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2 Out-Migration and Return Migration of Puerto Ricans

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The study of the movement of persons between Puerto Rico and the United States differs from most of the studies in the international migration literature in two important ways. First, Puerto Ricans do not face any statutes restricting either their exit from Puerto Rico or their entry into the host country. Because Puerto Rico is a territory of the United States, Puerto Ricans are U.S. citizens and can therefore move freely between the two "countries." The size and composition of migration flows can, in effect, be attributed entirely to differences in social and economic factors between the sending and the receiving regions.

Second, Puerto Rican migration to the United States is characterized by a large probability of return migration. Unlike most return migration flows, the size and skill composition of that to Puerto Rico are well documented in publicly available data sets. As is well known, nonrandom return migration propensities can generate an erroneous portrayal of Puerto Rican assimilation into the United States in cross-sectional data sets. For instance, if only the most successful migrants remain in the United States, the cross-sectional correlation between the U.S. earnings of Puerto Ricans and years since migration will be positive, even in the absence of any true assimilation or aging effects.[1] It is also likely that many Puerto Ricans did not perceive their migration to the United States as permanent. Many migrated with the expectation that they

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1. Borjas (1985), Carliner (1980), and Chiswick (1978) study the assimilation of immigrants in the U.S. labor market.

would return to their homeland.[2] A study of return migration flows can, therefore, significantly increase our understanding of the social and economic consequences of immigration.[3]

I will use the U.S. Census of Population to investigate migration and return migration decisions of Puerto Rico–born and U.S.-born Puerto Ricans between the United States and Puerto Rico. These data will be used to test a version of the self-selection migration model developed by Borjas (1987). This model is based on the assumption that migration flows are generated as persons choose to reside in countries that maximize their economic well-being. The income maximization hypothesis has an important prediction: skilled workers will choose to reside in the country that offers a higher rate of return for their skills.

My results indicate that the skill composition of Puerto Rican migration flows is consistent with the predictions of the Borjas model. First, migrants in the United States have less advantageous observable socioeconomic characteristics (such as education). This finding is consistent with the fact that Puerto Rico has a much more unequal income distribution and that it offers higher returns to skills than the United States. Second, return migrants to Puerto Rico tend to be more skilled than the Puerto Ricans who remain in the United States. Furthermore, U.S.-born Puerto Ricans moving to Puerto Rico also have more human capital than U.S.-born Puerto Ricans who choose to remain in the United States.

2.1 Puerto Rican Migration to the United States

Migration has been an important aspect of Puerto Rico's economic development for the past four decades. Unfortunately, the only source of historical data on the migratory flows is the net flow of passengers at the airport in San Juan, Puerto Rico. In the 1950s, there was an annual average outflow of 45,800 passengers. This outflow decreased to an average of 27,300 between 1960 and 1969 and 24,300 between 1970 and 1979.[4]

Table 2.1 shows population figures for Puerto Ricans residing either in Puerto Rico or in the United States proper in 1980. I define Puerto Ricans as individuals who either were born in Puerto Rico or are of Puerto Rican heri-

2. Intended temporary migration is especially important in the cases of migrant workers (who are permitted by the country of destination to remain for only a limited period of time) and of groups who are allowed unrestricted access between the place of origin and the place of destination (such as internal migration and the Puerto Rican case). Those permitted unrestricted access can move back and forth without the need to make a more permanent decision about their residential choice. For a detailed explanation of the different types of return migration, see King (1986) and Bohning (1984).

3. King (1986) surveys the return migration literature and presents eleven return migration case studies.

4. These data are reported by the Puerto Rico Planning Board (1983).

Table 2.1 **Puerto Rican Population Living in Puerto Rico and in the United States in 1980**

	Living in Puerto Rico		Living in the United States	
	N	%	*N*	%
Total population				
Total	3,097,000	100.0	2,014,000	100.0
Born in:				
Puerto Rico	2,889,000	93.3	930,600	46.2
United States	177,000	5.7	1,014,500	50.4
Other	31,000	1.0	68,900	3.4
% of Puerto Rico born	75.6		24.4	
% of U.S. born	14.9		85.1	
Age 20–64				
Total	1,520,000	100.0	1,022,000	100.0
Born in:				
Puerto Rico	1,461,600	96.1	712,100	69.8
United States	45,000	3.0	265,300	25.9
Other	14,400	.9	44,600	4.3
% of Puerto Rico born	67.2		32.8	
% of U.S. born	11.3		88.7	

Source: Author estimates from U.S. (1/100) and Puerto Rico (5/100) Census tapes.

tage (i.e., have at least one parent born in Puerto Rico). Throughout the analysis, I will refer to the United States as a political (and geographic) entity that does not include the island of Puerto Rico.

