Extended Abstract: Migration and Entrepreneurship in Mexico

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1 Introduction

The Mexican labor force is distinguished by exceptionally high rates of both international migration and entrepreneurship. During the last half-century, large flows of Mexican workers have migrated to the United States. As noted by Hanson (2006), approximately 10% of the Mexican population resided in the United States in 2004. On the other hand, about 25% of the Mexican labor force is self-employed, making Mexico one of the most entrepreneurial countries in the world (Fairlie 2006).

The factors that affect entrepreneurship may be particularly important in explaining the dynamics of emerging economies such as Mexico, since entrepreneurship appears to be an important driver of development and growth. (Murphy et al. (1991), Schmitz (1989), Banerjee and Newman (1993)) . A natural question then, is whether labor migration and entrepreneurial activity are related in an economy. One argument advanced by both Mesnard (2004)and Dustmann and Kirchkamp (2002)is that higher rates of international migration might increase rates of entrepreneurship if individuals face credit constraints and must incur non-divisible entry costs when starting a new business. In such an environment, individuals can temporarily migrate in order to more quickly raise startup funds. Studies using Mexican data suggest that there may be such a positive connection between migration and entrepreneurship. (Woodruff and Zenteno (2007), Massey and Emilio (1998)).

However, it is not clear whether positive correlation between entrepreneurship and migration in Mexico reflects this particular causal link, or if it could be driven by other causal mechanisms, or perhaps the self-selection of certain kinds of workers into both migration and entrepreneurship. Our paper extends this literature by further investigating the relationship between entrepreneurship and migration in Mexico, and attempts to assess the importance of theoretical arguments on this relationship that have hitherto been ignored or viewed in isolation. Our preliminary empirical analysis using Mexican Migrant Project (MMP) data suggests that migration experience can boost the probability that a return migrant will start a business. We hope to explore three possible explanations for the relationship between these activities: (1). Migration Complements Entrepreneurship I: Prospective business owners may choose to temporarily migrate and accumulate assets in the U.S. in order to overcome credit constraints impeding entrepreneurship in Mexico (2). Migration Complements Entrepreneurship II: Temporary out-migration to U.S. could also improve Mexican worker's entrepreneurship ability through learning-by-observing and increase their chance of success back in Mexico. (3). Migration is a Substitute for Entrepreneurship: Individuals from communities with a high propensity to migrate might also have the kinds of characteristics and opportunities that increase their propensity for entrepreneurship. If so, then restrictions on their migratory opportunities might actually increase their rates of business ownership.

We hope to make a novel contribution to the literature by developing a model of an individual's migration and entrepreneurship decisions over the course of the life-cycle which captures all three explanations identified above. Using data from the MMP, we will estimate the parameters of this structural model. Such structural parameter estimates will allow us to perform interesting counter-factual policy experiments, such as assessing the consequences of changes in US migration policy or Mexican entrepreneurship policy on the behavior of Mexican workers. Understanding the relative strengths of the three mechanisms is crucial for shaping a policy response to poverty. If mechanisms (1) and (2) above are dominant, then policies that increase the ease of migration will also stimulate greater entrepreneurship in Mexico. Policymakers should then also be interested the

Mexican and U.S. policies shaping the costs and benefits of legal and illegal migration. However, if mechanism (3) dominates, then migration and entrepreneurship may be alternate pathways to the alleviation of poverty. In this case, policymakers must be careful that their proposals are promoting the most expedient pathway. Of course, all three of these mechanisms may be operative, and the optimal policy response will depend on their relative strengths.

2 Data and Descriptive Statistics

In this section, we briefly introduce the primary data source for our project. We also hope to further expand this data to combine with Mexican Census. Every year since 1987, the Mexican Migration Project (MMP) has conducted household interviews in Mexican communities.[1] The database also includes survey responses from a pilot project conducted in 1982 and 1983. The data used here are those included in the MMP124 database, which includes 124 surveyed communities. After selecting a particular community for inclusion in the database, the Project randomly selects households within that community for the survey.[2]

The MMP collects data on household and community level demographic and economic variables and the migration histories of the household members, with more detailed data on the most recent migratory trip taken by each member. Some survey items, such as the income of the household head, are recorded as of the time of the interview. However, the survey also requests a detailed, self-reported life history from household heads recording some economic, demographic, and migra-

[1]The Project is jointly administered by researchers from the University of Guadalajara and Princeton University. For more details, see http://mmp.opr.princeton.edu

[2]Two potential problems with the use of the MMP data relate to the selection of communities for the survey and the problem of absent migrants. The Project does not randomly select the communities involved in its surveys, but instead employs a method that "targets specific communities for intensive study." (Massey et al., 2003) Early waves of the MMP surveys focused on communities in the high-migration areas of West-Central Mexico. This focus raises the concern that the MMP data may overrepresent households prone to migration. This concern is partially alleviated by the inclusion of new regions and communities in each successive year of the Project's survey. New survey locations are chosen to "build into the sample variation with respect to population size, geographic location, climate, economic base, social structure, and ethnic composition." Massey et al. (2003).

tion variables for every year in their lives. The data allow one to track whether or not a household head made a new trip in a given year, what documentation, if any, was used in making such a trip, and the number of months spent in the U.S. each year. The survey also asks for a retrospective life-history of the ownership of some assets, including businesses, which will be crucial for the purposes of this study.

