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THE IMPORTANCE OF EDUCATION-OCCUPATION MATCHING IN MIGRATION DECISIONS*

MICHAEL A. QUINN AND STEPHEN RUBB

In this article, we present and test a model that incorporates education-occupation matching into the migration decision. The literature on education-occupation matching shows that earnings are affected by how individuals' education matches that required by their occupation. Accordingly, individuals with more schooling than required by their occupation have an additional incentive to migrate: the increase in earnings that occurs with a more beneficial education-occupation match. Using data from Mexico, we found statistical support for the importance of education-occupation matching in migration decisions. Education-occupation matching provides a plausible explanation for the mixed findings in the literature on the relationship between educational attainment and migration.

Given recent demographic trends, researching the interaction between education and migration has become an increasingly important issue. In the past few decades, developing countries have seen a dramatic increase in both educational levels and migration. For instance, from 1975 to 1995, literacy rates rose from 79% to 90% in Mexico and from 31% to 48% in developing countries overall (World Bank 2002). Worldwide, the number of international migrants has been increasing for decades, more than doubling since 1970 (United Nations, UN, 2002). The number of Mexican-born workers in the United States rose from 4.3 million to 8.3 million from 1990 to 2000 (U.S. Census Bureau 2001). In Mexico, domestic migration has been a major source of the rapid growth of urban areas. The percentage of the Mexican population that lives in urban areas grew from 42% in 1950 to 74% in 2000 (UN 2001). These trends have made researching the interaction between education and migration a matter of growing interest to policy makers. As is noted in the next section, no consensus has been reached in the literature as to the effect of education on the decision to migrate.

In this article, we propose that the extent to which individuals' education matches their occupational levels has a significant effect on the migration decision. Education-occupation matching is important because it affects individuals' returns on earnings from their education. Workers in occupations that require less than their level of schooling are more likely to migrate to achieve a better match, ceteris paribus. In contrast, individuals in occupations that normally require more than their level of schooling are less likely to migrate. Education-occupation matching theory has previously been applied to studies of wage determination, but this article is the first to apply it to migration.

The use of the education-occupation framework may offer an explanation for the mixed effects of education on migration that have commonly been observed in the literature. If, in a given area, the matching (or mismatching) of individuals to their occupations varies across educational levels, so will the incentive to migrate. In a given area, individuals with higher educational levels may have worse or better education-occupation matches than individuals with lower educational levels, so the effect of educational

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attainment on migration could be positive or negative, respectively. Thus, the effect of education on migration is not homogeneous with respect to setting. In a similar vein, research has found that relative income/wealth can be an important factor in migration decisions (Quinn forthcoming; Stark and Taylor 1989, 1991).

In this article, we present and test a migration model that incorporates the effects of educational attainment and the extent to which individuals' schooling matches the educational requirements of their occupations. We begin with a brief review of the relevant literature and then discuss the development of a theoretical model, which we tested empirically using data from the Mexican Migration Project (MMP; 1982–1999). The article concludes with a discussion of the implications of the analysis.

REVIEW OF THE LITERATURE

There are several theoretical approaches to modeling migration: neoclassical economics, new economics theories, dual-labor-market theory, social capital theory, world systems theory, and others (for reviews of different migration theories, see Massey et al. 1994; Taylor and Yunez-Naude 1999). One of the main ideas in the literature linking education and migration is that the decision to migrate is influenced by differences in individuals' return via earnings from their education in the origin and migration-destination areas.

There is no clear consensus in the migration literature on the effect of education on the likelihood of migration. On the one hand, some researchers have found a positive relationship between education and domestic migration (e.g., Stark and Taylor's 1991 study of Mexico and Caces et al.'s 1985 study of the Philippines). On the other hand, Lucas (1985) reported a negative relationship between education and domestic migration in Botswana. Other studies did not find any significant relationship between education and domestic migration (e.g., Sahota's 1968 study of rural Brazil and Emerson's 1989 study of the United States).

Studies of the relationship between international migration and educational attainment have also been mixed. In the case of Mexico-U.S. migration, most studies have found the relationship between educational attainment and the likelihood of migration to be negative (Curran and Rivero-Fuentes 2003; Massey and Espinosa 1997; Taylor 1987), although Taylor and Wyatt (1996) found a positive relationship, as did Caces et al. (1985) in their study of the Philippines. In some cases, such as Adam's (1993) study of Egyptian migration, the education–international migration relationship has been found to be statistically insignificant. None of these studies examined the nature of the match (or mismatch) between educational and occupational levels.

