based on data from border apprehensions.[15] In 2005, the DHS reported that over one million (86 percent) of the 1.2 million illegal immigrants apprehended along international borders of the United States were Mexican nationals.

The large flows of undocumented Mexican migrants to US-border states prompted the introduction of initiatives in three of the nine US Border Patrol sectors

[15] While annual border apprehensions are not a completely accurate measure of illegal immigration flows, they do provide a rough indication of the magnitude of illegal immigration relative to legal immigration.

along the US-Mexico border. These initiatives targeted the most highly trafficked sections of the border and both increased the number of border agents and provided more sophisticated technology for detecting and apprehending undocumented migrants within their sectors. The first, Operation Blockade was a two-week long initiative launched in 1993 in El Paso (Texas) Sector which was replaced in 1994 by the longer-term Operation Hold the Line. Also in 1994, a third initiative, Operation Gatekeeper was formally established in San Diego (California) Sector. Later, McAllen (Texas) Sector implemented Operation Rio Grande in 1997, which was followed most recently by Tucson (Arizona) Sector's Operation Safeguard in 1999. In this paper, I examine the impact that these initiatives have on Mexican migrants' ultimate destination choices in the US through a more general analysis of the effects of geographic variation in border enforcement.

Models of migration based on the human capital investment model predict that migration is less likely in response to greater expected costs of migration. The increased probability of apprehension can affect the expected costs of migration in several ways. First, it may increase the probability that migrants employ the services of a human smuggler ("coyote"), holding constant the price of coyotes. Second, more stringent border enforcement likely increases the costs of smuggling to coyotes. Thus, the expected price of a coyote is higher, holding constant the probability of employing a coyote. Finally, greater enforcement may increase a migrant's expected number of unaided crossing attempts. There are numerous studies that investigate the effect of border protection on Mexicans' decision to migrate.[16] The simplest analyses employ dummy variables that indicate the implementation of government policies designed to increase border protection, the Immigration Reform and Control Act of 1986, for example. Alternative analyses utilize aggregated data on annual line-watch hours (man hours expended on border monitoring) for the entire US-Mexico border, which ignores the significant variation in enforcement levels over the 2,000 mile-long border.[17] These studies find weak evidence, if any, that border enforcement deters illegal immigration.

In light of the apparent weak deterrent effects of border enforcement, some recent studies have highlighted the possible diversionary effects of border enforcement. That is, they explore the phenomenon of migrants choosing alternative US-entry routes in response to geographically concentrated increases in border enforcement. Gathmann (2004) studies enforcement effects in the market for migrant smugglers. She provides evidence that increases in aggregate border enforcement during the mid-1990s caused illegal migrants to shift from traditional crossing routes to more remote, and hence dangerous, crossing routes.

More relevant to the current analysis, Sorensen and Carrion-Flores (2007) discuss the effects of sector-level border enforcement on migrants' crossing location choices. They use data from Hanson and Spilimbergo (1999) that track both time-series and geographic variation in border protection. This richer dataset enables analysis of the

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[16] See for example, Donato, Durand and Massey (1992), Koussoudji (1992), Espenshade (1994), Hanson and Spilimbergo (1999), and Guzman, Haslag and Orrenius (2002).

[17] An exception is Hanson, Robertson and Spilimbergo (2002) which explores the relationship between sector-level border enforcement and wages in border communities in Southern California and west Texas. Migrant diversion, however, is not the focus of the paper.

diversionary effects of non-uniform border enforcement across border patrol sectors. Using a modified nested logit framework, the authors decompose the effect of enforcement into a deterrence effect, wherein migrants choose not to migrate, and a diversion effect, where illegal immigrants simply choose to cross the border in a different sector. Both types of effects are significant, indicating that targeted enforcement is successful in deterring some migration, but does divert some migrants to alternative crossing locations in different border sectors.

The true implications of migrant diversion for US communities, however, depend on whether the estimated diversionary effects of enforcement on crossing location ultimately influence migrants' destination choices. This issue is not addressed by Sorensen and Carrion-Flores (2007) as the nested logit framework used does not identify the specific effects of enforcement in a given sector on the probability of choosing a specific crossing alternative. For example, the authors are unable to address whether increased enforcement in San Diego diverts migrants to the adjacent El Centro sector, or whether migrants are diverted to McAllen sector, along the southernmost tip of Texas. The way in which migrants are diverted may have consequences for the geographic distribution of illegal immigrants in the United States. If migrants are diverted to adjacent sectors, the ultimate destination choices may be unaffected. If, however, migrants choose more distant crossing alternatives, enforcement in California may influence the flow of illegal immigrants to Texas. Given the well-documented influence of enclaves and familial ties on destination choice, even diversion to distant border crossings may not ultimately affect migrants' destinations within the US. As such, this paper seeks to identify patterns in the effect of targeted enforcement not on crossing choices, but on migrant destination choices. I find evidence in support of migrant diversion in crossing location in response to variation in border enforcement. Results indicate that diversion appears to have a relatively small effect on migrants' ultimate destination choices, however, and that there is a strong degree of persistence in destination choice.

In the following section I examine the historical variation in border enforcement, showing the effects of the border initiatives on line-watch hours. In Section III.3, I briefly discuss the theoretical model. Section III.4 describes the data and sample used to model migrants' location choices. Section III.5 discusses the probit models of destination choice, motivates the need for the nested logit models of migrants' joint crossing-destination choices, and reviews the results from the nested logit specifications. Section III.6 concludes.

III.2. Graphical Evidence

Border enforcement, measured in line-watch hours, did not vary much from the late 1970s through the early 1980s. With the exception of a slight, temporary increase in line-watch hours following the Immigration Reform and Control Act in 1986, significant increases in border enforcement did not begin until the mid-1990s (see Figure 1).

Figure 2 shows the disaggregated border enforcement data by sector. San Diego sector has consistently contributed the majority of total line-watch hours and was the first to experience a large increase in line-watch hours, followed shortly after by more modest increases in enforcement in El Paso sector. The increase in line-watch hours in Tucson sector and McAllen sector in the late 1990s follows from the implementation of Operations Safeguard and Rio Grande, respectively.

Figure 3 shows border enforcement per border-mile when sectors are grouped together according to coincidence with border state lines. San Diego and El Centro sectors are responsible for patrolling the California border and Yuma and Tucson sectors monitor the Arizona border. I associate El Paso, Marfa, Del Rio, Laredo, and McAllen sectors with Texas. The increase in hours per mile along the California border beginning in 1994 is driven primarily by San Diego sector. The increase a few years later in Texas is due to primarily to increases in El Paso, Laredo and McAllen sectors. Finally, the increase in line-watch hours per mile along the Arizona border are driven mostly by Tucson Sector's Operation Safeguard, though there were modest increases in line-watch hours in Yuma Sector in the late 1990s.

III.3. Empirical Framework

Geographic variation in border protection has potentially significant implications for the geographic distribution of Mexican migrants in the United States. The relative concentrations of Mexican migrants in various US regions can be viewed as the culmination of individual migrants' decisions to choose one destination over another. The empirical strategy, therefore, will involve estimation of a discrete choice, typically derived from a random utility model (RUM). Consider a random utility model broadly defined in the migration context, in which each of N potential migrants chooses from among US destination alternatives, $j = 1, \ldots J$, based on the utility, U_{nj}, he receives from each alternative. The probability that individual n chooses alternative j is then given by:

$$P_{nj} = P(U_{nj} > U_{ni}, \forall j \neq i). \tag{9}$$

In the current context, utility at each destination will be a function of the destination's characteristics, D_j. These characteristics include the costs of migration and expected benefits to be accrued at each destination. Utility is also a function of personal attributes, X_n, such as age, education, and occupation-type, etc. Making the typical assumption that utility is linear in these characteristics, the utility of alternative j is given by

$$U_{ij} = \alpha D_{ij} + \beta X_i + e_{ij}, \tag{10}$$

where α and β are parameters to be estimated and e_{ij} is the error term.

Typically, the cost of migrating to a destination is approximated using the distance between origin and destination. As border protection also likely influences the cost of migration to each alternative, it should be included along with the other alternative-specific attributes. In practice, the way in which border protection is incorporated in the model will depend on how the migrant's choice set is ultimately specified, as will be discussed below.

III.4. Data

To uncover any potential diversion effects of non-uniform border protection I use data provided by the Mexican Migration Project (MMP), a collaborative effort of Princeton University and the University of Guadalajara. The MMP surveys began in 1982, and have been conducted annually from 1987 through 2004. Each survey year, interviewers randomly select approximately 200 households from each of two to five Mexican communities. Though households within communities are selected at random, the communities are located in Mexican states whose residents have historically had high propensities for migration to the United States. As no community is surveyed twice, the data are repeated cross-sections that cover 107 communities in 19 Mexican states. The survey collects demographic and economic characteristics of each community and each household, personal migration histories for each family member in the household, and life histories of each household head. Included in these life histories is a yearly account of each household head's migrations. I restrict the sample to include only trips for illegal migrants as border enforcement should not directly influence the cost of migration for legal migrants. Finally, due to data limitations, I consider only migrant trips made from 1982 to 2000.

The MMP data do not contain information on the household head's residential location for all migratory trips to the US, but a reasonable proxy for the household head's residence, the state and city in which the household head is employed, is included.[18] As outlined in the discussion of the empirical model, determinants of migrants' location choices can be grouped into destination attributes, migrant characteristics and border enforcement variables. Destination attributes include unemployment rate, real cost of living, real per capita income, and distance from migrants' home communities in

[18] Any concerns over this minor shortcoming of the data are mitigated in the current analysis as we are simply concerned with the state of residence. The lack of residential information will only be a problem if migrants' residential and occupational locations in the US are separated by state lines.

Mexico.[19] Individual-level variables are age, years of education, characteristics of the migrant's primary occupation, personal migration experience, and the migration experience of each migrant's home community in each destination choice. These last three variables warrant some discussion.

Each migrant reports his primary occupation in the MMP survey. The two characteristics of the migrant's primary occupation are dummy variables indicating whether or not the occupation is skilled and whether or not the occupation is in the agricultural sector, respectively. There are two personal migration experience variables. The first, *PME*, is a dummy variable that takes a value of unity if the migrant has previously migrated to the destination region. The second personal migration experience variable, *PMmonths*, is the cumulative number of months the migrant has spent in the destination region prior to the current migration. The community migration experience variable for a migrant is the proportion of total number of months spent in the US that were spent in the destination region, summed across all community members surveyed up to the year preceding the migrant's trip. This is the same variable constructed by Bauer, Epstein, and Gang (2006) and is designed to capture differences in available networks across US destinations. It also may account for some community-specific heterogeneity in destination choice. This measure should have a positive effect on the probability of choosing a given destination.

The concept of border enforcement in a given sector can be loosely defined as some function of line-watch hours in that sector. Before proceeding to the empirical

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[19] The variables are available at the MSA-level. I have averaged the values across all MSAs within each state to arrive at the state-level variables.

model of migrants' responses to geographically non-uniform border enforcement, it will be helpful to first consider what information might influence migrants' destination choices and, more generally, what information migrants may have regarding border enforcement. I will make the simplifying assumption that migrants do not respond to future levels of border enforcement.[20] Therefore, each of the border-enforcement measures considered will utilize current-year or historical line-watch hours. Additionally, line-watch hours alone may not be a fully appropriate measure of enforcement in each region since the different border offices are responsible for patrolling stretches of the border whose lengths vary widely by state. To account for differences in such responsibility, I use line-watch hours per border-mile as the basic measure of border enforcement. Admittedly, measures of enforcement based on line-watch hours will not capture increases in border enforcement due to technological developments (thermal imaging, night-vision equipment, seismic sensors, radios etc.), but line-watch hours (border patrol agents) are typically the largest budgetary component of border enforcement.

Initially, I consider annual hours per border-mile in the year of migration as a proxy for expected border enforcement. Of course, it is possible that there are delays in the transmission of information from previous migrants to potential migrants regarding levels of border enforcement and success of crossing in various locations. As such, I also consider annual line-watch hours per mile in the year previous to migration as a proxy for

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[20] This assumption is more troubling in the context of the migration choice than the destination choice. In terms of destination choices, this assumption is troubling if intertemporal substitution between destinations is a characteristic of migrant decision-making. Allowing for such substitution would suggest that migrants both predict future enforcement levels and make multiple migrations to the US. As a first pass, then, I do not view dismissing future enforcement as overly restrictive.

expected border enforcement. In all specifications, the logarithm of line-watch hours per border-mile is used as the border enforcement measure.

Of course, the endogeneity of border enforcement is a concern in modeling many aspects of migration decisions, including destination choice. Typically an issue with aggregated migration data, border enforcement is likely a function of the expected number of illegal immigrants. This may present a challenge in the current case as the expected number of illegal immigrants is likely based on past illegal immigration (and hence, the decisions of previous migrants) and current migrants tend to follow previous migrants (based on community or personal migration experience). Thus, the border enforcement variable may be correlated with the unobserved portion of utility since border enforcement and the current migration decision are both likely influenced by previous migration decisions. The migration experience variables will mitigate this problem. Nevertheless, I treat border enforcement as an endogenous variable as factors unobserved by the researcher may cause some degree of correlation between border enforcement and the error term to remain.