Our basic sample consists of all male household heads aged 15 years or older in the Mexican Migrant Project LIFE file observed during the years 1987-2008. To avoid modeling the process by which legal visas are allocated, we exclude individuals who are ever observed migrating legally to the United States, unless they migrated legally under the auspices of the Bracero program from 1942-1967.[3] Since those with legal migration experience constitute less than 9% of the larger sample, we feel that any selection bias introduced by this restriction is unlikely to be severe. However, ignoring legal migration greatly simplifies our efforts to model the joint migration and entrepreneurship decisions.

2.1 Identifying Entrepreneurship in the Data

The MMP questionnaire explicitly asks household heads when they acquired any businesses and when they exited the businesses. The answers to these direct questions furnish our most basic measurement of entrepreneurial activity. We define the variable $BusinessDef1_{it}$ to take the value 1 if individual i reports owning any business in year t based on this variable, and 0 otherwise.[4] We refer to this as *Definition 1* of business ownership in a given year. One concern in directly using this variable is that it may capture very small businesses that do not represent a substantial source of income for the individual. To get a feel for whether or not reported business ownership corresponds to a full-time enterprise, we can examine the distribution of reported occupations during the person-year of each business start observed in the data, which is summarized by Table

[3]The only exceptions are individuals who entered the United States as temporary Bracero workers during the period 1942-1967. These individuals

[4]Although individuals do report owning multiple businesses, we will focus on explaining the extensive decision to become an entrepreneur.

1. First, note that business owners report a large variety of occupations. The top two responses, "Agricultural Workers," and "Merchants, retail business owners," account for 15% and 13% of the sample, respectively. However, a large number of occupations each account for less than 2% of the sample, and these occupations collectively represent about 40% of the observations.

Many of the top-ranking reported occupations appear to be consisted with entrepreneurial activities. For example, the occupations "Merchants, retail business owners," (13%), "Small and Medium Service Establishment Owners," (7%), and "Small and Medium Sized Factory Owners" (3%) are represented among the most frequent responses. Also represented are several occupations that do not necessarily imply the ownership of an establishment, but may require the acquisition of certain pieces of capital equipment, such as "Truck Drivers" (3%), and "Ambulatory service workers (e.g. food vendors)," (1.77%). Still, we may be concerned that some of these reported occupations suggest that the individuals are engaged in substantial paid work that is not related to a business. For example, Agricultural work accounts for about 14% of the person-year observations, and this might come about if people consider farm ownership to be small business ownership. We are reasonably satisfied that individuals are primarily engaged in entrepreneurial work during the the vast majority of person-years with reported business ownership. However, we also introduce a second, more restrictive definition of business ownership. Since the Mexican Migrant Project data also ask for a retrospective occupational history, we can identify those years during which an individual was engaged in an occupation that is highly likely to be entrepreneurial. Table 2 lists the occupations that we believe satisfy this criterion. Let the variable $BusinessDef2_{it}$ take the value 1 if individual i reports being involved an an occupation that unambiguously suggests business ownership or other entrepreneurial activities.

3 Preliminary Findings: Descriptives on Entrepreneurship and Migration

We report some of the preliminary findings we have to motivate our theoretical model. These findings indicate that investigating individual joint decisions of entrepreneurship and migration as well as its implications on growth and poverty is a promising research agenda.

To characterize the prevalence of entrepreneurial activity in the sample, it is useful to look at entrepreneurship rates at different points in the life-cycle. The top panel of Figure 1 reveals that the fraction of individuals currently owning a Definition 1 business appears to grow steadily over the course of the life-cycle. Whereas less than 10% of individuals own Def. 1 businesses in their early twenties, between 20% and 25% of individuals report owning businesses in their late forties. At any given age, the fraction of individuals who report ownership of Definition 2 businesses is substantially lower than the fraction reporting ownership of Definition 1 businesses. However, ownership of Def. 2 businesses also steadily increases over the life-cycle, from well under 5% during the early twenties, to just under 10% during the late 40s.

In contrast, the bottom panel of Figure 1 plots out the fraction of individuals at different ages who have ever migrated. This reveals that the propensity to take a first migration is very high during an individual's late teens and early twenties. Indeed, the fraction of individuals who have ever migrated increases from about 3% at age 16 to 13% at age 20, and appears to plateau near 20% at the age of 30. This suggests that individuals who migrate typically take their first migration early on in life. However, individuals who choose to become entrepreneurs tend to wait longer, with entry rates into entrepreneurship steadily increasing even after 30.