Research has also examined the importance of individuals' education relative to the average educational level of workers in their occupation in determining wages. This average has frequently been defined as the "required education" of workers in an occupation. Given that education-occupation matching has been shown to affect the return from education (i.e., wages), it is logical that it should affect the likelihood of migration. The effect of education-occupation matching (or mismatching) on wages has been well documented for industrialized countries (Alba-Ramirez 1993; Allen and van der Velden 2001; Rumberger 1987; Sicherman 1991; Sicherman and Galor 1990) and documented for Mexico (Rubb and Quinn 2002). Two extensive surveys of this literature were by Rubb (2003a) and Hartog (2000).

A "match" occurs when workers' schooling equals the amount of education that is generally required in their occupation. Mismatched individuals who have more education than is the average in their occupation are "overeducated" relative to others in their occupation. For example, an individual with eight years of education who works in an occupation that requires only four years of education will earn more than individuals with fewer than eight years of education who work in the same occupation; the return from his or her above-average years of schooling is not zero. However, this overeducated individual would be better off in an occupation that requires a higher level of education (an occupation that better matches his or her level of education). Individuals who have more schooling than is required by their occupation generally increase their earnings by finding employment in an occupation that requires their level of education.

Individuals who have less education than is the average in their occupation are described as "undereducated." For example, an individual with four years of education who works in an occupation that requires six years of education would be undereducated relative to others in this occupation. He or she would earn less than an individual with more years of education who works in the same occupation. However, this undereducated individual is beneficially education-occupation mismatched and would become worse off by moving to an occupation that requires four years of education (which would be a match for his or her four years of education).

Thus, individuals who currently have more than the amount of education required by their occupation will benefit from an education-occupation match. In addition, they are likely to believe that they have a "good" chance of upward occupational mobility because of their relatively "high" educational level. In contrast, individuals with less than the required amount of education are likely to believe that they have a "poor" chance of upward occupational mobility because of their relatively "low" educational level.

Furthermore, having more schooling than is required to perform an occupation adversely affects job satisfaction (Allen and van der Velden 2001; Tsang and Levin 1985) and the turnover/mobility of workers (Alba-Ramirez 1993; Robst 1995; Sicherman 1991). In a similar vein, each of these factors should also increase the likelihood of migration. That is, factors that lead to higher turnover/mobility and lower job satisfaction are likely to increase the probability of migration, regardless of the impact these factors have on wages.

THEORETICAL MODEL

Let us assume that there are a total of $g = 1 \ldots n$ geographically distinct labor markets. Each of these n labor markets has a total of $\ell = 1 \ldots k$ occupations. Thus, there are a total of nk distinct employment possibilities. The education required by occupation ℓ is r_ℓ. Occupations can be ranked by the amount of required education, $r_1 > r_2 > \ldots > r_k$. The wage paid to any given employment position $g\ell$ is represented by $W_{g\ell}$. The probability of an individual obtaining any given position $g\ell$ is $P_{g\ell}$, which is believed to be directly related to each individual's actual level of schooling, ed.

The cost of migrating to labor market g is d_g. The individual's wage in his or her current (C) position is $W_{g\ell}^C$ and his or her wage in the position after migrating is $W_{g\ell}^M$. The individual's expected income gain from migration, $E(M)$, can be written as

$$E(M) = \sum_{g\ell} P_{g\ell} \cdot \left(W_{g\ell}^M\right) - W_{g\ell}^C - d_g . \tag{1}$$

The individual's income benefit from migration comes from two sources. The first is through differences in wage levels between different labor markets. When we observe $W_{1\ell} > W_{2\ell}$ for all ℓ, geographic Labor Market 1 has higher wages than geographic Labor Market 2 for any given level of occupation ℓ. Another source of advancement is through occupational upgrading. Moving from Occupation 2 to Occupation 1 would be considered an occupational upgrade if, for any given geographic labor market g, we observe $W_{g1} > W_{g2}$. For simplicity, it is assumed that this occurs whenever $r_1 > r_2$.

Individuals with the highest expectation of occupational upgrading will be those who are currently in occupations that do not fully utilize their education. These individuals will benefit from an education-occupation match (or from a beneficial mismatch), ceteris paribus. Individuals who are in occupations that require more than their current level of education will be less likely to experience a beneficial occupational upgrade via migration, since they are already experiencing a beneficial education-occupation mismatch and would need the unlikely occurrence of an even more beneficial mismatch to become better off, ceteris paribus. To the extent that the beneficial mismatch is the result of personal connections in the community, these individuals will be less likely to migrate because they may not have the same level of employment connections in the destination area.