The total Puerto Rican population in Puerto Rico in 1980 was 3.1 million persons, of whom 2.9 million were born in Puerto Rico. There were 2.0 million Puerto Ricans in the United States, 46.2 percent of whom were born in Puerto Rico. If we restrict the calculations only to those persons born in Puerto Rico, we find that 24.4 percent of the Puerto Rico–born population was living in the United States in 1980.

Borjas (1987) calculated similar shares for most of the source countries with sizable migration flows to the United States. The results for selected countries are reported in table 2.2. Borjas found that the country with the largest share of its population living in the United States was Jamaica, with 10.3 percent. The share of the Puerto Rican population living in the United States is almost 2.5 times greater than the largest share for other countries. This difference clearly reflects the fact that Puerto Rican migration is not hindered by political restrictions on the ability to enter (or leave) the United States: Puerto Ricans are U.S. citizens, so they have unrestricted access to the United States proper.

As an alternative measure, therefore, I calculate the average share of per-

Table 2.2 **International and Internal Migration Flows in the United States, 1980**

	Migrants as % of Population of Origin
Country	
Greece	2.4
Ireland	3.5
Canada	2.8
Cuba	6.3
Dominican Republic	4.3
Jamaica	10.3
Panama	2.6
Trinidad & Tobago	8.0
Puerto Rico	24.4
State	
Alaska	49.9
California	19.6
Florida	27.2
Georgia	29.3
Hawaii	33.7
Louisiana	24.2
Massachusetts	29.4
Michigan	21.8
Mississippi	44.7
Missouri	36.2
Nevada	54.3
New York	30.6
Pennsylvania	29.8
Texas	21.8
Virginia	33.6
All states	31.0

Sources: Country data from Borjas (1987); state data from the 1980 census (1/1000).

sons in the United States who live in a state other than the one in which they were born. The results are also presented in table 2.2. The average share for the United States is 31.0 percent, that is, about one-third of the persons in the United States reside in a state different from their state of birth. Puerto Rico's share exceeds that of only California (19.6), Texas (21.8), Michigan (21.8), and Louisiana (24.2). The relative size of Puerto Rican migration flows, therefore, is large relative to international flows but small relative to intranational flows. Throughout this paper, I will continue to compare Puerto Rican migration to international flows. The cultural and language differences between Puerto Rico and the United States are more likely to resemble those encountered by international migrants than those encountered by internal migrants in the United States.

2.2 Selection Model

The migration model used in this paper is an application of the Roy model and was introduced into the literature by Borjas (1987).[5] Following Borjas, migration takes place when expected earnings, net of migration costs, in the new country (country 1) are greater than in the source country (country 0). The earnings distribution in the country of origin is described by

$$\log w_0 = X\beta_0 + e_0, \tag{1}$$

where X is a vector of socioeconomic characteristics, and e_0 is a normally distributed random variable with mean zero and variance σ_0^2. Similarly, the wage structure in the United States is given by

$$\log w_1 = (1 - M)X\beta_n + MX\beta_1 + e_1, \tag{2}$$

where M is a dummy variable equal to one if an individual is foreign born. The vectors β_n and β_1 represent the returns to the socioeconomic characteristics of natives and migrants, respectively. These returns can differ because of discrimination or differences in the quality of the characteristics. The random variable e_1 is normally distributed with mean zero and variance σ_1^2. A person residing in country 0 will migrate if he or she can earn more in country 1 (net of migration costs). The decision to migrate is summarized by the sign of the index function:

$$I = \log [w_1/(w_0 + C)] = [X(\beta_1 - \beta_0) - \pi + (e_1 - e_0)], \tag{3}$$

where C represents migration costs, and $\pi = C/w_0$ is a time-equivalent measure of these costs. For simplicity, I will assume that π is constant across individuals. Individuals will migrate if $I > 0$. The probability that individuals with characteristics X will migrate is given by

$$P(X) = pr\{v > -[X(\beta_1 - \beta_0) - \pi]\} = 1 - \Phi(z), \tag{4}$$

where $v = e_1 - e_0$, $z = -[X(\beta_1 - \beta_0) - \pi]/\sigma_v$, and Φ is the standard normal distribution function. The conditional expectations $E[\log w_0 \mid X, I > 0]$ and $E[\log w_1 \mid X, I > 0]$ give the expected wages of migrants prior to their migration as well as after their migration. Because of the normality assumptions, these conditional expectations are given by

$$E(\log w_0 \mid X, I > 0) = X\beta_0 + [\sigma_0\sigma_1/\sigma_v](\rho - \sigma_0/\sigma_1)\lambda, \tag{5}$$

$$E(\log w_1 \mid X, I > 0) = X\beta_1 + [\sigma_0\sigma_1/\sigma_v](\sigma_1/\sigma_0 - \rho)\lambda, \tag{6}$$

where $\lambda = \phi(z)/P(X)$, ϕ is the density of the standard normal distribution, and ρ is the correlation between the random variables e_0 and e_1. The condi-

