International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States

Daniel Chiquiar

Banco de México

Gordon H. Hanson

University of California, San Diego and National Bureau of Economic Research

We use the 1990 and 2000 Mexican and U.S. population censuses to test Borjas's negative-selection hypothesis that the less skilled are those most likely to migrate from countries with high skill premia/earnings inequality to countries with low skill premia/earnings inequality. We find that Mexican immigrants in the United States are more educated than nonmigrants in Mexico; and were Mexican immigrants to be paid according to current skill prices in Mexico, they would be concentrated in the middle of Mexico's wage distribution. These results are inconsistent with the negative-selection hypothesis and instead suggest that there is intermediate selection of immigrants from Mexico.

I. Introduction

In recent decades, rising immigration from poor countries has made the U.S. labor force larger, younger, and less skilled than it otherwise

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would have been (Borjas 1999). The shift in the composition of immigrants appears due in part to the 1965 Immigration Act, which relaxed long-standing country of origin restrictions on immigrant admissions.

In an important body of work, Borjas (1987) argues that who migrates to the United States from a particular country will depend on that country's wage distribution. In countries with high returns to skill and high wage dispersion, as in much of the developing world, there will be negative selection of immigrants. Those with the greatest incentive to migrate to the United States will be individuals with below-average skill levels in their home countries. In countries with low returns to skill and low wage dispersion, as appears to be the case in western Europe, there will be positive selection of immigrants. Those with above-average skill levels will have the greatest incentive to migrate. In support of this selection hypothesis, Borjas (1987, 1995) finds that as sources for U.S. immigration have shifted from Europe to Asia and Latin America, the economic performance of new immigrants has deteriorated. Relative to earlier cohorts, recent immigrants earn lower wages than natives at time of arrival and take longer for their earnings to converge to native levels.[1] These findings counter an earlier belief that, irrespective of country of origin, immigrants have high potential for earnings growth (Chiswick 1978).[2]

Largely missing in the discussion of U.S. immigration is evidence from source countries. Surprisingly, there is little work on how the skills of immigrants compare to the skills of nonmigrating individuals in countries of origin. Such data are essential to evaluate the nature of migrant selection. One exception is Ramos (1992), who uses 1980 census data for the United States and Puerto Rico. Consistent with negative selection, nonmigrants in Puerto Rico are more educated than individuals migrating from Puerto Rico to the United States and less educated than those migrating from the United States to Puerto Rico.[3]

In this paper, we use data from the 1990 and 2000 Mexican population censuses and data on Mexican immigrants in the 1990 and 2000 U.S. population censuses to examine who in Mexico migrates to the United States and how their earnings and observable skills compare to those who remain at home. Mexico is the largest source country for U.S.

[1] Identifying changes in the average quality of immigrant cohorts is complicated by changes in unobserved cohort quality, immigrant assimilation, and labor market disturbances that vary by skill group. See LaLonde and Topel (1992, 1997), Borjas (1999), and Butcher and DiNardo (2002) on how to deal with this issue.

[2] Evidence of positive selection includes brain drain from poor countries (Carrington and Detragiache 1998; Beine, Docquier, and Rapoport 2001) and the internal migration of skilled workers (Borjas, Bronars, and Trejo 1992; Bound and Holzer 2000).

[3] To compare Ramos's results to ours, it is important to note that many costs of migrating to the United States that are relevant for Mexico (binding quotas, border enforcement, and bureaucratic delays) are not relevant for Puerto Rico.

immigration, accounting for 31.3 percent of net new arrivals in the 1990s. In 2000 the 9.2 million Mexican immigrants in the United States were equal to 9.4 percent of Mexico's total population. Mishra (2003) estimates that over the period 1970–2000, emigration raised average wages in Mexico by 8.0 percent.[4] Relative to the United States, Mexico has high returns to schooling and high wage dispersion, making it an ideal candidate to test the negative-selection hypothesis.

Following Borjas (1991), we develop a simple model, presented in Section II, to show that migrant selection in a country such as Mexico may be negative, intermediate, or positive, depending on the size of migration costs and how they vary with skill. A simple test for negative selection is to compare the observable skills of those who migrate and those who do not. In Section III, we find that Mexican immigrants, while much less educated than U.S. natives, are more educated than residents of Mexico. Individuals with 10–15 years of schooling are the Mexican cohort most overrepresented in the United States.[5] This is suggestive evidence against the negative selection of Mexican immigrants in terms of observable skill.[6] However, schooling may not be a sufficient statistic for skill or for potential earnings. To compare migrants and nonmigrants, we would prefer to see what each would earn in the same labor market, under a *common* price for skill. *Realized earnings* of nonmigrants, which reflect Mexican skill prices, and of migrants, which reflect U.S. skill prices, are not very informative.

To evaluate the selection of Mexican immigrants in terms of observable skills, we compare actual wage densities for residents of Mexico with counterfactual wage densities that would obtain were Mexican immigrants paid according to skill prices in Mexico. The *difference* between these actual and counterfactual wage densities nonparametrically summarizes immigrant selection in terms of potential earnings. To construct these densities, we extend the framework in DiNardo, Fortin, and Lemieux (1996), as shown in Section IV. The results, presented in Section V, suggest that were Mexican immigrants in the United States paid according to Mexican skill prices, they would fall disproportionately in the middle and upper portions of Mexico's wage distribution. These

[4] In the United States, many studies find that regional immigration inflows are only weakly correlated with wage changes for low-skilled U.S. natives, suggesting that immigration has little impact on U.S. wages (LaLonde and Topel 1997; Smith and Edmonston 1997; Borjas 1999). However, Borjas, Freeman, and Katz (1997) and Borjas (2003) argue that commonly used cross-area wage regressions require strong and unrealistic identifying assumptions. Using alternative approaches, these two studies find that higher immigration depresses wages for low-skilled U.S. natives.

[5] In related work, Feliciano (2001) finds that before 1990, average schooling was also higher for Mexican immigrants.

[6] Case study evidence supports this view. See Durand et al. (2001), Marselli and Cornelius (2001), and Orrenius and Zavodny (forthcoming).

findings do not support negative selection and suggest instead that there is intermediate or positive selection of Mexican immigrants. Also in Section V, we examine the robustness of these results.

II. Theory

In this section, we motivate the empirical analysis by developing a simple model of migration. Borjas (1987) applies Roy (1951) to show that in countries with relatively high returns to skill and earnings inequality, migrants tend to be negatively selected: they are drawn primarily from the lower half of the skill distribution in their home country. Borjas (1991) shows that this result depends on assuming that migration costs are constant across individuals. If migration costs are negatively correlated with earnings, negative selection may be overturned. We apply this insight to show that if migration costs are decreasing in skill, migrants may be negatively or positively selected in terms of skill, depending on the size of migration costs and the shape of the skill distribution.

Individuals from Mexico, indexed by 0, choose whether or not to migrate to the United States, indexed by 1. For simplicity, we treat this as a one-time decision, though the extension to a dynamic setting is straightforward (see Sjaastad 1962; Borjas 1991). Residents of Mexico face a wage equation given by

$$\ln (w_0) = \mu_0 + \delta_0 s, \tag{1}$$

where for Mexico w_0 is the wage, μ_0 is the base wage, s is the level of schooling, and δ_0 is the return to schooling. We focus on migrant selection in terms of observable skills, in this case, schooling. Implicitly, we imagine that there are random components to wage determination, but for simplicity we leave such features in the background. If the population of Mexicans were to migrate to the United States, they would face the wage equation

$$\ln (w_1) = \mu_1 + \delta_1 s, \tag{2}$$

where for Mexican migrants in the United States w_1 is the wage, μ_1 is the base wage, and δ_1 is the return to schooling. Consistent with the scarcity of skill in Mexico, we assume that $\delta_0 > \delta_1$, or that the return to schooling is higher in Mexico than in the United States.

Let C be migration costs and let $\pi = C/w_0$ be migration costs in time-equivalent units (i.e., the number of labor hours needed to migrate to the United States). When (1) and (2) are combined, a resident of Mexico will migrate to the United States if

$$\ln (w_1) - \ln (w_0 + C) \approx \ln (w_1) - \ln (w_0) - \pi > 0. \tag{3}$$

Borjas (1987, 1999) assumes that π is constant, implying that all indi-

viduals require the same number of labor hours in order to migrate to the United States. This assumption simplifies the analysis but may not be an accurate reflection of reality. We assume instead that time-equivalent migration costs decrease with schooling, such that

$$\ln(\pi) = \mu_\pi - \delta_\pi s. \tag{4}$$

This corresponds to the case in Borjas (1991) in which the random component of earnings is negatively correlated with the random component in migration costs. Why might migration costs decrease with schooling? First, individuals migrating legally to the United States must satisfy many bureaucratic requirements, involving extensive paperwork and repeated interactions with U.S. immigration authorities. More educated individuals may be able to meet these requirements more easily.[7] Second, a large service industry of lawyers and other specialists exists to help migrants manage the U.S. admissions process. Given that the cost of these services is more or less fixed, the time-equivalent cost of migration will be lower for individuals with higher hourly wages. There is also a large service industry oriented toward illegal immigrants (Orrenius 1999). To enter the United States successfully, an illegal entrant must cross the border, find transport to a safe location in the United States, and obtain counterfeit residency documents. These costs are also fixed, implying that higher-wage individuals require fewer effective labor hours to migrate to the United States. Third, credit constraints may raise migration costs for low-income individuals, who are also likely to be less educated. Individuals may have to borrow to cover migration costs. If lower-income individuals face higher borrowing costs because of a higher expected probability of default, they will face higher migration costs.[8]

Combining (3) and (4), figure 1 shows $\ln(w_0)$ and $\ln(w_1) - \pi$, which defines the cutoff schooling level for who migrates to the United States in the case in which $\delta_\pi = 0$ and $\mu_1 - \mu_0 > e^{\mu_\pi}$. Here, time-equivalent migration costs are constant and small, which corresponds to the assumptions in Borjas (1987). He focuses on unobservable skills, but the analogy to observable skills is straightforward. In figure 1, there is negative selection of migrants: individuals with schooling less than s^* migrate from Mexico to the United States and individuals with schooling greater than s^* remain in Mexico. Individuals with relatively high levels

[7] Over 90 percent of legal Mexican immigrants in the United States are admitted under family reunification provisions of U.S. immigration law. While obtaining legal assistance cannot change an individual's eligibility for admission, it may help an individual clear the queue for legal admission more quickly.

[8] A related possibility is that more educated individuals may face less uncertainty with regard to the U.S. wages they would earn, making them more likely to migrate for any given wage differential.

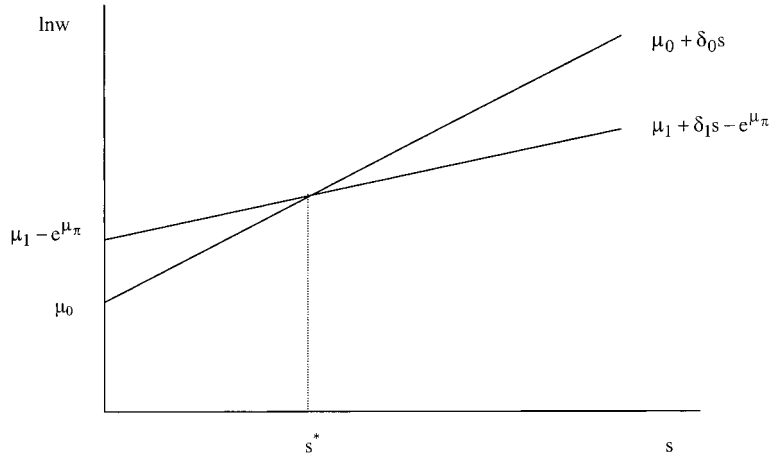

FIG. 1

of schooling are less likely to migrate to the United States because the return to schooling is higher in Mexico.