In the case of Mexican migration (and certainly that of other countries), highly educated migrants may face additional difficulties in obtaining employment internationally (primarily in the United States) versus domestically. We theorize that this can be true for a number of reasons, including language barriers, licensing requirements and nonacceptance of Mexican educational credentials, discrimination and poor screening methods by U.S. employers, immigration legality issues, the lack of social networks into these positions, and a perception among U.S. employers that Mexican education is of a lower quality than is comparable U.S. education (American Association of International Medical Graduates 2003; American Bar Association 2003; Docquier and Rapoport 1998; Gomez-Pompa 1989; Immigration and Naturalization Service 2001; Ong and Morales 1988; Paral 2002; Taylor 1987; Waldinger and Bozorgmehr 1996). These issues may lead to more highly educated Mexicans gaining a higher return from their education domestically, rather than internationally (giving them an incentive to choose domestic migration).

One can consider the labor markets to be separated into domestic (*D*) and international (*I*) areas. If significant barriers exist internationally that do not exist domestically, then we expect to see that when migration occurs, these barriers will limit international migration more than domestic migration, particularly for individuals with high levels of actual education (*ed*). If we consider the conditional probabilities of obtaining an employment position domestically and internationally as $P_{g\ell}^{D}\big|M$ and $P_{g\ell}^{I}\big|M$, respectively, then we would expect to see

$$\left(\frac{\partial P_{g\ell}^{I}\big|M}{\partial ed}\right) < \left(\frac{\partial P_{g\ell}^{D}\big|M}{\partial ed}\right). \tag{2}$$

We theorize that individuals with higher levels of education are more likely to choose domestic migration, rather than international migration, when migration occurs. Although the foregoing barriers are also likely to limit the likelihood that migration will occur in the first place, at this time we make no predictions a priori about the relationship between actual education and the probability of migrating because of a variety of other factors.

The three main predictions of the model that we tested empirically are as follows:

1. Years of overeducation (education greater than that required by one's occupation) are positively related to the probability of migration. Overeducated individuals are likely to migrate to seek to improve their education-occupation match because they have a "reasonable" probability of improving their occupational level.

2. Years of undereducation (education less than that required by one's occupation) are negatively related to the probability of migration. Undereducated individuals are likely to have a favorable education-occupation match, and migration is unlikely to result in a more favorable occupation.

3. If migration is chosen, the level of actual education is positively related to the probability of choosing domestic migration instead of international migration.

DATA AND VARIABLES

The data were taken from the 1987–1999 MMP, which is conducted jointly by the University of Guadalajara and Princeton University. Each year, the MMP samples at least 200 households from three to five different (nonrepeating) Mexican communities.[1] The

1. The MMP also collects data from a small sample of Mexican households living in the United States (equivalent to roughly 10% of the size of the Mexican sample). This U.S.-based sample was not viable for our

data are cross-sectional in that different communities are surveyed each year. Interviewers collect information about individuals who are present in the household and about those who are not present because of migration.

The data set is useful because it contains information on wages, rural/urban area, marital status, years of schooling, migration experience, and 100 occupational categories. It also includes an extensive migration history of individuals in the household, such as education, occupation, and wages for employment in their home community before migration. This information is provided by other family members for individuals who are currently not in the household because of migration. The availability of data on education, occupation, and wages was crucial to our analysis. The data set also contains a number of other individual-, household-, and community-level variables.

The sample contained 6,024 individuals aged 14–72 who were in the labor force and reported working in the previous year. We present the results from this sample of 6,024 individuals, along with two smaller subsamples. The subsamples used a case-control correction that resulted in the loss of observations. Two standards were used for the case-control correction, resulting in samples of 2,605 and 1,243 observations, with the smaller sample being a more precise matching of cases and controls.

Three education variables were central to our analysis: the individual's actual education, years of overeducation (if any), and years of undereducation (if any). Another variable, required education, was necessary to calculate the years of over- and undereducation variables. Required education was equal to the mean level of schooling, by occupation.[2] This approach has been used by Cohn, Johnson, and Ng (2000); Cohn and Khan (1995); Kiker, Santos, and De Oliveira (1997); Ng (2001); Rubb (2003b); and Verdugo and Verdugo (1989). Required education was based on the occupation of individuals prior to their migration decision. The variable *years of overeducation* was defined as the individual's number of years of schooling minus the years of required schooling. The variable *years of undereducation* was defined as the years of required schooling minus the individual's number of years of schooling. Overeducation and undereducation are both continuous variables, measured in years, with a lower bound of zero. Thus,

$$\text{Years of Education} = \text{Years of Required Education} + \text{Years of Overeducation} \\ - \text{Years of Undereducation}. \quad (3)$$

Since the definition of required education is relative, overeducation can exist in a country with low levels of educational attainment. Researching education-occupation mismatches in Spain, Alba-Ramirez (1993:260) noted that overeducation can exist "even in an economy without a surplus of college graduates, . . . it is likely that some workers perform jobs for which they are overqualified. In this case, overeducation is present at all levels of schooling." We make no claim as to the extent to which overeducation exists in developing countries, only that mismatches are likely to occur.