The simplest solution to the endogeneity of enforcement is to use lagged values of border enforcement. Alternatively, existing studies have dealt with the endogeneity of border enforcement in several different ways.[21] Most notably, Sorensen and Carrion-

[21] Hanson, Robertson and Spilimbergo (2002) model border enforcement as a function of several variables exhibiting only time-series variation. Gathmann (2004) instruments for border enforcement using the drug budget of the Drug Enforcement Administration (DEA), arguing that illegal immigration and drug-trafficking are typically separate enterprises and that the budget of the DEA is correlated with the budget of the border patrol. Since my aim is to exploit geographic and time-series variation in enforcement, I require instruments that exhibit both geographic and time-series variation. Thus, the instrumental variables approaches employed by Hanson, Robertson and Spilimbergo (2002) and Gathmann (2004) are inadequate in the current context.

Flores (2007) instrument for sector-level border enforcement using two political process variables, arguing that local politicians influence the level of enforcement in sectors proximate to their districts. For each border sector, they first ascertain the size of the Congressional delegation representing the border sector, counting how many Congressional districts share the sector's border with Mexico. The authors assert that the budget and level of enforcement in a sector should increase as the size of the sector's lobby in Congress grows. Second, they argue that the strength of the state Congressional delegation representing a border patrol sector should affect the level of funding and enforcement in that sector. They count how many members from the each border state's delegation are on the House Appropriations committee and then match those state delegations to border patrol sectors. Sorensen and Carrion-Flores (2007) construct these data using the Congressional Quarterly Almanac.[22]

One drawback to using this instrumental variables strategy is that it requires somewhat unfamiliar methods for inclusion within discrete choice models. Furthermore, results are qualitatively similar when either this more complex IV strategy or lagged values of enforcement are utilized in dealing with endogeneity. As such, I favor the treatment that employs lagged values of line-watch hours to correct for the endogeneity of border enforcement.[23]

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[22] I constructed similar data using various editions each of Congressional Quarterly's Politics in America and the Congressional Staff Directory.

[23] The control function approach is described in Petrin and Train (2003) and implemented in Sorensen and Carrion-Flores (2007). Results using this approach are available from the author upon request.

III.5. Empirical Results

III.5.1. Probit Specifications

While patterns of migration from Mexico to the US are admittedly complex and varied, the probit model offers perhaps the simplest framework within which one might reasonably analyze enforcement effects on migrant location choice. Given California's role as the most common destination for Mexican migrants and the overwhelming increase in line-watch hours per mile that occurred following Operation Gatekeeper, I offer as a preliminary analysis a consideration of border enforcement's role in affecting migrant choices to go to California versus elsewhere in the US. Table 5 shows the results from probit model specifications that include several variations of enforcement measures that differ by degree of disaggregation. A model lacking border enforcement is shown in column (1) for comparison purposes. The effects of variables in this model are largely robust to the inclusion of enforcement variables. Migration experience plays a significant role, with migrants tending to choose California if they have previously been to California. The effect of experience is also significant with respect to the length of time spent in California, where migrants are more likely to choose California the greater the number of months spent in California previously. Community migration experience plays a similar role as estimates indicate that migrants tend to follow those in their communities who have migrated in the past. Finally, migrants whose home communities are farther from the Texas border are more likely to choose California. This may be evidence of destination substitution, as it suggests that choosing California is more likely for migrants for whom it is more costly to migrant to an alternative state. The model in column (2) includes total annual line-watch hours. The negative and significant coefficient on this variable indicates that as enforcement along the entire border increases, the likelihood of migrants choosing California as a destination decreases. Since variation in California border enforcement is responsible for much of the variation in total border enforcement for a large part of the sample period, such a finding may be evidence of migrant diversion.

To more explicitly uncover a diversion effect, I consider a specification that distinguishes California border enforcement from enforcement along the remainder of the border in column (3). If migrant diversion were taking place and if migrants consider the level of line-watch hours in making location choice, we should expect a negative coefficient on enforcement in California and a positive coefficient on non-California enforcement. The estimate of the coefficient on California border enforcement, though negative, is insignificant. Additionally, the negative estimate of the effect of enforcement in border regions other than California is inconsistent with the diversion hypothesis as it implies migration to California is less likely when enforcement is greater in non-California sectors.

Of course, employing an aggregated measure of enforcement along other sections of the border constrains the effect of enforcement in sectors proximate to California and the effect of enforcement in more distant sectors to be equal. This shortcoming is addressed in the specification shown in column (4), in which enforcement is disaggregated by border state. This model has the greatest log-likelihood of the probit specifications, though none of the enforcement variables are individually statistically significant. A likelihood ratio test of their joint significance rejects the null hypothesis that the joint effect on the probability of choosing California is zero.[24] One explanation for this is the high degree of correlation between the enforcement variables – each pairing of enforcement variables generates a correlation coefficient greater than 0.9.

While the probit analysis is attractive for its simplicity, it does not take full advantage of the richness in the data and limits the researcher's ability to examine any potential complexity in migrants' destination substitution patterns. In particular, aggregating all destination alternatives other than California into a single entity obscures any diversion effects that may take place between destinations that comprise the aggregate. In the next section, I discuss more flexible models of destination that will facilitate the analysis of such diversion.

III.5.2. Polytomous Choice Specifications

Extending the probit model to a polytomous choice model of destination choice (i.e., a model in which migrants choose from among different destination states) presents complications in integrating border enforcement into any of several variants one might consider. First consider a model in which border enforcement along each state's border is interpreted as a characteristic of that state. While this model is attractive because utility is specified as a function of enforcement in only one border region, it has the significant drawback of leaving interior states with no convenient border-sector pairing. These interior states would presumably require elimination from the analysis.

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[24] The χ^2 statistic is 10.04, which is greater than the critical value of 7.81 at the 95 percent confidence level with three degrees of freedom.

Alternatively, utility can be specified as a function of border enforcement along each border region. This approach has its complications, as well. While the conditional logit yields estimates of the effect of characteristics that vary across choices such as distance, unemployment rates, or cost-of-living, the state-level border enforcement variables used in the probit specifications do not vary across destination choices. Thus, without special treatment, these enforcement terms drop out of the familiar logit probability equation. Regressors that are constant across destination alternatives, such as border enforcement, must be included as an interaction with alternative specific dummy variables. This modification allows the coefficient on the border enforcement terms to vary across choices rather than enforcement itself varying across choices. As with standard dummy variables, one of the attribute-destination interactions for each individual-level attribute must be dropped to avoid singularity. The resulting coefficients are then interpreted relative to the dropped interaction. Thus, the relative interpretation of the coefficients precludes the calculation of any absolute marginal effects or elasticities with respect to the enforcement variables. Such effects are necessary to determine whether the statistically significant effect of enforcement has any practical import in affecting migrants' destination choices.

I ultimately favor an alternative approach which expands the migrant's choice set, so that migrants choose from among joint crossing-destination pairs. In this way, each alternative has an associated level of border enforcement and enforcement varies across alternatives, obviating the need to create the interactions required in the model of simple destination choices.

I simplify the conditional logit analysis so that both destination and crossing locations are defined at the state level. That is, the crossing location component for each crossing-destination alternative is defined as California border crossing, Arizona border crossing or Texas border crossing. The destination component consists of one the states on the US-Mexico border (California, Arizona, and Texas) or an alternative choice consisting of all the "interior" states of the Union, resulting in four possible destination components.[25] Aggregation of all interior states is not overly restrictive in that, once a migrant chooses an interior state, his particular state of residence is not likely influenced by the level of border protection as the border has already been crossed. Combining these three crossing locations and four destinations yields 12 unique alternatives from which migrants may choose. Two of the possible crossing-destination pairs (California-Arizona and Arizona-Texas) were eliminated because they were chosen too infrequently, leaving ten possible alternatives in the estimation.

III.5.3. Nested Logit Specifications

A key assumption of the conditional logit model is that the random components of alternative-specific utility are uncorrelated across alternatives. This assumption imposes patterns of substitution between alternatives in which the elimination of an alternative

[25] New Mexico shares about 150 miles of its border with Mexico but has been included as an interior state. The border area of New Mexico is rugged and remote, making it difficult to cross into the United States there. This may suggest that its characterization as a border state, while technically correct, may not necessarily be appropriate, and that it could reasonably be treated as an interior state. Though conditional logit estimates tend to show sensitivity to the specification of the choice set in many applications, unreported results show that estimates in this context are robust to the separation of New Mexico from other interior states. For considerations of parsimony, then, I consider only models that group New Mexico with interior states.

increases the probability of choosing remaining alternatives proportionately so that the ratio of the probabilities of choosing any two existing alternatives remains the same. Such an imposition is particularly unrealistic for modeling the migrant's crossing-destination decision. For example, suppose that the alternative that includes an El Centro crossing and California destination is eliminated. The assumption of the standard conditional logit model suggests that the probabilities of choosing all other crossing-destination alternatives increase proportionally, even for those alternatives that neither include California as a destination nor include crossing sectors adjacent to El Centro. A Hausman test rejects the validity of the IIA assumption with a $\chi^2(10)$ statistic of 43.28 at the 99 percent significance level when the alternative consisting of California crossing and California destination is excluded from the choice set. The empirical strategy, then, must not depend on the IIA assumption. Perhaps the most commonly used procedure that relaxes the IIA assumption is the nested logit. As the literature on the nested logit model is extensive, I forego a full technical discussion and note simply that while the IIA assumption is relaxed across nests, it is retained within nests.

Using the nested logit in the current context, we may think of the choice process in one of two logically appealing ways. The first possible nesting structure models first the choice of crossing location, after which migrants choose a destination. Alternatively, we may specify a nesting structure in which migrants first choose a destination region and then choose a crossing location conditional on the destination choice.[26]

[26] Though the sequential interpretation of the nesting structures is intuitively appealing, the sequence is not technically imposed by the nested logit model.

The results from the nested logit specifications are shown in Table 6. The migrant characteristic variables – age, education, marital status and occupation type – are noticeably absent from these specifications. As mentioned above, inclusion of these variables requires interaction with alternative specific dummy variables because migrant characteristics do not vary across alternatives within choice situations. These interactions were statistically insignificant when included in the conditional logit models.

Columns (1) through (3) show results from models utilizing current-year enforcement values and the models in columns (4) through (6) use lagged enforcement values. There are three types of models summarized: a standard conditional logit model, a nested logit model in which nests are specified according to destination region, and a nested logit model in which nests are specified according to crossing location. Enforcement is consistently insignificant in the models using the current-year enforcement measure. Additionally, the models utilizing lagged measures of border enforcement universally show greater log-likelihood values than their counterparts using current measures of border enforcement.

The model in column (5) is a nested logit specification in which nests are specified according to crossing-state. A likelihood ratio test that the log-sum parameters are jointly unity is rejected at any of the usual levels of significance, favoring this nested logit specification over the standard conditional logit in column (4).[27] The log-sum parameter estimates in this nested logit model are all greater than one, indicating that greater substitution occurs across nests than within nests. That is, an increase in

[27] The standard conditional logit is recovered from the nested logit by restricting log-sum parameters to unity.

enforcement in a given border sector will induce disproportionate diversion of migrants to alternatives that have other crossing-state components. It should also be noted that log-sum parameters greater than unity are only consistent with utility maximizing behavior for a specified range of data.[28] I forego any detailed discussion of this aspect of the model as the nested logit specifications with crossing-state nests have lower log-likelihood values than models with destination nests.

Results from the model in which nests are specified according to destination region, shown in column (6), are qualitatively similar to the model in column (5) in terms of signs and significance of coefficients on common variables. The likelihood ratio test also rejects both the standard conditional logit model and the crossing-state nested logit model in favor of the destination nested logit model at any of the usual levels of significance. In contrast, however, the log-sum parameter estimates all lie between zero and one. This result indicates that an increase in enforcement in a given border sector will induce disproportionate diversion of migrants to other alternatives that share the same destination region. Thus, these estimates imply a degree of persistence in destination choice. The relative magnitudes of the log-sum parameters suggest that this persistence is greatest for choices that include Arizona as a destination and least for choices that include Texas as a destination.

The marginal effects for this preferred nested logit model are shown in Table 7. These marginal effects are calculated as the average change in the probability of choosing each alternative given a one percent increase in border enforcement along each state

[28] Herriges and Kling (1996) discuss the consistency of nested logit models with utility maximization in the case that log-sum parameters are greater than one.

border.[29] There are multiple negative effects in response to increases in enforcement. For example, increases in enforcement along the California border negatively affect the probability of choosing all alternatives that include a California border crossing component. This is a result of the negative effect of enforcement on choosing a given alternative. Of course, the ultimate effect of interest is how enforcement affects the probability of choosing destination regions within the US. The marginal effects of enforcement on the probability of choosing destination regions are shown in Table 8. Notably, the probability of choosing each state on the border is negatively influenced by increases in enforcement along its border. Enforcement increases in Arizona and Texas also negatively influence the probability of choosing interior states.

The varying magnitudes of the marginal effects discussed above suggest that a given increase in border enforcement will more strongly influence the probability of choosing some US destinations than others. Furthermore, a one percent increase in border enforcement in California, where annual line-watch hours per mile are relatively high, will be more costly in terms of additional border agents than a one percent increase in border enforcement in either Arizona or Texas, where annual line-watch hours per mile are relatively low. Table 9 shows the change in proportion of migrants choosing each destination region for an annual 100,000 line-watch hour increase in border enforcement along each state's border.[30] It also shows the change in the absolute number of migrants choosing each destination region for the same increase in enforcement, based on an

[29] Another commonly used approach in calculating marginal effects in discrete choice models is to calculate the marginal effects at sample means or medians of the explanatory variables.