Figure 2 shows an alternative case in which $\delta_\pi > 0$ and $\mu_1 - \mu_0 < e^{\mu_\pi}$.[9] Here, time-equivalent migration costs are decreasing in schooling and are large. Individuals with schooling in the interval (s_L, s_U) migrate from Mexico to the United States, and those with schooling outside this interval remain in Mexico. The selection of migrants in terms of observable skills depends on the distribution of schooling in Mexico. There are three possible cases: (*a*) *negative selection*: if the support for the schooling distribution goes from some value between s_L and s_U to some value greater than s_U, migrants will have low schooling relative to those who remain in Mexico; (*b*) *positive selection*: if the support of the schooling distribution runs from some value below s_L to some value between s_L and s_U, migrants will have relatively high levels of schooling; or (*c*) *intermediate selection*: if the support of the schooling distribution goes from some value below s_L to some value above s_U, migrants will have intermediate levels of schooling. In case *c*, fixed migration costs preclude those with low schooling from migrating and high returns to schooling in Mexico dissuade those with high schooling from migrating, giving those with intermediate schooling the strongest incentive to migrate to the United States.

One caveat is that our analysis ignores migration networks, which

[9] If $\mu_1 - \mu_0 > e^{\mu_\pi}$ (migration costs are small), then even if migration costs are decreasing in schooling, there is still an unambiguous prediction for the negative selection of migrants. An additional assumption needed to obtain fig. 2 is that $\partial(\ln w_1 - \pi)/\partial s = \delta_1 + \delta_\pi \exp(\mu_\pi - \delta_\pi s) > \delta_0$ for small s.

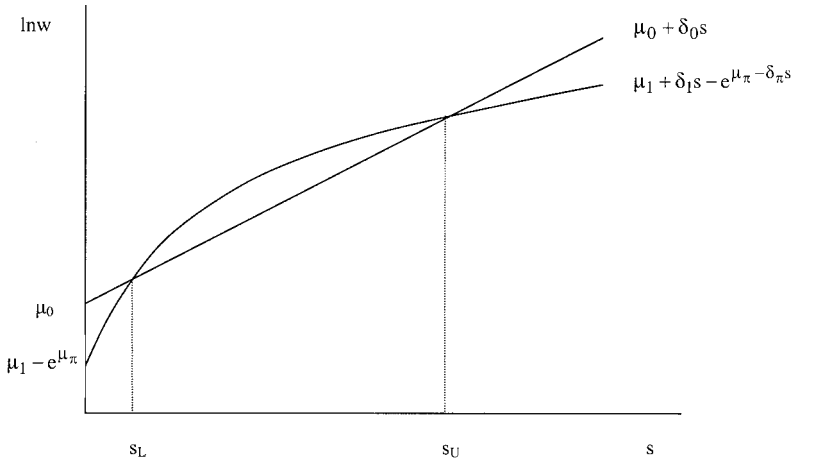

FIG. 2

appear to be important in Mexico (Woodruff and Zenteno 2001; Munshi 2003). Individuals with friends or relatives in the United States may face lower migration costs. A second caveat is that we ignore unobservable skills. If the correlation between observable and unobservable skills is positive and strong, we expect that our results would apply to migrant selection in terms of unobservable skills as well. In the empirical analysis, we discuss how migration networks and unobserved determinants of migration might affect our results.

III. Data and Preliminary Evidence

To compare outcomes for residents of Mexico and immigrants from Mexico, we use 1 percent samples from Mexico's 1990 and 2000 Census of Population and Housing and the 5 percent Public-Use Microdata Sample (PUMS) from the U.S. 1990 and 2000 Census of Population and Housing. For much of the analysis, we focus on recent Mexican immigrants, defined as those arriving in the United States within the last 10 years. They reflect individuals admitted under current U.S. policy. One measurement issue is that many Mexican immigrants are in the United States illegally. The U.S. census shows 4.3 million Mexican-born individuals in the United States in 1990 and 9.2 million in 2000. Of these, the Census Bureau estimates that 1.0 million were illegal immigrants in 1990 and 3.9 million were in 2000 (Costanzo et al. 2001). By its own estimation, the Census Bureau undercounts illegal immigrants by 15–20 percent. Others suggest that the undercount rate is higher. The Immigration and Naturalization Service (INS 2003) puts the num-

TABLE 1
SHARE OF U.S. IMMIGRANTS FROM MEXICO IN POPULATION OF MEXICO, 1990 AND 2000 (%)

		MEN			WOMEN		
		% Residing in United States			% Residing in United States		
AGE IN 1990	AGE IN 2000	1990	2000	Change	1990	2000	Change
…	16–25	…	11.99	…	…	7.68	…
16–25	26–35	7.57	17.53	9.96	4.89	12.62	7.73
26–35	36–45	10.87	15.49	4.62	7.69	11.90	4.21
36–45	46–55	9.18	12.21	3.03	7.47	10.44	2.97
46–55	56–65	7.00	8.64	1.64	6.44	8.36	1.92
56–65	…	5.70	…	…	5.84	…	…

NOTE.—For 1990 and 2000, this table shows Mexican immigrants in the United States as a percentage of the population of individuals born in Mexico (equal to the sum of the Mexican-born residing in Mexico and the Mexican-born residing in the United States) by age and sex categories.

ber of illegal Mexicans at 2.0 million in 1990 and 4.8 million in 2000, close to estimates by Bean, Hook, and Woodrow-Lafield (2001) and Passel, Capps, and Fix (2004).[10] In Section V we assess how undercounting illegal immigrants may affect our results.

A. Summary Data

Overall, the accumulated outflows of individuals born in Mexico are large. Table 1 shows Mexican immigrants in the United States as a percentage of the total population born in Mexico by age cohort for men and women. We take the total Mexican-born population to be the sum of the Mexican-born population in Mexico and the Mexican-born population in the United States. Consider first the cohort of men born in Mexico who were 16–25 years old in 1990 (and thus 26–35 years old in 2000). The fraction of this cohort residing in the United States was 7.6 percent in 1990 and 17.5 percent in 2000, implying that during the 1990s about 10 percent of the cohort migrated to the United States. Consider next the cohort of men who were 26–35 years old in 1990. The fraction of this cohort residing in the United States rose from 10.9 percent in 1990 to 15.5 percent in 2000, implying a within-decade emigration rate of about 4.6 percent. Within-decade migration rates decline for each succeeding cohort. This suggests that migration rates from Mexico to the United States are highest for young adults. Comparing the stock of individuals in the United States for different cohorts at the

[10] Most estimates of the illegal immigrant population subtract from the enumerated immigrant population new legal immigrant admissions (less estimated departures and deaths for these individuals). This residual foreign-born population is taken to be illegal immigrants. See Bean et al. (2001), Costanzo et al. (2001), and INS (2003).

same age suggests that migration rates are rising over time. The share of men 16–25 years old who resided in the United States rose from 7.6 percent in 1990 to 12.0 percent in 2000 and rose also for every other age group. For women, migration rates and migrant stocks are lower, but patterns are similar.

Table 2 shows means for age, schooling, labor force participation, and hourly wages for residents of Mexico, Mexican immigrants in the United States, and, for comparison, other U.S. immigrants and U.S. natives. We choose education categories that are reported in the U.S. census (Mexico reports more categories). Fortunately, these categories correspond to modes for highest grade of schooling completed in Mexico, which occur at grade 6 (primary schooling), grade 9 (secondary schooling), and grade 12 (preparatory schooling).[11] Grogger and Trejo (2002) report that Mexican immigrants who arrive in the United States before age 6 complete as much education as second-generation Mexican Americans. In contrast, those who arrive after age 15 complete much less schooling. To focus on migrants likely to have been schooled in Mexico, we limit the immigrant sample to individuals aged 21 or older at the time of entry into the United States.

Table 2 reproduces the familiar facts that when compared to U.S. natives, Mexican immigrants in the United States are younger, are much less educated, and have much lower hourly wages. In 1990, 68.3 percent of all Mexican immigrant men and 62.8 percent of recent Mexican immigrant men had completed nine or fewer years of school, compared to only 7.3 percent of U.S. native men. However, Mexican immigrants, and recent immigrants in particular, compare favorably when we examine residents of Mexico. In 1990, 75.2 percent of male residents of Mexico had nine or fewer years of schooling. Beyond nine years of education, Mexican immigrants outperform Mexican residents in every category except college graduates. Relative to male residents of Mexico, recent Mexican immigrant men are less likely to have nine or fewer years of education (62.8 percent vs. 75.2 percent), more likely to have 10–15 years of education (32.4 percent vs. 16.3 percent), and less likely to have 16+ years of education (4.8 percent vs. 8.4 percent). A similar pattern holds for women.

[11] For Mexico, average hourly wages are calculated as monthly labor income/(4.5 × hours worked last week); for the United States, average hourly wages are calculated as annual labor income/(weeks worked last year × usual hours worked per week). For Mexico, we need to assume that individuals work all weeks of a month, which could bias wage estimates downward. However, this does not affect the results in Sec. V since in no exercise do we compare Mexican and U.S. wage levels. To avoid measurement error associated with implausibly low wage values or with top coding of earnings, we restrict the sample to be individuals with hourly wages between $0.05 and $20 in Mexico and $1 and $100 in the United States (in 1990 dollars). This restriction is nearly identical to dropping the largest and smallest 0.5 percent of wage values.

TABLE 2
SUMMARY STATISTICS

VARIABLE	MEXICAN RESIDENTS	U.S. RESIDENTS			
		Mexican Immigrants			
		Recent	All	Other Immigrants	U.S. Natives
	A. Men, 1990				
Age	36.8	33.2	39.1	42.7	40.0
Highest grade of schooling completed (%):					
0	.138	.133	.146	.040	.005
1–4	.223	.125	.167	.029	.005
5–8	.276	.289	.302	.095	.039
9	.115	.081	.068	.028	.024
0–9	.752	.628	.683	.192	.073
10–11	.048	.059	.050	.041	.069
12	.066	.178	.152	.234	.333
13–15	.049	.087	.077	.200	.284
10–15	.163	.324	.279	.475	.686
16+	.084	.048	.038	.334	.242
Wage earners (%)	.726	.832	.830	.792	.833
Hourly wage	1.39	7.17	8.23	14.57	14.27
Observations	163,798	22,207	39,780	152,047	609,786
	B. Women, 1990				
Age	36.7	34.3	40.4	43.8	40.2
Highest grade of schooling completed (%):					
0	.188	.138	.146	.048	.004
1–4	.228	.142	.169	.036	.003
5–8	.274	.298	.318	.107	.031
9	.100	.074	.064	.031	.023
0–9	.790	.652	.697	.222	.061
10–11	.044	.047	.044	.045	.073
12	.077	.174	.156	.298	.370
13–15	.045	.084	.073	.207	.299
10–15	.166	.305	.273	.550	.742
16+	.044	.042	.031	.229	.197
Wage earners (%)	.207	.440	.465	.597	.709
Hourly wage	1.34	6.08	6.57	10.19	9.98
Observations	178,726	18,640	34,381	168,222	650,229
	C. Men, 2000				
Age	37.2	33.2	39.5	43.5	41.4
Highest grade of schooling completed (%):					
0	.069	.096	.127	.035	.005
1–4	.166	.057	.080	.013	.002
5–8	.270	.300	.307	.071	.021
9	.189	.105	.087	.025	.017
0–9	.694	.558	.601	.144	.045
10–11	.045	.064	.055	.036	.053
12	.101	.245	.212	.240	.328

TABLE 2
(*Continued*)

