

The cohorts that arrived in the 1970s or 1980s, however, start out at a much greater disadvantage, making it unlikely that they will catch up with comparably aged native workers during their working lives.³⁰

8-6 The Decision to Immigrate

A number of studies have tried to identify the factors responsible for the decline in relative skills across immigrant waves.³¹ Some of the studies have pointed to a single culprit: the changing national-origin mix of the immigrant flow. As noted earlier, post-1965 immigrants are much more likely to originate in Latin American and Asian countries. Table 8-2 documents a lot of variation in the relative wage of immigrants across national-origin groups. Immigrants from the United Kingdom earn 37 percent more than natives, whereas those from Mexico earn 40 percent less.

Two factors account for the dispersion in relative wages across national-origin groups. First, skills acquired in advanced, industrialized economies are more easily transferable to the American labor market. After all, the industrial structure of advanced economies and

TABLE 8-2
Wages of
Immigrant
Men in 1990,
by Country
of Birth

Source: George J. Borjas, "The Economics of Immigration," *Journal of Economic Literature* 32 (December 1994): 1686.

Country of Birth	Percent Wage Differential between Immigrants and Natives
Europe	
Germany	24.5
Portugal	-3.1
United Kingdom	37.2
Asia	
India	17.6
Korea	-12.0
Vietnam	-18.9
Americas	
Canada	24.0
Dominican Republic	-29.2
Mexico	-39.5
Africa	
Egypt	12.2
Ethiopia	-21.0
Nigeria	-18.9

³⁰ An interesting study of the factors that contribute to immigrant assimilation in the Swedish context is given by Per-Anders Edin, Peter Fredriksson, and Olof Aslund, "Settlement Policies and the Economic Success of Immigrants," *Journal of Population Economics* 17 (February 2004): 133-155.

³¹ George J. Borjas, "Self-Selection and the Earnings of Immigrants," *American Economic Review* 77 (September 1987): 531-553; and LaLonde and Topel, "The Assimilation of Immigrants in the U.S. Economy."

the types of skills rewarded by firms in those labor markets greatly resemble the industrial structure of the United States and the types of skills rewarded by American employers. In contrast, the industrial structure of less-developed countries probably rewards skills that are less useful in the American labor market. The human capital embodied in residents of those countries is, to some extent, specific to those countries and cannot be easily transferred to the United States.

There is, in fact, a strong positive correlation between the earnings of an immigrant group in the United States and per capita GDP in the country of origin; a doubling of the source country's per capita GDP may increase the U.S. earnings of an immigrant group by as much as 4 percent.³² Because more recent immigrant waves tend to originate in low-income countries, they will be somewhat less successful in the U.S. labor market.

The Roy Model

There also will be dispersion in skills among national-origin groups in the United States because different types of immigrants come from different countries. Which subset of workers in a given source country finds it worthwhile to migrate to the United States: the most skilled or the least skilled?

Consider workers residing in a country that offers a low rate of return to a worker's human capital so that the skilled do not earn much more than the unskilled. This is typical in countries such as Sweden that have relatively egalitarian income distributions and almost confiscatory income tax systems. Relative to the United States, these countries tax able workers and insure the unskilled against poor labor market outcomes. This situation generates incentives for the skilled to migrate to the United States because they have the most to gain by moving. Put differently, the United States is the recipient of a "brain drain."

Consider instead workers originating in source countries that offer a high rate of return to human capital. This is typical in countries with substantial income inequality, as in many less-developed countries. In this situation, it is the United States that taxes the skilled and subsidizes the unskilled (relative to the source country). The United States thus becomes a magnet for workers with relatively low earnings capacities.

