

*Who Crossed the Border? The Selection of Mexican
Migrants in the Early 20th Century*

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Abstract

Despite a long history of migration from Mexico to the United States, most economic scholarship on the subject concentrates only on recent episodes of this phenomenon. In this paper, we explore the selection of Mexican migrants between the United States and Mexico in the early 1920s. Were the individuals who came to the United States of higher or lower quality than the population they left in Mexico? We construct a unique dataset, hand-collecting micro data for migrants from manifest lists for those crossing into the United States from Mexico through various border towns. The dataset includes the height of the individual migrant, an anthropometric measure that serves as a proxy for quality and that we use to measure the selection into migration. We compare the distribution of migrant heights in 1920 to the distribution of heights in Mexico measured in both Mexican military records and Mexican passport records. Our results indicate strong evidence that migrants at the time came from the mid to upper portion of the height distribution in Mexico, suggesting that there was a pattern of intermediate to positive selection of migrants in 1920.

Introduction

Investigating migration from Mexico to the United States accounts for a large portion of the current migration literature. Exploring the question, “Who migrates from Mexico?” is a major aim of many migration studies. Whether high or low quality individuals tend to migrate has real implications for both economic growth and development in Mexico as well as for the labor market in the United States. Given the persistence of migrant networks, a better understanding of who came nearly a century ago will surely inform us about those who make the journey today. Despite the prominent position of selection into migration in the current discussion and its importance in the determination of economic outcomes, little exists to better understand the historical origins of this phenomenon. One can attribute this to the lack of data and reliable measures of quality for both immigrants and comparison groups in Mexico in the early twentieth century. Thus, we focus our attention on migration from Mexico in 1920, utilizing a unique dataset and a new measure of selection to better understand selection patterns in migration from an historical perspective.

In this paper, we utilize migrant height as a measure of quality to determine whether those who migrated in 1920 from Mexico to the United States were positively or negatively selected from the home population. We hand-collect data for permanent, legal migrants from border crossing manifest lists for 1920 in order to create a dataset with individual level characteristics. First, we show that more traditional measures of quality such as assets and occupational class do not paint a true picture of the selection pattern among Mexican migrants. Then, using height as a proxy for standard of living, we compare the height distribution of our immigrant sample with the height distributions for two different samples in Mexico—a sample of those in the Mexican military and a sample of those holding Mexican passports. Comparing

average height in the migrant sample and the non-migrant sample allows us to more accurately describe the pattern of selection in migration from Mexico to the United States in 1920.

We find that although permanent Mexican migrants in 1920 carried very little cash with them across the border and were most likely to come from the unskilled occupational class, it is not fair to assume that they were of low quality relative to those they left behind in Mexico. Our analysis indicates that individuals from the sample of immigrants were, on average, four to five centimeters taller than similar individuals in the military sample of those remaining in Mexico. This implies that migrants from Mexico to the United States in 1920 were positively selected from the home distribution, relative to those that selected into the Mexican military. This result holds even *within* occupational class and is a pattern that would not necessarily be evident in a more common, occupational level analysis. Moreover, we find that individuals from the sample of migrants were, on average, only about one centimeter shorter than similar individuals in the passport sample of those remaining in Mexico. This implies that migrants from Mexico to the United States in 1920 were selected from a similar part of the home distribution as were holders of passports, a group likely to come from the upper classes. Taken together, these results support the claim that migrants from Mexico were positively selected from the home population in 1920.

This paper makes several significant strides in the right direction as we attempt to better understand the extensive migration history that exists between Mexico and the United States. First and foremost, we contribute a unique, hand-collected dataset that provides individual level characteristics of migrants to the United States in 1920. Using this data, we are able to provide a descriptive overview of a population of migrants that, until now, has been largely ignored in the migration literature. Perhaps more importantly, we are the first to make use of historical height data available for immigrants from passenger and manifest lists as a measure of quality in order

to present evidence about patterns of selection. This allows us to move beyond predictions made based on more aggregated measures of occupational class, despite lacking reliable, individual income or earnings data. We are confident that this approach will lay the foundation for much future research utilizing historical height data available for migrants.

Selection into Migration

Migrants are not a random draw from their home country's population. Only a select group finds the benefits of migration to a foreign labor market greater than the costs of moving, leaving family, and a familiar home country. Borjas (1987) theorized that the type of selection would either be *positive* where migrants are better (e.g., more education, higher income, etc.) than those they leave behind or *negative* where migrants are drawn from the lower end of the home country's distribution. The selection depends on relative wages, the costs of migration, and the relative income inequality in the two countries. Through the end of the 19th century and beginning of the 20th century, the United States attempted many times to influence the selection of migrants, adding restrictions and imposing costs to keep out the less skilled. For example, the Immigration Act of 1917 required that migrants demonstrate literacy, and made it more costly for migrants to enter by increasing the head tax. The quota laws in the early 1920s created restrictions to immigration based on nativity. These laws were aimed at curbing migration from Southern and Eastern Europe and the Americas were specifically exempt from the quotas.