Variable	Mexican Residents	U.S. Residents: Mexican Immigrants, Recent	U.S. Residents: Mexican Immigrants, All	U.S. Residents: Other Immigrants	U.S. Residents: U.S. Natives
13–15	.047	.079	.083	.186	.308
10–15	.193	.388	.350	.462	.689
16+	.113	.054	.050	.394	.267
Wage earners (%)	.740	.789	.800	.800	.824
Hourly wage	1.21	7.90	8.72	15.23	14.88
Observations	215,804	39,073	80,453	222,605	652,895
	D. Women, 2000				
Age	37.0	34.8	40.5	44.0	41.5
Highest grade of schooling completed (%):					
0	.092	.113	.133	.042	.004
1–4	.179	.066	.087	.017	.001
5–8	.28	.301	.315	.079	.016
9	.174	.101	.085	.025	.015
0–9	.725	.581	.620	.163	.036
10–11	.04	.054	.049	.037	.050
12	.112	.228	.204	.272	.323
13–15	.042	.079	.079	.209	.337
10–15	.194	.361	.332	.518	.710
16+	.080	.058	.048	.320	.255
Wage earners (%)	.321	.418	.463	.605	.739
Hourly wage	1.24	6.90	7.30	11.57	11.28
Observations	235,086	35,277	72,967	247,970	693,483

NOTE.—The sample is individuals 21–65 years old (in the United States, excluding group quarters; in Mexico, excluding those not born in the country). Residents of Mexico in 1990 are the 1 percent microsample of the XII Censo General de Poblacion y Vivienda, 1990, and in 2000 are a 10 percent random sample of the 10 percent microsample of the XIII Censo General de Poblacion y Vivienda, 2000. Mexican and other immigrants are taken from the 1990 and 2000 5 percent U.S. PUMS, and U.S. natives are taken from the 1990 and 2000 1 percent U.S. PUMS. Immigrants in the United States are restricted to individuals 21 years or older at the time of entry into the country. Recent immigrants are individuals who entered the United States during the period 1981–90 for 1990 and 1991–2000 for 2000. Schooling variables show the percentage of individuals whose highest grade completed is that indicated and wage earners shows the percentage of individuals with positive labor earnings. Wage levels are in 1990 U.S. dollars (see n. 11 on how wages are constructed). Average wages in Mexico pertain to those individuals with average hourly earnings between $0.05 and $20 and in the United States pertain to those individuals with average hourly earnings between $1 and $100. See n. 18 for the list of high-emigration states. Internal (return) migrants are individuals who lived in a different state (in the United States) five years previously.

Over time, educational attainment among the Mexican-born has increased, but this has not changed the gap in educational attainment between Mexican residents and Mexican immigrants. In 2000, relative to male residents of Mexico, recent Mexican immigrant men remain less likely to have nine or fewer years of education (55.8 percent vs. 69.4 percent), more likely to have 10–15 years (38.8 percent vs. 19.3 percent), and less likely to have 16+ years (5.4 percent vs. 11.3 percent). Again, a similar pattern holds for women.

Table 2 gives preliminary evidence against the negative-selection hy-

TABLE 3
EDUCATIONAL ATTAINMENT FOR SUBSAMPLES OF THE MEXICAN BORN
A. RESIDENTS OF MEXICO

	HIGH-EMIGRATION STATES		INTERNAL MIGRANTS		RETURN EMIGRANTS	
	1990	2000	1990	2000	1990	2000
	Men					
Highest grade of schooling (%):						
0	.190	.093	.087	.042	.094	.039
1–4	.264	.203	.141	.106	.211	.135
5–8	.263	.286	.262	.238	.368	.372
9	.096	.169	.130	.203	.139	.222
0–9	.813	.751	.620	.589	.812	.768
10–11	.034	.034	.061	.052	.039	.041
12	.055	.081	.090	.124	.057	.093
13–15	.037	.037	.075	.063	.022	.035
10–15	.126	.152	.226	.239	.118	.169
16+	.063	.096	.154	.171	.070	.062
Observations	54,778	78,330	8,913	9,694	459	1,695
	Women					
Highest grade of schooling (%):						
0	.233	.113	.123	.051	.093	.019
1–4	.265	.213	.159	.117	.173	.109
5–8	.259	.297	.278	.270	.360	.336
9	.084	.157	.122	.198	.121	.225
0–9	.841	.780	.682	.636	.747	.689
10–11	.031	.030	.063	.055	.033	.053
12	.061	.090	.106	.141	.117	.163
13–15	.035	.036	.073	.055	.065	.046
10–15	.127	.156	.242	.251	.215	.262
16+	.032	.064	.075	.112	.037	.049
Observations	61,297	88,818	9,491	10,141	214	733

pothesis. In terms of observable skills, it is the moderately well educated, not the least educated, who are most likely to migrate from Mexico to the United States. One concern about this evidence is that recent Mexican immigrants may have high levels of schooling in part because they are relatively young and educational attainment in Mexico has been rising over time. To control for age, table 3 shows average schooling for 26–35-year-old Mexican residents and Mexican immigrants in the United States. For this high-migration age cohort, it remains the case that Mexican immigrants have high schooling relative to Mexican residents.

A related concern is that Mexican immigrants may obtain schooling after arriving in the United States, in which case the U.S. census would overstate educational attainment of Mexican immigrants at the time they left Mexico. Additional schooling may take the form of degree-

TABLE 3 (*Continued*)
B. Mexican Immigrants in the United States, 26–35 Years Old

	26–35-Year-Olds		0–3 Years		4+ Years	
	1990	2000	1990	2000	1990	2000
	Men					
Highest grade of schooling (%):						
0	.086	.036	.113	.076	.113	.078
1–4	.172	.103	.103	.045	.112	.043
5–8	.297	.263	.278	.303	.309	.275
9	.129	.246	.082	.114	.081	.116
0–9	.684	.648	.576	.538	.615	.512
10–11	.058	.059	.061	.064	.057	.067
12	.082	.129	.188	.260	.189	.278
13–15	.057	.044	.103	.075	.096	.098
10–15	.197	.232	.352	.399	.342	.443
16+	.118	.121	.073	.062	.043	.046
Observations	52,864	68,206	3,599	9,358	9,121	15,839
	Women					
Highest grade of schooling (%):						
0	.121	.047	.097	.070	.109	.078
1–4	.196	.116	.113	.041	.121	.043
5–8	.309	.278	.278	.269	.348	.294
9	.109	.219	.076	.112	.082	.125
0–9	.735	.660	.564	.492	.660	.540
10–11	.053	.054	.052	.056	.045	.062
12	.090	.145	.205	.276	.170	.253
13–15	.056	.039	.106	.083	.088	.090
10–15	.199	.238	.363	.415	.303	.405
16+	.065	.103	.074	.093	.038	.055
Observations	58,069	75,625	3,211	6,575	7,057	16,173

Note.—The sample is individuals 21–65 years old (in the United States, excluding group quarters; in Mexico, excluding those not born in the country). Residents of Mexico in 1990 are the 1 percent microsample of the XII Censo General de Poblacion y Vivienda, 1990, and in 2000 are a 10 percent random sample of the 10 percent microsample of the XIII Censo General de Poblacion y Vivienda, 2000. Mexican and other immigrants are taken from the 1990 and 2000 5 percent U.S. PUMS, and U.S. natives are taken from the 1990 and 2000 1 percent U.S. PUMS. Immigrants in the United States are restricted to individuals 21 years or older at the time of entry into the country. Recent immigrants are individuals who entered the United States during the period 1981–90 for 1990 and 1991–2000 for 2000. Schooling variables show the percentage of individuals whose highest grade completed is that indicated. See n. 18 for the list of high-emigration states. Internal (return) migrants are individuals who lived in a different state (in the United States) five years previously.

oriented learning or, more commonly, English language classes. We have dealt with this issue in part by restricting the sample to those who were aged 21 years or older at the time of arrival in the United States. Adults appear less likely to continue schooling in the United States. Some adult immigrants may further their education by satisfying a high school equivalency requirement through passing the General Education Development (GED) exam.[12] The bunching of Mexican immigrants at exactly

[12] On the returns to a GED, see Cameron and Heckman (1993), Murnane, Willett, and Tyler (2000), Clark and Jaeger (2002), and Grogger and Trejo (2002).

12 years of education (relative to Mexican residents) in table 2 could be consistent with such behavior.

Available evidence indicates that few Mexican immigrants pass the GED. Using the Current Population Survey, Clark and Jaeger (2002) find that among Mexican immigrants who lack a high school diploma and who completed their schooling abroad, only 1.2 percent had passed the GED. And among Mexican immigrants who completed some schooling in the United States (most of whom arrived in the United States as young children), only 3.7 percent had passed the GED. More generally, while Betts and Lofstrom (2000) find that school enrollment rates for adult immigrants are higher than for adult U.S. natives, the same does not hold for immigrants from Mexico (Borjas 1996; Trejo 1997). Panel B of table 3 shows schooling levels for 26–35-year-old Mexican immigrants who have been in the United States zero to three years or more than four years. In 1990 and 2000, earlier arrivals are not less likely to have 12 years of schooling, suggesting that adult immigrants are unlikely to continue formal education after arriving in the United States.

B. Labor Force Participation in Mexico and the United States

As shown in panels A and B of table 2, there appear to be differences in labor force participation rates between residents of Mexico and Mexican immigrants in the United States. Table 4 reports the fraction of the population of Mexican residents and of recent Mexican immigrants in the United States with positive labor earnings by year, age, and schooling cells. This definition of labor force participation reflects the sample of individuals for whom we have observations on wages. For men 26–55 years of age with more than four years of education, labor force participation rates in the two countries are similar. Participation rates are somewhat higher for Mexican immigrant men in the oldest cohort (56–65 years) and in the cohort with least schooling (zero to four years).

However, labor force participation rates for women differ markedly between migrants and nonmigrants. Among women with 11 or fewer years of education, immigrants are much more likely to have positive labor earnings. This could be due to more elastic female labor supply, in which case higher wages in the United States would induce higher rates of labor force participation. Alternatively, women who are more likely to work at any wage level may be more likely to self-select into migration. In either case, Mexican immigrant women in the United States who work may differ from the subpopulation of these women who would work were they to return to Mexico.[13]

[13] See Baker and Benjamin (1997) for further discussion of immigrant male and female labor supply.

TABLE 4
Labor Force Participation Rates for Various Age Categories

Years of Schooling	Residents of Mexico				Recent Mexican Immigrants			
	26–35	36–45	46–55	56–65	26–35	36–45	46–55	56–65
	A. Men, 1990							
0	.63	.65	.61	.50	.81	.83	.81	.67
1–4	.72	.72	.66	.54	.86	.85	.82	.70
5–8	.79	.81	.75	.58	.86	.85	.82	.65
9	.84	.85	.78	.59	.85	.86	.79	.66
10–11	.87	.88	.77	.60	.85	.85	.74	.72
12	.85	.88	.81	.59	.86	.84	.81	.66
13–15	.85	.89	.83	.60	.87	.87	.76	.70
16+	.86	.91	.85	.67	.87	.83	.89	.72
	B. Men, 2000							
0	.60	.61	.57	.45	.73	.77	.74	.59
1–4	.70	.69	.64	.49	.77	.82	.72	.55
5–8	.78	.78	.75	.54	.82	.79	.76	.66
9	.84	.84	.79	.56	.81	.81	.82	.75
10–11	.87	.88	.81	.60	.80	.79	.80	.63
12	.86	.87	.78	.51	.83	.82	.79	.58
13–15	.82	.91	.82	.54	.85	.88	.86	.55
16+	.86	.90	.87	.66	.86	.87	.78	.69
	C. Women, 1990							
0	.09	.09	.08	.07	.41	.43	.36	.13
1–4	.10	.11	.09	.07	.44	.52	.42	.20
5–8	.16	.19	.16	.10	.46	.50	.44	.23
9	.28	.29	.27	.10	.46	.52	.53	.28
10–11	.36	.40	.33	.14	.46	.46	.47	.43
12	.47	.48	.40	.20	.47	.57	.45	.24
13–15	.57	.56	.48	.27	.52	.53	.58	.30
16+	.57	.63	.53	.31	.53	.62	.50	.34
	D. Women, 2000							
0	.16	.19	.16	.13	.36	.44	.34	.19
1–4	.21	.22	.20	.12	.41	.44	.40	.18
5–8	.25	.29	.27	.17	.38	.46	.41	.19
9	.33	.39	.36	.19	.41	.51	.45	.23
10–11	.41	.48	.43	.22	.40	.51	.35	.25
12	.47	.51	.45	.27	.43	.50	.48	.24
13–15	.57	.67	.52	.23	.53	.55	.56	.34
16+	.67	.71	.63	.35	.50	.46	.54	.22

Note.—The table shows the percentage of the population that reported positive labor earnings by year, age, and highest year of schooling completed for residents of Mexico and for recent Mexican immigrants in the United States (individuals who arrived in the United States during the previous 10 years). Immigrants are those 21 years or older at the time of entry into the United States.