We used several individual-, household-, and community-level variables in the analysis: age, age squared, sex, marital status, number of children, number of migration contacts in the United States, prior U.S. migration experience, and domestic Mexican migration experience. We expected that age would be positively related to the probability of choosing to migrate until a certain point, after which it will become negative; we captured this expectation in the analysis through the inclusion of both age and age squared.

analysis, since occupational attainment in Mexico prior to migration is not available for individuals in these U.S. households.

2. Individuals who were in an occupational category with fewer than 10 observations were pooled into the closest occupational category.

We used two experience variables—U.S. migration experience and Mexican migration experience—corresponding to months of previous U.S. migration experience and to the number of previous migrations within Mexico, and a contact variable—U.S. contacts—composed of the number of individuals (both family members and friends) that the person knows who are currently living in the United States.

We expected that prior U.S. migration experience would increase the likelihood of U.S. migration and made the corresponding expectation concerning prior migration within Mexico. Contacts in the United States were expected to have a positive impact on the likelihood of U.S. migration. Contacts and prior experience at a migration destination have been found to increase the probability of migrating to that destination in several studies (Curran and Rivero-Fuentes 2003; Massey 1990; Stark 1991).

Some household control variables included dummy variables for ownership of a business, a home, a television, and a radio. There was also a continuous variable for hectares of land owned.[3] Community-level variables included whether the community has a train station, central market, irrigation, and *ejido* land; metropolitan category; and how many miles the community is to the nearest highway.[4] Controls for the year of survey and the exchange rate (pesos per dollar) were included as well. Macroeconomic variables are meant as controls because the focus of the article is on the impact of the microeconomic variables on migration decisions. A list, description, and summary statistics of key variables that were used in the empirical analysis are shown in Table 1.

Three wage variables—the individual's predicted wage without migration, predicted wage if migration to the United States occurs, and predicted wage if migration within Mexico occurs—were calculated as follows, using the wage-equation approach (which is standard in the migration literature). The sample was separated into three groups of individuals: those who did not migrate in the survey year, those who migrated to the United States in the survey year, and those who migrated within Mexico during the survey year. Three regressions (one for each group) were run with observed real wages regressed on age, age squared, years of education, marital status, rural/urban status, and year dummy variables. The coefficients from these regressions were used to construct predicted wages for individuals in the other two groups in the sample. For instance, a wage equation was estimated using data from individuals who did not migrate. The coefficients from this regression were then multiplied by the values of the independent variables for individuals who did migrate to calculate a "no migration wage" for individuals who did migrate. Thus, the "no migration wage" would be an observed wage for those who did not migrate and a predicted wage for those who did migrate. For brevity, the wage-equation estimates are not shown.

As Heckman (1979) noted, there may be a selectivity issue with respect to migrants' wages. Therefore, we ran the wage equations with a Heckman correction for migration selection. The Heckman selection is a probit that is run with the likelihood of being in the observed group (no migration, U.S. migration, or Mexican migration, depending on the wage regression) as the dependent variable. The inverse Mills ratio from this probit is then included as an independent variable in the regression with wages (for the corresponding observed group).

Since our goal was to determine the effect of education-occupation matching on migration, the empirical focus was on the three education variables: actual education, years of overeducation, and years of undereducation. However, there may be systematic differences between migrants and nonmigrants involving other variables that may confound the

3. Because of a few large landowners, the land variable has a high standard deviation (15.6) relative to its mean (1.5).

4. *Ejido* land is communal farmland in a community and is the result of a land reform in the Mexican constitution that was designed to reduce inequality.