Economic historians have recently become interested in the selection of migrants during the Age of Mass Migration (1850-1913). Abramitzky et al. (2012a) find a pattern of negative selection for Norwegian migrants during the 19th century. They also find that permanent migrants were positively selected during the early 20th century (Abramitzky et al., 2012b). Stolz and Baten (2012) use age heaping techniques on migrants to support the Borjas model of

selection. They find that some European countries experienced a “brain drain” where migrants had more human capital than those who remained in Europe, while other countries (Scandinavian, Central European) experienced a “brain gain” as the less educated populace left the country.¹ While these papers add knowledge about the selection of migrants from Europe, not much is known about the historical relationship between Mexico and the United States. Feliciano (2001) is the only paper to our knowledge that explores the historical selection of Mexican migrants by comparing the literacy of Mexicans recorded in the United States Census and Mexican Census. She finds that in 1910 the Mexicans in the United States had a higher literacy rate than individuals in Mexico. Furthermore, the relative skill advantage of Mexican immigrants decreased over the 20th century. However, not much is known about Mexican migration between 1910 and 1940, a period that included the Mexican Revolution and the initiation of temporary work programs for Mexican migrants.

Rather than using measures of income, age heaping, literacy, or education level to quantify the selection of migrants, we use a different technique that has a long tradition in economic history. We compare the heights of the migrants to the heights of individuals who remained in Mexico to determine the type of selection. Variation in occupational class is limited using Mexican data since a large majority of migrants listed “Laborer” as occupation. Using height allows us to measure the selection within occupation by allowing finer detail about the quality of migrant.

Describing Migrants Using Border Crossing Manifests

¹ The question of brain drain has gained interest in the economics literature in recent years (Gibson and McKenzie, 2011). It is unclear what the effects on the sending country’s economy would be since brain drain would lower the country’s human capital stock, but remittances from migrant workers could ease capital constraints and stimulate investment within the economy.

In order to understand exactly who migrated to the United States from Mexico in 1920, we construct a unique dataset of individual migrant characteristics. Specifically, we hand-collect individual observations for immigrants to the United States, utilizing manifest lists for those crossing the border from Mexico in the towns of Ajo, Arizona, Douglas, Arizona, Brownsville, Texas, and El Paso, Texas in 1920.² The map in Figure 1 shows the locations of each of these border crossing stations. In 1904 a head tax was first applied to immigrants crossing U.S. land borders, although those from Mexico were initially excluded, and so officials began keeping records on these admissions. Then, with the Immigration Act of 1917, head tax and literacy requirements were imposed on migrants from Mexico, requiring officials to maintain extensive records on these migrants as well (Ettinger, 2009). Thus, we are able to access these detailed manifest lists from 1920, available on microfilm from the National Archives of the United States, to examine individual level decisions and outcomes.³

In the early twentieth century, there are several extraordinary events that unfold and that could affect our analysis. The Mexican Revolution, which began in 1910 and ended in 1917 with the signing of a new constitution, is one such event.⁴ We choose a year after the end of the revolution to be sure that our results are not confounded by the unrest in Mexico at that time. Moreover, in the United States immigrant quota laws were enacted in 1921 and 1924 that restricted migration from places outside of the Americas. Although these laws did not target migration from Mexico, they may have had indirect effects on the demand for migrant labor

² Due to the labor intensity of this data collection we only have 9 months of data collected for El Paso, TX. We plan to finish collecting observations for the entirety of 1920 in El Paso but we do not expect the additional observations to qualitatively change our results.

³ We accessed the manifest lists for land border crossings from Mexico from both the Rocky Mountain Regional Office of the National Archives in Denver and the genealogy website, Ancestry.com.

⁴ The exact end date for the Mexican Revolution is disputed by historians. Some believe that the actual end was in 1920 with the *Plan de Agua Prieta*, the assassination of Venustiano Carranza and the election of General Alvaro Obregon as President of Mexico (Ettinger, 2009).

from Mexico.⁵ We choose a year prior to these new laws in order to avoid any confounding effects from the changing nature of migration policy in the United States. Thus, we select the year 1920 for study; a year that follows the civil unrest in Mexico but that also occurs prior to major changes in U.S. policy.

We collect information on permanent, legal migrants only.⁶ Once an individual is classified as a permanent migrant, we collect all available data for that person. The data that are available range from basic demographics, information about the trip itself, geographic information, and anthropometric measures.⁷ One key variable that we obtain for each migrant is the amount of money that they carried across the border with them, which is measured in dollars. Another key variable that is coded is the individual migrant's occupation. We follow an occupational classification similar to that by López-Alonso (2000) in order to categorize a person as unskilled, skilled or professional, according to their listed occupation. Table A1 gives the occupational categories as well as the occupations that fall within each category. Additionally, we associate each migrant with a region of birth according to the same regional classification used by López-Alonso and Condey (2003).⁸ Immigrants most often came from central and

⁵ This is an interesting question and a topic that we plan to pursue in future work.

⁶ We employ a systematic approach to the collection of these data. First, we visually inspect each entry to determine whether or not the individual can be classified as a permanent immigrant. Only permanent immigration is considered here and so an observation was collected if only if the individual's intended length of stay was listed as permanent or indefinite, the last permanent residence was outside of the United States, the place of birth was outside of the United States, and the final destination was within the United States. These are similar criteria used by the United States officials to classify each individual as a measureable immigrant on the form.