This poses a problem for the empirical analysis. Differences in labor force participation between migrant and nonmigrant women may affect the pattern of migrant selection we uncover from data on wage earners. We return to this issue in Section IV.

C. Returns to Observable Skill in Mexico and the United States

A primary motivation for individuals in Mexico to emigrate is to earn higher wages. The model in Section II assumes that the base wage (the wage of an individual with minimal skill) is higher in the United States and that returns to skill are higher in Mexico. Available evidence is consistent with these assumptions. For Mexican immigrants in the United States, estimated returns to education are low. In the 1980s and 1990s, an additional year of schooling is associated with an increase in log wages for men of 0.025–0.032 (Borjas 1996; Trejo 1997; Grogger and Trejo 2002).[14] In Mexico in the 1990s, an additional year of schooling is associated with an increase in log wages for men of 0.076–0.097 (Chiquiar 2003).[15] Figure 3 shows kernel density estimates for wages of Mexican immigrants and Mexican residents (individuals 21–65 years of age, where immigrants were at least 21 years of age at the time of entry into the United States and immigrated within the previous 10 years). Not surprisingly, mean wages in Mexico are much lower.[16]

To summarize differences in returns to observable skills in the two countries, we estimate ordinary least squares (OLS) wage regressions for four samples of men: residents of Mexico, recent Mexican immigrants in the United States (those arriving in the last 10 years), all Mexican immigrants in the United States, and other U.S. immigrants. Table 5 reports the results. Unreported results for women are similar. The regressors are dummy variables for schooling, age group, marital status, residence in a metropolitan area, region of residence, race (for other U.S. immigrants only), and year of entry into the United States (for immigrants only).

Estimated returns to schooling for residents of Mexico are much

[14] Bratsberg and Ragan (2002) estimate slightly higher returns to schooling (0.035) for a sample of U.S. immigrant men from any country. In all samples, the estimated return to education for U.S. natives is roughly twice as large.

[15] On the returns to education in Mexico, see also Cragg and Epelbaum (1996) and Ariola and Juhn (2003).

[16] Figure 3 suggests that wage dispersion is lower among Mexican immigrants in the United States than among residents of Mexico. However, since immigrants tend to be more homogeneous than the population from which they came, it is natural for them to exhibit lower wage dispersion. This is a direct implication of self-selection (Heckman and Honore 1990).

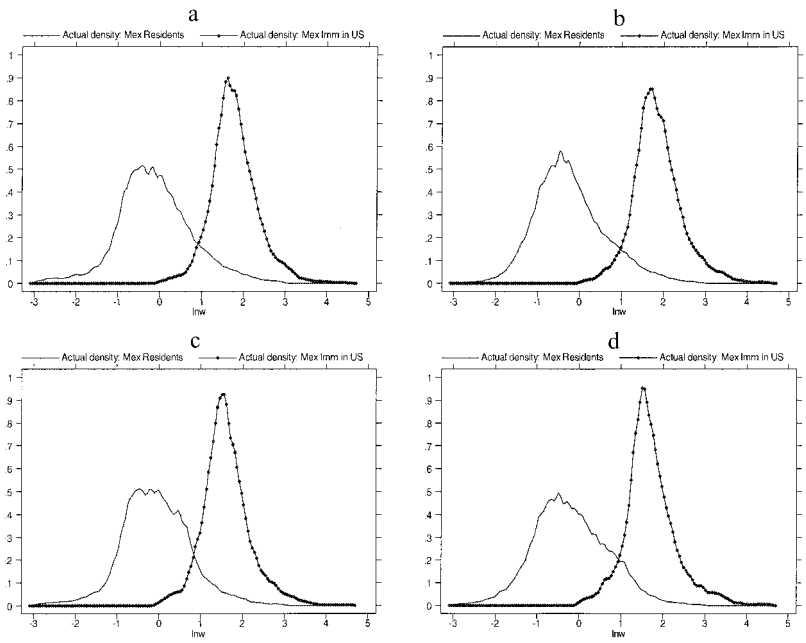

FIG. 3.—Wage densities for residents of Mexico and Mexican immigrants in the United States: *a*, men, 1990; *b*, men, 2000; *c*, women, 1990; *d*, women, 2000.

higher than for Mexican immigrants.[17] In 2000, completing 12 years of schooling is associated with an increase in hourly wages of 60.5 log points for men in Mexico but only 11.2–15.4 log points for Mexican men in the United States. The difference is even larger for the 13–15 years and 16+ years of education categories. Returns to age are also higher for Mexican residents than for Mexican immigrants. Table 5 confirms previous results that estimated U.S. returns to education are lower for recent immigrants relative to earlier immigrants and for Mexican immigrants relative to other immigrants (Borjas 1996, 1999).

D. Migration Networks, Internal Migration, and Return Migration

Unobserved characteristics surely matter for the migration decision. Individuals may be more likely to migrate if they are highly motivated,

[17] If unobserved ability and schooling are correlated, estimates of returns to schooling may be biased. Also, self-selection into the labor force or into migration may introduce further biases. In unreported results, we estimated wage regressions for Mexican-born men in Mexico and in the United States, including the inverse Mills ratio derived from a probit model of the migration decision. Since we lack an instrument for migration, identification is achieved through the nonlinear way in which the other regressors enter into the inverse Mills ratio and so depends on distributional assumptions. With these concerns in mind, correcting for self-selection into migration has little effect on the coefficient estimates.

TABLE 5
OLS Wage Regressions for Men, 1990 and 2000

	1990				2000			
		Mexican Immigrants				Mexican Immigrants		
	Mexican Residents (1)	Recent (2)	All (3)	Other Immigrants (4)	Mexican Residents (5)	Recent (6)	All (7)	Other Immigrants (8)
Highest grade of schooling:								
5–8	.202	.038	.070	.022	.196	.006	.039	.017
	(.006)	(.011)	(.008)	(.010)	(.007)	(.011)	(.007)	(.010)
9–11	.359	.071	.130	.080	.358	.033	.079	.100
	(.008)	(.014)	(.011)	(.010)	(.007)	(.012)	(.008)	(.010)
12	.551	.115	.163	.202	.605	.112	.154	.202
	(.010)	(.013)	(.010)	(.008)	(.009)	(.011)	(.007)	(.009)
13–15	.741	.182	.257	.339	.960	.209	.283	.358
	(.012)	(.016)	(.012)	(.009)	(.013)	(.014)	(.009)	(.009)

16+	1.096	.416	.487	.690	1.328	.460	.493	.783
	(.009)	(.020)	(.016)	(.008)	(.009)	(.016)	(.011)	(.008)
Age:								
26–35	.110	.060	.059	.116	.126	.068	.069	.154
	(.007)	(.012)	(.012)	(.010)	(.006)	(.010)	(.010)	(.011)
36–45	.210	.081	.094	.208	.207	.106	.107	.166
	(.008)	(.015)	(.014)	(.011)	(.007)	(.012)	(.011)	(.011)
46–55	.240	.075	.055	.194	.242	.079	.086	.118
	(.009)	(.019)	(.015)	(.011)	(.008)	(.015)	(.012)	(.011)
56–65	.168	.092	−.007	.095	.195	.076	.023	.046
	(.011)	(.029)	(.019)	(.012)	(.011)	(.023)	(.014)	(.012)
R^2	.233	.063	.140	.248	.354	.062	.098	.212
Observations	112,111	17,939	32,011	112,552	142,113	30,036	62,551	164,864

NOTE.—The table reports OLS results for the log average hourly wage (see n. 11 for details on wages). Heteroskedasticity-consistent standard errors are in parentheses. Samples are men 21–65 years of age, whose usual or average weekly hours of work are 10–80, and who are residents of Mexico (cols. 1 and 5), Mexican immigrants in the United States who arrived during the previous 10 years (cols. 2 and 6), all Mexican immigrants in the United States (cols. 3 and 7), or non-Mexican-born U.S. immigrants (cols. 4 and 8). Immigrant samples exclude individuals aged 20 years or less at the time of entry into the United States. The Mexican resident sample includes individuals with hourly wages between $0.05 and $20, and U.S. resident samples include individuals with hourly wages between $1 and $100 (in 1990 U.S. dollars). Regressors not shown are dummy variables for marital status, metropolitan residence, and region (all columns); dummy variables for race (cols. 4 and 8); and dummy variables for year of entry into the United States (cols. 2–4 and 6–8).

have family or other contacts in the United States, or have access to credit or financial resources. In the census, information on these features is lacking. If unobservables relevant to migration are correlated with schooling, the evidence in table 2 might be misleading. To gain insight into how unobservables affect migration, we examine three groups of Mexican residents: individuals from high-migration states, internal migrants, and return migrants from the United States.

One important unobserved characteristic is access to migration networks. In Mexico, there is strong historical persistence in regional migration behavior, which suggests that migration networks are regionally concentrated. This appears due in part to historical accident. In the early 1900s, Texas farmers began to recruit laborers in Mexico. Given the small populations on the Texas-Mexico border, recruiters followed the main rail line into Mexico, which ran southwest to Guadalajara, a major city in the center west of the country. Early migrants came from rural areas near the rail line. They helped later generations of migrants find jobs in the United States (Durand, Massey, and Zenteno 2001). Emigration continues to be concentrated in central and western Mexico. The correlation between the fractions of the Mexican state population migrating to the United States in the 1950s and in the 1990s is 0.73 (Woodruff and Zenteno 2001). This suggests that individuals in high-migration regions in Mexico may be the relevant comparison group for Mexican immigrants in the United States. Panel A of table 3 shows educational attainment for individuals in Mexico's high-migration states.[18] Average schooling levels in these states are below those in the rest of the country, indicating that comparing Mexican immigrants with residents of high-migration states would yield stronger evidence against negative selection.

Other important unobserved characteristics are drive and motivation, which may help an individual take the risk of moving abroad. Similar to emigrants, internal migrants have made the decision to relocate. Part of what distinguishes internal and external migration is the much higher cost of migrating abroad. If it is unobserved drive, and not migration costs, that shapes migration decisions, external and internal migrants should have similar characteristics. In a comparison of tables 2 and 3, internal migrants (adults who resided in a different state five years previously) are more educated than Mexican residents overall. However, relative to immigrants in the United States, internal migrants are underrepresented among those with 10–15 years of schooling and over-

[18] These states are Aguascalientes, Colima, Guerrero, Hidalgo, Jalisco, Guanajuato, Michoacán, Morelos, Nayarít, Oaxaca, Queretero, San Luis Potosí, and Zacatecas. In 2000, 9.0 percent of the households in these states had sent migrants to the United States between 1995 and 2000, as compared to 2.6 percent of households in the rest of the country.

represented among those with lower and higher schooling levels. This again suggests that external migrants are intermediately selected in terms of educational attainment.