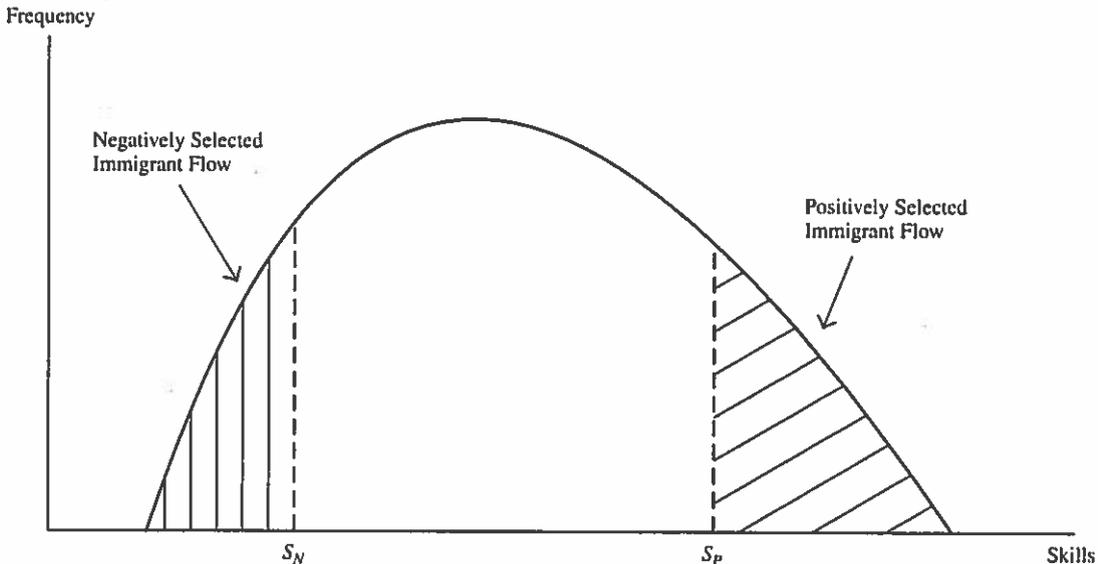
The economic intuition underlying these arguments is based on the influential Roy model, which describes how workers sort themselves among employment opportunities.³³ The key insights of the Roy model can be derived easily. Suppose that persons currently residing in the source country are trying to decide if they should migrate to the United States. We assume that earnings in both the source country and the United States depend on a single factor—skills—that is completely transferable across countries. Let the

³² Guillermina Jasso and Mark R. Rosenzweig, "What's in a Name? Country-of-Origin Influences on the Earnings of Immigrants in the United States," *Research in Human Capital and Development* 4 (1986): 75–106.

³³ Andrew D. Roy, "Some Thoughts on the Distribution of Earnings," *Oxford Economic Papers* 3 (June 1951): 135–146. The model was applied to the migration decision by Borjas, "Self-Selection and the Earnings of Immigrants." Recent research also examines how international migrants are sorted across the potential countries of destination; see Gordon H. Hanson and Jeffrey T. Grogger, "Income Maximization and the Selection and Sorting of International Migrants," *Journal of Development Economics*, forthcoming 2011.

FIGURE 8-8 The Distribution of Skills in the Source Country

The distribution of skills in the source country gives the frequency of workers in each skill level. If immigrants have above-average skills, the immigrant flow is positively selected. If immigrants have below-average skills, the immigrant flow is negatively selected.



variable s denote the number of efficiency units embodied in the worker. The frequency distribution of skills in the source country's population is illustrated in Figure 8-8. We wish to determine which subset of workers chooses to migrate to the United States.

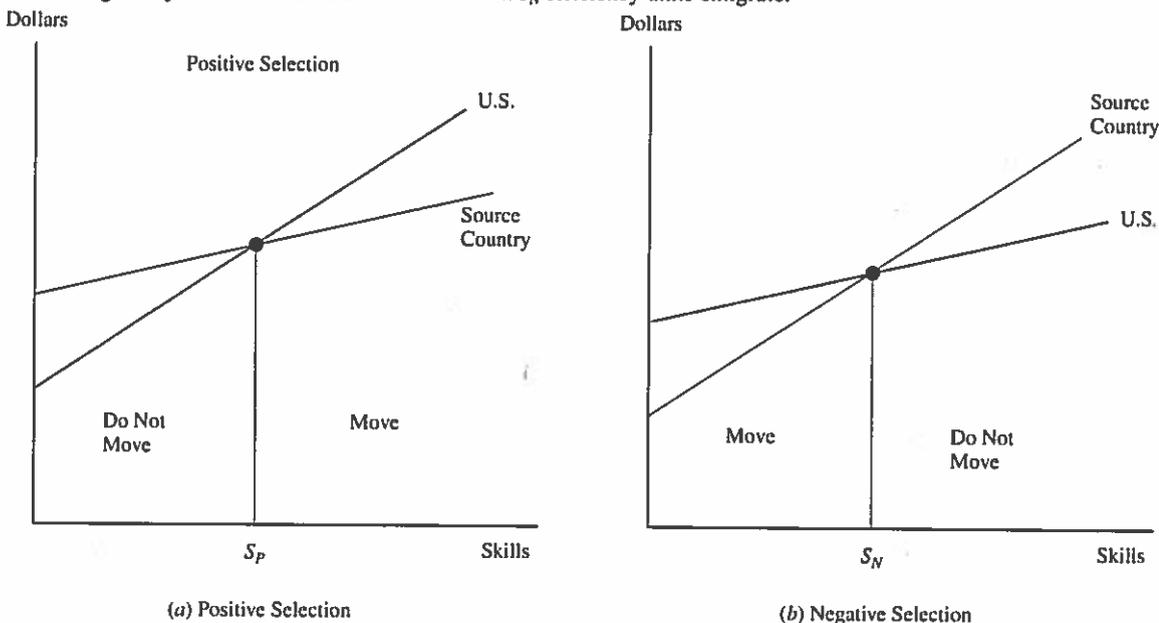
Each worker makes his or her migration decision by comparing earnings in the source country and in the United States. Figure 8-9 illustrates the relation between wages and skills for each of the countries. The slope of these wage-skill lines gives the dollar payoff to an additional efficiency unit in the United States or in the source country. In Figure 8-9a, the wage-skill line is steeper in the United States, so the payoff to an efficiency unit of human capital is higher in the United States than in the source country. In Figure 8-9b, the wage-skill line is steeper in the source country, so the payoff to skills is higher in the source country. To easily illustrate how the migration decision is reached, let's assume initially that workers do not incur any costs when they move to the United States. The decision rule that determines immigration is then quite simple: A worker migrates to the United States whenever U.S. earnings exceed earnings in the source country.³⁴