5. I will describe the model only briefly. Borjas (1987, 1991) presents a more extensive derivation and discussion of the model.

tional means in (5) and (6) can be used to identify the types of selection in unobserved characteristics that characterize the migrant flow from Puerto Rico to the United States, depending on the sign of the coefficient of λ. As shown by Borjas, three types of selection are possible: positive, negative, and refugee selection. It follows from (5) and (6) that the necessary and sufficient conditions for each type of selection are as follows:

a) *Positive selection.* A high value of ρ and a more unequal distribution of income in the United States relative to the country of origin. This selection implies that migrants have above-average earnings both in Puerto Rico and in the United States.

b) *Negative selection.* A high value of ρ and a more unequal distribution of income in the country of origin than in the United States. This selection implies that migrants have below-average earnings both in Puerto Rico and in the United States.

c) *Refugee sorting.* A small or negative value of ρ. This selection implies that migrants have below-average earnings in Puerto Rico and above-average earnings in the United States.

Because of its political and economic association with the United States, Puerto Rico's economy has adopted many U.S. economic institutions. It is likely, therefore, that ρ takes on a relatively high value. The Borjas model thus implies that the migration flow from Puerto Rico to the United States should be characterized by either positive or negative selection, depending on which of the two "countries" has a more unequal income distribution (i.e., offers a higher rate of return for skills).

One of the most frequently used measures of the distribution of earnings in a country is the Gini coefficient. The Gini coefficient for the Puerto Rican wage distribution in 1977 was 3.97, while it was only 3.57 for the U.S. wage distribution, thus reflecting a more unequal distribution of wage income in Puerto Rico.[6] Furthermore, the Gini coefficient for Puerto Rico underestimates the true amount of wage inequality in the population because it incorporates wage information only on workers. The unemployment rate in Puerto Rico has been historically higher than the unemployment rate in the United States. In 1977, for instance, 19.9 percent of the Puerto Rican labor force was unemployed, while the unemployment rate in the United States was only 7.1 percent. Thus, the exclusion of the unemployed from the calculation of the Gini coefficients underestimates the Puerto Rican Gini coefficient more than the U.S. coefficient. More of the lower tail of the income distribution is truncated in the case of Puerto Rico.

One of the reasons for the higher unemployment rate in Puerto Rico is the minimum wage (see Castillo-Freeman and Freeman, in this volume). In 1977, the U.S.-level minimum wage also began to apply to Puerto Rico. Since the

6. For a detailed analysis of the estimated Gini coefficients for Puerto Rico and the United States, see Mann (1985) and Moroney (1978), respectively.

minimum wage generates unemployment among the least skilled, it truncates the lower tail of the earnings distribution, and the real measure of earnings dispersion will be higher than that estimated by the Gini coefficient.

In order to obtain an estimate of the extent of income inequality that is not biased by the truncation due to the minimum wage, I analyzed the sample of individuals with more than a high school education. The truncation problem for this group is minimal because these workers are not likely to be affected by the imposition of a relatively high minimum wage. I calculated the variance of the logarithm of wages for this group. The results are consistent with the implications of the comparisons of Gini coefficients. The log variance of wages of these highly educated workers (high school graduates) is higher in Puerto Rico (0.325) than in the United States (0.298).[7]

I note, of course, that these calculated variances, which show a more unequal distribution in Puerto Rico than in the United States, do not necessarily measure true population variances. After all, as documented above, a large number of Puerto Ricans moved out of Puerto Rico. In order to measure the true difference in income distribution, one must make the comparison *before* the migration process began. The earliest comparable measure of inequality for the two economies is for 1947, around the period when Puerto Rican outmigration accelerated. Measured Gini coefficients for family income for 1947 are also higher for Puerto Rico (0.52) than for the United States (0.40).[8]

Throughout the rest of the paper, I will rely on the estimated Gini coefficients and the earnings distribution for the college educated and assume that earnings are more unequally distributed in Puerto Rico than in the United States, both at the time of the initial migration wave and for more recent immigrants. The economic model of migration then predicts that we should observe negative selection on unobserved characteristics for migrants from Puerto Rico to the United States. We should also observe positive selection on unobserved characteristics for return migrants to Puerto Rico.