Return migrants are individuals who have chosen not to reside in the United States permanently. This may be by design—in migrating to the United States they may have planned to stay temporarily—or be a result of their lower than expected U.S. earnings. Borjas and Bratsberg (1996) show that where migrants are positively (negatively) selected, return migrants will be more (less) skilled than nonmigrants but less (more) skilled than permanent migrants. The Mexican census asks whether an individual resided in the United States five years ago, which gives some information on the return migrant population. In table 3, returnee women fit the pattern of positive selection (they have schooling levels between those of residents and U.S. immigrants), but men fit neither pattern (they have lower schooling levels than either residents or U.S. immigrants). However, extremely small sample sizes for returnees make these results difficult to interpret.[19]

IV. Migration Abroad and the Distribution of Wages in Mexico

In this section, we develop a framework to compare wage distributions for residents of Mexico and immigrants from Mexico in the United States. This exercise will allow us to assess nonparametrically whether in terms of observable skills there is positive or negative selection of individuals who migrate from Mexico to the United States.

Wage distributions for Mexican residents and Mexican immigrants may differ either because of differences in the distribution of skills between the two groups or because of differences in the prices of skills in the two labor markets. To examine differences in the distribution of skills between Mexican residents and Mexican immigrants, we compute the counterfactual wage density of Mexican immigrants in the United States, assuming that they are paid according to Mexico's wage structure, and compare it to the actual distribution of wages in Mexico. Our framework does not address how the distribution of unobserved characteristics might influence the distribution of wages. If, with age, education, and other observables held constant, Mexican immigrants in the United States have low unobserved ability relative to residents of Mexico, we will tend to understate the extent of negative selection. By taking skill prices as given, our framework also fails to address the general equilibrium effects of migration from Mexico to the United States.

[19] The fraction of adults aged 21–64 years who reported living in the United States five years prior in 2000 was only 0.7 percent for men and 0.3 percent for women and in 1990 was only 0.2 percent for men and 0.1 percent for women.

A. *Counterfactual Wage Densities*

Let $f^i(w|x)$ be the density of wages w in country i, conditional on a set of observed characteristics x. Also, let D_i be an indicator variable equal to one if the individual is in the labor force and equal to zero otherwise. We further define $h(x|i = \text{Mex}, D_i = 1)$ as the density of observed characteristics among wage earners in Mexico and $h(x|i = \text{US}, D_i = 1)$ as the density of observed characteristics among wage-earning Mexican immigrants in the United States. To begin, we suppress time subscripts. The observed density of wages for individuals working in Mexico is

$$g(w|i = \text{Mex}, D_i = 1) = \int f^{\text{Mex}}(w|x)h(x|i = \text{Mex}, D_i = 1)dx. \quad (5)$$

Likewise, the observed density of wages for Mexicans working in the United States is

$$g(w|i = \text{US}, D_i = 1) = \int f^{\text{US}}(w|x)h(x|i = \text{US}, D_i = 1)dx. \quad (6)$$

Differences in $f^{\text{Mex}}(w|x)$ and $f^{\text{US}}(w|x)$ capture differences in skill prices in the two countries.[20] Differences in $h(x|i = \text{Mex}, D_i = 1)$ and $h(x|i = \text{US}, D_i = 1)$ capture differences in the distribution of observed characteristics for Mexican resident workers and for Mexican immigrant workers. The differences in the $h(\cdot)$ functions are due in part to differences in the characteristics of Mexican immigrants and Mexican residents and in part to differences in who participates in the labor force in the two countries.

Consider the density of wages that would prevail for Mexican immigrant workers in the United States if they were paid according to the price of skills in Mexico:

$$g^{\text{Mex}}_{\text{US}}(w) = \int f^{\text{Mex}}(w|x)h(x|i = \text{US}, D_i = 1)dx. \quad (7)$$

This corresponds to the distribution of wages for Mexican residents in (5), except that it is integrated over the skill distribution for working

[20] When the conditional expectation is linear in the observed characteristics, these terms are closely related to the regression equation for wages on observable characteristics (Butcher and DiNardo 2002).

Mexican immigrants in the United States. While this distribution is unobserved, we can rewrite it as

$$g_{\text{US}}^{\text{Mex}}(w) = \int f^{\text{Mex}}(w|x)h(x|i = \text{US}, D_i = 1) \times \frac{h(x|i = \text{Mex}, D_i = 1)}{h(x|i = \text{Mex}, D_i = 1)}\,dx$$

$$= \int \theta f^{\text{Mex}}(w|x)h(x|i = \text{Mex}, D_i = 1)dx, \tag{8}$$

where

$$\theta = \frac{h(x|i = \text{US}, D_i = 1)}{h(x|i = \text{Mex}, D_i = 1)}. \tag{9}$$

DiNardo et al. (1996) show that a counterfactual density as in (7) can be estimated by taking an observed density (e.g., for wage earners in Mexico) and reweighting it (e.g., to reflect characteristics of Mexican immigrant workers) as in (8). To compute the weights, use Bayes' law to write

$$h(x) = \frac{h(x|i = \text{US}, D_i = 1)\Pr(i = \text{US}, D_i = 1)}{\Pr(i = \text{US}, D_i = 1|x)} \tag{10}$$

and

$$h(x) = \frac{h(x|i = \text{Mex}, D_i = 1)\Pr(i = \text{Mex}, D_i = 1)}{\Pr(i = \text{Mex}, D_i = 1|x)}. \tag{11}$$

Combining (10) and (11), we can obtain an expression for θ that is a function of the ratio of the conditional probability that a Mexican-born individual works in Mexico to the conditional probability that a Mexican-born individual works in the United States. DiNardo et al. suggest estimating these probabilities parametrically, using the estimates to calculate θ, and then applying the θ's to estimate a counterfactual wage density as in (8).

However, the counterfactual density in (8) is not precisely what we desire. The weight θ, as seen in (9), adjusts for differences in the distribution of skills between Mexican immigrants and Mexican residents, conditional on Mexican immigrants working in the United States and Mexican residents working in Mexico. In order to compare wage distributions for the two groups, we want to condition on common labor force participation behavior, which requires modifying the weight we use to construct the counterfactual wage density. First, note that it is possible to write the joint probability of migration and labor force par-

ticipation, conditional on x, as the product of the conditional distribution of the participation outcome and the marginal distribution of the migration outcome:

$$\Pr(i = \text{US}, D_i = 1|x) = \Pr(D_i = 1|i = \text{US}, x) \Pr(i = \text{US}|x) \quad (12)$$

and

$$\Pr(i = \text{Mex}, D_i = 1|x) = \Pr(D_i = 1|i = \text{Mex}, x) \Pr(i = \text{Mex}|x). \quad (13)$$

Given (9)–(13), we can write

$$\theta = \frac{\Pr(D_i = 1|i = \text{US}, x) \Pr(i = \text{US}|x) \Pr(i = \text{Mex}, D_i = 1)}{\Pr(D_i = 1|i = \text{Mex}, x) \Pr(i = \text{Mex}|x) \Pr(i = \text{US}, D_i = 1)}. \quad (14)$$

Next, note that $\Pr(i = \text{Mex}, D_i = 1)/\Pr(i = \text{US}, D_i = 1)$ is a constant given by the sample proportions of Mexican resident and Mexican immigrant workers. Since θ is scaled to sum to one once we estimate wage densities, without loss of generality we can set $\Pr(i = \text{Mex}, D_i = 1)/\Pr(i = \text{US}, D_i = 1) = 1$. Thus the weight θ can be written as

$$\theta = \theta^P \theta^M, \quad (15)$$

where

$$\theta^P = \frac{\Pr(D_i = 1|i = \text{US}, x)}{\Pr(D_i = 1|i = \text{Mex}, x)},$$

$$\theta^M = \frac{\Pr(i = \text{US}|x)}{\Pr(i = \text{Mex}|x)}. \quad (16)$$

The first ratio—the conditional probability that a Mexican immigrant in the United States is working over the conditional probability that a Mexican resident is working—adjusts Mexico's wage density in (8) to reflect U.S. labor force participation rates for each realization of x. The second ratio—the probability that a Mexican-born individual is in the United States over the probability that a Mexican-born individual is in Mexico—adjusts the wage density of Mexican residents to reflect the characteristics of Mexican immigrants.

The second ratio, θ^M, is the appropriate weight to construct counterfactual wage densities. The full weight, θ, adjusts for differences in observables *and* in labor force participation between Mexican immigrants and residents. In (8), we replace θ with θ^M, which yields the wage distribution that would obtain if immigrants were paid according to Mex-

ican skill prices and participated in the labor force as Mexican residents do.[21]

To compute θ^M, we estimate $\Pr(i = \text{US}|x)$ parametrically by running a logit on the probability that a Mexican adult is in the United States using the full sample of Mexican immigrants and Mexican residents (and not just wage earners). Once we estimate this model, we can compute $\Pr(i = \text{Mex}|x) = 1 - \Pr(i = \text{US}|x)$ and construct the relevant weight θ_j^M for each observation j in the sample. After computing the weights, we estimate the wage densities nonparametrically, using a kernel density estimator.

To characterize the nature of immigrant selection nonparametrically, we estimate the *difference* between the wage density for Mexican immigrants and Mexican residents (under common skill prices and labor force participation behavior), which is

$$g_{\text{US}}^{\text{Mex}}(w) - g^{\text{Mex}}(w) = \int (\theta^M - 1) f^{\text{Mex}}(w|x) h(x|i = \text{Mex}, D_i = 1) dx. \tag{17}$$

If there is negative selection of migrants in terms of observable skills, this difference would show positive mass in the lower part of the wage distribution—indicating that migrants are overrepresented among Mexican-born individuals with below-average skills—and negative mass in the upper part—indicating that migrants are underrepresented among the Mexican-born with above-average skills. In contrast, with positive selection there would be negative mass for low wages and positive mass for high wages.

B. Comparing Migrant Selection over Time

During the 1990s, shocks to the Mexican and U.S. economies included changes in the return to education (evident in table 5), a severe recession in Mexico, and a sharp increase in U.S. expenditure on enforcement against illegal immigration (Hanson and Spilimbergo 1999). Each of these events may have altered the incentive to migrate from Mexico to the United States for individuals at different points in the skill distribution.

To evaluate how immigrant selection has changed over time, we can-

[21] For men, θ and θ^M are close in value (male labor force participation is similar in the two countries), and either weight yields similar results. For women, labor force participation rates differ in the two countries (see table 4). The counterfactual wage density for women with θ used as the weight puts more emphasis on earnings of women with low schooling and so is more supportive of negative selection (in contrast to the reported results, with θ^M used as the weight).

not compare the density difference in (17) for 1990 with that for 2000, since this would confound changes in the composition of immigrant and resident populations with changes in skill prices. A meaningful comparison across time requires holding skill prices constant. To do so, first rewrite the weighting function, θ^M, using time subscripts:

$$\theta^M\left(\frac{\text{US, } 90}{\text{Mex, } 90}\right) = \frac{\Pr\,(i = \text{US}|x,\ t = 1990)}{\Pr\,(i = \text{Mex}|x,\ t = 1990)}. \tag{18}$$

This weight, as defined in (16), adjusts the characteristics of Mexican residents in 1990 to reflect those of Mexican immigrants in 1990. Second, define two weighting functions:

$$\theta^M\left(\frac{\text{Mex, } 00}{\text{Mex, } 90}\right) = \frac{\Pr\,(i = \text{Mex}|x,\ t = 2000)}{\Pr\,(i = \text{Mex}|x,\ t = 1990)},$$

$$\theta^M\left(\frac{\text{US, } 00}{\text{Mex, } 90}\right) = \frac{\Pr\,(i = \text{US}|x,\ t = 2000)}{\Pr\,(i = \text{Mex}|x,\ t = 1990)}. \tag{19}$$

The first adjusts the population of Mexican residents in 1990 to reflect Mexican residents in 2000, and the second adjusts Mexican residents in 1990 to reflect Mexican immigrants in 2000. These weights can be estimated using a simple logit, as described in Section IV.*A*.