Since the plots in Figure 1 only look at current business ownership, they reveal nothing about dynamics in entrepreneurial activity. For example, we might be interested in whether individuals

cycle in and out of entrepreneurship, and how likely they are to exit a business. To address the first point, Table 3 presents the distribution of the number of entrepreneurial spells that an individual undertakes, under Definition 1. The vast majority of entrepreneurs, over 96%, are only observed engaging in one entrepreneurial spell. It appears to be quite rare for an individual to enter a business, subsequently exit that business, and then later engage in another round of entrepreneurial activity. Therefore, to simplify our theoretical analysis, we ignore the possibility of this kind of cycling in entrepreneurial behavior, and exclude individuals engaging in multiple entrepreneurial spells from our sample.

A second noteworthy feature of the data is that entrepreneurship and migration do not occur simultaneously. Our assumption is that any businesses in the sample are owned and operated in Mexico. However, it could be the case that individuals either own businesses in the United States as migrants, or are able to maintain possession of their Mexican businesses and operate them while abroad. However, these patterns of behavior are almost never seen in the data. Of the 32,606 person-years that we observe in which an individual owns a business (Def. 1), only 698, or about 2% are observed during a year in which the individual spent some time in the United States. Furthermore, if migration and business ownership both occur in the same year, this doesn't mean that they occur simultaneously, as these events could occur in different parts of the year. To simply our analysis, we exclude a small number of people who report owning a business while they are in the United States, and are also in the United States in both the preceding and following years.

3.1 The Relationship between Migration and Entrepreneurship

One of our primary interests is learning about what linkages exist between the decision to migrate and the decision to become an entrepreneur. First, it is useful to see if having past experience as a migrant is related to one's current status as an entrepreneur. Figure 2 plots out the fraction of individuals at each age who currently own a business for two groups: those who have ever migrated

by that age and are currently in Mexico, and those who have no migration experience by that age. The plots reveal that, at almost every age, individuals who have never migrated are more likely to currently own a business than return migrants. While non-migrants have a non-trivial advantage in terms of entrepreneurship rates during the twenties, this gap seems to close, so that both migrants and non-migrants have approximately the same rates of entrepreneurship in their early thirties. However, non-migrants appear to be more likely to be entrepreneurs at older ages. At the very least, this establishes that at any given age, past migration experience migration does not appear to be *unconditionally* associated with higher rates of entrepreneurship. In fact there appears to be a trade-off, with non-migrants being more likely to start a business.

Since the evidence in Figure 2 only informs us about unconditional correlations between migration and entrepreneurship at a given age, it is useful to investigate the correlations between migration and entrepreneurship a bit more formally. Table 4 presents estimates of a linear probability model explaining the probability that an individual starts a business in a given person-year. In these regressions, we include all person-years from our basic sample occurring before an individual starts a business, along with the person-years in which an individual starts a business. Recall that we have dropped the small number of individuals observed with multiple entrepreneurial spells, so an individual can have at most one entry. We only include person-years during which an individual reside entirely in Mexico. In all specifications, we include controls for age and it square, education, as well as fixed effects controlling for the year and the individual's home community in Mexico. In Column 1 of Table 4, we include two regressors related to migration experience. First, we include a dummy indicating if an individual has just returned from a migratory trip. For a year t, this indicates if the individual was in the United States in year $t-1$. We have also included a dummy variable indicating if the individual has accumulated migration experience at any point in the past. The results from Column 1 indicate that individuals with any past migration experience are about 0.4% more likely to start a business than a non-migrant in any given year, no matter when their migration experience was accumulated. Furthermore, the coefficient on *Return* indicates that an

individual who has just returned from a migration is about 2.4% more likely to start a business in that year relative to all other individuals. Both of these coefficients are significant at the 0.01 level. The economic significance of these estimates are perhaps most clearly seen by comparing the entry probabilities of an individual who has never migrated and an individual who has just returned from a migration. If both individuals are aged 30 years old with 6 years of education and come from the same arbitrary community in Mexico, then in the year 2000, the non-migrant would have a predicted probability of 0.0214 of entering a business. However, an individual who just returned from a migratory spell would have a predicted probability of 0.0496, which is 132% larger than the entry probability for the non-migrant. Furthermore, in future years, the estimates suggest that having some migration experience increases an individual's probability of starting a business by about 19% in any later year relative to a non-migrant.