Consider first the sorting that occurs in Figure 8-9a. Workers with fewer than s_P efficiency units earn more if they stay in the source country than if they migrate to the United States. Workers with more than s_P efficiency units, however, earn more in the United States than in the source country. Hence, workers with relatively high skill levels migrate to the United States.

³⁴ Note that the model is also implicitly assuming that immigration policy does not restrict the entry of any immigrants who find it worthwhile to move to the United States.

FIGURE 8-9 The Self-Selection of the Immigrant Flow

(a) If the rate of return to skills is higher in the United States than in the source country (so that the wage-skills line is steeper in the United States), the immigrant flow is positively selected. Workers with more than s_p efficiency units find it profitable to migrate to the United States. (b) If the rate of return to skills is lower in the United States, the immigrant flow is negatively selected. Workers with fewer than s_N efficiency units emigrate.



As long as the payoff for skills in the United States exceeds the payoff for skills in the source country, all persons who have a skill level exceeding the threshold s_p are better off in the United States. Therefore, the migration flow is composed of workers in the upper tail of the skill distribution illustrated in Figure 8-8. This type of self-selection is called positive selection. Immigrants, on average, are very skilled and do quite well in the United States.

Consider now Figure 8-9b, where the payoff for skills in the source country exceeds the payoff in the United States. Workers with fewer than s_N efficiency units earn more in the United States and will want to move. In contrast, workers who have more than s_N efficiency units have higher earnings in the source country and will not emigrate. When the payoff for skills in the United States is relatively low, therefore, the immigrant flow will be composed of the least-skilled workers in the source country. This type of self-selection is called negative selection. Immigrants, on average, are unskilled and perform poorly in the United States.

The key implication of the Roy model is clear: *The relative payoff for skills across countries determines the skill composition of the immigrant flow.* If an efficiency unit of human capital is highly valued in the United States, immigrants will originate in the upper tail of the skill distribution and will have higher-than-average skills. In contrast, if the source country offers a higher payoff, the immigrant flow contains workers from the lower tail of the skill distribution, who will have lower-than-average skills. Workers "selling" their skills behave just like firms selling their products. Both workers and goods flow to those markets where they can get the highest price.

Theory at Work

HITLER'S IMPACT ON THE PRODUCTION OF THEOREMS

Immediately after seizing power in 1933, the National Socialist Party enacted legislation known as the *Law for the Restoration of the Professional Civil Service*. This Orwellian-named statute, in fact, led to the dismissal of all Jewish professors (as well as professors with unacceptable political orientations) from German universities.

As a result, a remarkable 18 percent of German mathematics professors were dismissed between 1932 and 1934. The dismissals included some of the most famous mathematicians of the time, including John von Neumann, Richard Courant, and Richard von Mises. Many of the dismissed mathematicians eventually managed to migrate to other countries, mainly the United States. Von Neumann, for instance, moved to Princeton University where, after teaming with an economist, Oskar Morgenstern, he wrote his landmark text, *The Theory of Games and Economic Behavior*, in 1944. Most of the small number of Jewish mathematicians who remained in Germany, however, died in concentration camps.

The Jewish mathematicians had not been randomly employed across German universities prior to 1933, so some university departments barely noticed the departure of the luminaries, while other departments lost more than 50 percent of the faculty. The most affected departments included some of the (at the time) best mathematics departments in the country, including Göttingen and Berlin. A remarkable exchange between David Hilbert, one of the most famous mathematicians of the twentieth century, and the Nazi Minister of Education summarizes the impact:

Minister: How is mathematics in Göttingen now that it has been freed of Jewish influence?