Putting (19) together with (17), we summarize nonparametrically immigrant selection in 2000, *evaluated at 1990 skill prices*, with the following density difference:

$$g^{\text{Mex},90}_{\text{US},00}(w) - g^{\text{Mex},90}_{\text{Mex},00}(w)$$

$$= \int \left[\theta^M\left(\frac{\text{US}, 00}{\text{Mex}, 90}\right) - \theta^M\left(\frac{\text{Mex}, 00}{\text{Mex}, 90}\right)\right] f^{\text{Mex}}(w|x, t = 90)$$

$$\times\ h(x|i = \text{Mex}, D_i = 1, t = 90)dx. \tag{20}$$

Finally, we evaluate the change in migrant selection between 1990 and 2000 with the following double difference in wage densities:

$$[g^{\text{Mex},90}_{\text{US},00}(w) - g^{\text{Mex},90}_{\text{Mex},00}(w)] - [g^{\text{Mex},90}_{\text{US},90}(w) - g^{\text{Mex},90}(w)] =$$

$$\int \left\{\left[\theta^M\left(\frac{\text{US, } 00}{\text{Mex, } 90}\right) - \theta^M\left(\frac{\text{Mex, } 00}{\text{Mex, } 90}\right)\right] - \left[\theta^M\left(\frac{\text{US, } 90}{\text{Mex, } 90}\right) - 1\right]\right\}$$

$$\times\ f^{\text{Mex}}(w|x,\ t = 90)h(x|i = \text{Mex},\ D_i = 1,\ t = 90)dx. \tag{21}$$

Equation (21) shows the change in immigrant selection between 1990 and 2000, based on 1990 skill prices. If negative selection of immigrants in terms of observable skills increased (decreased) in the 1990s, the double difference would have positive (negative) mass below zero—

indicating an increase (decrease) in the relative population of migrants with below-average skill—and negative (positive) mass above zero—indicating a decrease (increase) in the relative population of migrants with above-average skill.

V. Empirical Results

We apply the methodology to the combined sample of Mexican residents and recent Mexican immigrants in the United States (individuals born in Mexico who are 21–65 years of age) in 1990 and 2000. Immigrants are individuals 21 years or older at the time of entry into the United States and who have been in the United States for 10 years or less. To construct counterfactual wage densities, we estimate a logit for $\Pr(i = \text{US}|x)$, using the sample of Mexican residents and Mexican immigrants in each year. The model links the choice of migrating to the United States to age and age squared, dummy variables for schooling and marital status, and interactions of these variables. Logit results are shown in Appendix table A1. We use these to compute the weights, θ^M, which we apply to the sample of wage-earning Mexican residents to estimate counterfactual kernel densities of wages for Mexican immigrants in the United States. All estimates are based on a Gaussian kernel function.[22]

A. *Actual and Counterfactual Wage Density Estimates*

The results for Mexican men in 1990 are in figures 4*a* and *b*. Although the counterfactual density for Mexican immigrants is close to the actual density of Mexican residents, some clear differences are apparent. Contrary to the negative-selection hypothesis, it is *not* the lowest-wage men who exhibit a stronger tendency to migrate to the United States. For Mexican immigrants, there is less mass in the lower half of the wage density and more mass in the upper half, when compared with the actual wage density of Mexican residents. This is seen more clearly in figure 4*b*, which shows the difference between the counterfactual and actual wage densities. The immigrant resident density difference is negative from the left tail to just below zero, positive for middle and upper-middle wage values, and negative for high wage values. This suggests

[22] We first used Silverman's (1986) optimal bandwidth, which minimizes the mean integrated squared error if the data are Gaussian and a Gaussian kernel is used. However, the resulting densities appeared to be excessively smoothed and could in fact suffer from bias if the data do not conform to the Gaussian assumption. In order to avoid large bias in our estimates, we instead started with a bandwidth of 0.03 log wage units and sequentially increased it until the resulting densities looked relatively smooth. This implied bandwidths in our final estimates of 0.07 log wage units.

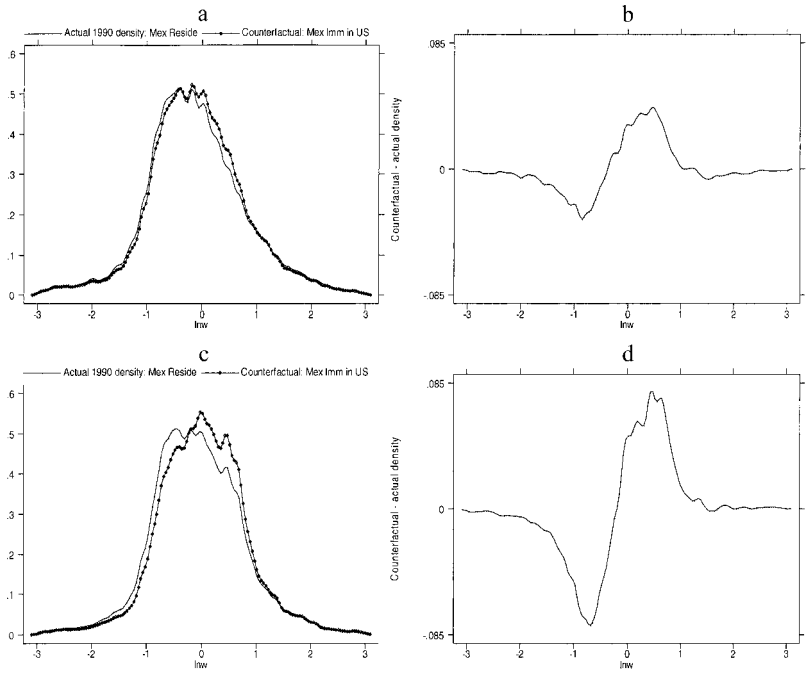

FIG. 4.—Actual and counterfactual wage densities, 1990 (based on skill prices in Mexico). *a*, Men: actual (resident) and counterfactual (immigrant) wage densities. *b*, Men: immigrant wage density minus resident wage density. *c*, Women: actual (resident) and counterfactual (immigrant) wage densities. *d*, Women: immigrant wage density minus resident wage density.

that immigrant men are drawn disproportionately from the middle and upper middle of Mexico's wage distribution rather than from the bottom half. Low-wage and high-wage individuals appear least likely to migrate to the United States. These counterfactual wage densities support intermediate selection of immigrant men in terms of observable skills.

The results for women in 1990, shown in figures 4*c* and *d*, contain even less support for negative selection. Except for high wage values, the counterfactual wage density for immigrant women lies to the right of the actual wage density for resident women. The immigrant resident density difference is negative for low wage values, strongly positive for upper-middle wage values, and zero for high wage values. For women, there appears to be moderate positive selection of immigrants.

Figure 5 shows counterfactual wage densities for immigrants in 2000, evaluated at Mexican skill prices in 2000. For women, wage densities are very similar to those in 1990, again showing moderate positive selection of immigrants. For men, intermediate selection of immigrants

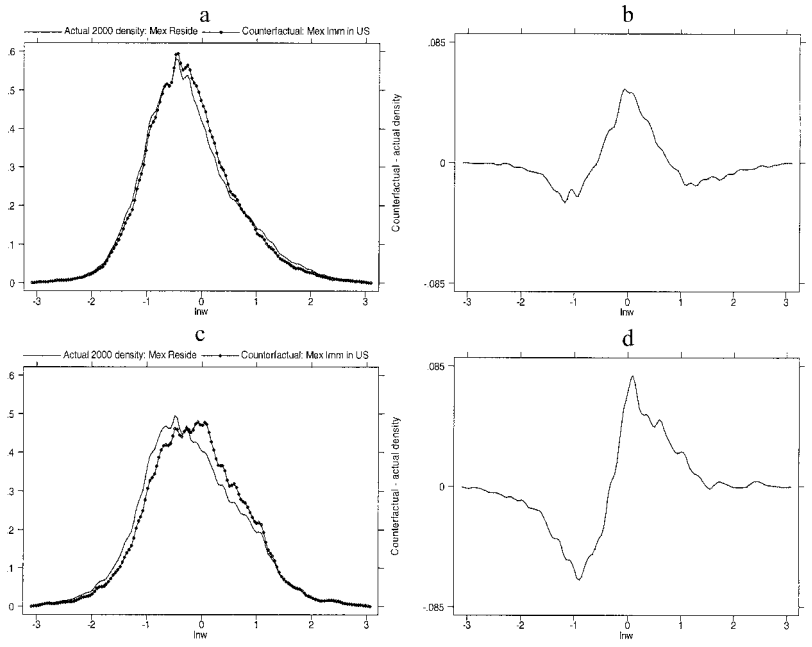

FIG. 5.—Actual and counterfactual wage densities, 2000 (based on skill prices in Mexico). *a*, Men: actual (resident) and counterfactual (immigrant) wage densities. *b*, Men: immigrant wage density minus resident wage density. *c*, Women: actual (resident) and counterfactual (immigrant) wage densities. *d*, Women: immigrant wage density minus resident wage density.

again appears, but less strongly. In a comparison of figures 4*b* and 5*b* in 2000, immigrant men became somewhat less underrepresented among low-wage workers and somewhat more underrepresented among high-wage workers.

To compare changes in the pattern of immigrant selection more precisely, we estimate the difference between immigrant (counterfactual) and resident (actual) wage densities in 1990 and 2000, using 1990 skill prices. Figures 6*a* and *b* show the density differences for 1990 and 2000 at 1990 skill prices (eqq. [17] and [20]) for men and women and figures 6*c* and *d* show the density double differences (eq. [21]) for men and women. For women, the density differences in the two years are very similar, causing the double density difference to fluctuate around zero. For men, the density difference in 2000 has less negative mass for low wage values and more negative mass for high wage values, as suggested by figures 4*b* and 5*b*. The double density difference is thus positive below the mean, zero around the mean, and negative above the mean. This is consistent with male immigrants becoming less underrepresented at

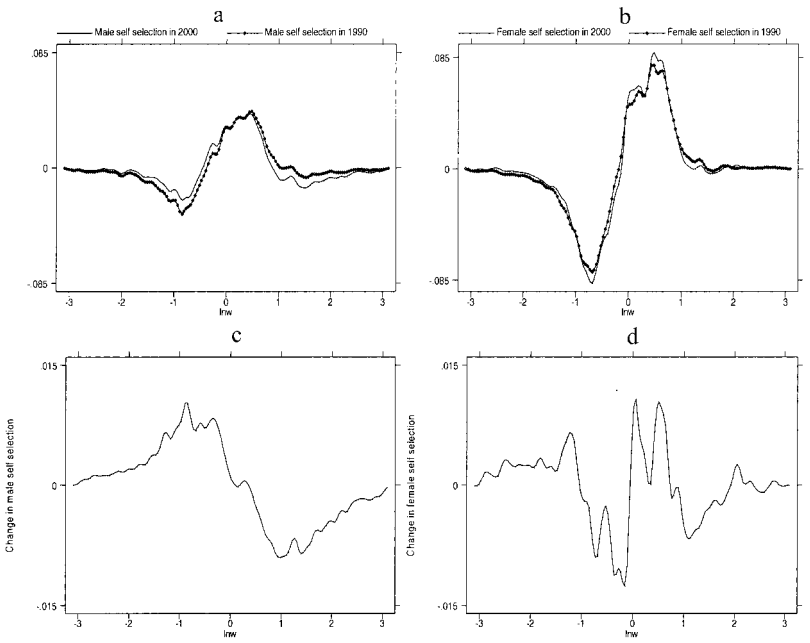

FIG. 6.—Immigrant minus resident wage densities at 1990 skill prices. First row: Immigrant minus resident wage densities in 1990 and 2000. Second row: (immigrant minus resident wage density, 2000) minus (immigrant minus resident wage density, 1990). *a*, Men: single density differences. *b*, Women: single density differences. *c*, Men: double density difference. *d*, Women: double density difference.

low wage values and more underrepresented at high wage values during the 1990s.