Columns 2 and 3 of Table 4 add additional regressors to the linear probability model, and the results demonstrate that the correlation between migration and entrepreneurship depends on the kind of migration experience that an individual accumulates. In Column 2, we interact the *Return* dummy variable with a continuous measure of the duration of the individual's migratory trip, measured in months, as well as the square of this duration variable. The coefficient on the Duration term is positive and significant at the 0.01 level, and the coefficient on the squared Duration term is small and negative but significant. For the range of durations observed in the data, these estimates suggest that individuals who return from longer migratory trips are more likely to start businesses than those taking shorter trips. Indeed, the migratory duration matters critically. When these duration interactions are added, the coefficient on the Return dummy becomes very close to zero. For example, fixing the controls at the same levels discussed in the previous paragraph, this means that while an individual returning from a 1 year migration will start a business with probability 0.0437, and individual returning from a 3 year migration will start a business with probability 0.0767, which is approximately 75% larger. Finally, Column 3 of Table 4 indicates that when we also add in interactions between Return and the age variables, these interactions are also found to

be significant. Return migration appears to boost the probability of entering a business the most for individuals in their early forties.

3.2 Discussion

The descriptive statistics suggest that at any age, return migrants are less likely to currently own a business in Mexico than non-migrants. However, if we look at the probability of entering an entrepreneurial activity, this is substantially higher for return migrants immediately after their return, and remains higher in all subsequent years. Furthermore, longer migrations are associated with higher probabilities of starting a business, and migration appears to be less strongly associated with an increased start-up probability for very young and very old individuals.

A number of theoretical explanations could rationalize the patterns that we see in the data. For example, it could be the case that these patterns are purely a consequence of heterogeneity in the population and self-selection into migration and entrepreneurship. Individuals with high wages and returns to entrepreneurship in Mexico may be less likely to migrate than those with worse domestic opportunities. In this scenario, the positive correlation between return migration and entrepreneurship might simply reflect the endogeneity of the return decision. That is, we might observe higher business start-up rates among newly returned migrants because a positive shock to the payoff of becoming an entrepreneur might have triggered a return. However, such a theory by itself would seem to have a difficult time explaining why migratory duration seems to influence the effect of return on a business startup. An alternate explanation is that, in the presence of credit constraints, some individuals might use migration as a tool for more quickly accumulating the assets needed to start their businesses in Mexico. Individuals are unable to self-finance entrepreneurial projects in Mexico, so they migrate, accumulate assets, and return when they have saved enough to cover the costs of entry. The positive relationship between duration and the probability that a return migrant starts a business emerges in this scenario because individuals who choose to return after short migratory spells are less likely to have accumulated the necessary start-up funds.

In the next section, we propose a model to nest both of these theoretical explanations. We aim to accomplish several goals using this model for our paper. First, we will modify and complete the modeling specifications such that it can be used for quantitative analysis. Second, we will apply this model to our data and assess the relative importance of each of mechanisms linking migration and entrepreneurship. Finally, using estimated model parameters, we plan to conduct systematic counterfactual experiments which will shed light on how immigration and entrepreneurship policies affect Mexican worker's occupational choice, migration decision, and long-run wealth accumulation.

4 Model

Consider the following environment. An individual lives for T discrete periods, and each period can either choose to locate in Mexico, m, or in the United States, us. Each period, the individual chooses to work in one of three sectors. The individual can be a worker in Mexico, an entrepreneur in Mexico, or a worker in the United States. The choice of sector implies a location choice, L_{it}, where $L_{it} = 0$ indicates location in Mexico and $L_{it} = 1$ indicates location in the United States.

We assume that every individual is endowed with some entrepreneurial idea, which consists of a productivity as an entrepreneur, u_i^e, and a start-up cost, SC_i. We assume that SC_i is drawn from a distribution that is independent of u_i^e: $SC_i \sim G^{sc}$. An individual knows their own values of u_i^e and SC_i, although the actual payoff each period to owning a business is stochastic. We assume that an individual will only start one business in their lifetime. If they open a business and then exit a business, they will not have the option of starting another business in the model. We also assume that businesses can only be opened in Mexico, and that the individual exits the business upon leaving Mexico. These are strong assumptions, but as demonstrated in the previous section, we observe very few people that engage in more than one entrepreneurial spell, and we observe very few person-years in which a person both resides in the United States and owns a business. Let E_{it} be a variable that keeps track of an individual's entrepreneurial status. Let $E_{it} = 0$ if an

individual has not yet opened a business, $E_{it} = 1$ if an individual is currently running a business, and $E_{it} = 2$ if an individual has exited a business.