[30] In the conversion from percentage changes to absolute changes in enforcement, year 2000 values of line-watch hours were used as the base.

annual flow of 500,000 illegal immigrants. The estimates suggest that California border enforcement is most effective in reducing migration to its state. Adding 100,000 line-watch hours annually along the California border reduces the proportion of migrants going to California by almost three percentage points. The estimates indicate that the bulk of these diverted migrants go to Texas and interior states. A similar increase in annual line-watch hours on the Texas border would reduce the proportion of migrants going to Texas by 1.7 percentage points. This is comparative to the diversionary effect of Texas enforcement on the proportion of migrants choosing California. The same increase in enforcement along the Arizona border has a relatively small effect, reducing the proportion of migrants that goes to Arizona by only .18 percentage points. The largest diversionary effect of Arizona is for California, with the increase in line-watch hours in Arizona increasing the proportion of migrants going to California by almost 1.4 percentage points.

The distribution of border enforcement also appears relevant to interior states. An increase in enforcement along the Arizona border decreases the proportion of migrants choosing interior destinations by almost two percentage points. This effect on choosing interior states is much weaker for Texas-border enforcement increases. Nevertheless, the negative effects suggest that migrants traveling to interior states may typically choose to cross in Texas and Arizona.

III.6. Conclusion

Previous literature on border enforcement has focused primarily on the deterrent effect of border enforcement initiatives on migration. The few studies that address migrant diversion in response to geographically targeted increases in border enforcement explore only border enforcement's effect on crossing location choice. The true implications of migrant diversion for US communities, however, depend on whether the estimated diversion effects of enforcement ultimately influence migrants' destination choices. Using a nested logit model of migrants' joint crossing-destination choices, I document that greater border enforcement in a given border region decreases the likelihood of crossing the border in that region. The estimated nesting parameters suggest that migrants tend to substitute more across crossing locations than across destination regions. That is, migrants can be characterized as being relatively persistent in making destination choices. Diversionary effects of enforcement on destination choice are relatively small, with the greatest degree of substitution between Texas and California. California and the interior states also exhibit a relatively high degree of substitution, followed closely by Arizona and California.

These results suggest that border enforcement officials could improve the efficacy of border enforcement policies through a coordinated approach, rather than the geographically concentrated methods they have employed thus far. The analysis also suggests that state governments need to consider enforcement of border regions other than their own in reducing illegal immigration to their respective states.

This evidence also provides a partial explanation for small wage and employment effects of increased enforcement for border cities in the US, especially if the estimated persistence in destination states also applies for destination cities. Migrants may be diverted to alternate crossing locations in response to greater enforcement, but there may be only minor effects on wages or employment in border cities if there is but a small degree of destination diversion among migrants who are intent on border cities as destinations.

While this analysis provides several insights as to the nature of border enforcement's influence on destination choice – in particular the interdependency of illegal immigration and regional border enforcement policies – they do not address policies for reducing illegal immigration once the border has been crossed. Thus, one issue of particular relevance to state governments is the possible interdependency among states with respect to illegal immigration enforcement in each state's interior, via checks on employment documentation, etc. Future research might include exploring how interior enforcement may influence destination choices for illegal immigrants.

CHAPTER IV

FOREIGN DIRECT INVESTMENT AND MEXICAN MIGRATION

IV.1. Introduction

Concern over the significant flows of illegal Mexican immigrants to the United States has grown substantially in the last two decades, as evidenced by the dramatic increase in enforcement along the US-Mexico border. The primary instrument of the US government in controlling illegal immigration, line-watch hours, increased from approximately two million hours annually in 1980 to almost nine million hours annually in 2000. A growing body of literature indicates that such increased enforcement is largely ineffective in deterring illegal immigration to the US (Hanson, Robertson, & Spilimbergo, 2002; Kossoudji, 1992; Donato, Durand, & Massey, 1992). This inefficacy is particularly striking given the $2.2 billion the US government spends annually on border enforcement (Hanson, 2005). Among other approaches, increased investment in Mexico has been promoted as an alternative to border enforcement as a deterrent of migration. In 1992, amidst ongoing negotiations for the North American Free Trade Agreement (NAFTA), then Mexican President Carlos Salinas de Gortari wrote: "…if we do not create additional jobs in Mexico, Mexicans will merely walk across the border looking for jobs in the north. We want to export goods, not people" (Hadjian, 1992, p. 46). This notion is supported by research indicating that investment by multinational firms seeking lower labor costs increases employment opportunities and raises wages in

Mexico, thus reducing the net benefit of migration to the US (Jones, 2001; Massey & Espinosa, 1997, Davila & Saenz, 1990).

Despite the large and increasing flows of US foreign direct investment (FDI) into Mexico and the growing concern over Mexican migration in the US, the effect of this type of investment of resources on Mexican immigration remains an open question. For example, existing literature provides mixed evidence on the effects of FDI on Mexican wages (Jensen & Rosas, 2007; Markusen & Zahniser, 1999; Feenstra & Hanson, 1997; Markusen & Venables, 1997). Similarly, there are conflicting views on the role of home-country wages in determining migration propensity more generally (DaVanzo, 1976; Stark & Taylor, 1991; Greenwood, 1997; Lucas, 1997). Rising above questioning the particular mechanism through which variation in FDI might influence patterns of migration, this paper uses data on FDI flows into Mexican states and individual-level survey data from Mexican households to explore the relationship between Mexican-bound FDI and Mexican immigration to the US.

The next section discusses the geographic and time-series variation in FDI flows to Mexico since the 1980s. Section IV.3 reviews the extant literature. In Section IV.4 I describe the data used in the empirical analysis that is presented in Section IV.5. Section IV.6 concludes and offers some suggestions for future research.

IV.2. Foreign Direct Investment in Mexico

Mexico received relatively small infusions of foreign direct investment (FDI) during the 1980s due to some efforts to liberalize the financial sector and gradual relaxation of restrictions on import and export licenses for intermediate goods. The dramatic increases in FDI, however, did not occur until the mid-1990s as restrictions on FDI were relaxed beginning in 1994, in accordance with NAFTA terms. Figure 1 shows both FDI stock in and flows to Mexico in both nominal and year-2000 US dollars over the period 1981 to 2006. FDI stock in Mexico has grown consistently since the early 1980s. In years previous to 1994, FDI stock increases relatively slowly and FDI flows are relatively constant. Consistent with NAFTA-induced investment, Figure 4 evidences a large increase in the flow of FDI to Mexico in 1994. This is followed by lower levels of flows in 1995 and 1996, which was likely due to the Mexican peso crisis in late 1995. Shortly thereafter, however, FDI flows increase once again reaching a peak in 2001.

The geographic distribution of cumulative FDI inflows for the six-year period following the implementation NAFTA is shown in Figure 5. Mexican states are shaded according the sum of FDI inflows over the period 1994 – 1999. The various shades indicate the quintiles of these cumulative flows, with darker shades representing higher flow values. Most striking is the concentration of post-NAFTA FDI flows in states along the US-Mexico border. There is also a large concentration of FDI in the area surrounding Mexico City. One reason for this is that firms often register FDI at their headquarters, located in Mexico City, when the ultimate destination of the FDI is in other states. Additionally, the Distrito Federal – the state which includes Mexico City – has an unusually large financial services component to its FDI flows.

IV.3. Literature

A growing body of literature documents the complex effects of FDI on labor markets in receiving countries. Several papers (Markusen & Zahniser, 1999; Lopez & Schiff, 1998; Feenstra & Hanson, 1997; Markusen & Venables, 1997) provide theoretical motivation and empirical evidence of differential effects of FDI based on worker skill levels, suggesting that employer demand due to FDI is biased toward relatively skilled workers. In support of these findings, evidence from Jensen and Rosas (2007) indicates that greater FDI flows are positively correlated with wage inequality within Mexican states. Furthermore, a study by Ernst (2005) shows differential wage effects depending on the sectoral composition and type of FDI inflows.

The standard model of migration predicts that, in the absence of financing constraints, the incentive to migrate should be reduced by greater employment opportunities and higher wages in Mexico that may result from FDI. Other strands of the FDI literature suggest the existence of technology spillovers, wherein the entry of foreign firms introduce new production technology and innovations that is then adopted by domestic firms. Nevertheless, studies of migration within countries (Greenwood, 1997; Lucas, 1997) have found no significant relationship between migration propensities and "push" factors, such as wages and employment in the origin. Additionally, analyses of Mexico-US migration find weak influences of these factors on migration propensity. Models which augment the standard theory with migration financing constraints may provide a reasonable explanation for the lack of consensus (see for example, Stark & Taylor, 1991; DaVanzo, 1976; and Lopez & Schiff, 1998). The proponents of these models posit the existence of migration financing constraints that prevent migration by those who would have otherwise migrated. Increases in wages can relax this financing constraint for relatively low wage earners, resulting in higher migration rates, while wage increases have negative effects on migration propensity for relatively high wage earners.

Several existing studies present evidence suggestive of an important relationship between FDI and emigration, examining how migration rates are correlated with measures of maquiladora activity and female labor force participation rates (e.g. Massey & Espinosa, 1997; Davila & Saenz, 1990; Jones, 2001). Alternatively, Aroca and Maloney (2006) use Mexican census data to examine how state-level FDI affects internal migration rates between pairs of Mexican states. They briefly address the issue of migration to the US, providing back-of-the-envelope calculations that indicate FDI decreases the likelihood of migration to the United States.

IV.4. Data

In the context of Aroca and Maloney's analysis, ideally one would prefer to have annual data on migration rates for each Mexican state. One could then exploit both cross-sectional and time-series variation in FDI across Mexican states to test whether state-level migration rates are correlated with state-level FDI. Unfortunately, the available census data do not include annual migration rates. This absence, combined with several other features of the census data, suggests that an alternative approach is necessary. First, the data concerning migration to the US is generated as a response to the question of whether someone in the household has been to the US in the previous five years. As a result, the census does not provide information about the migration history of the household prior to the last five years. Thus, in an analysis of US migration at the Mexican state level, the effect of FDI may be confounded with the effect of state-specific migration propensity that is unrelated to the level of FDI in the origin state. Failing to include the prior migration history may result in seriously misleading conclusions. For example, if FDI tends to go to Mexican states with relatively low migration rates, one might conclude that FDI reduces migration to the US. Conversely, if FDI tends to go to Mexican states with relatively high migration rates, one might conclude that FDI increases migration to the US.

The disadvantages from using census data suggest that an alternative approach will be needed. The Mexican Migration Project (MMP) is a collaborative effort of Princeton University and the University of Guadalajara. To uncover any potential diversion effects of non-uniform border protection I use data provided by the Mexican Migration Project (MMP), a collaborative effort of Princeton University and the University of Guadalajara. The MMP surveys began in 1982, and have been conducted annually from 1987 through 2004. Each survey year, interviewers randomly select approximately 200 households from each of two to five Mexican communities. Though households within communities are selected at random, the communities are located in Mexican states whose residents have historically had high propensities for migration to the United States. As no community is surveyed twice, the data are repeated cross-sections that cover 107 communities in 19 Mexican states.[31] The survey collects

[31] The data used in the current analysis do not contain observations from household heads in the Distrito

demographic and economic characteristics of each community and each household, personal migration histories for each family member in the household, and life histories of each household head. Since each household head is only surveyed once, these life histories comprise an unbalanced panel data set. Included in these life histories is a yearly account of each household head's migrations. I use this information to construct a binary variable for each person-year observation that indicates whether or not the household head migrated to the US.

I combine these household-head migration histories with annual data on FDI in Mexico to examine the effects of FDI on migration. Aggregated measures of stocks and flows of FDI are available online from the Secretaria de Economia for the years 1981 – 2005. This office also provides flows of FDI at the state level for the years 1999 – 2005. Andre Mollick generously provided FDI flows by Mexican state for the years 1994 – 1999. Unfortunately, FDI data at the state-level are not available prior to 1994. This limitation necessitates placing one of two restrictions on the empirical approach. First, a straightforward analysis can be had by limiting the sample to person-year observations from 1994 forward. This approach carries with it the minor disadvantage of reducing the number of available observations. A second approach, which uses observations from both before and after 1994, requires some simplifying assumptions about the geographic distribution of FDI flows in order to maintain a tractable empirical strategy.

Federale. Therefore, empirical specifications will not include variables designed to distinguish this region from others. The issue remains, however, that the ultimate destinations of a part of the FDI flows attributed to the Distrito Federale are elsewhere in Mexico. This caveat should accompany all interpretations of relevant estimates in the specifications to follow.

IV.5. Empirical Analysis

IV.5.1 Border States As Proxy For FDI Flows

I consider two separate empirical approaches in identifying the effect of FDI flows on migration propensity. The first approach is motivated by the apparent positive correlation between border proximity and FDI flows from 1994 to 1999. That is, one can exploit two tendencies in the data. First, Mexico received a significant infusion of FDI following NAFTA. Second, this FDI fell disproportionately to border-states. If FDI flows do influence the migration decision, then the implementation of NAFTA – acting as a proxy for the timing of FDI – should influence the migration decision differently for migrants living in border-states versus non-border states. While this method is attractive in its simplicity, it does not make direct use of the available FDI data. Admittedly, there may be other macroeconomic influences on migration that are correlated with FDI and that are not included in the empirical specifications. It will be important to have in mind this caveat when interpreting the results.