In summary, Mexican immigrants in the United States are drawn disproportionately from the middle and upper middle of Mexico's wage distribution. Those most likely to migrate abroad would earn medium to high wages in Mexico, and those least likely to migrate would earn low or very high wages in Mexico. In terms of observable skills, men exhibit intermediate selection and women exhibit positive selection.

B. Parametric Results on Actual and Counterfactual Wage Distributions

An advantage of our nonparametric approach is that it characterizes differences in resident and immigrant wage densities across the entire distribution. A disadvantage is that it is difficult to assess whether the density differences are statistically significant. In this subsection, we provide a parametric analogue to the density differences reported in the last subsection in order to gauge the statistical precision of these esti-

mates. We see whether the counterfactual wage distribution for Mexican immigrants matches the actual wage distribution for Mexican residents, when we summarize the distributions in terms of quantiles. First, we sort wage observations for Mexican residents in a given year into deciles. Then we calculate the share of the population in each decile, *weighting observations by* θ^M (which adjusts the Mexican resident population to reflect the characteristics of the Mexican immigrant population in the United States). For each decile, we test whether the θ^M-weighted shares are statistically different from 0.10. Negative selection of immigrants in terms of observable skills would produce population shares above 0.10 for deciles below the median and below 0.10 for deciles above the median.

Table 6 reports the results. For men in 1990, immigrant population shares are below 0.10 in the first four deciles, above 0.10 in the fifth to ninth deciles, and below 0.10 in the tenth decile. All shares, except for the fourth decile, are statistically different from 0.10 at a 5 percent level of significance. This pattern reinforces the results in figure 4, which shows that immigrants are overrepresented in the upper middle of the wage distribution. For men in 2000, results are similar, except that immigrants are no longer underrepresented in the fourth decile and are now underrepresented in the ninth decile. This is consistent with the results in figure 6, which suggest that during the 1990s male Mexican immigrants became somewhat less positively selected. For women in 1990, immigrant population shares are below 0.10 in the first four deciles, close to 0.10 in the fifth decile, and greater than 0.10 in the sixth to tenth deciles. All shares, except for the fifth decile, are statistically different from 0.10 at the 5 percent level. This is also consistent with figure 4, in which female immigrants from Mexico appear to be positively selected. For women in 2000, the results are similar. Table 6 suggests that the differences between actual and counterfactual wage densities in figures 4 and 5, though small, are statistically significant.

C. Correcting for the Undercount of Illegal Immigrants

As discussed in Section III, the U.S. census appears to undercount illegal immigrants. If undercounted immigrants have low education levels, then our results could be biased against finding negative selection. We cannot remedy this problem directly, since we lack data on which immigrants are illegal within our sample. However, we do have data from other sources on the characteristics of illegal immigrants.

We repeat the exercises from the previous subsection, but now modify the immigrant sample so that the sampling weights for the logit analysis used to construct the counterfactuals correspond to those of a synthetic sample in which there is no undercount of illegal immigrants. We re-

TABLE 6
COUNTERFACTUAL WAGE DECILES

Decile	Males 1990	Males 2000	Females 1990	Females 2000
	A. Main Sample			
1	.090	.096	.080	.085
	[.089, .092]	[.094, .097]	[.077, .083]	[.083, .088]
2	.092	.097	.083	.087
	[.091, .094]	[.096, .099]	[.080, .086]	[.085, .089]
3	.095	.100	.088	.090
	[.094, .097]	[.099, .102]	[.085, .091]	[.087, .092]
4	.099	.102	.093	.093
	[.097, .100]	[.100, .103]	[.090, .097]	[.091, .095]
5	.102	.104	.099	.099
	[.101, .104]	[.103, .106]	[.096, .102]	[.097, .102]
6	.105	.104	.109	.105
	[.103, .106]	[.103, .106]	[.106, .112]	[.103, .108]
7	.107	.110	.111	.115
	[.105, .108]	[.108, .112]	[.108, .114]	[.113, .118]
8	.110	.108	.115	.111
	[.108, .112]	[.106, .109]	[.112, .119]	[.109, .114]
9	.106	.099	.117	.110
	[.104, .108]	[.097, .100]	[.114, .120]	[.107, .112]
10	.093	.081	.104	.104
	[.092, .095]	[.079, .082]	[.101, .108]	[.101, .106]
	B. Correcting for Illegal Immigrant Undercount			
1	.096	.093	.089	.082
	[.094, .098]	[.091, .094]	[.086, .092]	[.080, .084]
2	.097	.095	.089	.085
	[.095, .098]	[.094, .097]	[.086, .092]	[.083, .087]
3	.098	.099	.093	.089
	[.096, .100]	[.098, .101]	[.090, .096]	[.086, .091]
4	.100	.101	.096	.092
	[.098, .102]	[.100, .103]	[.093, .100]	[.090, .094]
5	.102	.104	.099	.099
	[.101, .104]	[.102, .105]	[.096, .102]	[.097, .101]
6	.104	.105	.106	.107
	[.102, .106]	[.103, .106]	[.103, .109]	[.105, .109]
7	.105	.111	.106	.116
	[.103, .107]	[.110, .113]	[.103, .110]	[.114, .119]
8	.106	.109	.109	.113
	[.105, .108]	[.108, .111]	[.106, .113]	[.111, .115]
9	.102	.101	.110	.112
	[.100, .104]	[.099, .102]	[.107, .114]	[.110, .115]
10	.090	.083	.101	.105
	[.088, .092]	[.081, .084]	[.098, .104]	[.103, .108]

NOTE.—The table reports the weighted share of the Mexican resident population that occupies a given decile of the wage distribution (95 percent confidence intervals are in brackets). Unweighted shares are by definition 0.10. The weights used to calculate the reported shares are those defined in eq. (16), which adjust the characteristics of the Mexican resident population to reflect the characteristics of the Mexican immigrant population in the United States. Mexican residents are individuals 21–65 years of age with positive labor earnings. Mexican immigrants are individuals 21–65 years of age who arrived in the United States in the previous 10 years. The weights are calculated using the logit results shown in App. table A1. Panel A shows results corresponding to figs. 4 and 5 (with no adjustment for the undercount of illegal immigrants) and panel B shows results that correspond to fig. 7*b* (the sample is adjusted for the high undercount of illegal immigrants).

weight the original sample so that (i) the new weights reflect an increase in the total Mexican immigrant population in the United States, corresponding to the estimated number of uncounted illegal immigrants; and (ii) the reweighting procedure increases the population size to a greater extent for education groups in which out-of-sample evidence suggests that illegal immigrants are concentrated.

Given multiple estimates of the illegal undercount, we report results based on both Census Bureau and INS estimates of the illegal Mexican population. The Census Bureau (Costanzo et al. 2001) estimates put the number of Mexican illegal immigrants counted in the U.S. census at 1 million in 1990 and 3.9 million in 2000. When census undercount rates of 20 percent in 1990 and 15 percent in 2000 are used, the number of Mexican illegal immigrants would be 1.3 million in 1990—implying a 5.9 percent increase in the Mexican immigrant population counted in the census—and 4.6 million in 2000—implying a 7.4 percent population increase. For the Census Bureau–based estimates, we reweight the original sample to increase the populations by these percentages. The INS (2003) puts the illegal Mexican population at 2.0 million in 1990 and 4.8 million in 2000. These figures already take into account assumptions of an undercount and imply a much higher undercount rate for 1990.[23] For the INS-based estimates, we reweight the original sample to increase the populations by the implied percentages. We call the Census Bureau–based estimate the low-undercount estimate and the INS-based estimate the high-undercount estimate.

To make this increased population have the characteristics of illegal immigrants, we adjust the weights by schooling group. The "new" population is assumed to follow the distribution of immigrants by schooling in Orrenius (1999), shown in Appendix table A2. This distribution is based on the Mexican Migration Project (MMP), a household survey in rural Mexican communities over the period 1987–97 in which migration to the United States tends to be high (Massey et al. 1994; Durand et al. 1996). Many migrants in the MMP report having entered the United States illegally. Schooling levels of this group are much lower than of Mexican immigrants in the U.S. census or of Mexican residents in the Mexican census. A second data source on illegal immigrants is the Survey of Newly Legalized Persons in California, from 1989, which covered undocumented immigrants who were granted legal residence in the United States under the amnesty provision of the 1986 Immigration Reform and Control Act. Appendix table A2 shows that this population has higher education levels than in the MMP, suggesting that migrants

[23] The INS estimate of 4.8 million illegal Mexican immigrants in 2000 is based on an assumed undercount rate of 10 percent, which is less than the 15 percent undercount rate in Costanzo et al. (2001) for that year. However, the INS estimates are based on a different methodology for computing the residual foreign-born population.

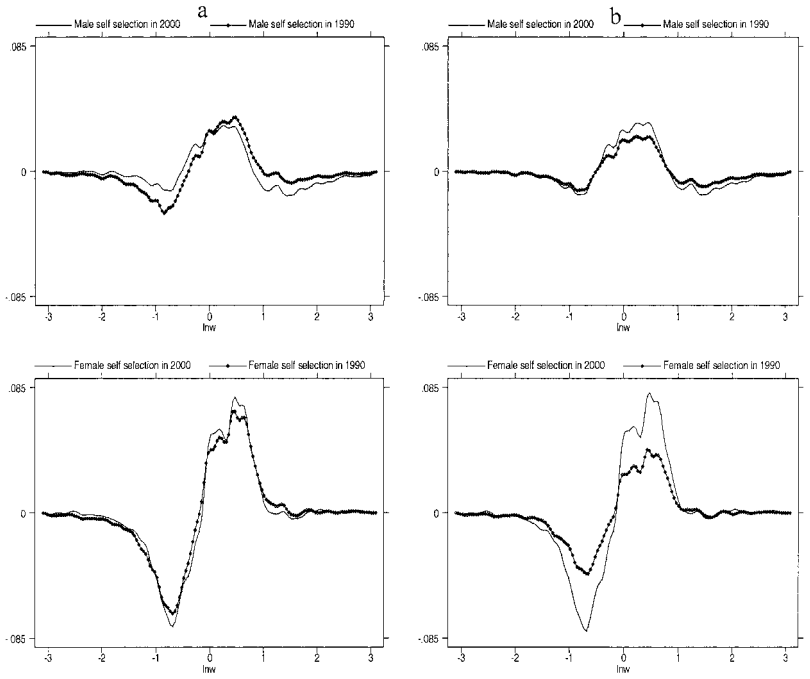

FIG. 7.—Actual minus counterfactual wage densities, correcting for illegal immigrant undercount (at 1990 skill prices). *a*, Density difference with low undercount. *b*, Density difference with high undercount.

with low schooling may be overrepresented in the MMP. In our analysis, we use MMP education levels to give greater weight to the possibility that our results are biased against negative selection.

Figure 7 shows results of correcting for an undercount of illegal immigrants. When a low undercount rate is used, differences between actual and counterfactual wage densities are very similar to those in figures 4 and 5. When a high undercount rate is used, results are very similar for 2000 and in 1990 show somewhat weaker patterns of intermediate selection for men and positive selection for women. Overall, results for either a low or a high undercount rate have qualitative implications similar to those without the undercount correction. Immigrants in the United States are overrepresented in the middle and upper middle of Mexico's wage distribution. This suggests that the undercount rate would need to be implausibly large to overturn our main findings.[24] Table 6 shows that, after we control for the undercount of illegal im-

[24] Other results based on data in which illegal immigrants are overrepresented tend to support our findings. Using the MMP, Orrenius and Zavodny (forthcoming) find that migrants tend to come from the middle of the schooling distribution.

migrants, differences between the actual and counterfactual wage distributions are statistically significant. The θ^M-weighted population shares by decile are statistically different from 0.10 for nearly all deciles.