When an individual is in Mexico and chooses to be a worker, he or she inelastically supplies labor each period and receives the following period labor income:

$$w_{it}^{m,l} = X_{it}^{m}\beta^{m,l} + u_i^{\ell} + \varepsilon_{it}^{m,l} \tag{1}$$

Where X_{it}^{m} is a vector of observable characteristics that may also include time-trend terms. The variable u_i^{ℓ} represents a permanent component to heterogeneity that is known to to the individual, and $\varepsilon_{it}^{m,l}$ is wage shock that is i.i.d. across individuals and time periods. When an individual is in the United States and chooses to be a worker, he or she inelastically supplies labor each period and receives the following labor income:

$$w_{it}^{us} = X_{it}^{us}\beta^{US} + \gamma u_i^{\ell} + \varepsilon_{it}^{us} \tag{2}$$

Where X_{it}^{us} contains the same variables as X_{it}^{m} except with different, U.S.-specific time trend terms. We assume that, u_i^{ℓ}, the permanent unobserved heterogeneity term from the Mexican labor income equation, also appears in the U.S. labor income equation, but now multiplied by the parameter γ which may capture the imperfect portability of human capital across countries. Note that ε_{it}^{us} is an income shock that is i.i.d. across individuals and periods.

When an individual chooses to be an entrepreneur, he or she receives the following period income:

$$w_{it}^{m,e} = X_{it}^{m}\beta^{m,e} + u_i^{e} + \varepsilon_{it}^{m,l} \tag{3}$$

An individual's productivity as an entrepreneur, u_i^{e} enters as a permanent component of entrepreneurial income. We assume the pair of individual productivity components, $\{u_i^{\ell}, u_i^{e}\}$ is jointly

distributed in the population according to some bivariate distribution: $\{u_i^\ell, u_i^e\} \sim G^{e,l}$. As before, $\varepsilon_{it}^{m,l}$ is an income shock that is distributed i.i.d. across individuals and periods.

Important that we are modeling entrepreneurship as a black-box income process. We assume that an individual pays some start-up cost, SC_i and this entitles him or access some income process $w_{it}^{m,e}$. Thus, while individuals are not constantly making decisions about investment in their business period after period, this is in some sense rolled into our more reduced form notion of net income from entrepreneurial activities. The data are not sufficiently rich to allow us to track business investment, and therefore empirically implement an model that incorporates these features.

We assume that asset market in Mexico is incomplete, so individuals can only save out of their own retained earnings. They need to make their consumption and saving problems over their life cycle. Every period, an individual receives draws of the following shocks, which constitute an individual's information set at the start of time t: $\Omega_{it} = \{\varepsilon_{it}^{m,l}, \varepsilon_{it}^{us}, \varepsilon_{it}^{m,l}, \eta_{it}, ex_t\}$. Here the ε shocks are the shocks described above, η_{it} is a preference shock that indicates the relative desirability of residing in the United States over Mexico, and ex_t is the real exchange rate in period t (pesos per dollar). On the basis of these shocks, the individuals choose an activity, $S_{it} \in \{\ell^m, \ell^{us}, e^m\}$, where ℓ^m and ℓ^{us} denote working in the Mexico and the US, respectively, and e^m denotes acting as an entrepreneur. Simultaneously, the individual also makes a decision about the level of consumption, c_{it}, where consumption is measured in units of real pesos.

Let $V_t^m(A_{it}, E_{it}, \Omega_{it})$ denote the value to starting period t in Mexico with asset stock A_{it}, entrepreneurial status E_{it}, and shocks Ω_{it}. Likewise define the value function $V_t^{us}(A_{it}, E_{it}, \Omega_{it})$ for beginning period t in the United States conditional on the state variables. In order to define the individual's activity choice problem and the values functions, $V_t^m(A_{it}, E_{it}, \Omega_{it})$ and $V_t^{us}(A_{it}, E_{it}, \Omega_{it})$, it is useful to define two sub-value functions that will be used in defining the larger value functions. Specifically, let's define $\nu_t^m(\widetilde{A}_{it}, E_{it})$ and $\nu_t^{us}(\widetilde{A}_{it}, E_{i,t+1}, ex_t)$ as the values associated with residing

in m or us, and choosing the optimal consumption choice in period t given that you entrepreneurship status will be $E_{i,t+1}$ in the next period, and that you have net assets on hand of $\widetilde{A}_{it}$. Net assets here means gross assets, A_t, plus any income that that has been earned, and less migration costs or business fixed costs that have been paid in that period.

When an individual is in Mexico, the consumption-savings problem can be summarized by the sub-value function ν_t^m and it's solution:

$$\begin{aligned} \nu_t^m(\widetilde{A}_{it}, E_{i,t+1}) &= \max_{c_{it}} u(c_{it}) + \beta E_{\Omega_{t+1}}\left[V_{t+1}^m(A_{i,t+1}, E_{i,t+1}, \Omega_{t+1})\right] \\ & s.t.\ A_{t+1} = R\left[\widetilde{A}_{it} - c_{it}\right] \\ & c_{it} \leq \widetilde{A}_{it} \end{aligned} \tag{4}$$