Table 1. Descriptive Statistics of Key Variables

Variable	Description	Mean	*SD*
Continuous Education Variables			
Actual education	Years of education	5.8	4.6
Required education	Years of education required by one's occupation	6.0	3.2
Years of overeducation	Actual education – required education	1.3	2.1
Years of undereducation	Required education – actual education	1.4	1.9
Other Continuous Variables			
U.S. contacts	Number of migration contacts in the United States	9.1	12.8
U.S. experience	U.S. migration experience (in months)	14.9	42.9
Mexico experience	Number of previous migration trips within Mexico	1.0	2.3
Age	Age	41.0	12.7
Children	Number of children	3.4	2.4
No migration wage	Predicted wage if individual does not migrate	11.0	3.7
Mexican migration wage	Predicted wage if individual migrates within Mexico	11.2	3.7
U.S. migration wage	Predicted wage if individual migrates to the United States	1.4	0.5
Land	Land owned (in hectares)	1.5	15.6
Dummy Variables			
Market	Central market in community (1 = yes)	0.7	0.4
Train station	Train station in community (1 = yes)	0.6	0.5
Own business	Own business (1 = yes)	0.3	0.5
Sex	Sex (1 = female)	0.1	0.3
Married	Married	0.8	0.4

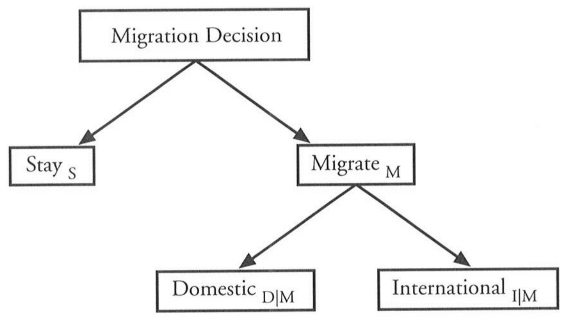
Notes: Additional variables include controls for the year of the survey; the exchange rate; metropolitan area; an *ejido* in the community; distance to a highway; irrigation in the community; and ownership of a vehicle, radio, television, and house. Wage variables are in logs of real dollars and pesos, as appropriate.

analysis. For instance, migrants may be older or younger than nonmigrants, and age may affect rates of under- and overeducation. Rothman and Greenland (1998) discussed the classic example of a study that showed that alcohol consumption increases the risk of contracting lung cancer. On further investigation, it was found that individuals who chose to drink were much more likely to smoke, causing it to appear that alcohol consumption was causing lung cancer. In this case, smoking was termed a *confounding variable*.

A common method for dealing with this issue is the case-control method (see, e.g., Clayton and Hills 1993; Hennekens and Buring 1987; Rothman and Greenland 1998). This method, although established in the epidemiological/medical literature for decades, has only recently been applied by migration researchers (Curran and Rivero-Fuentes 2003). In the discussion that follows, the mechanics of the case-control method, how it compares to propensity-score modeling, how it controls for confounding variables, and possible problems with this approach are explained.

To implement a case-control method, one must separate the sample on the basis of the individual's migration choice. Individuals who migrated (case observations) are matched to individuals who did not migrate (control observations) on the basis of age group and community number. The community variable encompasses other variables, such as survey year, economic opportunities in the migration origin, rural/urban origin,

Figure 1. Nested Logit Decision Tree



and any community-level network effects on migration. Cases and controls must be from the same community and the same age group to match. Controls that do not match with a case observation (based on community and age group) are dropped.

This matching procedure helps to reduce differences between the migrant and nonmigrant populations in the sample with respect to the age and community variables. It allows for a better focus on the effect of the education variables by controlling for possible confounding variables (age and community). The case-control method used in this article is similar to propensity-score modeling. A propensity-score approach uses coefficients from a logit to create a "score" variable to match cases and controls. Both methods of matching are acceptable in the case-control literature.

One potential problem in a case-control analysis is identifying variables to choose for the matching (i.e., determining which variables may confound the analysis). The other major potential problem is that the case and control observations should be drawn from the same population. In the case of the MMP, prior researchers have used age and community, as we did. Both variables certainly affect migration and could confound the analysis, making them logical choices for the matching. The case and control observations are both part of the MMP survey, so the second issue is not a problem. This makes the use of a case-control method well suited to the MMP data.

The next sections present the empirical method and the results using a case-control correction with 15 age groups (resulting in a 1,243-observation sample). The matching of cases and controls by exact age would result in the loss of too many observations, hence the use of age groups. To check for robustness, the appendix contains the results for a 2,605-observation sample (corresponding to 12 age groups) and for the entire uncorrected sample consisting of 6,024 observations. The appendix also contains the results for the men in the sample separately and results that were run using an alternative formulation of the education variables. The results are robust across the samples.

EMPIRICAL METHOD

The empirical method used in this analysis is the nested logit. The nested logit approach is a variation of the logit that uses a decision-tree framework (see Figure 1). In this empirical application, the nested logit has two levels. In the first level, the individual decides whether to stay, S, in the home community or to migrate, M. The individuals who decide to migrate then choose whether to migrate internationally, I, or to migrate domestically, D. The domestic ($D|M$) and international ($I|M$) migration alternatives are contingent on the initial choice to migrate (M).