To simplify the analysis, I analyze US migration from 1989 to 1999. I select this time period since 1999 is the end of the period covered by the data provided by and used in Aroca and Maloney (2006). Additionally, the implementation of NAFTA falls in the middle of this window. Since the MMP surveys began before NAFTA and are administered only once for each household head, not all household heads surveyed will have sufficient information to be included in the analysis. Furthermore, the migration behavior of a household head will be censored if his community was sampled shortly after NAFTA came into effect. Thus, I include in the sample only migrants for whom there exists a person-year observation for each year in the sample period. This restriction results in a balanced panel of 955 migrants over 11 years. The panel nature of the data will allow treatment of the individual-specific migration propensity, diminishing the likelihood of confounding its effects with the effects of FDI flows.

Other variables included in each specification can be broadly categorized at the individual, community, and national levels. Individual-level variables include, age, years of education, number of children, marital status, an interaction between the household head's marital status and employment status of the household head's spouse, and characteristics of the migrant's primary occupation and personal migration experience. The primary occupation variables are based on each household head's primary occupation as reported in the MMP survey and categorize the occupation as skilled or not and agricultural or not. The personal migration experience variable is calculated as the cumulative number of months the migrant has spent in the US prior to the observation year.

Community-level variables include population, female labor force participation rate, the proportion of adults with more than six years of education, and the proportion of adults that earn at least twice the minimum wage. These variables are meant to capture economic opportunities in the household head's community. I also include community's distance from the Mexico-US border and the community's migration experience. Distance is measured at the state-level as the logarithm of the distance between the state's capital and the distance to the nearest border crossing. The community migration experience variable is calculated as the total number of months spent in the US summed across all community members surveyed up to the observation year. This variable is designed to capture community-specific tendency toward migration to the US as well as the availability of migrant networks in the US.

National-level variables included in the specification are the unemployment rates for the US and Mexico and the dollar-peso exchange rate. Following the literature, distance and annual border enforcement are included to proxy for migration costs. Border enforcement is measured as the logarithm of line-watch hours in the previous year. The lagged value is used to reduce the possibility that enforcement is endogenous to the individual's migration decision. Finally, the specifications also include a linear time trend.

As the dependent variable indicates the binary choice of whether or not the household head migrated to the US, one would anticipate using a logit or probit model. While I do provide estimates from a panel probit, I consider a linear probability model as the primary empirical approach for two reasons. First, estimation is relatively straightforward compared to probit or logit models for panel data and the linear probability model produces qualitatively similar results. Second, the empirical approach is quite general, and the magnitude of any significant effect found cannot credibly be interpreted as the marginal effect of FDI on migration propensity. Thus, I am primarily concerned with the sign of the effect.

The models in Table 10 show results from models that do not explicitly include FDI flows. Recognizing that border states received relatively large flows of FDI following the implementation of NAFTA, these models include binary variables indicating that NAFTA is in effect and whether or not the migrant lives in a border state. The interaction of these two indicators should give the marginal effect of living in a border state after the implementation of NAFTA – thus the interaction is meant to provide a rough proxy for FDI flows. The model in column (1) shows results from a model that does not include state-specific dummies. The estimated coefficient on the border-state dummy is significant and negative indicating that migration to the US before NAFTA is less likely for migrants living along the border. The estimates also suggest that migration is less likely after the implementation of NAFTA for migrants living in the Mexican interior, though this effect is only significant at the 10 percent level. Most importantly, the coefficient on the interaction between these two variables is positive and significant indicating that the likelihood of migration to the US from border states increased following NAFTA. The relatively small magnitude of this coefficient compared to the relatively large magnitude of the border-state dummy coefficient suggests that both before and after NAFTA, the effect of living in a border state has a negative effect on the likelihood of migration. Ostensibly, these results suggest that FDI flows increase the likelihood of migration lending support to the hypothesis that FDI may, in fact, relax the migration financing constraints face by potential migrants.

The effects of other variables are generally in concordance with previous studies. Age has a negative effect on the likelihood of migration to the US, consistent with findings that immigrants are typically younger. Household heads who report their primary occupation as being agricultural are more likely to migrate, further evidence that agricultural migration tends to be temporary and repeated. Both individual and community migration experience also have a positive influence on the likelihood of migration, with individual migration experience playing the larger role.

Two of the variables have effects that may initially be inconsistent with priors, namely the distance variable and the female labor force participation rate. The positive effect of distance on the probability of migration may be due to a tendency for states in western Mexico to be common migrant sources and these states are farther from the border. The female labor force participation rate, which is typically used as a proxy for the economic health of the community, also has a positive effect on the likelihood of migration. Though priors suggest that migration is less likely the better the economic conditions in a community, this positive effect can be explained in thinking about the migration decision as a household problem. Potential migrants may face a lower opportunity cost of migration if their spouses are employed. If spouses are more likely to be employed in communities with higher female labor force participation rates, we may observe greater migration propensity in such communities. This is consistent with the positive effect of FDI on migration propensity if spouses tend to benefit from the greater employment opportunities and higher wages associated with FDI.

The model shown in column (2) excludes the border state dummy and the distance variable in lieu of Mexican state fixed effects. The interaction is still included as it contains variation over time. The coefficient estimates on variables common to both models remain largely unchanged with the exception of the coefficient on the female labor force participation rate. This is likely due to female labor force participation rates exhibiting more variation across communities than within communities.

Finally, for comparison purposes I also include a panel data probit model with random effects. This model does not include state-specific dummy variables. The signs and significance on the explanatory variables in this model are similar to their counterparts in the linear probability model of column (1).

IV.5.2 Analyses Using Aggregate and State-Level FDI Flows

The results of the previous models suggest a potentially significant relationship between FDI and migration propensity over the sample period in the previous specifications. Though state-level FDI flows are not available prior to NAFTA, total FDI flows into Mexico are published beginning in 1980. These aggregate flows provide time-series variation in FDI with which to analyze the effect of FDI flows on migration propensity both before and after NAFTA. Table 11 shows specifications of linear probability models of US migration using aggregate FDI flows incorporated in several different ways. None of the models shows FDI to be a significant determinant of migration to the US, though the effect of FDI may be dampened by the lack of variation in FDI flows early in the sample period. Table 12 shows results from similar models with the sample period restricted to post-NAFTA years. There is only marginal evidence that FDI influences migration propensity when FDI is included as a quadratic in column (2), however, the effect becomes insignificant when Mexican state dummies are included in the model. Taken together, these results suggest that any effect of FDI indicated by the first empirical strategy is due primarily to cross-sectional variation in FDI flows.

The next series of models exploit both time-series and cross-sectional variation in FDI flows at the state level. Since state-level FDI flows are only available beginning in 1994, these specifications model the US migration decision for household heads over the period 1994 – 2004. Recognizing that the effect of FDI may differ by geographic region, I consider, in turn, migration models for all household heads, household heads in border states, and household heads in non-border states.

In the models that pool household heads across all household regional locations, the significance of FDI flows as a determinant of migration is sensitive to the inclusion of non-linear effects, as evidenced by columns (1) and (2) in Table 13. There is no statistically significant effect of FDI on migration propensity when FDI is included only linearly. At first blush, the results from column (2) appear to contradict the positive effect of FDI found in earlier models that used the interaction of NAFTA and border states to proxy for FDI flows. Though the estimated linear effect is negative, the positive coefficient estimate on the quadratic term actually reverses the effect of FDI in states that receive the highest levels of FDI. As no households in the sample were located in Mexico City, the household heads whose states received the highest flows of FDI were in border states. In particular, the FDI flows received by Nuevo Leon in 1997 and 2000 were of a magnitude large enough that FDI increases the propensity for migration.

Of course, it is possible that the effect of FDI for household heads in border states is different from the effect of FDI for those in the Mexican interior. The non-linear effect of FDI could arise empirically if, for example, FDI flows increase the probability of migration for border-state residents but decrease the probability of migration for interior residents. Table 14 repeats the specifications shown in Table 13, but for a sub-sample consisting only of household heads in border states. That the estimates in columns (2) and (4) remain of similar sign and significance for this sub-sample provides evidence that the non-linear effect is not due solely to a difference in the relationship between FDI flows and migration propensity between border and interior regions. There is, however, one important difference between the estimates for this sub-sample and the estimates for the entire sample. Namely, the magnitudes of FDI flows in the sample period for the border states are not sufficiently large to ever cause the marginal effect of FDI to be positive. Thus, FDI flows to border states negatively influence the probability of migration to the US, albeit at a diminishing rate.

Similar specifications for the sub-sample consisting of household heads in interior states, shown in Table 15, provide mixed evidence that the non-linear effect of FDI persists in interior states. The magnitudes and significance of the FDI variables in column (2) are roughly similar to their counterparts in the border-state models. When state-specific dummies are included in the model, however, FDI is an insignificant determinant of migration.

IV.5.3 Multinomial Logit Models of Migration

Based on the preceding evidence, it would appear that FDI affects migration propensity more so for household heads in border states than for household heads in interior states. The negative effect of FDI on migration to the US from border states is consistent with the notion that FDI provides employment opportunities in Mexico, thereby increasing the opportunity cost of migration to the US. If this is a valid hypothesis, then in addition to reduced migration, one might reasonably expect that FDI flows are correlated with changes in the employment characteristics of household heads that do not migrate. To address such a possibility, I use a multinomial logit approach to model the household head's decision each year to migrate to the US, remain in Mexico and change employment, or remain in Mexico in his current employment.

The MMP data include for each year the reported occupation of each household head, the location of employment, and a binary indicator of employment change. I use this binary indicator combined with the location of employment to construct the dependent variable for the multinomial logit specification. The household head can be categorized in one of three ways. First, he may experience no employment change and remain in Mexico. Second, he may experience an employment change while remaining in Mexico. Finally, I categorize as the group of US migrants those household heads that had employment in the US and may or may not have reported an employment change.

Panel A of Table 16 presents the results of this multinomial logit model for household heads residing in all Mexican states. In these and all subsequent models, effects indicated by coefficients should be interpreted relative to the choice to remain in Mexico in current employment. Thus, the negative coefficient on the FDI flow variable in column (2) indicates that greater FDI flows are associated with lower likelihood of migration to the US relative to remaining in Mexico in current employment. The non-linear effect of FDI on US migration remains in these specifications and is robust to the inclusion of state-specific dummy variables. Foreign direct investment also does not appear to influence non-migrants' employment.

Panels B and C of Table 16 divide the sample in two sub-samples, an important distinction as earlier models indicate that the effect of FDI may be different for household heads in border states than for household heads in interior states. Panel B shows results for the border state sub-sample. Columns (1) and (3) indicate a non-linear effect of FDI on the propensity for employment change. Furthermore, the effect exhibits opposing patterns for employment change and US migration. That is, FDI flows in border states increase the probability of employment change at a decreasing rate and also decrease the probability of US migration at a decreasing rate. These results are again consistent with the general hypothesis that greater FDI in Mexico reduces migration by providing employment opportunities and increasing the opportunity cost of migration.

Panel C of Table 16 shows similar specifications for the interior state sub-sample. The estimates indicate that the positive employment effect of FDI is limited to household heads in border states. For residents of interior states, the signs of the estimated coefficients suggest a pattern for employment changes that is similar to that for US migration. The negative effect, however, is not statistically significant and the second order effect is only significant at the 90 percent significance level.

Taken together, the results from these multinomial logit specifications provide evidence that greater investment in Mexico, and in border states in particular, is associated with both household head employment changes and reduced propensity for US migration. For household heads in interior states, foreign direct investment has similar effects on the likelihood of US migration, but does not appear to induce similar employment changes. One possible explanation for this difference may be differences in the type of foreign direct investment flowing to border states versus interior states. For example, there may be no real gain in employment opportunities from FDI that is primarily portfolio investment or mergers and acquisitions of existing firms. The lack of impact of FDI on employment changes in interior states may therefore be due to a tendency for this type of FDI to flow to interior states. Likewise, FDI in border states, in the form of maquiladoras, may lead to comparatively larger increases in employment opportunities. Thus, the difference in the effect of FDI across these regions may be due to differences in the type of FDI typically flowing to each region.

IV.6. Conclusion

Proponents of NAFTA have pointed to reduced migration from Mexico to the US as an ancillary benefit of the investment in Mexico that would accompany NAFTA. Despite the large expenditure on border enforcement by the US government and a consensus in the literature that this border enforcement is ineffective in reducing immigration, there are few studies that investigate the effect of investment in Mexico on migration to the US. I use retrospective survey data from household heads in Mexico and state-level FDI flows to specify a linear probability model of household head migration to the US. I document that household heads in border states are generally less likely to migrate to the US in response to greater FDI flows and that this marginal effect is diminishing in the size of FDI flows. I find a similar effect for household heads in interior states, though the results for this sub-sample of household heads are not robust. To investigate whether FDI reduces migration in border states by increasing employment opportunities, I use the same data to specify a multinomial logit model wherein household heads may remain in Mexico in their current employment, remain in Mexico and change employment, or migrate to the US. These models suggest that FDI flows are associated positively with employment changes and negatively with migration propensity for household heads in border states, lending credence to the benefits of investment espoused by NAFTA proponents. In contrast, household heads in interior states do not appear to respond to greater FDI flows with employment changes, but FDI does reduce the probability of migration among this sub-sample of household heads.

Though the focus of the current analysis is on Mexican migration to the US, the results have wider implications for other regions of the world. In particular, Western European countries may use investment as an alternative to border enforcement or restrictions on immigrant rights to alleviate immigration pressures from Eastern Europe.