D. Robustness Checks

In Section III, we discussed the possibility that Mexican immigrants may obtain additional education after arriving in the United States. In figure 8*a*, we restrict the immigrant sample to be individuals who arrived in the previous three years—a group unlikely to have obtained U.S. schooling. The estimated density differences are very similar to those in figures 4 and 5. There again appears to be intermediate selection of immigrant men and positive selection of immigrant women. An alternative way to address this issue would be to adjust for the bunching of immigrants at 12 years of education. In unreported results we combined individuals with nine to 12 years of education into a single schooling category. This addresses the concern that some immigrants with 12 years of schooling may have obtained a GED or, in response to cultural pressure, may overstate their educational attainment. Again, these results are very similar to those reported.[25]

There remains the concern that education may be correlated with unobserved characteristics that affect the migration decision, in which case our results might exaggerate the extent of positive selection. Following the discussion in Section III, we examine the importance of unobservables by restricting the sample of Mexican residents to whom we compare Mexican immigrants. In figure 8*b*, we construct immigrant resident density differences (evaluated at 1990 skill prices) using the sample of Mexican residents who live in high-migration states (see n. 18). Migration rates in these states are 3.5 times those in the rest of the country, suggesting the presence of regional migration networks. Relative to figures 4 and 5, figure 8*b* shows stronger evidence of positive selection for both men and women. Given table 3, which shows that residents of high-migration states have low schooling levels relative to either Mexican immigrants in the United States or residents in Mexico overall, this does not come as a surprise.

In figure 8*c*, we limit the sample of Mexican residents to individuals who moved between states in the previous five years. Similar to external migrants, internal migrants may be highly driven or motivated, which may be important unobserved determinants of the migration decision. Relative to figures 4 and 5, there is somewhat weaker evidence of intermediate selection for men. Immigrant men are still overrepresented

[25] Results are also very similar when we expand the immigrant population to those at least 16 years old at entry into the United States.

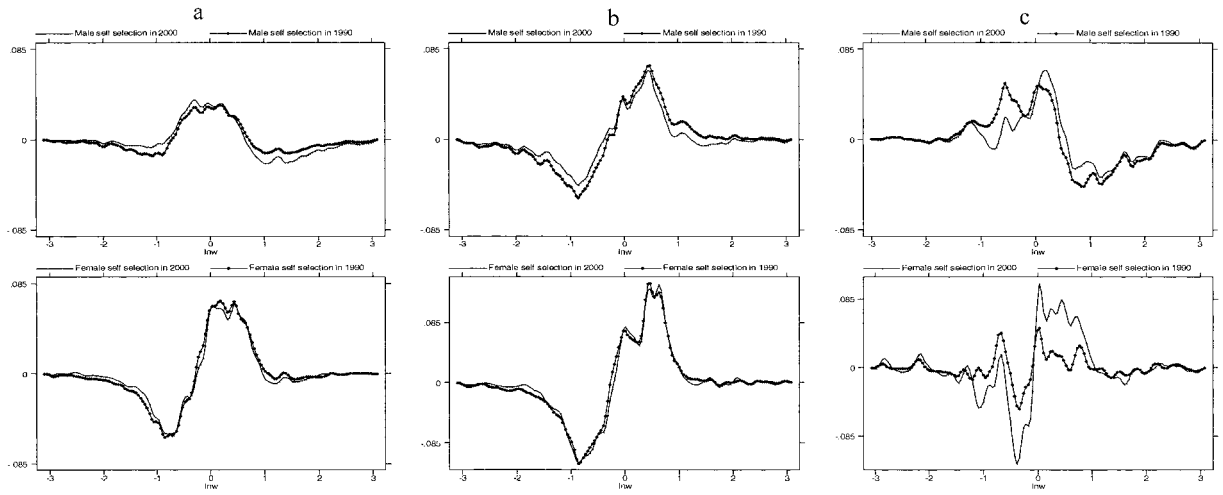

FIG. 8.—Actual minus counterfactual wage densities, additional results for restricted samples (at 1990 skill prices). *a*, Very recent immigrants. *b*, Residents from high-emigration states. *c*, Residents who are internal migrants.

in the middle of the wage distribution but are now more underrepresented in the upper tail. For women, positive selection is modest in 1990 but appears quite strongly in 2000. Overall, the qualitative patterns are broadly similar to previous results. Immigrants remain concentrated in the middle or upper middle of Mexico's wage distribution.[26]

We have argued that it is important to hold constant how skill prices affect labor force participation when comparing wage distributions across workers in different countries. So far, we have used skill prices and labor force participation in Mexico as the basis for these comparisons. For evaluating immigrant selection, it is no less valid to use U.S. skill prices and labor force participation. As a consistency check on our results, we estimated the distribution of wages that would obtain if residents of Mexico were paid according to U.S. skill prices and participated in the labor force as Mexican immigrants do, and we then compared this to the actual wage distribution for Mexican immigrants. In unreported results, we find that neither for men nor for women is there support for negative selection of Mexican immigrants in terms of observable skills. Resident men are underrepresented in the middle and upper middle of the immigrant wage distribution and overrepresented in the upper tail, consistent with intermediate selection of immigrants. Resident women are underrepresented in the upper middle part of the wage distribution, consistent with moderate positive selection of immigrants.

VI. Discussion

In this paper, we use data on residents of Mexico and Mexican immigrants in the United States to test Borjas's (1987) negative-selection hypothesis that the less skilled are those most likely to migrate from countries with high returns to skill and high earnings inequality to countries with low returns to skill and low earnings inequality. Our results are inconsistent with the negative selection of Mexican immigrants in the United States. For Mexican-born men, there is evidence of intermediate selection, and for Mexican-born women, there is evidence of positive selection. Those most likely to migrate are young adults with moderately high schooling. Were these immigrants to return to Mexico, they would tend to fall in the middle or upper portions of Mexico's wage distribution.

To arrive at these results, we construct counterfactual wage densities for Mexican immigrants in the United States, in which we use their

[26] U.S. return migrants are another potential sample to whom to compare Mexican immigrants. However, sample sizes for this group (see table 3) are very small, complicating estimation of wage densities.

observed characteristics to project the wages they would earn in Mexico under current patterns of wage determination in the country. The results are robust to controlling for undercounts of illegal immigrants in the U.S. census, for opportunities to gain education in the United States, for changes in skill prices over time, and for access to regional migration networks.

There are several important caveats to our results. We cannot say how the return of Mexican immigrants in the United States would affect Mexico's wage structure. Other work gives some guidance on this issue. Using data for 1970–2000, Mishra (2003) estimates an elasticity of wages with respect to emigration in Mexico of 0.4. Given the concentration of emigrants among moderately well-educated young adults, wage gains in Mexico have been largest among 25–40-year-olds with 12–15 years of schooling. Wage changes are not the only consequence of emigration. In 2003, remittances by immigrants in the United States were 2 percent of Mexico's gross domestic product. In high-migration regions, remittances appear to have raised investments in small businesses (Woodruff and Zenteno 2001).

Another caveat is that our findings against negative selection and in favor of intermediate or positive selection are given in terms of observable characteristics only. We cannot say whether the unobserved skills of Mexican immigrants in the United States are high or low relative to those who remain in Mexico. There is some evidence on the role of unobservables in the migration decision. When we limit the comparison to external and internal migrants—individuals who may possess similar unobserved characteristics—we continue to find evidence against the negative selection of Mexican immigrants.

That immigrants from Mexico appear to be relatively high-wage individuals is surprising. The estimated returns to education are higher in Mexico than in the United States, suggesting that low-wage individuals from Mexico would have the most to gain from migrating to the United States. Heterogeneity in migration costs is one way to reconcile these facts. The more educated may be better able to negotiate the migration process, they may have better access to migration networks in the United States, or they may be less subject to credit constraints in financing migration. Also, higher discount rates or greater risk aversion among the low-skilled may make migration abroad relatively less attractive for this group. Finally, a "Washington apples" effect (Alchian and Allen 1964) may also contribute to positive selection of migrants. Given long queues for legal admission to the United States, two-thirds of Mexicans immigrate illegally on their first attempt. Enforcement against illegal immigration may act as a head tax, penalizing the less skilled. If more skilled and less skilled illegal immigrants compete for jobs in the United

States, it will be efficient, given fixed migration costs, to fill jobs with more skilled individuals first.

Appendix

TABLE A1
LOGIT ESTIMATION OF THE PROBABILITY OF MIGRATION TO THE UNITED STATES

	MEN 1990		MEN 2000	
VARIABLE	Coefficient	Standard Error	Coefficient	Standard Error
Years of schooling:				
1–4	−1.713	.37	−1.206	.392
5–8	−3.232	.329	−1.233	.302
9	−3.844	.501	−3.443	.409
10–11	−3.756	.604	−1.663	.44
12	−3.208	.443	−.907	.339
13–15	−5.88	.596	−4.363	.471
16+	−3.537	.679	−1.582	.471
Age	.164	.019	.207	.017
Age^2	−.28	.026	−.328	.022
Married	3.584	.265	4.734	.204
Age × :				
1–4	.042	.02	−.022	.021
5–8	.158	.018	.037	.016
9	.17	.03	.122	.024
10–11	.198	.037	.058	.025
12	.22	.026	.059	.019
13–15	.331	.037	.224	.028
16+	.118	.038	0	.026
Age^2 × :				
1–4	−.025	.025	.044	.026
5–8	−.167	.024	−.031	.021
9	−.179	.043	−.145	.033
10–11	−.197	.053	−.016	.035
12	−.256	.037	−.055	.025
13–15	−.39	.054	−.262	.038
16+	−.11	.05	.023	.034
Married × :				
1–4	−.147	.068	−.255	.072
5–8	−.403	.057	−.415	.054
9	−.492	.076	−.573	.063
10–11	−.877	.087	−.869	.074
12	−.62	.067	−.568	.059
13–15	−.356	.085	−.311	.078
16+	−.193	.107	−.324	.08
Pseudo R^2	.046		.065	

NOTE.—This table shows logit estimation results in which the dependent variable is one if an individual lives in the United States and zero if an individual lives in Mexico. The sample is Mexican-born men 21–65 years of age in the U.S. and Mexican population censuses in 1990 or 2000. Regressors are age, age squared, dummy variables for schooling and marital status, and interactions among these variables. Unreported results for women are similar. For women, we also include as regressors the number of children born to the individual and its interactions with age and schooling.

TABLE A2
EDUCATIONAL ATTAINMENT FOR MEXICAN ILLEGAL IMMIGRANTS

A. MEXICO MIGRATION PROJECT			B. SURVEY OF NEWLY LEGALIZED PERSONS	
Years of Education	Migrants*	Nonmigrants	Years of Education	Immigrants
0–1	27.1	23.3	0	5.6
2–4	32.6	22.1	1–3	14.6
5–6	23.1	22.5	4–6	41.6
7–9	8.9	11.7	7–9	22.2
10–12	4.3	8.1	10–12	12.8
13+	4.1	12.3	13+	3.2

NOTE.—Panel A is taken from Orrenius (1999). The sample is 5,478 male household heads between 15 and 65 years of age, surveyed between 1987 and 1995 in 35 communities in western Mexico. Panel B is based on California Health and Welfare Agency (1989). The sample is 4,091 Mexican-born individuals (men and women) residing in California in 1989 who arrived in the United States as illegal immigrants and who were granted permanent legal residence under the amnesty provision of the 1986 Immigration Reform and Control Act. Reported education levels are a weighted average of those granted amnesty on the basis of having arrived in the United States prior to 1982 (60 percent of those legalized) and those granted amnesty as special agricultural workers (40 percent of those legalized). The education categories shown above are as reported in the original data sources, which do not exactly match the categories we report in table 2. Since the Mexican census reports the exact number of years of schooling completed, we are able to use the above figures to reweight the samples, as described in Sec. V.C.

* The percentage of trips to the United States involving illegal entry is 60.8.

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