⁷ Specifically, we collect the date of departure, city of departure, head tax status, name, age, sex, marital status, ability to read and write, language, occupation, nationality, race, last permanent residence, final destination, whether or not the migrant had a ticket to the final destination, by whom the passage was paid, whether the migrant had at least fifty dollars in assets, the amount of money brought into the United States, the purpose in coming, whether or not the immigrant was joining someone upon arrival, height, and the place of birth.

⁸ Region of birth is split into North, Bajío, Center, and South. North includes Baja California Sur, Baja California, Sonora, Sinaloa, Chihuahua, Coahuila, Nuevo León, and Tamaulipas. Bajío includes Jalisco, Colima, Michoacán, Nayarit, San Luis Potosí, Durango, Zacatecas, Aguascalientes, Querétaro, and Guanajuato. Center includes Distrito Federal, México State, Morelos, Tlaxcala, Puebla, Vera Cruz, and Hidalgo. The South includes Guerrero, Oaxaca, Tabasco, Campeche, Yucatan, Quintana Roo, and Chiapas.

northern Mexico, with very few coming from the southern states.⁹ Finally, we are able to collect migrant height, which was recorded in inches and rounded to the nearest quarter inch. The migrant sample consists of 2,661 adult males.¹⁰

Our dataset is constructed from records collected by border officials as individuals crossed the border from Mexico into the United States. Therefore, our sample of immigrants contains only those who crossed legally in the sense that they crossed through an official border crossing station and not those who may have crossed surreptitiously at other points along the border. At this point in history, there were minimal restrictions on the migration of people from Mexico to the United States and most efforts were aimed at curtailing immigration of undesirable individuals from Asia and Southern and Eastern Europe (Ettinger, 2009). The only two elements of migration policy that served as obstacles to Mexican migration were the \$8 head tax and the literacy requirement, which was enacted in the immigration legislation of 1917 (Ettinger, 2009). Thus, those were trying to avoid either the head tax or the literacy requirement are the only people that had any incentive to cross the border at places other than official border stations. The geography and climate of the border area made crossing at places other than through official border stations difficult (Ettinger, 2009). Although Bloch (1929), through a comparison of census numbers with net migration flows, estimates that these numbers could have substantial for the decade from 1910 to 1920, he also admits that there is a lack of reliable information which would make study of this population feasible.¹¹ Therefore, we wish to be clear that our results

⁹ It is well noted that the construction of the Mexican Railroad helped transport Mexicans to the United States. However, the railroad did not reach the southern states below Veracruz by 1920, which explains why few of our observations are from the southern Mexican states.

¹⁰ Adult is defined as 18 years of age or older.

¹¹ Bloch (1929) compares the change in the number of Mexican individuals from the 1910 to the 1920 Census with net migration flows (i.e., immigration flows minus emigration flows) to estimate that over 111,000 entered the country illegally from Mexico over the course of the decade. In his own study of Mexican migration, however, he admits that reliable figures for these individuals does not exist and he must concentrate his own analysis on those who crossed through official stations such that they are included in the official immigration statistics.

apply to those migrants that crossed legally through official border crossing stations, and not necessarily to all migrants (i.e., those that crossed illegally or without going through an official crossing station).

Moreover, our dataset is limited to those individuals that reported either a permanent or an indefinite intended stay in the United States. These are individuals that we label permanent migrants from Mexico to the United States. In the current study, we analyze only permanent migrants because the long term impacts of selection into migration for these individuals will have the longest lasting economic impact on both the United States and on Mexico. Admittedly, a substantial amount of temporary migration from Mexico to the United States occurred at this time, with many individuals traveling temporarily to work as agricultural labor (United States Bureau of Immigration, 1920).¹² We are careful to state that our results apply to permanent migrants, and not necessarily to all migrants (i.e., those that migrated temporarily to the United States).¹³

Table 1 gives the mean characteristics for the sample of permanent, legal male immigrants that we collected. Male immigrants to the United States were, on average, 29 years old, equally likely to be married as single, and almost universally literate.¹⁴ They brought, on average, 29 dollars cash with them across the border. In terms of their occupational class, the majority of immigrants (89%) in the sample were members of the unskilled sector. The average immigrant was approximately 169 centimeters tall. The majority of our sample came from the Bajio region in Mexico and reported a final destination of Texas. Finally, 86% of immigrants in

¹² Official Immigration Statistics report that in the fiscal year ended June 30, 1920, there were about 34,000 male immigrant aliens (classified as more permanent migrants) admitted to the United States. Over the same time period, there were nearly 12,000 male nonimmigrant aliens (classified as more temporary migrants) admitted to the United States (United States Bureau of Immigration, 1920).

¹³ We consider the selection of temporary migrants a different, yet equally important question. Border crossing manifest lists contain records for temporary migrants. In future work we will do a similar analysis for temporary migrants and compare our results for temporary and permanent Mexican migrants in 1920.