Finally, variation in the type of FDI flowing to particular Mexican regions provides one explanation for the contrasting effects for household heads in border states versus interior states. These differences suggest that extensions of this analysis that include variation in FDI flows at the sector level would provide further conclusions regarding the effect of FDI on migration.

APPENDIX A

TABLES

Table 1. Log-Wage Equation w/ Single-Selection: Most Recent US Trips

	Partial ML: *Most Recent Trips*		Two-Step: *Most Recent Trips*	
	(1)	(2)	(3)	(4)
	Log(US wage)	Migration	Log(US wage)	Migration
Rho (*p-value*)	0.153 (*0.042*)			
Lambda			0.089**	
			(0.040)	
US trip duration (mos.)	0.003***		0.003***	
	(0.000)		(0.000)	
Cum. US experience (mos.)	0.003***		0.003***	
	(0.001)		(0.001)	
(Cumulative US exp)^2	-0.000***		-0.000***	
	(0.000)		(0.000)	
Illegal	-0.102***		-0.102***	
	(0.032)		(0.032)	
Unemployment rate in dest.	-0.020***		-0.021***	
	(0.005)		(0.005)	
Cost of Living	-0.004***		-0.004***	
	(0.001)		(0.001)	
Distance (origin-destination)	0.000***		0.000***	
	(0.000)		(0.000)	
Skilled	0.090***	-0.206***	0.089***	-0.201***
	(0.032)	(0.046)	(0.032)	(0.046)
Agricultural worker	-0.116***	-0.036	-0.116***	-0.030
	(0.035)	(0.047)	(0.035)	(0.047)
Wage Differential		0.256***		0.259***
		(0.042)		(0.042)
Married		-0.115**		-0.114**
		(0.049)		(0.049)
Num. of Children		-0.028***		-0.027***
		(0.009)		(0.009)
Father migrant		0.747***		0.752***
		(0.049)		(0.049)
Female LFP		1.884***		1.898***
		(0.341)		(0.342)
% of Adult w/ 6+ years ed.		-1.477***		-1.457***
		(0.243)		(0.244)
Population of origin		-0.477***		-0.478***
		(0.087)		(0.088)
Line-watch Hours		-0.000***		-0.000***
		(0.000)		(0.000)
US unemployment rate		-24.661***		-24.453***
		(2.383)		
Mexican unemployment rate		8.783***		
		(3.254)		
Peso-Dollar exchange rate		-0.128***		
Measure of Fit	Wald X^2 (13) = 287.93		Wald X^2 (17) = 695.65	
Observations	7300		7300	

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. All equations also include age, age^2, years of education, linear time trend, and a constant..

Table 2. Log-wage Equation w/ Single-Selection: First Trips Only

	Two Step: All Earners		Two Step: Middle 50% Earners	
	(1)	(2)	(3)	(4)
	Log-wage	Migration	Log-wage	Migration
λ (selection into migration)	0.073		-0.043**	
	(0.070)		(0.019)	
Duration of 1st US trip (mos.)	0.003***		0.000	
	(0.001)		(0.000)	
Illegal	-0.080		-0.040**	
	(0.060)		(0.020)	
Skilled occup. (1st US trip)	0.062		0.040**	
	(0.051)		(0.016)	
Agricultural occup. (1st US trip)	-0.077		0.034*	
	(0.061)		(0.019)	
Unemployment rate in dest.	-0.009		-0.001	
	(0.008)		(0.003)	
Cost-of-Living in dest.	-0.007***		0.000	
	(0.002)		(0.000)	
Distance (origin-destination)	0.000***		-0.000	
	(0.000)		(0.000)	
Constant	-45.608***	17.730	-1.659	13.193
	(17.364)	(40.377)	(5.401)	(52.576)
Year	0.024***	-0.006	0.002	-0.004
	(0.009)	(0.020)	(0.003)	(0.026)
Wage Differential		0.478***		0.447***
		(0.059)		(0.076)
Father migrant		0.177**		0.177*
		(0.076)		(0.094)
Married		-0.336***		-0.432***
		(0.060)		(0.074)
Children		-0.045***		-0.065***
		(0.014)		(0.018)
Skilled		-0.123**		-0.132*
		(0.061)		(0.079)
Agricultural worker		-0.063		-0.010
		(0.069)		(0.087)
Female LFPR		3.781***		4.123***
		(0.475)		(0.604)
% of Adult w/ 6+ years of ed.		-2.483***		-2.999***
		(0.331)		(0.426)
Population of origin		-0.157		-0.079
		(0.111)		(0.148)
Line-watch Hours		-0.000***		-0.000***
		(0.000)		(0.000)
US unemployment rate		-20.678***		-18.765***
		(3.050)		(3.869)
Mexican unemployment rate		0.435		-5.073
		(4.747)		(6.320)
Peso-Dollar exchange rate		0.008		0.029
		(0.051)		(0.068)
Avg. distance from origin		-0.000***		-0.000
		(0.000)		(0.000)
Measure of Fit	Wald X^2 (15) = 442.75		Wald X^2 (15) = 209.35	
Observations	10099		9735	

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. All equations also include age, age^2, and years of education.

Table 3. Double – Selection Model First Stage: Selection into Migration and Repeat Migration

	Model 1: First US trip vars. *excluded*		**Model 2:** First US trip vars. *included*	
	(1)	(2)	(3)	(4)
	Repeat Migrant	Migrant	Repeat Migrant	Migrant
Log(real US wage) (1st trip)			0.283***	
			(0.049)	
Duration of 1st US trip			0.002	
			(0.001)	
Skilled Occ. (1st trip)			-0.375***	
			(0.079)	
Agricultural Occ. (1st trip)			0.230***	
			(0.061)	
US unemployment rate		-24.025***		-23.977***
		(2.115)		(1.689)
Skilled occ. (primary)	-0.061	-0.195***		-0.196***
	(0.073)	(0.047)		(0.041)
Agricultural occ. (primary)	-0.035	-0.011		-0.011
	(0.064)	(0.049)		(0.042)
Wage Differential	-0.212***	0.316***	-0.219***	0.315***
	(0.063)	(0.044)	(0.062)	(0.039)
Father migrant	0.620***	0.693***	0.618***	0.694***
	(0.079)	(0.050)	(0.079)	(0.038)
Married	0.279***	-0.136***	0.295***	-0.136***
	(0.070)	(0.043)	(0.070)	(0.035)
Children	-0.037**	-0.037***	-0.028*	-0.037***
	(0.016)	(0.010)	(0.016)	(0.009)
Female LFP	-1.445***	1.815***	-1.527***	1.813***
	(0.495)	(0.331)	(0.498)	(0.300)
% of Adult w/ 6+ years ed.	0.488	-1.259***	0.397	-1.260***
	(0.353)	(0.243)	(0.353)	(0.220)
Population of origin	-0.308*	-0.774***	-0.259	-0.774***
	(0.178)	(0.099)	(0.178)	(0.093)
Line-watch hours	-0.000***	0.000*	-0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Avg. distance from origin	-0.000*	-0.000***	-0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Mexican unemployment rate	-25.005***	18.788***	-23.496***	18.817***
	(3.762)	(2.533)	(3.833)	(2.305)
Peso-Dollar exchange rate	0.080*	-0.190***	0.065	-0.190***
	(0.044)	(0.031)	(0.044)	(0.029)
Year	0.052**	0.020	0.064***	0.020*
	(0.021)	(0.012)	(0.021)	(0.011)
Constant	-106.579**	-35.173	-130.660***	68.391***
	(41.745)	(24.650)	(42.102)	(14.071)
Rho (ρ)	-0.079		-0.101	
	(0.117)		(0.112)	
Obs.	8499		8499	
Log-L	-4855.353		-4838.675	

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. All equations also include age, age^2, and years of education.

Table 4. Log-Wage Equation For Repeat Migrants

	Log-Wage Model		
	(1)	(2)	(3)
	No Selection	*Single Selection*	*Double-Selection*
λ_2 (selection into repeat migration)			-0.005
			(0.006)
λ_1 (selection into migration)		0.030	-0.047**
		(0.045)	(0.019)
Log(1st US trip wage)	0.270***	0.270***	0.294***
	(0.032)	(0.032)	(0.031)
Duration of 1st US trip	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)
Duration of most recent trip	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Cumulative US experience	0.002***	0.003***	0.002**
	(0.001)	(0.001)	(0.001)
(Cumulative US exp.)^2	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
Illegal (most recent US trip)	-0.105***	-0.104**	-0.090**
	(0.039)	(0.041)	(0.038)
Skilled occ. (most recent US trip)	0.036	0.017	0.029
	(0.045)	(0.046)	(0.043)
Agricultural occ. (most recent US trip)	-0.092**	-0.102**	-0.117***
	(0.045)	(0.048)	(0.045)
Year	0.004	0.008	0.005
	(0.008)	(0.008)	(0.007)
Unemployment rate at destination	-0.020***	-0.022***	-0.020***
	(0.007)	(0.007)	(0.006)
Cost-of-living at destination	-0.001	-0.004***	-0.002*
	(0.001)	(0.001)	(0.001)
Origin-Destination Distance (mi.)	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Constant	-6.768	-12.878	-7.849
	(16.026)	(15.508)	(14.086)
Obs.	711	711	711
R-squared	0.952	...	0.959

Standard errors in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. All equations also include age, age^2, and years of education.

Table 5. Probit models of California Choice – Lagged Enforcement Measures

	No Enforcement	Lagged Measures of Border Enforcement		
	(1)	(2)	(3)	(4)
Total Annual Hours (t-1)		-0.831***		
		(0.250)		
LW hpm (t-1) - CA			-0.197	
			(0.248)	
LW hpm (t-1) - non-CA			-0.667*	
			(0.343)	
LW hpm (t-1) - CA				-0.197
				(0.249)
LW hpm (t-1) - AZ				-0.700
				(0.473)
LW hpm (t-1) - TX				-0.060
				(0.460)
Age	-0.024	-0.024	-0.024	-0.024
	(0.018)	(0.018)	(0.018)	(0.018)
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Years of education	0.000	-0.001	-0.001	-0.001
	(0.010)	(0.010)	(0.010)	(0.010)
Children	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Married	-0.148**	-0.152**	-0.152**	-0.153**
	(0.070)	(0.070)	(0.070)	(0.070)
Skilled worker	-0.081	-0.080	-0.080	-0.079
	(0.080)	(0.080)	(0.080)	(0.080)
Agricultural worker	-0.048	-0.047	-0.047	-0.048
	(0.072)	(0.072)	(0.072)	(0.072)
Has been to CA	0.945***	0.944***	0.944***	0.943***
	(0.091)	(0.092)	(0.092)	(0.092)
Prev. months in CA	0.009***	0.009***	0.009***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Prev. months in non-CA	-0.022***	-0.022***	-0.022***	-0.022***
	(0.004)	(0.004)	(0.004)	(0.004)
Comm. Mig Exp. to CA	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Comm. Mig Exp. to non-CA	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Avg UE rate (CA MSAs)	0.043	-0.046	-0.036	-0.037
	(0.044)	(0.052)	(0.058)	(0.059)
Avg UE rate (non-CA MSAs)	-0.102	-0.015	-0.024	-0.015
	(0.082)	(0.086)	(0.089)	(0.090)
Avg real income pc (CA MSAs)	0.000*	0.000	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Avg real income pc (non-CA MSAs)	-0.000***	-0.000	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Year	0.229***	0.118*	0.118*	0.031
	(0.050)	(0.061)	(0.062)	(0.103)
Dist to AZ border	0.239	0.222	0.222	0.258
	(0.874)	(0.873)	(0.872)	(0.868)
Dist to CA border	-0.368	-0.345	-0.345	-0.375
	(0.766)	(0.765)	(0.765)	(0.760)
Dist to TX border	1.560***	1.575***	1.570***	1.569***
	(0.256)	(0.256)	(0.256)	(0.256)
Constant	-452.685***	-227.859*	-227.059*	-53.543
	(99.262)	(121.586)	(122.669)	(204.521)
Obs.	3883	3883	3883	3883
Log-L	-1612.813	-1608.477	-1608.412	-1607.793

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 6. Nested Logit Specifications of Migrants' Joint Destination-Crossing Choice