Let us index the first-level alternatives (stay, migrate) as i, the second-level alternatives as j, $\mathbf{X}_{ij}$ as a vector of explanatory variables, β as parameters, and n as the number of observations. One can state the conditional probability for the nested logit outcome ij as

$$P_{j|i} = \frac{e^{X_{ij}\beta}}{\sum_n e^{X_{in}\beta}}. \tag{4}$$

For the jth branch, the inclusive term, I_{ij}, is $I_{ij} = \ln\left(\sum_n e^{x_{ijn}\beta}\right)$.

One advantage of using a nested logit approach is that it relaxes the independence of irrelevant alternatives (IIA) assumption as compared with a multinomial logit approach. A multinomial logit approach to modeling migration would assume that the odds ratio of any given choice is independent of the inclusion of other choices. The nested logit approach maintains the IIA assumption within the branches but relaxes the assumption between the branches; thus, the nested logit approach is believed to be the appropriate specification. Another aspect of migration research that makes a nested logit approach desirable is the intuitive arrangement of the decision-tree branches (for more information on the nested logit approach, see Greene 2002; Maddala 1983).

We used two formulations of the nested logit, the difference between the two being the inclusion of the education-occupation variables. The first model includes a variable for an individual's years of education and a vector of other control variables. The first stage in the nested logit has as its dependent variable migration with two outcomes: stay and migrate. In the second stage, individuals who have chosen to migrate in the first stage have a choice of migration destination (1 if Mexico, 0 if the United States). The two nested-logit equations are

$$\Pr(\text{Migration}) = \alpha_0 ED + \alpha_1 \mathbf{X} + \varepsilon \tag{5a}$$

and

$$\Pr(\text{Destination}\,|\text{Migration}) = \beta_0 ED + \beta_1 \mathbf{Z} + \varepsilon. \tag{5b}$$

The variables include actual years of education of the individual (ED) and a vector of other control variables ($\mathbf{X}$). Table 1 describes the variables contained in $\mathbf{X}$. The vector $\mathbf{Z}$ is identical to $\mathbf{X}$ except that it does not include the "no migration wage," since this variable is not relevant in the second stage because the individual has already chosen to migrate.

The second nested logit includes the two education-mismatch variables in addition to years of actual education. The two nested-logit equations for this approach are

$$\Pr(\text{Migration}) = \gamma_0 ED + \gamma_1 OVER\_ED + \gamma_2 UNDER\_ED + \gamma_3 \mathbf{X} + \varepsilon \tag{6a}$$

and

$$\Pr(\text{Destination}|\text{Migration}) = \delta_0 ED + \delta_1 OVER\_ED + \delta_2 UNDER\_ED + \delta_3 \mathbf{Z} + \varepsilon. \tag{6b}$$

The two new variables, *OVER_ED* and *UNDER_ED*, represent the number of years an individual is overeducated or undereducated, respectively.

RESULTS

The nested-logit results are shown for the two decisions: migrate or not and choice of destination (conditional on migration) in Table 2 (Eqs. (5a) and (5b) and Eqs. (6a) and (6b)) for the 1,243-observation sample described in the Data section. As we noted earlier, we also ran the analysis with alternative samples to check for robustness. The appendix contains the results for the men in the sample separately and for a sample using age-dependent education variables. The appendix also compares the results in Table 2 to the results for the 2,605- and 6,024-observation samples. The results are robust. The results