¹⁴ The majority of our sample is literate due to the literacy requirement in the Immigration Act of 1917.

the sample reported not meeting anyone (friend, relative or employer) upon their entry into the United States.¹⁵

Preliminary inspection of these summary statistics might lead one to conclude that these migrants from Mexico were of low quality and so were negatively selected from the home population. For instance, they brought only 29 dollars in assets with them across the border. This is quite low, especially considering that non-Mexican immigrants arriving through the port of New Orleans in the same year brought over 200 dollars with them.¹⁶ Migrants from Mexico, however, probably did not need much cash on hand when they arrived to cover their costs. As the map in Figure 2 shows, most settled in areas quite close to the border. These areas were close both in distance and in culture, given that they were, less than a century ago, part of Mexico and that networks were probably developed to help with the assimilation process. Additionally, U.S. employers were eager to hire these individuals and so finding a job was probably not difficult. Thus, determining quality by assets on hand is not the best measure for these migrants from Mexico. Moreover, the vast majority of these migrants were from the unskilled class. Although this might indicate low quality, it does not tell us about individuals. What we really would like to know is whether individuals, *within* a given occupational class, are positively or negatively selected into migration to the United States. In other words, did the U.S. get migrants from the upper or lower end of the quality distribution, conditional on occupational class? Thus, we will rely on a new measure of migrant selection and explore individual migrant heights to determine if they were positively or negatively selected from the home population.

¹⁵ This is a somewhat confusing observation. One might think that migrant networks for Mexican migrants would be much more developed and so migrants should be more likely to say they are meeting someone. On the other hand, networks might be so well developed that an entire community exists in the destination such that the migrant isn't meeting anyone in particular but will find himself assimilated into a strong migrant community. This is something we would like to explore in the future.

¹⁶ This figure comes from similar work that we have done with passenger lists for boats arriving at New Orleans in 1920.

Height as a Measure of Selection

Due to a lack of reliable national accounting before the 1930s, economic historians have relied on other measures to proxy for standard of living. Height as a measure became popular in the 1980s since height is positively correlated with income and improved health and nutrition. High living standards with ample food during childhood increases height while poor nutrition and disease environment can stunt growth. Height remains mostly fixed by the 20s and is not influenced by contemporaneous living standards, so the economic historian can use heights recorded years later to estimate economic conditions of the past. Furthermore, comparing heights from different subpopulations shows how resources are allocated and can proxy for inequality within a society (Steckel, 1995; Steckel, 2009). Many studies have used military, passport, and prison records to estimate growth trends over time; we are the first to our knowledge to use immigration records. The United States started to record heights of migrants in 1907 during a time when the government wanted information on the massive flow of labor into the United States.

Not only does average height of a society indicate overall health and well-being, but taller people earn more than their shorter counterparts within a country. Recent studies show that the return on a one centimeter increase in height is comparable to an additional year of schooling (Schultz, 2002). In developing countries, height is a determinant of wages since larger and stronger men (as measured by BMI) are rewarded in the labor market (Thomas and Strauss, 1997). The return to physical strength is especially important in developing countries where large sectors of the economy rely on the physical productivity of labor. Mexican migrants worked in labor-intensive jobs, such as mining, railroad construction, and farm labor, where improved physiology could lead to higher productivity.

While some (Persico et al., 2004) argue higher wages for taller individuals are due to non-cognitive reasons (e.g., confidence), others (Case and Paxson, 2008; Schick and Steckel, 2010) argue that early childhood inputs into health and nutrition can increase the cognitive functioning of an individual later in life. Taller individuals are more likely to remember their exact date of birth (Humphries and Leunig, 2009). Taller individuals score higher on early childhood cognitive and non-cognitive tests. While the return to physical strength explains much of the wage premium for stature in developing countries, increased cognitive functioning can explain why even in developed countries taller individuals earn more (Steckel, 2009). Either way, it has been shown that those with a larger stature are of a higher quality, both in terms of health and in terms of productivity. If the migrants who arrived in the United States were taller than those who remained in Mexico, then that would indicate a pattern of positive selection for Mexican migrants.

Ideally we would compare the heights of migrants to a sample that is representative of the entire Mexican population, but no such data exist. To make an inference about the selection of migrants from Mexico we compare the heights of migrants to two samples of people living within Mexico—military soldiers and passport holders. López-Alonso (2003) collected heights of individuals in Mexico from military and passport records to analyze the anthropomorphic history of Mexico in the 19th and early 20th century.

The *Secretaría Nacional de la Defensa* holds federal military records in the *Archivo de Concentración*, recording deceased soldiers in the *Sección de Personal Extinto* and deserters in the *Sección de Cancelados* (López-Alonso and Condey, 2003). Birth records did not become widely available until the 1930s, so the military had to keep track of members that would potentially desert by recording their height (measured and rounded to the nearest centimeter),

place of birth, age and occupation. The bulk of the military data is for individuals who joined the Mexican Army between 1915 and 1935.¹⁷ Since the military did not have required service until 1939, only those who made the choice to join the military appear in the data, creating a sample-selection bias.¹⁸

López-Alonso (2007) argues that the federal military represents the lower middle classes of a highly unequal Mexican society.¹⁹ The decades after the end of the *Porfiriato* era were particularly tumultuous, with the Mexican Revolution ending in 1917, and then the Cristero War occurring from 1926 to 1929.²⁰ The Mexican military was highly politicized following the revolution, enforcing the social changes of the Constitution of 1917 that barred the *encomienda* system which would eventually lead to President Lázaro Cárdenas establishing the communal land system (*ejidos*) in 1934 (Lieuwen, 1984). Many who joined the revolutionary efforts of the 1910s continued to stay with the army. These were mostly peasants and semi-skilled individuals from rural areas that supported strong labor and agrarian laws protecting the small landholder. After the end of the revolution, Leaders Alvaro Obregon and Plutarco Elias Calles sought to professionalize the army by establishing war colleges and requiring extensive training for enlistees (Lieuwen, 1968). The military offered benefits to those from lower classes such as reliable wages, a pension, and health benefits (López-Alonso, 2000). Overall, the military represents a lower class within Mexican society.