Hilbert: Mathematics in Göttingen? There is really none any more.

A recent study exploits the differential impact of the dismissals on the various German universities to document how the exodus affected the productivity of the doctoral students left behind. If highly skilled mathematicians have beneficial effects on the productivity of those students with whom they interact, one would expect that the doctoral students in the most affected departments in Nazi Germany would experience worse outcomes than other cohorts of graduate students. In fact, those doctoral students stranded in the most affected departments had a much harder time in the "mathematics market" after completing their dissertations. They were far less likely to publish their dissertations, and those publications received far fewer citations.

The emigration of a positively selected group of workers, therefore, may have significant effects not only on labor market outcomes in the sending and receiving countries, but may also have particular detrimental effects on the productivity of those left behind.

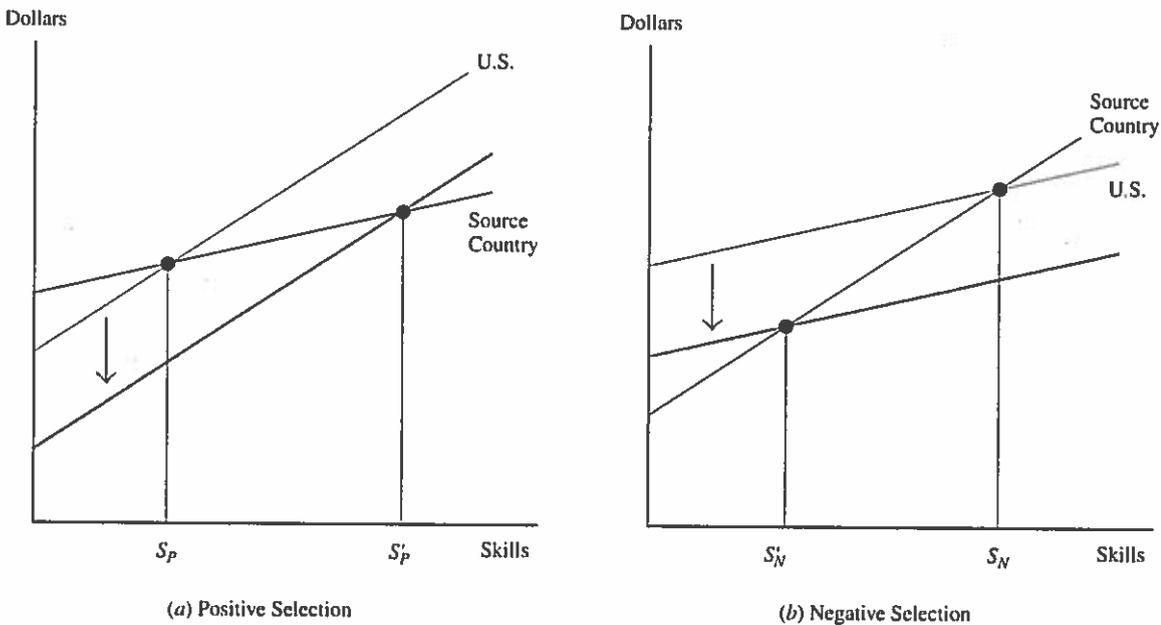
Source: Fabian Waldinger, "Quality Matters: The Expulsion of Professors and the Consequences for PhD Student Outcomes in Nazi Germany," *Journal of Political Economy* 118 (August 2010): 787-831.

The Roy model implies that immigrants who originate in countries that offer a low rate of return to human capital will earn more than immigrants who originate in countries that offer a higher rate of return. The available evidence indeed indicates that there may be a negative correlation between measures of the source country's income inequality (which proxies for the rate of return to skills) and the earnings of immigrants in the United States.³⁵ The income distribution in Mexico, for instance, has about three times more dispersion than the income distribution in the United Kingdom. As a result, part of the sizable wage differential between a Mexican and a British immigrant arises because different types of persons choose to emigrate from these two countries.

³⁵ Borjas, "Self-Selection and the Earnings of Immigrants"; and Deborah Cobb-Clark, "Immigrant Selectivity and Wages: The Evidence for Women," *American Economic Review* 83 (September 1993): 986-993.

FIGURE 8-10 The Impact of a Decline in U.S. Incomes

If incomes in the United States fall (or if there is an increase in migration costs), the wage-skills line for the United States shifts down and fewer workers migrate. The decline in U.S. incomes, however, does not change the type of selection that characterizes the immigrant flow.