	Current Measures (1)	Current Measures (2)	Current Measures (3)	Lagged Measures (4)	Lagged Measures (5)	Lagged Measures (6)
Enforcement	-0.138	-0.164	-0.056	-0.669**	-0.700**	-0.310**
	(0.238)	(0.241)	(0.113)	(0.275)	(0.279)	(0.144)
Distance to Border	-1.981***	-1.901***	-0.957***	-1.998***	-1.918***	-0.976***
	(0.218)	(0.225)	(0.202)	(0.218)	(0.225)	(0.203)
Previous Crossings	0.972***	0.948***	0.483***	0.975***	0.951***	0.490***
	(0.055)	(0.056)	(0.088)	(0.055)	(0.056)	(0.088)
$(\text{Prev. Crossings})^2$	-0.038***	-0.037***	-0.019***	-0.038***	-0.037***	-0.020***
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)
VME	2.545***	3.178***	2.617***	2.545***	3.185***	2.616***
	(0.107)	(0.221)	(0.106)	(0.107)	(0.221)	(0.106)
PME	1.449***	1.784***	1.546***	1.448***	1.786***	1.544***
	(0.108)	(0.161)	(0.108)	(0.108)	(0.162)	(0.108)
PME*PMmonths	1.073***	1.449***	1.256***	1.076***	1.459***	1.255***
	(0.268)	(0.355)	(0.262)	(0.269)	(0.357)	(0.262)
Dest. Distance	1.937	2.184	1.059	1.887	2.141	1.040
	(3.272)	(4.069)	(3.035)	(3.274)	(4.077)	(3.038)
Dest. UE rate	-0.002	-0.009	-0.001	-0.003	-0.011	-0.002
	(0.027)	(0.032)	(0.026)	(0.027)	(0.032)	(0.026)
Dest. Real Inc PC	-0.000	-0.000*	-0.000	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Alt. Spec. Constants	Yes	Yes	Yes	Yes	Yes	Yes
Destination Nests (log-sum param.)						
Interior			0.453***			0.457***
			(0.085)			(0.085)
AZ			0.242***			0.245***
			(0.081)			(0.081)
CA			0.443***			0.448***
			(0.091)			(0.090)
TX			0.506***			0.510***
			(0.107)			(0.107)
Crossing Nests (log-sum param.)						
AZ		1.126***			1.128***	
		(0.118)			(0.118)	
CA		1.405***			1.408***	
		(0.106)			(0.106)	
TX		1.262***			1.266***	
		(0.102)			(0.102)	
LR Test of homosced. Chi2 (d.f.)		19.9 (3)***	40.2 (4)***		20.6 (3)***	39.9 (4)***
Obs.	30700	30700	30700	30700	30700	30700
Log-L	-3184.308	-3174.354	-3164.199	-3181.501	-3171.420	-3161.562

Standard errors in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 7. Alternative-Level Marginal Effects for Nested Logit with Destination Region Nests

Joint Alternative		Average effect on probability of choosing alternative with respect to percentage increase in enforcement along state border		
Destination	**Crossing**	**AZ**	**CA**	**TX**
Interior	Arizona	-0.0188	0.0090	0.0096
		(0.0202)	(0.0103)	(0.0123)
Interior	California	0.0064	-0.0138	0.0074
		(0.0088)	(0.0168)	(0.0094)
Interior	Texas	0.0083	0.0090	-0.0173
		(0.0113)	(0.0099)	(0.0195)
Arizona	Arizona	-0.0013	0.0004	0.0012
		(0.0016)	(0.0025)	(0.0016)
Arizona	Texas	0.0009	0.0006	-0.0008
		(0.0012)	(0.0014)	(0.0012)
California	Arizona	-0.0042	0.0036	0.0006
		(0.0050)	(0.0046)	(0.0008)
California	California	0.0066	-0.0168	0.0104
		(0.0070)	(0.0149)	(0.0104)
California	Texas	0.0004	0.0044	-0.0048
		(0.0006)	(0.0062)	(0.0066)
Texas	California	0.0007	-0.0021	0.0018
		(0.0010)	(0.0033)	(0.0030)
Texas	Texas	0.0161	0.0054	-0.0081
		(0.0362)	(0.0067)	(0.0093)

Standard Deviations in parentheses.

Table 8. State-Level Elasticities for Nested Logit Model with Destination Region Nests

	Average effect on probability of choosing destination region with respect to percentage increase in enforcement along state border		
Destination Region	**AZ**	**CA**	**TX**
IN	-0.00408	0.004243	-0.00031
	(0.003862)	(0.004693)	(0.003558)
AZ	-0.00037	0.001249	0.000422
	(0.000751)	(0.001299)	(0.000813)
CA	0.002891	-0.00884	0.006233
	(0.003251)	(0.007884)	(0.006053)
TX	0.001565	0.003352	-0.00634
	(0.002154)	(0.004005)	(0.00696)

Standard Deviations in parentheses.

Table 9. State-Level Marginal Effects for Nested Logit Model with Destination Region Nests

	Average effect on probability of choosing destination region with respect to 100,000 annual line-watch hour increase in enforcement along state border (Change in annual number of migrants choosing destination region with respect to 100,000 annual line-watch hour increase in enforcement along state border based on annual 500,000 illegal immigrants)		
Destination Region	**AZ**	**CA**	**TX**
IN	**-0.0197** (-9850)	**0.0142** (7100)	**-0.0008** (-400)
AZ	**-0.0018** (-900)	**0.0042** (2100)	**0.0011** (550)
CA	**0.0139** (6950)	**-0.0297** (-14850)	**0.0169** (8450)
TX	**0.0075** (3750)	**0.0112** (5600)	**-0.0172** (-8600)

Table 10. Panel Linear Probability Models and Probit Model of Migration using FDI proxy

	Random Effects (1)	Random Effects: State Dummies (2)	Random Effects Panel Probit (3)
NAFTA	-0.027*	-0.028*	-0.261*
	(0.014)	(0.014)	(0.134)
NAFTA*Border state	0.042***	0.042***	0.369***
	(0.011)	(0.012)	(0.105)
Border state	-0.098***		-0.605***
	(0.017)		(0.114)
Age	-0.005**	-0.005**	-0.007
	(0.002)	(0.002)	(0.016)
Age2	-0.000	-0.000	-0.001***
	(0.000)	(0.000)	(0.000)
Education	-0.002	-0.002	-0.015
	(0.002)	(0.002)	(0.010)
Children	-0.002	-0.002	0.003
	(0.002)	(0.002)	(0.017)
Married	0.004	0.005	-0.045
	(0.011)	(0.011)	(0.074)
Married*Spouse Employed	0.002	0.001	0.047
	(0.011)	(0.011)	(0.075)
Skilled worker	-0.008	-0.008	-0.011
	(0.013)	(0.013)	(0.075)
Agricultural worker	0.080***	0.083***	0.387***
	(0.014)	(0.014)	(0.082)
Migrant's prev. mos. in US	0.218**	0.213**	2.331***
	(0.091)	(0.091)	(0.616)
Community-Level Variables			
Migration Exp to US	0.019***	0.022***	0.078***
	(0.003)	(0.003)	(0.018)
Population	-0.070***	-0.072***	-0.480***
	(0.023)	(0.025)	(0.161)
Female LFPR	0.492***	0.223	2.988***
	(0.130)	(0.154)	(0.882)
% of adults w/ educ. > 6 yrs	0.179**	0.362***	1.014**
	(0.075)	(0.107)	(0.479)
% of adults w/ 2X min. wage	-0.008	-0.027	-0.640
	(0.077)	(0.094)	(0.558)
US Unemp. Rate	0.349	0.161	0.956
	(0.597)	(0.600)	(5.382)
MX Unemp. Rate	0.495	0.442	3.830
	(0.404)	(0.405)	(3.573)
Linewatch Hours (t-1)	0.030	0.022	0.251
	(0.031)	(0.031)	(0.273)
Exchange Rate	0.005	0.005	0.049
	(0.006)	(0.006)	(0.052)
Year	-0.008*	-0.007	-0.040
	(0.004)	(0.004)	(0.039)
Min. distance to border	0.198***		0.931***
	(0.031)		(0.192)
State-specific dummies	NO	YES	NO
Constant	15.565*	13.290	72.937
	(8.339)	(8.396)	(74.859)
Obs.	10505	10505	10505
Log-L	-665.413	-657.303	-2542.883

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 11. Linear Probability Models of Migration: Aggregate FDI flows, 1982 – 2004.

	(1)	(2)	(3)	(4)	(5)	(6)
FDI flow to Mexico	0.030	-0.102	-0.435	0.014	-0.108	-0.485
	(0.116)	(0.410)	(0.414)	(0.116)	(0.410)	(0.414)
(FDI flow to Mexico)^2		0.338			0.312	
		(1.004)			(1.004)	
NAFTA*FDI flow to MX			0.476			0.511
			(0.406)			(0.407)
NAFTA	-0.002	0.003	-0.027	-0.000	0.005	-0.027
	(0.015)	(0.021)	(0.026)	(0.015)	(0.021)	(0.026)
Age	0.002**	0.002**	0.002**	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age2	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.003**	0.003**	0.003**	0.003**	0.003**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Children	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Married	0.024***	0.024***	0.024***	0.023***	0.023***	0.023***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Married*Spouse Employed	0.001	0.001	0.001	0.003	0.003	0.003
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Skilled worker	-0.028***	-0.028***	-0.028***	-0.027***	-0.027***	-0.027***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Agricultural worker	0.019**	0.019**	0.019**	0.015	0.015	0.015
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Migrant's prev. mos. in US	0.457***	0.457***	0.457***	0.479***	0.479***	0.479***
	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)	(0.062)
Community-Level variables						
Migration Exp to US	0.023***	0.023***	0.023***	0.020***	0.020***	0.020***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Population	0.001	0.001	0.002	-0.000	-0.000	0.000
	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
Female LFPR	-0.001	-0.001	-0.007	-0.010	-0.010	-0.017
	(0.040)	(0.040)	(0.041)	(0.041)	(0.041)	(0.041)
% of adults w/ educ. > 6 yrs	-0.048	-0.048	-0.044	-0.000	-0.000	0.005
	(0.043)	(0.043)	(0.043)	(0.045)	(0.045)	(0.045)
% of adults w/ 2X min. wage	-0.082**	-0.082**	-0.085***	-0.136***	-0.136***	-0.139***
	(0.033)	(0.033)	(0.033)	(0.035)	(0.035)	(0.035)
US Unemp. Rate	-0.791***	-0.760***	-0.647***	-0.763***	-0.734***	-0.608***
	(0.153)	(0.179)	(0.197)	(0.154)	(0.179)	(0.197)
MX Unemp. Rate	0.027	0.000	-0.024	0.038	0.013	-0.016
	(0.163)	(0.181)	(0.168)	(0.163)	(0.181)	(0.168)
Linewatch Hours (t-1)	0.011	0.012	0.003	0.015	0.015	0.005
	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)
Exchange Rate	-0.003	-0.003	-0.002	-0.003	-0.003	-0.002
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
Year	0.002*	0.003*	0.004**	0.003**	0.004**	0.005***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Min. distance to border	-0.036**	-0.036**	-0.036**			
	(0.016)	(0.016)	(0.016)			
Border state	-0.037***	-0.037***	-0.037***			
	(0.013)	(0.013)	(0.013)			
State-specific dummies	NO	NO	NO	YES	YES	YES
Constant	-4.886*	-5.447*	-7.504**	-7.009**	-7.525**	-9.815***
	(2.762)	(3.226)	(3.554)	(2.817)	(3.272)	(3.595)
Obs.	44006	44006	44006	44006	44006	44006
Log-L	-7278.220	-7278.164	-7277.536	-7242.128	-7242.080	-7241.338

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 12. Linear Probability Models of Migration: Aggregate FDI flows, 1994 – 2004.

	(1)	(2)	(3)	(4)
FDI flow to Mexico	0.109	1.781**	0.094	1.459
	(0.154)	(0.901)	(0.154)	(0.902)
(FDI flow to Mexico)^2		-3.960*		-3.234
		(2.103)		(2.104)
Age	0.019	0.021		
	(0.025)	(0.025)		
Age2	-0.021	-0.021		
	(0.014)	(0.014)		
Education	-0.009***	-0.009***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Children	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Married	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Married*Spouse Employed	0.000	0.000	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Skilled worker	0.007	0.007	0.004	0.004
	(0.012)	(0.012)	(0.011)	(0.011)
Agricultural worker	0.004	0.004	-0.004	-0.004
	(0.011)	(0.011)	(0.011)	(0.011)
Migrant's prev. mos. in US	0.041***	0.040***	0.029**	0.029**
	(0.012)	(0.012)	(0.012)	(0.012)
Community-Level Variables				
Migration Exp to US	-0.010	-0.010	-0.007	-0.007
	(0.012)	(0.012)	(0.011)	(0.011)
Population	0.496	1.164**	0.455	1.001*
	(0.379)	(0.519)	(0.379)	(0.519)
Female LFPR	0.001	-0.011	0.007	-0.003
	(0.052)	(0.052)	(0.052)	(0.052)
% of adults w/ educ. > 6 yrs	-0.032*	-0.031	-0.043**	-0.042**
	(0.019)	(0.019)	(0.021)	(0.021)
% of adults w/ 2X min. wage	0.028	0.032	-0.279***	-0.272***
	(0.074)	(0.074)	(0.101)	(0.101)
US Unemp. Rate	0.018***	0.018***	0.022***	0.023***
	(0.002)	(0.002)	(0.003)	(0.003)
MX Unemp. Rate	0.429***	0.429***	0.434***	0.433***
	(0.071)	(0.071)	(0.070)	(0.070)
Linewatch Hours (t-1)	-2.408**	-2.405**	-2.249**	-2.248**
	(0.977)	(0.976)	(0.977)	(0.977)
Exchange Rate	0.253***	0.253***	0.422***	0.420***
	(0.075)	(0.075)	(0.105)	(0.105)
Year	-0.184***	-0.189***	0.033	0.026
	(0.059)	(0.059)	(0.093)	(0.093)
Min. distance to border	-0.004	-0.002		
	(0.008)	(0.008)		
Border state	0.004	0.001		
	(0.011)	(0.011)		
State-specific dummies	NO	NO	YES	YES
Constant	-6.760	-2.188	-5.233	-1.601
	(21.125)	(21.262)	(21.236)	(21.365)
Obs.	9837.000	9837.000	9837.000	9837.000
Log-L	-1663.491	-1661.718	-1612.677	-1611.496

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.0

Table 13. Linear Probability Models of Migration: State-level FDI flows, 1994 – 2004.