¹⁷ 95% of the military sample is recorded between 1915 and 1935.

¹⁸ Recently Bodenhorn, Guinnane, and Mroz (2012) criticize anthropomorphic methods that use samples that made not be representative of the entire population, but recognize that no such data may exist for earlier time periods.

¹⁹ The soldiers in the sample are referred to as federal soldiers, but they are not the *Federales* associated with the *Porfiriato* federal army since the *Federales* were disbanded by Carranza in 1914. The *Federales* were drawn from the lower end of the income distribution and lacked skill and education. Historians have argued that the poor quality of the *Federales* is partly what led to Diaz's quick demise during the early year of the Revolution (Lieuwen 1968).

²⁰ While some historians date the end of the Revolution at 1917 due to the creation of the Mexican Constitution, others argue it ends in 1920 with the *Plan de Agua Prieta* rejecting the government of Carranza.

A common econometric issue for military samples is the enforcement of a minimum height requirement, which truncates the height distribution and overestimates the mean height of the underlying population. The stated height requirement for the Mexican military is 160 centimeters, but the enforcement of this restriction is unclear since many observations are below 160 centimeters. To properly estimate a *trend* of heights from a truncated sample, one can use maximum likelihood regression or the Komlos-Kim method (Komlos, 2004). However, we are attempting to estimate a difference in means rather than a trend of heights. Since a minimum height requirement provides an *upwardly biased* estimate for people wanting to conscribe in the military ($\bar{x}_{Mil} > \mu_{Mil}$), the selection of migrants compared to military personnel ($\mu_{Mig} - \mu_{Mil}$) estimate would be *negatively biased* ($\bar{x}_{Mig} - \bar{x}_{Mil} < \mu_{Mig} - \mu_{Mil}$).²¹

Table 2 gives the mean characteristics for the sample of males in the Mexican military. Males in the Mexican military were, on average, approximately 164 centimeters tall. A comparison with average height in the immigrant sample reveals that immigrants were approximately five centimeters taller than those in the military. Utilizing height as a measure of selection, this suggests that migrants were more positively selected from the home distribution than were those that joined the military. Approximately 77 percent of the sample came from the unskilled labor class, while 21 percent came from the skilled labor class. With a higher percentage coming from the skilled class in the military sample than in the migrant sample, one could construe this to be evidence of more negative selection of migrants from the home distribution. We will utilize a regression framework to determine whether or not the positive selection result as measured by height holds *within* occupational class, despite the tendency for

²¹ For instance, this would be a bias against us finding positive selection of Mexican migrants.

those in lower skilled occupations to migrate. Finally, individuals in the military sample come from all over Mexico, with the majority coming from the Center and Bajio regions.

We also compare migrants to a sample of passport applications from Mexico. We use passport applications between 1910 and 1935, which have been collected from the *Archivo de Pasaportes*. Passports were used for business and leisure, which reflects an underlying population that had the funds to afford traveling. Height was self-reported, and the data also include occupation, year of birth, and region of birth.²²

Table 2 gives the mean characteristics for those in the sample of male holders of passports in Mexico. These individuals averaged approximately 39 years of age, much older than both those individuals in the immigrant sample and those in the military sample. Those in the passport sample were, on average, 170 centimeters tall. Compared to those individuals in the migrant sample, they were only about one centimeter taller than those immigrating to the United States. Thus, these two groups were very similar in terms of their height. Given that most individuals holding passports were selected from a group at the upper end of the income distribution, the fact that migrants were close in height is further proof of the positive selection of Mexican migrants in 1920.

Estimation and Results

We estimate the selection of migrants using two methods. The first uses nonparametric techniques to estimate the distributions of heights for each of the immigrant, military and passport samples. Visually inspecting the distributions gives a clear indication of the selection of migrants.

²² This data is also from López-Alonso (2003). The coding of the file makes the occupational and geographical classification unclear.

Figure 3 estimates height distributions for male immigrants and military personnel.²³ Immediately one sees that migrants are much taller than those who stay in the military. The distribution for the military shows evidence of height heaping on intervals of five. We do not see any evidence of truncation in the military distribution due to a minimum height requirement. Looking solely at occupational classification, one could argue that migrants were *negatively* selected since migrants were more unskilled than the military. However, the height distribution shows evidence for *positive* selection of Mexican immigrants relative to the military population. Migrants had a higher standard of living and better childhood environment than those that entered the military.

Figure 4 compares heights between male migrants and passport holders. The immigrant height density is slightly shifted to the left from that for passport holders. Migrants were almost as tall as passport holders. This is surprising since passport holders were largely from skilled and professional classes, and it is consistent with Mexican migrants being positively selected from the Mexican population. However, these densities do not control for location of birth, occupational class, or decade of birth, and so we proceed with regression analysis to control for other factors that influence final height.