As shown in Borjas (1991), migrants are also selected on observable characteristics. If the education (s) distribution for the population of the country of origin can be written as $s = \mu_s + e_s$, where the random variable e_s is normally distributed with mean zero and variance σ_s^2, Borjas has shown that the expected value of schooling for migrants can be expressed as

$$E(s \mid I > 0) = \mu_s + [\sigma_s^2 / \sigma_t^2](\beta_1 - \beta_0)\lambda, \tag{7}$$

where $t = (e_1 - e_0) + (\beta_1 - \beta_0)e_s$, and β_1 and β_0 are the rates of return to education in the destination country and the country of origin, respectively.

7. An F-test reveals that the difference in the variances is statiistically significant at the 99 percent level of significance. The sample sizes are 3,817 for Puerto Rico and 15,076 for the United States (the U.S. sample was extracted from the 1/100 1980 U.S. Census microfile). The critical value is 1.00, which is smaller than the ratio of the variances (1.09).

8. For the Gini coefficient estimates for Puerto Rico and the United States, see Andic (1964) and Budd (1967), respectively.

This expression predicts that the education level of the migrant pool will depend on the relative return to education in the two countries. If the return to education is higher in the country of destination ($[\beta_1 - \beta_0] > 0$), there will be positive selection in schooling. Highly educated workers born in Puerto Rico as well as U.S.-born Puerto Ricans should migrate to the location with the higher returns to education.

There are, therefore, two important testable implications of the selection model. First, we should observe negative selection on unobserved characteristics in the migration between Puerto Rico and the United States. Second, highly educated individuals should migrate to the location with the higher returns to education.

For an intuitive explanation of these selection predictions, examine figure 2.1 and the migration index equation (3). Figure 2.1 illustrates the wage distribution of the Puerto Rican population. Since the variance of the U.S. income distribution is less than the variance of the Puerto Rican income distribution, the selection model predicts out-migration from the lower tail of the earnings distribution. The population to the left of $\tilde{a}$ will migrate to the United States. The migration decision expressed in the index function (3) depends on relative wages and migration costs. The migration costs variable (π) includes monetary relocation costs as well as psychological costs of adjustment. The psychological costs include, among other things, adjustment to a different culture, a different climate, and life away from family and friends. While monetary relocation costs are easily observed ex ante, psychological costs are difficult to measure. Individuals may be able to measure adjustment costs correctly only after migrating.

We can therefore divide the migration cost variable π into a component observed before migrating (monetary relocation costs) and one observed only after the migration decision (psychological adjustment costs). If observed psychological costs are higher than expected, total migration costs would increase and lead to a change in the sign of the migration index function for

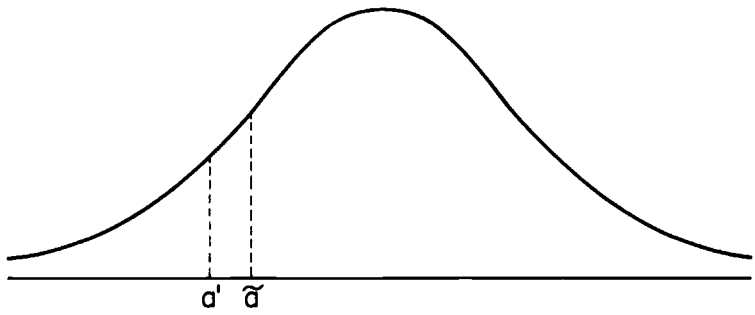

Fig. 2.1 Distribution of unobserved characteristics of the Puerto Rican population

some migrants. Not only are these persons worse off in the United States than they expected, but they may actually gain by migrating back to Puerto Rico. The number of individuals permanently migrating is reduced to the area to the left of a'. Return migrants are measured by the area between a' and $\tilde{a}$. Notice that return migration to Puerto Rico is characterized, as in the previous discussion, by positive selection (from the initially unskilled migrant flow). Return migrants are the most skilled among the original migrants.

2.3 Characteristics of Puerto Rican Migrants

The data used in this paper are drawn from the 1980 U.S. Census Public Use Samples for Puerto Rico and the United States. To obtain large numbers of observations, my sample of Puerto Ricans residing in the United States is obtained by combining the 1/100 sample with the 5/100 sample.[9] The sample of Puerto Ricans residing in Puerto Rico is extracted from 5/100 Census for Puerto Rico.

I am interested in distinguishing among four main groups in the Puerto Rico–born population: persons who, between 1975 and 1980, (1) migrated from Puerto Rico to the United States, (2) migrated from the United States to Puerto Rico, (3) resided in Puerto Rico, and (4) resided in the United States. I will also analyze two groups of U.S.-born Puerto Ricans: those who reside in Puerto Rico and those who reside in the United States.