Likewise, when an individual is in the United States, the consumption-savings problem can be summarized by the sub-value function ν_t^{us} and it's solution:

$$\begin{aligned} \nu_t^{us}(\widetilde{A}_{it}, E_{i,t+1}, ex_t) &= \max_{c_{it}} u(c_{it}\frac{ppp}{ex_t}) + \beta E_{\Omega_{t+1}}\left[V_{t+1}^{us}(A_{i,t+1}, E_{i,t+1}, \Omega_{t+1})\right] \\ & s.t.\ A_{t+1} = R\left[\widetilde{A}_{it} - c_{it}\right] \\ & c_{it} \leq \widetilde{A}_{it} \end{aligned} \tag{5}$$

Now we are in a position to define the beginning of period value functions $V_t^m(A_{it}, E_{it}, \Omega_{it})$ and $V_t^{us}(A_{it}, E_{it}, \Omega_{it})$. First, consider the case where $E_{it} = 2$, so the individual has exited the business. In this scenario, the individual compares the options of either working in Mexico or working in the United States, if migration is feasible. The value functions are given by:

$$V_t^m(A_{it}, E_{it}, \Omega_{it}) = \begin{cases} \nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 2) & \text{if } ex_t A_t < \lambda_t \\ \max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 2), & \\ \qquad \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell} - \lambda_{it}, E_{i,t+1} = 2)\Big] & \text{if } ex_t A_t \geq \lambda_t \end{cases} \tag{6}$$

$$V_t^{us}(A_{it}, E_{it}, \Omega_{it}) = \max[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 2), \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell}, E_{i,t+1} = 2)] \tag{7}$$

Now, if the individual is currently running a business, which means that $E_{it} = 1$ and that he or she must be in Mexico, then the value functions are given by:

$$V_t^m(A_{it}, E_{it}, \Omega_{it}) = \begin{cases} \max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 2), & \\ \qquad \nu_t^m(A_t + w_{it}^{m,e}, E_{i,t+1} = 1)] & \text{if } ex_t A_t < \lambda_t \\ \max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 2), & \\ \qquad \nu_t^m(A_t + w_{it}^{m,e}, E_{i,t+1} = 1)] & \\ \qquad \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell} - \lambda_{it}, E_{i,t+1} = 2)\Big] & \text{if } ex_t A_t \geq \lambda_t \end{cases} \tag{8}$$

Now, if the individual has not yet started a business, which means that $E_{it} = 0$, then the value functions are given by:

$$
V_t^m(A_{it}, E_{it}, \Omega_{it}) = \begin{cases}
\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 0) & \text{if } ex_t A_t < \lambda_t \text{ and } A_t < SC_i \\
\max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 0), & \\
\quad \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell} - \lambda_{it}, E_{i,t+1} = 0)\Big] & \text{if } ex_t A_t \geq \lambda_t \text{ and } A_t < SC_i \\
\max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 0), & \\
\quad \nu_t^m(A_t + w_{it}^{m,e} - SC_i, E_{i,t+1} = 1)] & \text{if } ex_t A_t < \lambda_t \text{ and } A_t \geq SC_i \\
\max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 0), & \\
\quad \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell} - \lambda_{it}, E_{i,t+1} = 0) & \\
\quad \nu_t^m(A_t + w_{it}^{m,e} - SC_i, E_{i,t+1} = 1)] & \text{if } ex_t A_t < \lambda_t \text{ and } A_t \geq SC_i
\end{cases} \tag{9}
$$

$$
V_t^{us}(A_{it}, E_{it}, \Omega_{it}) = \begin{cases}
\max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 0), & \\
\quad \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell}, E_{i,t+1} = 0)\Big] & \text{if } A_t < SC_i \\
\max\Big[\nu_t^m(A_t + w_{it}^{m,\ell}, E_{i,t+1} = 0), & \\
\quad \eta_{it} + \nu_t^{us}(A_t + w_{it}^{us,\ell}, E_{i,t+1} = 0)\Big] & \\
\quad \nu_t^{m,e}(A_t + w_{it}^{m,e} - SC_i, E_{i,t+1} = 1)] & \text{if } A_t \geq SC_i
\end{cases} \tag{10}
$$

The above laid-out model will be backbone of our analysis of the mechanisms that link migration and entrepreneurship in Mexico.

5 Estimation and Policy Simulations

We assume that utility function takes the simple form of log and the migration disutility shock η_{it} is IID $N(\bar{\eta}, \sigma_\eta)$ across individuals and overtime. The fixed cost migration λ_t is the same across individuals, but we allow for a time trend such that $\lambda_t = \bar{\lambda} + \lambda_b B_t$. Finally we follow Thom (2009) to specify a parametric functional form for initial asset level for each individual as $k_{i1} = exp(\gamma_k) + \gamma_p P_{i1} + \gamma_{fm} FM_{i1}$. P_{i1} is a dummy to indicate the ownership of a property and FM_{i1} indicates whether the worker's father had migrant experience before.