We utilize a linear regression model to further explore the pattern of selection among Mexican migrants in 1920, as measured by migrant height. Although the analysis of the estimated densities suggests a pattern of positive selection among these immigrants, it is possible that greater stature is simply correlated with other characteristics that are more prevalent among the migrant sample. Thus, we estimate the regression model in Equation 1 that controls for many of these additional characteristics that could confound our results.

²³ We use an Epanechnikov Kernel to smooth the data and let STATA choose the bandwidth.

$$Height_i = \beta_0 + \beta_1 Migrant_i + \delta' X_i + \epsilon_i \quad (1)$$

This model is a regression of an individual's height on a constant, an indicator variable for whether or not the individual is from the migrant sample, and a vector of controls. In the vector of controls, we include dummy variables for age bins of 18 to 20 years and 21-23 years in order to account for patterns in human growth rates.²⁴ We also include controls for decade of birth to account for any macro conditions that may have affected the height of all those born in Mexico during those times. Furthermore, we include geographic controls to account for any spatial pattern in Mexican heights.²⁵ Finally, we include controls for occupational class. This allows us to describe the selection of individuals within occupational class.

Table 3 presents the results of the selection regression that compares the sample of male migrants to the sample of males in the Mexican military. Column 1 is a simple regression that shows a basic comparison of means. Columns 2 through 4 systematically add controls to the regression. First and foremost, the result of positive selection as measured by height holds, with the migrant sample measuring, on average, 4 to 5 centimeters taller than those individuals in the military sample. This holds even after including the controls that could confound the result. Secondly, we find that individuals are positively selected into migration within occupational class. Although the descriptive statistics show that those who chose to migrate tended to come from lower level occupations, we find that within class (i.e., after controlling for occupational class in the regression model in Column 4) the individuals who migrated tended to be taller than those who were in the military. Finally, our regression models reveal patterns in heights that are consistent with a priori predictions. Adults in the 18 to 20 years age bin are much shorter than

²⁴ Final adult height may not be reached until 24 years of age and so individuals that are between 18 and 24 years might still be growing. The results are qualitatively similar in regressions that exclude those under 24 years of age.

²⁵ For example, those born in the Northern region tend to be taller as a result of a diet higher in protein than in other regions.

adults over 24 years old, while those in the 21 to 23 years age bin are only a bit shorter and the difference loses some statistical significance. This is consistent with the growth pattern of humans where heights increase at a decreasing rate up to age 24. Moreover, those born in the Northern region are significantly taller than those in other regions, consistent with the diet richer in protein that they grow up with in that area. Lastly, those in the skilled class are taller than those in the unskilled class, while those in the professional class are taller than individuals in either of the other two occupational classes. This is consistent with the claim that height is an anthropometric measure that is correlated with income, standards of living, productivity and cognitive ability.

Table 4 presents the results of selection regressions comparing the sample of male migrants to the sample of males holding Mexican passports. Column 1 shows a simple regression that conducts a basic comparison of means, while Column 2 includes controls for age bins under 24 years old and decade of birth.²⁶ First of all, we confirm the result from the simple comparison of height distributions. Those in the immigrant sample are, on average, just over a centimeter shorter than those in the passport sample. Given that the difference in height is quite small and the fact that those holding passports probably came from the upper end of the distribution in Mexican society, this is further evidence of a pattern of positive selection into Mexican migration in 1920. Secondly, the magnitude of the difference in height is reduced with the inclusion of the controls, indicating that much of the difference is probably a result of confounding characteristics and not just migration behavior. If we had a richer set of characteristics to include in the regression, it might be the result that a significant height difference would disappear altogether.

²⁶ The reasoning for the controls is the same as in previous regression model on the military sample. Fewer controls are included in this model simply because the passport sample lacks much of the detail found in the military sample.

Conclusions

The United States labor market drew the strongest and best workers from Mexico in the early 20th century. Mexican migrants were over four centimeters taller than members of Mexican military, and one centimeter shorter than passport holders. Using insights from the long literature on stature positively reflecting living standards, productivity, and cognitive ability, we argue that we can infer the selection of migrants by comparing heights of migrants to those who remained in Mexico. This individual approach is an improvement over other studies that infer selection using more aggregated measures such as occupational class. Since the military drew from lower classes of Mexican society and the passport holders were elite, migrants were positively selected from the Mexican population. Results are robust to controlling for place of birth, decade of birth and occupational classification. Even within occupation, the United States drew the best workers.

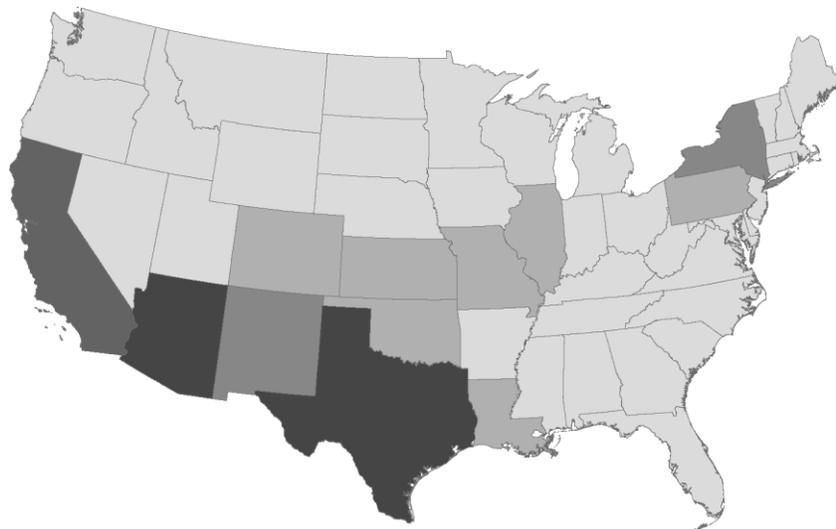
The positive selection represents a “skill drain” from Mexico to the United States. While it is unclear what this implies for long-run growth for both the United States and Mexico, the human capital stock (as measured by healthy individuals) decreased for Mexico since its best workers left to join the United States. It is possible that these workers remitted money back to their families in Mexico or later decided to return to Mexico with newly acquired skills and knowledge. Either way the selection of immigrants in the 20th century had a significant impact on the Mexican economy and is part of the complex story of Mexico’s growth throughout the century.