The questions asked in order to identify the migration status of the Puerto Rico–born population differ between the U.S. Census and the Puerto Rican Census. In the U.S. Census, individuals are asked where they were living in 1975. People responding that they were living in Puerto Rico are defined as migrants (between 1975 and 1980). People residing in the United States in 1975 are included in the migrant group that moved prior to 1975. In the Puerto Rican Census, individuals were asked if they lived in the United States between 1970 and 1980 and when (what year) they returned to Puerto Rico. People who returned between 1970 and 1980 are included in the migrant group. I assume that those persons who did not reside in the United States in the previous ten years never migrated out of Puerto Rico.

It is apparent that the migration variables that can be constructed from the Census have some significant shortcomings. For example, it is possible for recent migrants to the United States to have moved between Puerto Rico and the United States more than once in the past five years, but we observe only

9. For budgetary considerations, I used only 90 percent of the 5/100 U.S. Census. Data from the 5/100 Census tape were extracted for twenty-two states—Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Indiana, Iowa, Maryland, Massachusetts, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, Ohio, Pennsylvania, Texas, Virginia, Washington, and West Virginia—and the District of Columbia. The Puerto Rican population from these states accounts for 90 percent of all Puerto Ricans in the United States. Furthermore, the labor migration questions were asked only of a 50 percent subsample, so the Puerto Rican sample represents 2.75 percent of the total Puerto Rican population in the United States.

one move. Similarly, we do not know when those who resided in the United States between 1975 and 1980 migrated to the mainland; we know only that the migration took place prior to 1975. Therefore, we cannot estimate rates of assimilation into the U.S. economy. Furthermore, it is possible that some of these migrants moved to Puerto Rico after 1975 but returned to the United States prior to the 1980 Census. Finally, the data allow me to identify return migrants to Puerto Rico *only* if they returned after 1970. Individuals who returned prior to 1970 are included in the group that never migrated.

My sample is composed of men aged 20–64 who are not members of the armed forces, are not self-employed, are not enrolled in school, report an occupation, and have hourly wages below $100.[10] The data used below contain 480 recent migrants to the United States, 4,846 migrants to the United States before 1975, 1,650 U.S.-born Puerto Ricans residing in the United States, 12,193 nonmigrants in Puerto Rico, 2,344 recent return migrants to Puerto Rico (1,209 returning between 1975 and 1980 and 1,135 returning between 1970 and 1974), and 381 U.S.-born Puerto Ricans living in Puerto Rico.[11]

Tables 2.3 and 2.4 present the average characteristics of the Puerto Rican population in Puerto Rico and the United States, respectively. The average age of the migrants reflects the fact that migration is predominantly undertaken by young persons. Migrants are younger than nonmigrants. Recent migrants to the United States (whose average age is 32.3) are much younger than nonmigrating Puerto Rican residents (38.1); recent return migrants to Puerto Rico (34.2) are younger than nonreturning migrants (38.8); and U.S.-born Puerto Rican migrants (28.5) are younger than those living in the United States (29.6):

Differences in years of schooling, the most important human capital measure available in the data, show that persons who migrated from Puerto Rico to the United States are less educated than Puerto Ricans who migrated in the opposite direction. Recent migrants to the United States (who have an average education of 10.4 years) and men who migrated to the United States before 1975 (9.4 years) are less educated than Puerto Ricans who never left Puerto Rico (10.8 years). It is also worth noting that return migrants to Puerto Rico, who have 9.8 years of schooling, are more educated than the pre-1975 mi-

10. Observations with wages above $100 are considered coding errors. Hourly wages were calculated as (annual earnings)/(annual weeks worked × average weekly hours).

11. The sample sizes reported in tables 2.3 and 2.4 are not fully comparable to table 2.1 above because of the exclusion of females, members of the armed forces, the self-employed, students, and observations without reported occupation or with reported wages greater than $100. Including members of the armed forces, the self-employed, students, and observations without reported occupation or with reported wages greater than $100, the subgroups in tables 2.3 and 2.4 translate to the following population estimates for males (20–64-year-olds): (i) Puerto Rico: return migrants (1975–80), 64,780; return migrants (1970–74), 50,000; never migrated, 573,760; born in the United States, 19,440; (ii) United States: recent migrants, 33,200; migrated before, 288,600; born in the United States, 129,400.