	(1)	(2)	(3)	(4)
FDI flow	0.007	-0.107***	0.009	-0.083**
	(0.012)	(0.032)	(0.013)	(0.035)
(FDI flow) ^{2}		0.048***		0.038***
		(0.013)		(0.013)
Age	-0.009***	-0.009***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)
Age2	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Children	0.000	0.000	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Married	0.003	0.005	0.002	0.002
	(0.012)	(0.012)	(0.012)	(0.012)
Married*Spouse Employed	0.002	0.003	-0.006	-0.006
	(0.011)	(0.011)	(0.011)	(0.011)
Skilled worker	-0.009	-0.008	-0.006	-0.006
	(0.012)	(0.012)	(0.011)	(0.011)
Agricultural worker	0.041***	0.042***	0.029**	0.030**
	(0.012)	(0.012)	(0.012)	(0.012)
Migrant's prev. mos. in US	0.436***	0.440***	0.440***	0.440***
	(0.072)	(0.072)	(0.070)	(0.070)
Community-Level Variables				
Migration Exp to US	0.018***	0.018***	0.023***	0.023***
	(0.002)	(0.002)	(0.003)	(0.003)
Population	-0.032*	-0.028	-0.041*	-0.041*
	(0.019)	(0.019)	(0.021)	(0.021)
Female LFPR	0.024	0.039	-0.301***	-0.308***
	(0.075)	(0.075)	(0.103)	(0.103)
% of adults w/ educ. > 6 yrs	0.271***	0.227***	0.433***	0.429***
	(0.077)	(0.077)	(0.106)	(0.106)
% of adults w/ 2X min. wage	-0.196***	-0.165***	0.039	0.054
	(0.060)	(0.061)	(0.095)	(0.095)
US Unemp. Rate	-2.413**	-2.879***	-2.215**	-2.592***
	(0.988)	(0.995)	(0.998)	(1.006)
MX Unemp. Rate	0.537	0.656*	0.483	0.585
	(0.379)	(0.380)	(0.380)	(0.381)
Linewatch Hours (t-1)	0.000	0.030	0.004	0.033
	(0.052)	(0.053)	(0.053)	(0.054)
Exchange Rate	-0.006	-0.007	-0.006	-0.007
	(0.007)	(0.007)	(0.007)	(0.007)
Year	0.006	0.004	0.005	0.002
	(0.010)	(0.010)	(0.010)	(0.010)
Min. distance to border	0.018	-0.007		
	(0.025)	(0.026)		
Borderstate	-0.027*	0.010		
	(0.016)	(0.019)		
State-specific dummies	NO	NO	YES	YES
Constant	-12.080	-7.294	-9.772	-4.350
	(19.806)	(19.836)	(19.883)	(19.964)
Obs.	9589	9589	9589	9589
Log-L	-1594.893	-1587.493	-1543.748	-1539.581

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 14. Linear Probability Models of Migration: State-Level FDI flows, 1994 – 2004, Border States.

	(1)	(2)	(3)	(4)
FDI flow	0.025	-0.164***	0.025	-0.165***
	(0.017)	(0.061)	(0.017)	(0.061)
$(\text{FDI flow})^2$		0.066***		0.066***
		(0.020)		(0.021)
Age	-0.011***	-0.011***	-0.011***	-0.011***
	(0.002)	(0.002)	(0.002)	(0.002)
Age2	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.001	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Children	0.000	0.000	0.000	0.000
	(0.003)	(0.003)	(0.003)	(0.003)
Married	-0.005	-0.005	-0.005	-0.005
	(0.013)	(0.013)	(0.013)	(0.013)
Married*Spouse Employed	0.013	0.013	0.013	0.013
	(0.016)	(0.016)	(0.016)	(0.016)
Skilled worker	0.002	0.002	0.002	0.002
	(0.013)	(0.013)	(0.013)	(0.013)
Agricultural worker	0.030*	0.030*	0.030*	0.030*
	(0.016)	(0.016)	(0.016)	(0.016)
Migrant's prev. mos. in US	-0.095	-0.093	-0.095	-0.093
	(0.076)	(0.076)	(0.076)	(0.076)
Community-Level Variables				
Migration Exp to US	0.011**	0.010*	0.009	0.011
	(0.005)	(0.005)	(0.007)	(0.007)
Population	-0.076	-0.058	-0.087	-0.057
	(0.055)	(0.055)	(0.061)	(0.061)
Female LFPR	-0.143	-0.222	-0.034	-0.239
	(0.216)	(0.217)	(0.337)	(0.343)
% of adults w/ educ. > 6 yrs	0.578*	0.524	0.610*	0.519
	(0.331)	(0.332)	(0.340)	(0.341)
% of adults w/ 2X min. wage	-0.339**	-0.303*	-0.402*	-0.294
	(0.163)	(0.163)	(0.222)	(0.224)
US Unemp. Rate	-0.217	-0.967	-0.344	-0.950
	(4.036)	(4.033)	(4.048)	(4.042)
MX Unemp. Rate	1.160	1.476*	1.136	1.480*
	(0.780)	(0.784)	(0.782)	(0.788)
Linewatch Hours (t-1)	-0.008	0.075	-0.016	0.077
	(0.102)	(0.105)	(0.104)	(0.108)
Exchange Rate	-0.010	-0.005	-0.009	-0.005
	(0.017)	(0.017)	(0.017)	(0.017)
Year	0.021	0.009	0.022	0.009
	(0.021)	(0.021)	(0.021)	(0.022)
Min. distance to border	-0.425	-0.324		
	(0.276)	(0.277)		
State-specific dummies	NO	NO	YES	YES
Constant	-40.299	-19.349	-43.067	-19.161
	(40.493)	(40.907)	(40.924)	(41.495)
Obs.	2674	2674	2674	2674
Log-L	-115.767	-110.545	-115.680	-110.543

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table 15. Linear Probability Models of Migration: State-Level FDI flows, 1994 – 2004, interior states only.

	(1)	(2)	(3)	(4)
FDI flow	-0.033	-0.174**	-0.017	-0.048
	(0.024)	(0.074)	(0.024)	(0.081)
(FDI flow)^2		0.105**		0.023
		(0.052)		(0.056)
Age	-0.009***	-0.009***	-0.010***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Age2	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.003	-0.003	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Children	0.001	0.001	0.002	0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Married	0.014	0.015	0.014	0.014
	(0.016)	(0.016)	(0.016)	(0.016)
Married*Spouse Employed	-0.007	-0.007	-0.018	-0.018
	(0.014)	(0.014)	(0.014)	(0.014)
Skilled worker	-0.018	-0.017	-0.013	-0.013
	(0.016)	(0.016)	(0.015)	(0.015)
Agricultural worker	0.040***	0.041***	0.024	0.024
	(0.015)	(0.015)	(0.015)	(0.015)
Migrant's prev. mos. in US	0.681***	0.684***	0.695***	0.695***
	(0.100)	(0.099)	(0.096)	(0.096)
Community-Level Variables				
Migration Exp to US	0.018***	0.018***	0.023***	0.023***
	(0.003)	(0.003)	(0.003)	(0.003)
Population	-0.023	-0.022	-0.031	-0.031
	(0.028)	(0.027)	(0.029)	(0.029)
Female LFPR	-0.053	-0.077	-0.561***	-0.563***
	(0.115)	(0.115)	(0.131)	(0.131)
% of adults w/ educ. > 6 yrs	0.295***	0.264***	0.412***	0.410***
	(0.093)	(0.094)	(0.122)	(0.122)
% of adults w/ 2X min. wage	-0.128	-0.064	0.373***	0.378***
	(0.111)	(0.115)	(0.141)	(0.142)
US Unemp. Rate	-2.582**	-2.809**	-2.589**	-2.637**
	(1.117)	(1.122)	(1.117)	(1.124)
MX Unemp. Rate	0.254	0.298	0.101	0.113
	(0.454)	(0.454)	(0.454)	(0.455)
Linewatch Hours (t-1)	0.013	0.020	0.007	0.010
	(0.062)	(0.062)	(0.063)	(0.063)
Exchange Rate	-0.005	-0.007	-0.003	-0.004
	(0.008)	(0.008)	(0.008)	(0.008)
Year	0.003	0.005	0.001	0.001
	(0.012)	(0.012)	(0.012)	(0.012)
Min. distance to border	-0.006	-0.023		
	(0.029)	(0.030)		
State-specific dummies	NO	NO	YES	YES
Constant	-6.091	-9.375	-1.662	-2.102
	(23.168)	(23.225)	(23.218)	(23.243)
Obs.	6915	6915	6915	6915
Log-L	-1358.000	-1355.946	-1307.062	-1306.979

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.0

Table 16. – Panel A. Multinomial Logit Model of Migration using FDI flows, all states, 1994 – 2004.

	All States		All States – State FE	
	Job change	US Migration	Job change	US Migration
	(1)	(2)	(3)	(4)
FDI flow	0.204	-2.341***	0.491	-1.567***
	(0.374)	(0.381)	(0.450)	(0.334)
(FDI flow)^2	-0.086	0.875***	-0.183	0.557***
	(0.152)	(0.151)	(0.172)	(0.135)
Age	-0.087***	0.001	-0.087***	-0.003
	(0.016)	(0.028)	(0.016)	(0.027)
Age2	0.000**	-0.001***	0.000**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.023*	-0.005	-0.022*	-0.006
	(0.012)	(0.017)	(0.013)	(0.017)
Children	0.014	0.019	0.011	0.016
	(0.021)	(0.032)	(0.021)	(0.032)
Married	-0.184*	-0.267**	-0.186*	-0.258**
	(0.106)	(0.120)	(0.107)	(0.121)
Married*Spouse Employed	0.135	0.196	0.122	0.172
	(0.103)	(0.120)	(0.102)	(0.120)
Skilled worker	-0.130	-0.030	-0.131	-0.027
	(0.091)	(0.106)	(0.091)	(0.107)
Agricultural worker	-0.361***	-0.261**	-0.387***	-0.301**
	(0.110)	(0.130)	(0.111)	(0.131)
Migrant's prev. mos. in US	6.628***	17.822***	6.672***	17.902***
	(0.706)	(0.966)	(0.701)	(0.967)
Community-Level Variables				
Migration Exp to US	-0.048**	0.084***	-0.041*	0.091***
	(0.021)	(0.025)	(0.024)	(0.028)
Population	-0.501***	0.127	-0.406**	0.288
	(0.168)	(0.210)	(0.183)	(0.260)
Female LFPR	-0.029	-2.964***	-0.358	-3.029***
	(0.681)	(0.737)	(0.989)	(1.074)
% of adults w/ educ. > 6 yrs	0.349	0.621	-0.387	-0.312
	(0.654)	(0.864)	(0.955)	(1.342)
% of adults w/ 2X min. wage	-0.255	-0.209	0.422	0.290
	(0.526)	(0.652)	(0.903)	(1.051)
US Unemp. Rate	-21.056*	-29.374***	-18.602	-26.563***
	(11.936)	(8.679)	(12.170)	(8.759)
MX Unemp. Rate	-2.479	6.670**	-3.207	4.662*
	(4.545)	(2.654)	(4.593)	(2.611)
Linewatch Hours (t-1)	-1.186*	0.942**	-1.268*	0.664
	(0.638)	(0.433)	(0.667)	(0.438)
Exchange Rate	-0.016	-0.107**	-0.007	-0.088*
	(0.081)	(0.048)	(0.082)	(0.048)
Year	0.228*	-0.023	0.239*	0.008
	(0.125)	(0.079)	(0.129)	(0.081)
Min. distance to border	0.273	-0.902***		
	(0.245)	(0.261)		
Border state	-0.036	1.006***		
	(0.183)	(0.217)		
Constant	-435.112*	35.232	-455.981*	-21.111
	(240.711)	(151.129)	(246.563)	(155.236)
Obs.	12130		12130	
Log-L	-7943.777		-7899.400	

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Base category is "No Job Change, No Migration".

Table 16. – Panel B. Multinomial Logit Model of Migration using FDI flows, border states, 1994 – 2004.