Figures and Tables

Figure 1 – Border Crossing Stations

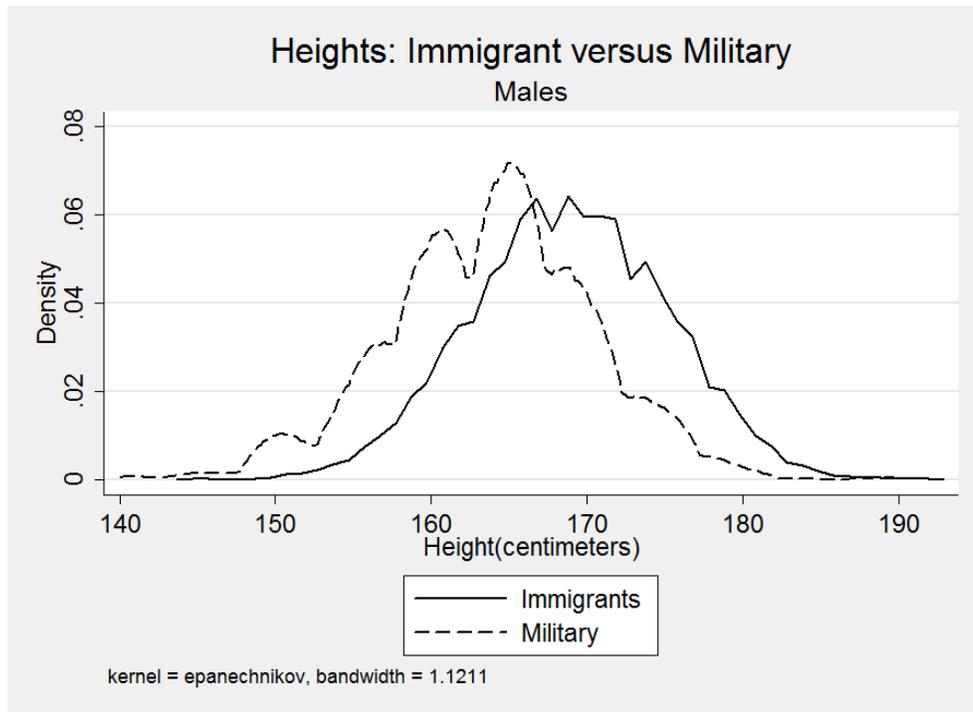


Figure 2 – Share of Mexican Immigrants by State, 1908-1920



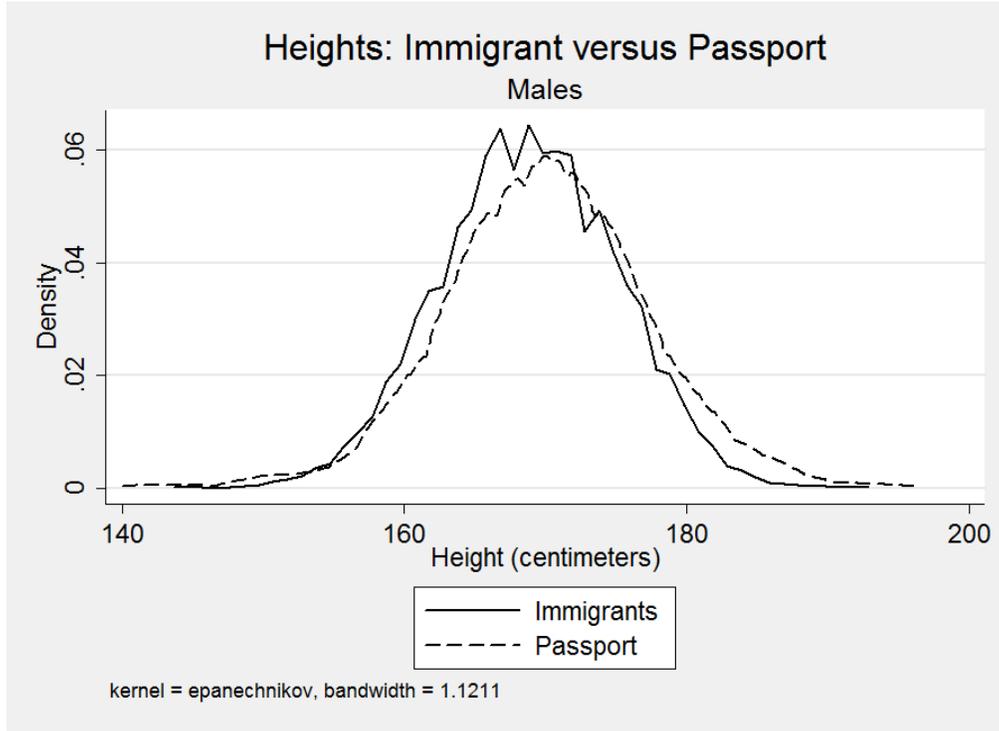
Notes: Source is from Reports of the General Commissioner of Immigration 1908-1930. The data is based on intended final destination when the migrants crossed the border. Lightest shade is 0-.001, lighter is .001-.01, medium is .01-.03, darker is .03-.10., and darkest is .10 and above.