Table 2.3 **Characteristics of the Puerto Rican Population in Puerto Rico (males 20–64), 1980**

	Return Migrants		Never Migrated	Born in U.S.
	1975–80	1970–74		
N	1,209	1,135	12,193	381
Age	34.2	36.8	38.1	28.3
	(9.52)	(9.36)	(11.2)	(8.06)
Education	9.8	10.5	10.8	12.8
	(3.80)	(3.83)	(4.11)	(2.82)
Hourly wage	3.59	3.97	4.14	4.56
	(2.18)	(2.94)	(2.97)	(3.36)
% Elementary (0–6)	22.2	.17	.18	.03
% Junior high (7–8)	11.5	.10	.09	.02
% Some high (9–11)	23.2	.20	.15	.13
% High school (12)	27.8	.31	.32	.37
% Some coll. (13–15)	8.0	.11	.12	.23
% Coll. grad (16–22)	7.4	.11	.15	.22
% Married	73.7	84.7	81.4	68.8
% Manager & profess.	10.3	16.4	19.7	28.3
% Admin. & sales	12.5	15.5	17.1	23.5
% Service	19.4	19.0	15.2	15.5
% Other	57.8	49.1	48.0	32.7

Note: Standard deviations are given in parentheses.

Table 2.4 **Characteristics of the Puerto Rican Population in the United States (males 20–64), 1980**

	Recent Migrants	Migrated Before	Born in U.S.
N	480	4,846	1,650
Age	32.3	38.8	29.6
	(10.2)	(10.5)	(8.95)
Education	10.4	9.4	11.8
	(3.92)	(3.54)	(2.75)
Hourly wage	5.11	6.25	6.60
	(2.95)	(3.09)	(4.20)
% Elementary (9–6)	15.8	.20	3.2
% Junior high (7–8)	13.1	.17	5.1
% Some high (9–11)	21.3	.26	25.2
% High school (12)	28.1	.25	38.7
% Some coll. (13–15)	12.5	.08	18.1
% Coll. grad (16–22)	9.2	.04	9.7
% Married	65.0	74.8	55.8
% Manager & profess.	13.3	10.2	17.8
% Admin. & sales	10.8	12.2	21.0
% Service	11.9	19.0	15.5
% Other	64.0	58.6	45.7

Note: Standard deviations are given in parentheses.

grants still in the United States (who have 9.4 years). The same pattern is observed for U.S.-born Puerto Ricans. Migrants to Puerto Rico (with 12.8 years of schooling) are more educated than U.S.-born Puerto Ricans who choose to remain in the United States (11.8 years). I will discuss below how these conditional means are consistent with the different returns to education in Puerto Rico and the United States, as predicted by the selection model.

There are significant differences in the hourly wages of recent migrants to Puerto Rico relative to other Puerto Rican residents and of recent migrants to the United States relative to Puerto Ricans residing on the mainland. The average wage of recent return migrants to Puerto Rico is 13.3 percent lower than the average wage of Puerto Ricans who never migrated, while the average wage of recent migrants to the United States is 18.0 percent lower than the average wage of older migrants. In addition, the wages of U.S.-born Puerto Ricans, both in Puerto Rico and in the United States, are higher than those of the Puerto Rico born.

The most interesting pattern in tables 2.3 and 2.4 is the higher level of education for residents of Puerto Rico (both migrants and nonmigrants) relative to residents of the United States (again both migrants and nonmigrants). In table 2.5, I pool data from the U.S. and Puerto Rican Censuses to estimate regressions with years of education as the dependent variable. This analysis attempts to examine whether the observed differences in schooling among the different groups are still significant after controlling for age. In the first column, I only include dummy variables indicating birthplace and migration status as independent variables (the group of persons who were born in Puerto Rico and never migrated to the United States is the omitted dummy variable).

Table 2.5 **Levels of Schooling by Group: Ordinary Least Squares**

	(1)	(2)
Intercept	10.79	13.58
	(.035)	(.242)
Return migrant	−.650	−.828
	(.087)	(.086)
Born in U.S., live in P.R.	2.057	1.383
	(.200)	(.193)
Born in U.S., live in U.S.	1.029	.439
	(.101)	(.101)
Born in P.R., live in U.S.	−1.346	−1.291
	(.065)	(.064)
Recent migrants to U.S.	−.376	−.774
	(.179)	(.176)
Age		−.069
		(.002)
R^2	.04	.07

Note: Standard errors are given in parentheses.

These coefficients, of course, reproduce the differences in the averages of tables 2.3 and 2.4. Return migrants to Puerto Rico, for example, have 0.65 fewer years of education than Puerto Ricans who never migrated.

In column 2, I control for age differences across the various groups. The evidence indicates that the systematic patterns discussed above remain even after controlling for age. In particular, the most-educated individuals still choose to reside in Puerto Rico. Recent migrants to the United States have 0.774 fewer years of education than Puerto Ricans who never migrated; recent return migrants to Puerto Rico have 0.05 more years of education than nonreturning migrants; and U.S.-born Puerto Rican residents of Puerto Rico have 0.94 more years of education than U.S.-born Puerto Ricans who chose to remain in the United States.