	Border States		Border States – State FE	
	Job change	US Migration	Job change	US Migration
	(1)	(2)	(3)	(4)
FDI flow	1.849**	-1.786***	2.125***	-1.504***
	(0.824)	(0.508)	(0.822)	(0.521)
(FDI flow)^2	-0.641**	0.689***	-0.736***	0.591***
	(0.274)	(0.188)	(0.277)	(0.196)
Age	-0.105***	-0.049	-0.108***	-0.051
	(0.030)	(0.053)	(0.031)	(0.053)
Age2	0.001*	-0.001	0.001*	-0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Education	-0.020	0.032	-0.022	0.031
	(0.023)	(0.028)	(0.023)	(0.028)
Children	0.006	-0.097	0.003	-0.098
	(0.043)	(0.076)	(0.043)	(0.076)
Married	-0.338*	-0.120	-0.338*	-0.122
	(0.189)	(0.229)	(0.190)	(0.230)
Married*Spouse Employed	0.219	0.459*	0.223	0.464*
	(0.225)	(0.244)	(0.223)	(0.245)
Skilled worker	-0.082	0.321*	-0.076	0.328*
	(0.171)	(0.194)	(0.171)	(0.194)
Agricultural worker	-0.241	0.469*	-0.241	0.468*
	(0.233)	(0.268)	(0.235)	(0.269)
Migrant's prev. mos. in US	6.609***	16.069***	6.598***	16.032***
	(1.200)	(1.681)	(1.197)	(1.680)
Community-Level Variables				
Migration Exp to US	-0.000	0.222**	-0.126	0.148
	(0.080)	(0.095)	(0.103)	(0.123)
Population	-2.226***	0.229	-3.297***	-0.175
	(0.788)	(0.816)	(0.878)	(0.775)
Female LFPR	2.172	-1.627	11.530**	3.176
	(3.146)	(3.608)	(4.826)	(3.839)
% of adults w/ educ. > 6 yrs	11.009**	-1.263	14.649***	-0.294
	(4.900)	(5.317)	(5.106)	(5.263)
% of adults w/ 2X min. wage	-4.382*	-0.557	-10.003***	-3.238
	(2.571)	(2.882)	(3.383)	(2.801)
US Unemp. Rate	-40.264	-8.648	-52.197	-13.795
	(52.054)	(30.033)	(52.859)	(29.879)
MX Unemp. Rate	-0.164	13.545**	-1.287	11.576**
	(10.018)	(5.284)	(10.003)	(5.327)
Linewatch Hours (t-1)	-3.681***	0.499	-4.537***	-0.127
	(1.296)	(1.016)	(1.362)	(1.027)
Exchange Rate	-0.253	-0.063	-0.254	-0.052
	(0.204)	(0.106)	(0.206)	(0.105)
Year	0.715***	0.074	0.849***	0.165
	(0.274)	(0.177)	(0.285)	(0.184)
Min. distance to border	-7.790*	-1.717		
	(4.542)	(4.597)		
Constant	-1366.547***	-150.527	-1624.369***	-323.606
	(528.904)	(338.997)	(549.406)	(353.258)
Obs.	3472		3472	
Log-L	-2144.749		-2140.912	

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Base category is "No Job Change, No Migration".

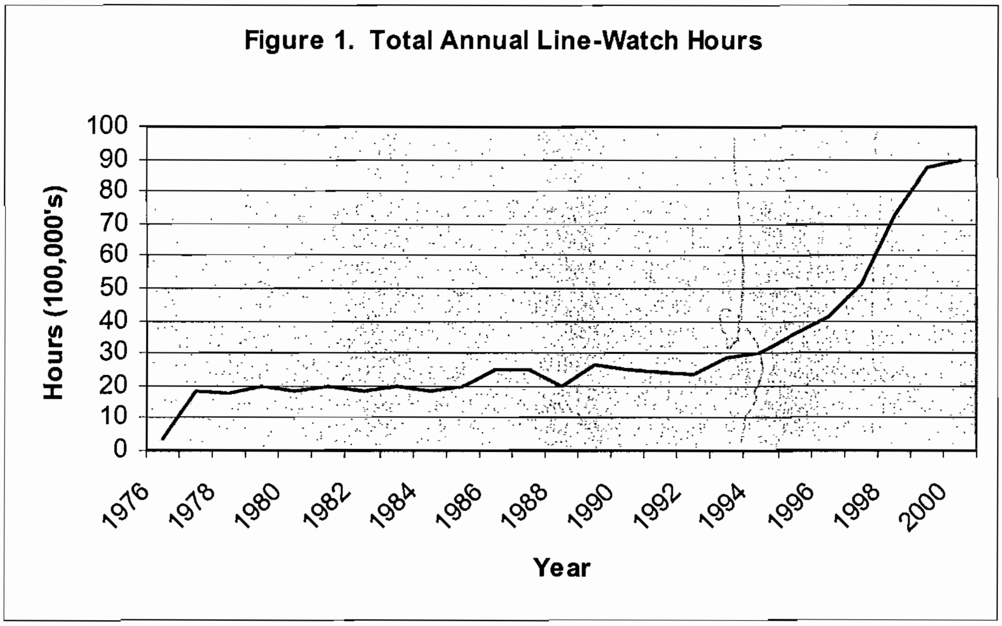
Table 16. – Panel C. Multinomial Logit Model of Migration using FDI flows, interior states, 1994 – 2004.

	Interior States		Interior States -- State FE	
	Job change	US Migration	Job change	US Migration
	(1)	(2)	(3)	(4)
FDI flow	-1.173	-3.434***	-1.566	-1.947***
	(0.800)	(0.764)	(1.069)	(0.668)
(FDI flow)^2	1.063*	1.854***	1.274*	0.886**
	(0.593)	(0.506)	(0.736)	(0.440)
Age	-0.087***	0.013	-0.085***	0.008
	(0.018)	(0.030)	(0.018)	(0.030)
Age2	0.000**	-0.001***	0.000**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.024	-0.024	-0.022	-0.022
	(0.015)	(0.021)	(0.015)	(0.022)
Children	0.008	0.037	0.004	0.034
	(0.025)	(0.035)	(0.025)	(0.035)
Married	-0.056	-0.317**	-0.075	-0.309**
	(0.129)	(0.145)	(0.131)	(0.147)
Married*Spouse Employed	0.107	0.124	0.087	0.082
	(0.118)	(0.138)	(0.117)	(0.138)
Skilled worker	-0.157	-0.151	-0.164	-0.155
	(0.107)	(0.131)	(0.107)	(0.133)
Agricultural worker	-0.389***	-0.476***	-0.426***	-0.564***
	(0.129)	(0.151)	(0.132)	(0.153)
Migrant's prev. mos. in US	6.832***	18.889***	6.883***	18.956***
	(0.924)	(1.161)	(0.916)	(1.149)
Community-Level Variables				
Migration Exp to US	-0.051**	0.065**	-0.037	0.099***
	(0.025)	(0.029)	(0.027)	(0.031)
Population	-0.394*	0.261	-0.305	0.425
	(0.217)	(0.256)	(0.230)	(0.311)
Female LFPR	0.810	-1.909*	-0.455	-4.673***
	(0.922)	(1.109)	(1.139)	(1.318)
% of adults w/ educ. > 6 yrs	-0.426	0.216	-0.985	-0.382
	(0.726)	(0.967)	(0.991)	(1.441)
% of adults w/ 2X min. wage	-0.875	-0.927	0.595	2.001
	(0.908)	(1.155)	(1.180)	(1.406)
US Unemp. Rate	-12.579	-30.243***	-13.944	-28.646***
	(12.882)	(9.147)	(12.959)	(9.429)
MX Unemp. Rate	-4.657	2.517	-4.520	0.374
	(5.393)	(3.144)	(5.455)	(3.128)
Linewatch Hours (t-1)	-0.955	0.816*	-0.696	0.695
	(0.762)	(0.491)	(0.800)	(0.497)
Exchange Rate	0.047	-0.108*	0.040	-0.075
	(0.094)	(0.057)	(0.096)	(0.057)
Year	0.184	0.004	0.158	-0.016
	(0.150)	(0.091)	(0.153)	(0.093)
Min. distance to border	0.021	-1.006***		
	(0.261)	(0.272)		
Constant	-350.164	-17.057	-303.643	24.372
	(287.181)	(174.614)	(293.255)	(179.075)
Obs.	8658		8658	
Log-L	-5713.710		-5669.673	

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Base category is "No Job Change, No Migration"

APPENDIX B

FIGURES



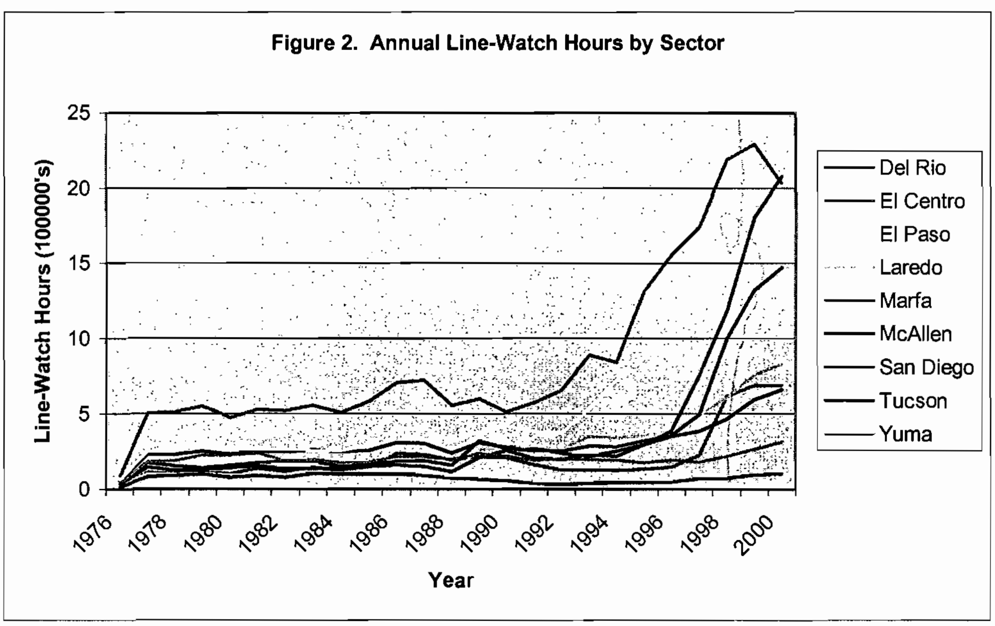


Figure 3. Line-watch Hours per Border Mile by State

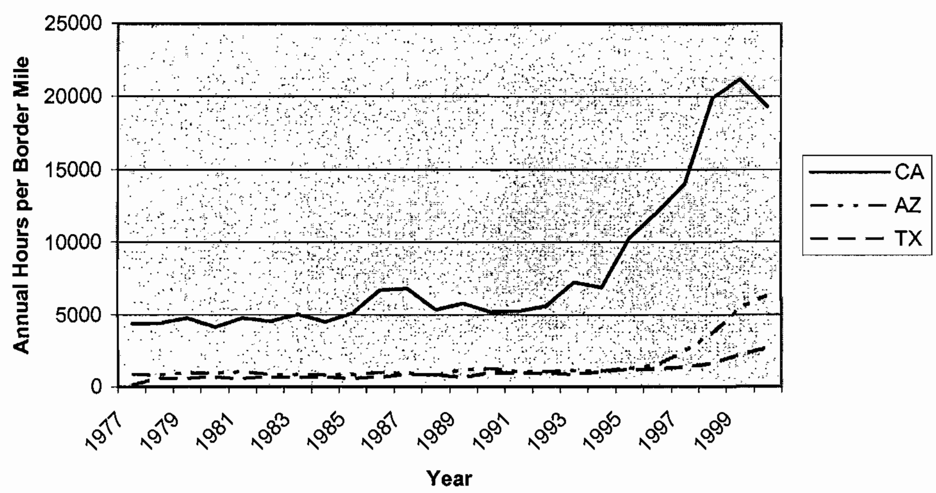


Figure 4. FDI Stock and Flow in Mexico, 1981 – 2006.

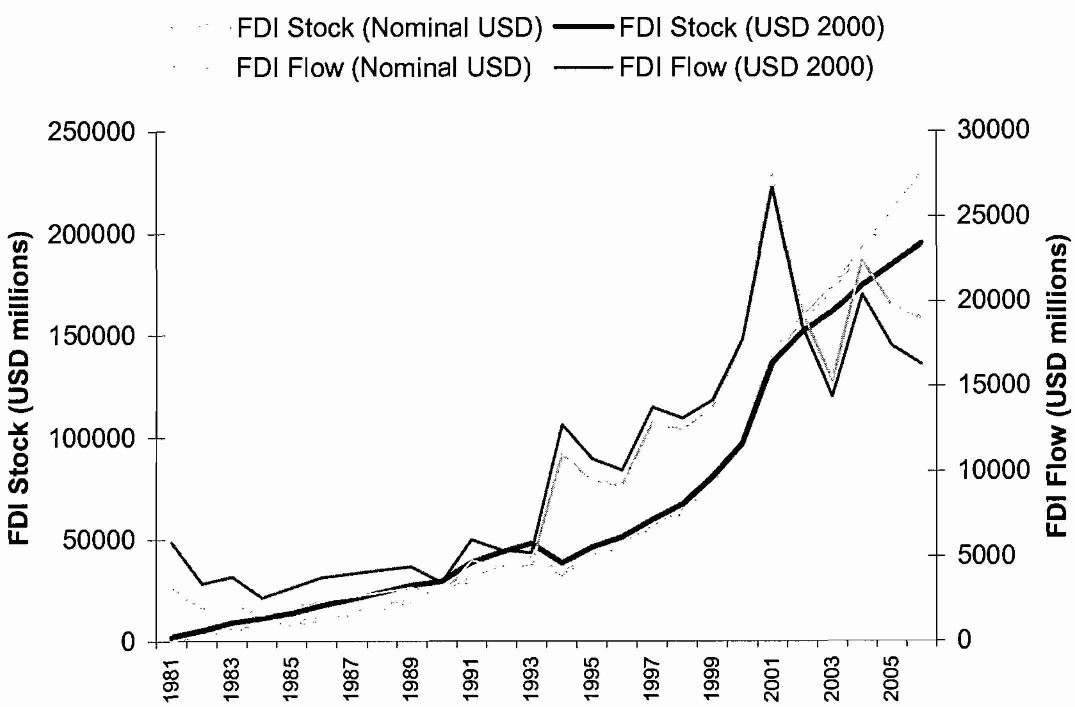


Figure 5. Cumulative FDI Flows (USD) to Mexican States, 1994 – 1999

Source: Author's calculations based on data described in text. Higher quintiles represented by darker shades.

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