There are persistent unobserved heterogeneity across individuals in terms of their worker and entrepreneur abilities u_i^l and u_i^e. In addition, their business start-up cost is also different sc_i. We utilize a finite mixture model to assume that individuals can be summarized by a finite number J types. For each $j = 1, 2, ..., J$, the individual of type j is endowed with a tuple (u^{lj}, u^{ej}, sc^j). Denote the probability of an individual i being type j as p_i^j, we will further parameterize p_i^j as a CDF function Φ of individual observable X_i. We will need to estimate Φ and $(u^{lj}, u^{ej}, sc^j)_{j=1,..,J}$ jointly.

We also allow contemporaneous income shocks to workers in both US and Mexico and entrepreneurs in Mexico. We assume these shocks $\epsilon_{it}^{ml}, \epsilon_{it}^{ul}, \epsilon_{it}^{me}$. We assume each of these shocks is IID normally distributed with mean zero. The standard deviations of these distributions are $\sigma^{ml}, \sigma^{ul}, \sigma^{me}$ respectively. Finally, we allow worker ability u_i^l to affect wages in Mexico and US in different ways by multiplying it with γ_{uw} in US wage equation.

To summarize, we need to estimate the following parameters: (1) contemporaneous income and utility shocks $\bar{\eta}, \sigma_\eta, \sigma^{ml}, \sigma^{ul}, \sigma^{me}$, (2) migration fixed cost $\bar{\lambda}, \lambda_b$ and US wage-ability shifter γ_{uw}, (3)J tuples $u = (u^{lj}, u^{ej}, sc^j)_{j=1,..,J}$, (4) initial capital condition $\gamma_k, \gamma_p, \gamma_{fm}$, and (5) CDF Φ, which determines probability of an individual i being type j. Denote these model parameters by blocks $\theta = (\theta_1, ...\theta_4) \in \Theta$ and Φ.

For given set of parameters in (1) (2) (3), we can solve the optimal life-cycle migration and entrepreneurship decisions of each type j individuals using our theoretical model. These policy functions can then be used to simulate path of migration and entrepreneurship activities, conditional on our sample individual's observable $D_i = (X_i, P_{i1}, FM_{i1})$. Any model conditional moments $E[m(\theta, \Phi)|D_i] = E[\sum_j p^j(D_i)m(\theta; j)|D_i]$ can be approximated can a mixture of simulated moments $\frac{1}{S}\sum_s \sum_j \Phi^j(X_i)m^s(\theta; j, P_{i1}, FM_{i1})$. Since p_i^j is not simulation specific, we can write the simulated moment of individual i as a weighted sum: $\sum_j \Phi^j(X_i)\frac{1}{S}\sum_s m^s(\theta; j, P_{i1}, FM_{i1})$.

Define sample vectorized moments of individual i as m^i, then denote the difference between sample moments and model moments as:

$$g(D_i, m^i; \theta, \Phi) = m^i - \sum_j \Phi^j(X_i) \frac{1}{S} \sum_s m^s(\theta; j, P_{i1}, FM_{i1})$$

Finally, using the sample analog of $E[g(D_i, m^i; \theta, \Phi)|X_i] = 0$, we can define the objective function as:

$$\begin{aligned} g(\theta, \Phi, \mathbf{D}, \mathbf{W}) = \frac{1}{N} \sum_i [m^i \otimes X_i - \sum_j \Phi^j(X_i) \frac{1}{S} \sum_s m^s(\theta; j, P_{i1}, FM_{i1}) \otimes X_i] \\ \mathbf{W} \frac{1}{N} \sum_i [m^i \otimes X_i - \sum_j \Phi^j(X_i) \frac{1}{S} \sum_s m^s(\theta; j, P_{i1}, FM_{i1}) \otimes X_i]' \end{aligned}$$

Using the estimated parameters, we plan to conduct several policy simulations. They include (1). How does immigration reform in U.S. affect Mexican entrepreneurship and poverty. (2). How does increased border control of U.S. affect Mexican migration and entrepreneurship. (3). How does a subsidy program for business startups in Mexico affect Mexican worker's migration and entrepreneurship decisions.

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Table 1: Distribution of Reported Occupations when Owning a Business