Table 2. Nested Logit Estimates of the Decision to Migrate and the Destination

Variable	Decision to Migrate: Education (5a)	Decision to Migrate: Relative Education (6a)	Destination Mexico: Education (5b)	Destination Mexico: Relative Education (6b)
Actual Education	–0.077** (0.021)	–0.128** (0.028)	0.056 (0.071)	0.201† (0.107)
Years of Overeducation	—	0.072† (0.043)	—	0.088 (0.166)
Years of Undereducation	—	–0.159* (0.069)	—	0.676** (0.214)
No Migration Wage	0.002 (0.075)	–0.016 (0.077)	—	—
Mexican Migration Wage	0.131 (0.111)	0.141 (0.112)	–0.161 (0.427)	–0.341 (0.404)
U.S. Migration Wage	–0.009 (0.290)	–0.057 (0.297)	–1.274 (1.007)	–1.554 (1.118)
Married	0.624† (0.353)	0.722* (0.366)	1.418 (1.164)	2.049 (1.315)
Children	0.014 (0.038)	0.003 (0.039)	–0.151 (0.146)	–0.176 (0.153)
Sex	2.166** (0.432)	2.257** (0.438)	–2.261 (1.458)	–2.439† (1.482)
U.S. Experience	–0.012** (0.002)	–0.014** (0.002)	–0.056** (0.008)	–0.058** (0.009)
Mexican Experience	–0.173* (0.081)	–0.114 (0.073)	0.944** (0.215)	0.933** (0.213)
U.S. Contacts	0.005 (0.006)	0.005 (0.006)	–0.013 (0.018)	–0.009 (0.019)
Age	0.154** (0.040)	0.173** (0.042)	0.059 (0.209)	0.029 (0.210)
Age Squared	–0.002** (0.0005)	–0.002** (0.0005)	0.001 (0.002)	0.001 (0.002)
Owned Business	0.503** (0.177)	0.471** (0.176)	–0.528 (0.637)	–0.164 (0.654)
Land	0.621* (0.273)	0.494† (0.269)	–1.976* (0.862)	–1.763* (0.882)
Exchange Rate (pesos/dollar)	–0.301** (0.079)	–0.298** (0.079)	–0.123 (0.451)	–0.212 (0.452)
Individuals	1,243	1,243		
Chi-squared	1,415	1,443		

Notes: Standard errors are in parentheses. Excluded from the table are controls for the year of the survey; metropolitan area; irrigation; distance to a highway; a train station in the community; a central market in the community; an *ejido* in the community; and ownership of a vehicle, radio, television, and house. The sample used 15 age groups for case-control correction.

†$p < .10$; *$p < .05$; **$p < .01$

are also robust to outlier analysis. As a test of the robustness to outliers, we also ran the model excluding the highest educated 1% of the sample and found that the results (not shown for brevity) did not change.

In both models, years of education is negatively and significantly related to the probability of migration. In terms of the destination choice, years of education is positive with respect to choosing Mexico, instead of the United States, as a destination. This finding suggests that higher levels of education make one less likely to migrate and that if one still chooses to migrate, then education makes one more likely to migrate domestically, rather than to the United States.

For the decision to migrate, years of undereducation is negative and significant and years of overeducation is positive and significant (both as predicted). Relative to others with their level of schooling, Mexicans who are overeducated for their occupations are more likely to migrate, whereas Mexicans who are undereducated for their occupations are less likely to migrate.

The coefficient for undereducation is positive and significant with respect to choosing Mexico as the destination. There is no a priori expectation for this variable. One possible explanation for this result is that the undereducated individuals obtained their beneficially mismatched positions through the use of personal connections. These connections may be better at helping individuals obtain domestic employment than international employment.[5] Since this article's theory makes no prediction about this result, it is only a possible explanation. However, it does suggest an interesting phenomenon for future study.

Variables other than those associated with education are also noteworthy. As expected, prior U.S. experience is significant and negative with respect to choosing Mexico as a destination (instead of the United States), and prior migration experience within Mexico is positive and significant. The variable for U.S. contacts is unexpectedly statistically insignificant. However, when we ran the nested logit without U.S. experience, the negative coefficient for U.S. contacts became significant, as predicted. This finding suggests that the high correlation between previous U.S. migration experience and U.S. contacts results in the insignificant coefficient for U.S. contacts.

With regard to the migration decision, age is significant and positive, and age squared is significant and negative. This finding was expected, since age increases the probability of choosing to migrate until a certain point, after which it decreases the probability of migration. Age and age squared are insignificant with respect to migration destination. The exchange rate (pesos per dollar) is insignificant with respect to choice of destination but is significant and negative with respect to the decision to migrate. This finding suggests that the depreciating peso has a negative effect on the likelihood of migration, perhaps because of the decrease in real incomes of Mexican households from the depreciation, which makes migration less feasible. Both the land and business variables are positive and significant with respect to the decision to migrate. This finding is logical, since migration requires resources. The wage variables are insignificant. The sex variable is positive and significant, implying that being female increases the likelihood of migration. However, caution should be taken in interpreting this result because of the small number of female observations.

CONCLUSION

In this article, we presented and tested a model that incorporates the effects of education-occupation matching on migration. The empirical results are consistent with the hypothesis that education-occupation matching is an important factor in the migration

5. The importance of connections in gaining employment has been well documented. For a few examples, see Banerjee (1991), Granovetter (1995), and Mortensen and Vishwanath (1994).

decision. When we controlled for educational levels, we found that negatively mismatched workers are more likely to choose to migrate and positively mismatched workers are less likely to migrate, as predicted.