The selection model described in the previous section predicts that individuals will migrate to the location that best rewards their human capital. The evidence in table 2.5, therefore, indicates that we would expect the returns to education for Puerto Ricans to be higher in Puerto Rico than in the United States. In table 2.6 and 2.7, I present ordinary least squares earnings regressions for Puerto Ricans both in Puerto Rico and on the mainland. The dependent variable is the logarithm of hourly wages. As shown in column 3, the coefficient on years of education is 0.060 in Puerto Rico but only 0.040 in the United States. The higher return to education in Puerto Rico explains not only why the most-educated Puerto Ricans choose to remain in Puerto Rico but also why return migrants are more educated than migrants who choose to remain in the United States.

The evidence presented in this section is consistent with the implication of the Borjas (1987) model. The Puerto Rican migration flow to the United States is relatively unskilled simply because skilled Puerto Ricans find better opportunities in the Puerto Rican economy. This same factor also explains why the return migration to Puerto Rico is composed of persons who are more skilled than those Puerto Ricans who choose to remain in the United States.

2.4 Pattern of Migration

The selection model not only predicts the type of observable skill characteristics most likely to characterize the immigrant flow but also has equivalent predictions about unobserved skill characteristics. The type of selection on unobserved characteristics depends on the shape of the distribution of earnings in the country of origin and in the country of destination. The variance of these distributions proxies for the return to unobserved skills in the countries. I argued above that, in the case of migration between Puerto Rico and the United States, we would expect negative selection on unobserved characteristics because earnings are more unequally distributed in Puerto Rico.

Table 2.6 presents ordinary least squares earnings regressions for Puerto Ricans residing in Puerto Rico in 1980. In these regressions, I compare the

Table 2.6 **Ordinary Least Squares Earnings Regressions by Location: Puerto Rico**

	(1)	(2)	(3)
Constant	1.319	.144	.373
	(.028)	(.030)	(.036)
Experience		.024	.020
		(.001)	(.002)
Experience squared		−.0003	−.0002
		(.00002)	(.00002)
Education		.077	.060
		(.001)	(.001)
Never migrated	−.071	−.075	−.061
	(.029)	(.025)	(.024)
Return migrant	−.141	−.079	−.061
	(.031)	(.027)	(.026)
Controls	no	no	yes
R^2	.01	.25	.31
N	14,918	14,918	14,918

Note: Standard errors are given in parentheses.

earnings of return migrants, nonmigrants, and U.S.-born migrants (this latter group represents the omitted dummy variable). The first column reports the earnings regressions without any controls. Nonmigrant wages are 7.1 percent lower than the wages of U.S.-born migrants and 7.0 higher than the wages of return migrants. After controlling for experience and education, the nonmigrant/U.S.-born migrant wage differential increases to 7.5 percent, and the wage differential between nonmigrants and return migrants falls to 0.4 percent. After controlling (in col. 3) for marital status, industry of employment, and occupation, the differential between nonmigrants and U.S.-born migrants falls to 6.1 percent, and the nonmigrant/return migrant differential disappears. To the extent that the migrant dummy variables capture unobserved skill characteristics of each group, the migration of U.S.-born Puerto Ricans to Puerto Rico is characterized by positive selection, while the return migrants have similar unobserved characteristics relative to nonmigrants.

Table 2.7 presents similar regressions for the United States with U.S.-born Puerto Ricans as the omitted group. In column 1, I show that the wages of Puerto Rico–born persons who migrated prior to 1975 are 1.7 percent lower than the wages of U.S.-born Puerto Ricans and 23.9 percent higher than those of recent migrants. After controlling for experience, education, marital status, industry, and occupation, the wage differentials change to 8.1 percent and 22.8 percent, respectively. These results imply that Puerto Rican migrants to the United States have less valuable unobserved skill characteristics than U.S.-born Puerto Ricans. The results in tables 2.6 and 2.7 are consistent with the selection model presented above. We observe that the migrant flow mov-

Table 2.7 **Ordinary Least Squares Earnings Regressions by Location: United States**

	(1)	(2)	(3)
Constant	1.743	.882	1.127
	(.012)	(.029)	(.045)
Experience		.033	.024
		(.002)	(.002)
Experience squared		−.0004	−.0003
		(.00003)	(.00003)
Education		.049	.040
		(.002)	(.002)
Pre-1975 migrant	−.017	−.075	−.081
	(.014)	(.015)	(.014)
Recent migrant	−.239	−.239	−.228
	(.025)	(.024)	(.023)
Controls	no	no	yes
R^2	.01	.14	.21
N	6,976	6,976	6,976

Note: Standard errors are given in parentheses.

ing to the country with the most income inequality is positively selected while the migrant flow moving to the country with the least income inequality is negatively selected.