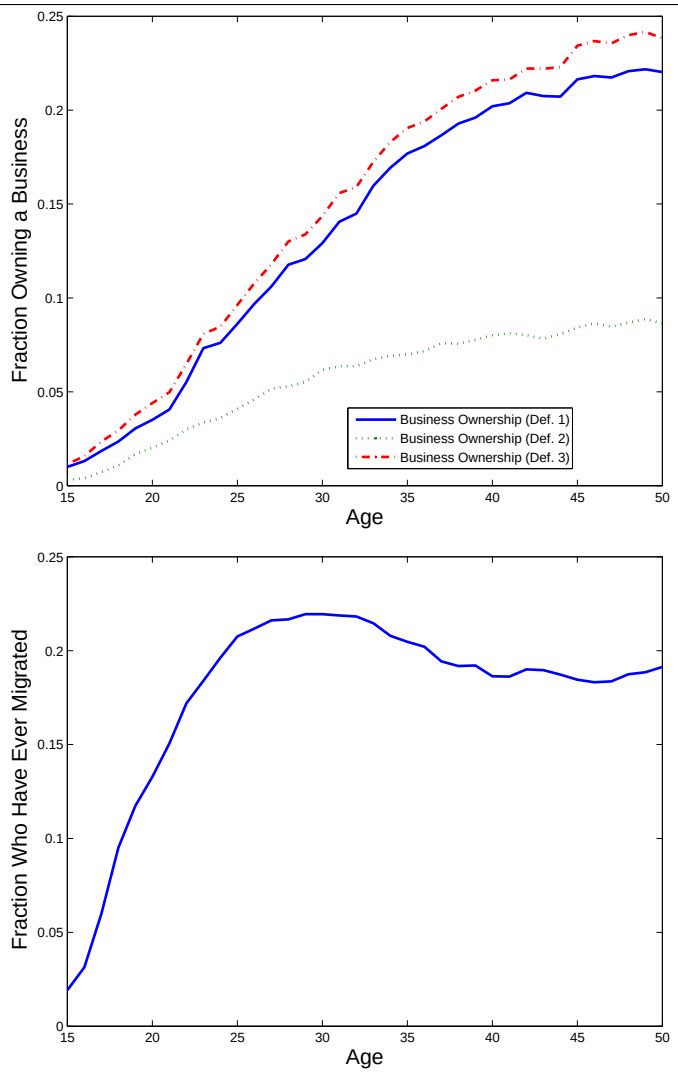
Reported Occupation	Percentage of Sample
Agricultural Workers	14.87
Merchants, retail business owners	12.57
Small and Med. Service Estab. Owners	7.41
Sales Agents or Representatives	6.02
Metal Production and treatment workers	4.73
Truck Drivers, land-transports drivers	3.25
Other craftsmen or manufacturing workers	3.20
Workers in retail establishments	2.53
Small and Medium Sized Factory Owners	2.44
Other unskilled workers	2.44
Construction, installation, maintenance	1.82
Ambulatory service workers (e.g. food vendors)	1.82
Other	36.90

The full sample consists of 24,587 person-year observations of male household heads born during or after 1950 who are aged 15 years or older.

Table 2: Entrepreneurial Occupations

President, director, senior manager, large factory owner
Small and Med. sized factory owner
Small and Med. Service Estab. Owners
Other administrators such as entrepreneurs
Merchants, retail business owners

Figure 1: Entrepreneurship Rates and Migration Experience by Age

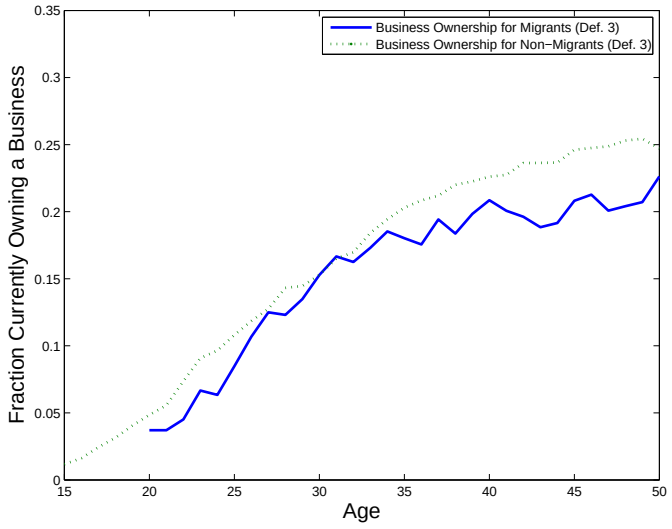


Notes

Table 3: Frequency of Entrepreneurial Spells

Number of Spells	**Frequency**	**Fraction of Entrepreneurs**
1	4,581	0.96
2	169	0.04
3	13	<0.01
4	1	<0.01

Figure 2: Entrepreneurship Rates by Migration Experience and Age



Notes

Table 4: Linear Probability Estimates of Probability of Starting Business while in Mexico

	(1)	(2)	(3)
Age	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
$Age^2/100$	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Educ. ($Year$)	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Return	0.024***	0.004	-0.074***
	(0.003)	(0.004)	(0.024)
Return X *Duration*		0.001***	0.001***
		(0.000)	(0.000)
Return X $Duration^2$ / 100		-0.000*	-0.000
		(0.000)	(0.000)
Return X *Age*			0.004***
			(0.001)
Return X Age^2 / 100			-0.006***
			(0.002)
Any US Experience	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)
$Community\ Fixed\ Effects$	Yes	Yes	Yes
$Year\ Fixed\ Effects$	Yes	Yes	Yes
N	132,960	132,960	132,960
R^2	0.009	0.010	0.010