The evidence also suggests that given migration, individuals who are positively mismatched choose domestic over international migration. These individuals may choose domestic migration to maximize the use of their connections within Mexico. Education has a negative impact on the probability of migration and a positive impact on choosing Mexico over the United States as a destination (if migration is chosen).

The theory tested here provides a plausible explanation for the different effects of education on migration that have been found in the literature. In a cross section of individuals from a community, some will be overeducated and some will be undereducated for their occupations. These education-occupation mismatches can occur at both high and low levels of actual education. One may find either a positive or negative relationship between education and migration, depending on the prevalence of education-occupation mismatches at different educational levels. It is possible that in some cases, the mixed empirical results for the effect of educational attainment on migration that have been reported in the literature may be explained by education-occupation matching.

From a policy perspective, the results have implications for governmental investments in education. Policy makers must focus on increasing both educational levels and employment opportunities (especially jobs that require a higher level of education). Increasing educational levels without corresponding increases in the educational requirements of the employment opportunities will increase the incidence of overeducation and may lead to migration out of the area. The overall impact of this out-migration on communities depends, to a large extent, on the amount of remittances sent home by migrants.

The findings of this article present some interesting avenues for future research. A possible extension of this work would be to study how the incidence and severity of education-occupation mismatches change as educational levels rise in an area. It would also be useful to study how economic transitions, such as China's, affect education-occupation matches and migration and, more generally, to broaden this type of analysis to other countries.

APPENDIX

Appendix Tables A1 and A2 display the results for five different samples. The results are robust across samples. Table A1 shows the results for 1,102 men (from the 1,243-individual sample) to check whether the results vary by gender. There were not enough female observations to run separately. Table A1 also displays the results for the 1,243-observation sample using age-adjusted education variables.

For the age-adjusted education variables, required education was constructed using the mean level of education by occupation and by age group. The variables for years of overeducation and years of undereducation were then constructed using this new age-adjusted required-education variable.

Table A2 shows the results for the 2,605-observation sample that used 12 age groups in the case-control method (instead of the 15 age groups in Table 2) and the results for the entire 6,024-observation uncorrected sample. The results for the education variables from Table 2 are also included in Table A2 for the purposes of comparison. The results are robust.

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Appendix Table A1. Nested Logit Estimates of the Decision to Migrate and the Destination: Male Sample and Sample With Age-Adjusted Education Variables

	Decision to Migrate		Destination Mexico	
Variable	Male-Only Sample	Age-Adjusted Education Variables	Male-Only Sample	Age-Adjusted Education Variables
Actual Education	−0.116**	−0.144**	0.409*	0.325**
	(0.033)	(0.031)	(0.172)	(0.132)
Years of Overeducation	0.073†	0.083†	0.047	−0.150
	(0.045)	(0.046)	(0.243)	(0.207)
Years of Undereducation	−0.131*	−0.228**	0.885**	0.913**
	(0.068)	(0.075)	(0.297)	(0.246)
Individuals	1,102	1,243		
Chi-squared	1,261	1,457		

Notes: Standard errors are in parentheses. Only the results for the education variables are shown. Other variables included in these logits are the same as those used in Table 2. Years of over- and undereducation are not age adjusted in the male-only sample.

†$p < .10$; *$p < .05$; **$p < .01$

Appendix Table A2. Nested Logit Estimates of the Decision to Migrate and the Destination: 15 Age Groups, 12 Age Groups, and the Uncorrected Sample

	Decision to Migrate			Destination Mexico		
Variable	15 Age Groups	12 Age Groups	Full Sample	15 Age Groups	12 Age Groups	Full Sample
Actual Education	−0.128**	−0.184**	−0.213**	0.201†	0.697*	0.274**
	(0.028)	(0.043)	(0.043)	(0.107)	(0.304)	(0.096)
Years of Overeducation	0.072†	0.096	0.189**	0.088	−0.404	−0.387**
	(0.043)	(0.065)	(0.058)	(0.166)	(0.434)	(0.131)
Years of Undereducation	−0.159*	−0.222**	−0.242**	0.676**	1.408**	0.364**
	(0.069)	(0.065)	(0.060)	(0.214)	(0.467)	(0.146)
Individuals	1,243	2,605	6,024			
Chi-squared	1,443	4,212	9,936			

Notes: Standard errors are in parentheses. Only the results for the education variables are shown. Other variables included in these logits are the same as those used in Table 2.

†$p < .10$; *$p < .05$; **$p < .01$

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