Even if the dummy variables in tables 2.6 and 2.7 accurately measure unobserved skill characteristics of the different migrant groups, we cannot unambiguously conclude that the observed migration patterns reflect different economic rewards in the two economies. While it is instructive to know how Puerto Rican migrants in the United States fare relative to the U.S.-born nonmigrant population, the relevant comparison should be how migrants would have fared *in Puerto Rico* had they not migrated relative to the nonmigrant population. To make that comparison, we need to predict the wages that migrants would have earned in Puerto Rico.

To calculate this prediction, I will follow a procedure described in detail in Lee (1978) and Robinson and Tomes (1984). I first estimate earnings equations for the United States and Puerto Rico controlling for the sample-selection bias introduced by the endogenous decision to migrate. The inverse Mills ratio for the earnings equations is calculated from equation (3). The coefficient estimates for the first-stage probit are reported in the first column of table 2.8. The coefficient estimates of the selectivity-corrected least squares earnings equations (reported in cols. 2 and 3 of table 2.8) are then used to calculate the wage that each individual would earn in each location given his or her observable characteristics.

We can make two important observations from the estimates of the selectivity-corrected earnings equations in table 2.8. First, the estimated coefficient

Table 2.8 **Migration Regressions—Puerto Rico Born**

		OLS Wage Regressions	
	Probit, U.S. = 1	Puerto Rico	United States
Constant	−.496	−.226	1.101
	(.054)	(.072)	(.140)
Experience	.028	.014	.020
	(.003)	(.002)	(.004)
Experience squared	−.0005	−.0001	−.0002
	(.00006)	(.00003)	(.00006)
Education	−.024	.073	.040
	(.003)	(.002)	(.003)
Marriage	−.289	.177	.219
	(.024)	(.018)	(.031)
Professional	−.363	.251	.156
	(.027)	(.020)	(.040)
Mills ratio		.571	−.220
		(.120)	(.128)
Children	.153		
	(.023)		
$-2 \times \log(\lambda)$	761.2		
R^2		.27	.13
N	19,863	14,537	5,326

Note: Standard errors are given in parentheses.

of the inverse Mills ratio in the U.S. equation is negative, indicating negative selection for migrants to the United States, while it is positive in the Puerto Rican equation, indicating positive selection.[12] This result is consistent with the migration model described above. The migrant flow to the economy with the more egalitarian income distribution (i.e., the United States) is negatively selected. Second, the returns to education in Puerto Rico remain higher than in the United States even after controlling for sample selection.

Table 2.9 reports the predicted hourly wages for three Puerto Rico–born groups: return migrants to Puerto Rico; individuals who never migrated; and persons who migrated to the United States. The first and second columns show the predicted wage for each group if those individuals lived in the United States and Puerto Rico, respectively. For example, persons born in Puerto Rico but living in the United States have a predicted log hourly wage of 1.97. If they lived in Puerto Rico, they would earn a predicted log hourly wage of 0.876.

The average migrant in the United States has relatively low predicted wages. In particular, the predicted wage for these migrants had they remained

12. The value of the inverse Mills ratio is positive in both regressions, so the sign of the coefficient also represents the sign of the selection.

Table 2.9 Average Predicted Log Hourly Wages

	Living in United States	Living in Puerto Rico
Migrant to the U.S.	1.967	.876
	(.003)	(.004)
Return migrant to Puerto Rico	1.984	.914
	(.004)	(.006)
Live in Puerto Rico, never migrated	2.039	1.002
	(.002)	(.003)

Note: Standard errors are given in parentheses.

in Puerto Rico is lower than the predicted wage of Puerto Ricans who chose not to migrate. The results also show the positive selection characterizing the return migrants to Puerto Rico. The predicted wages of return migrants are higher than the predicted wages of Puerto Ricans who chose to remain in the United States (but are still lower than the predicted wages of Puerto Ricans who never migrated to the mainland).

2.5 Conclusion

The special political relationship between Puerto Rico and the United States allows for continuous unrestricted movement across borders and permits a unique test of economic theories of migration, such as that given by the Roy model. The empirical evidence reported in this paper supports many of the predictions of the model. In particular, the data reveal that relatively unskilled Puerto Ricans migrate to the United States; hence, the out-migration flow is negatively selected. At the same time, however, the return migrant pool tends to be composed of the most skilled of these (relatively unskilled) migrants.

These empirical results are consistent with the hypothesis that workers choose to reside in those locations that offer the highest payoffs for their characteristics. The skill composition of Puerto Rican migration flows, therefore, can be understood in terms of the economic incentives created by differences in the rewards to skills between the sending and the destination regions.

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