Changes in Income Levels and Migration Costs

A surprising implication of the Roy model is that the “base level” of income in the source country or in the United States (as measured by the height of the wage-skills lines in Figure 8-9) do not determine the type of selection that generates the immigrant flow. Changes in these base income levels, however, do affect the *size* of the flow.

Suppose, for instance, that income levels in the United States fall because of a severe recession. The recession pushes down the wage-skills line in the United States, as illustrated in Figure 8-10. If the payoff for skills in the United States exceeds the payoff in the source country, as in Figure 8-10a, the threshold level s_p increases to s'_p . This implies that fewer workers now find it optimal to migrate to the United States. It is still the case, however, that workers who are above the new threshold s'_p are the ones who find it optimal to migrate, and hence the immigrant flow is positively selected.

If the payoff for skills is higher in the source country, as illustrated in Figure 8-10b, the threshold level s_N falls to s'_N . Because only workers who have skill levels below the threshold level want to move, the drop in U.S. incomes again reduces the number of immigrants. The immigrant flow is still negatively selected because immigrants originate in the lower tail of the skill distribution.

We have derived our main conclusions using the simplifying assumption that the worker does not incur any costs when migrating to the United States. We can now easily introduce migration costs into our framework. To simplify, suppose that it costs, say, \$5,000 to migrate to the United States, *regardless* of the worker’s skill level. Migration costs obviously reduce the net income the worker can expect to receive in the United

States. Therefore, migration costs shift down the wage-skills line in the United States and are *equivalent* to the reduction in the U.S. income level that we illustrated in Figure 8-10. If migration costs are constant in the population, therefore, an increase in migration costs reduces the number of immigrants, but does not alter the type of selection that generates the immigrant flow.³⁶

8-7 Policy Application: Labor Flows in Puerto Rico

Puerto Rico became a possession of the United States after the Spanish-American war in 1898.³⁷ The Jones Act of 1917 granted U.S. citizenship to all Puerto Ricans, implying that Puerto Ricans could move freely to the United States without the legal restrictions facing immigrants from foreign countries.

Despite the absence of legal restrictions, there was relatively little out-migration until after World War II. High unemployment in postwar Puerto Rico and the introduction of low-cost air travel (the six-hour flight from San Juan to New York City cost less than \$50) sparked the initial out-migration. In 1940, only 59 thousand Puerto Ricans lived in the United States; by 1960, there were 627 thousand.

Figure 8-11 illustrates the trend in the out-migration rate between 1940 and 2000. The out-migration rate gives the fraction of the Puerto Rican-born population that moved to the United States. In 1940, the out-migration rate was 3.1 percent. By 1960, it had risen to 21.1 percent. This remarkable exodus inspired Stephen Sondheim to have one of the key characters in the 1961 movie version of *West Side Story* predict that the island would soon empty out:

BERNARDO: I think I'll go back to San Juan.

ANITA: I know a boat you can get on.

BERNARDO: Everyone there will give big cheer.

ANITA: Everyone there will have moved here.

Anita was wrong, however. The outflow of Puerto Ricans to the United States slowed down in the 1960s.

The Puerto Rican case study is interesting for several reasons. First, the outflow involved a large fraction of the island's population and it happened at a remarkable speed. Second, U.S. immigration policy did not restrict the number and skill composition of the

³⁶ The predictions of the model are somewhat different if migration costs vary across workers who differ in their skills; see Daniel Chiquiar and Gordon Hanson, "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States," *Journal of Political Economy* 113 (April 2005): 239–281. Chiquiar and Hanson find that the probability of emigration to the United States is highest for Mexican workers in the middle of the Mexican skill distribution. More recent work, however, suggests that the undercount of illegal immigrants in the U.S. Census can seriously bias any analysis of the selection of Mexican emigrants and that a correction of this problem suggests that Mexican immigrants in the United States tended to do relatively poorly in Mexico prior to their migration; see Jesús Fernández-Huertas Moraga, "New Evidence on Emigrant Selection," *Review of Economics and Statistics* 93 (February 2011): 72–96.

³⁷ The discussion presented in this section is based on the findings reported in George J. Borjas, "Labor Outflows and Labor Inflows in Puerto Rico," *Journal of Human Capital* 2 (Spring 2008): 32–68. See also Fernando Ramos, "Out-Migration and Return Migration of Puerto Ricans," in George J. Borjas and Richard B. Freeman, editors, *Immigration and the Work Force: Economic Consequences for the United States and Source Areas*, Chicago: University of Chicago Press, 1992; and Maria E. Enchautegui, "Selectivity Patterns in Puerto Rican Migration," Working Paper, University of Puerto Rico, 2005.