Figure 3 – Comparing Height Densities, Immigrant vs. Military



Source: Migrants heights are from Border Manifests, Military heights are from Lopez-Alonso (2003).

Figure 4 – Comparing Height Densities, Immigrant vs. Passport



Source: Migrants heights are from Border Manifests, Military heights are from Lopez-Alonso (2003).

Table 1 – Mean Characteristics for Migrant Sample

	Migrant Sample
Height (cm)	168.67 (6.22)
Age	28.97 (9.69)
Unskilled	0.89 (0.31)
Skilled	0.07 (0.25)
Professional	0.05 (0.21)
North	0.21 (0.41)
Bajío	0.76 (0.43)
Center	0.03 (0.17)
South	0.00 0.00
Network: None	0.86 (0.35)
Network: Friend	0.01 (0.10)
Network: Relative	0.13 (0.34)
Network: Employer	0.00 0.00
Assets	28.91 (128.52)
Literate	0.99 (0.08)
Married	0.49 (0.50)
Single	0.48 (0.50)
Widowed	0.03 (0.16)
California	0.07 (0.23)
Texas	0.80 (0.37)
Arizona	0.09 (0.31)
Observations	2661

Notes: Standard deviations in parentheses.

Sources: Immigrant sample from border crossing manifest lists.

Table 2 – Mean Characteristics for Comparison Samples

	Military Sample	Passport Sample
Height (cm)	163.83 (6.72)	170.04 (7.63)
Age	28.37 (7.64)	38.70 (10.28)
Unskilled	0.77 (0.42)	
Skilled	0.21 (0.41)	
Professional	0.02 (0.14)	
North	0.19 (0.39)	
Bajio	0.30 (0.46)	
Center	0.40 (0.49)	
South	0.11 (0.32)	
Observations	3884	1437

Notes: Standard deviations in parentheses.

Sources: Military and Passport samples from Lopez-Alonso (2003).

Table 3 - Selection Regressions Comparing Male Migrants with Military Males

	(1) Height (cm)	(2) Height (cm)	(3) Height (cm)	(4) Height (cm)
Immigrant	4.840*** (0.16)	5.013*** (0.17)	4.033*** (0.20)	4.068*** (0.20)
Age, 18-20 years		-2.758*** (0.29)	-2.643*** (0.29)	-2.567*** (0.29)
Age, 21-23 years		-0.402* (0.23)	-0.315 (0.23)	-0.279 (0.23)
Born 1870s		-0.543 (0.37)	-0.46 (0.36)	-0.465 (0.36)
Born 1880s		-0.276 (0.28)	-0.0691 (0.27)	-0.0706 (0.27)
Born 1890s		-0.342 (0.22)	-0.217 (0.22)	-0.219 (0.22)
Born Center Region			1.032*** (0.35)	0.964*** (0.35)
Born Bajío Region			2.685*** (0.36)	2.721*** (0.36)
Born Northern Region			4.341*** (0.37)	4.388*** (0.37)
Skilled Worker				0.957*** (0.22)
Professional Worker				2.052*** (0.43)
Constant	163.8*** (0.11)	164.5*** (0.20)	162.3*** (0.36)	162.1*** (0.36)
Observations	6,545	6,545	6,545	6,545
R-squared	0.117	0.134	0.164	0.168

*Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Sources: Immigrant sample from border crossing manifest lists, military and passport samples from Lopez-Alonso (2003).

Table 4 - Selection Regressions Comparing Male Migrants with Male Passports

	(1) Height (cm)	(2) Height (cm)
Immigrant	-1.365*** (0.23)	-1.299*** (0.27)
Age, 18-20 years		-0.665 (0.57)
Age, 21-23 years		0.185 (0.34)
Born 1850s		-2.201 (1.41)
Born 1860s		-0.599 (0.73)
Born 1870s		-0.112 (0.54)
Born 1880s		0.226 (0.50)
Born 1890s		0.48 (0.47)
Constant	170.0*** (0.19)	169.8*** (0.40)
Observations	4,098	4,098
R-squared	0.01	0.014

*Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

Sources: Immigrant sample from border crossing manifest lists, military and passport samples from Lopez-Alonso (2003).

Appendix

Table A1 – Classification of Occupations

Occupational Groups	Occupational Class
Farm Worker/ Farmer (Labrador)	Unskilled
Peasant (Campesino)	Unskilled
Laborer (Jornalero)	Unskilled
Worker (Obrero)	Unskilled
Miner (Minero)	Unskilled
Construction Worker (Albanil)	Unskilled
Shoemaker (Zapatero)	Skilled
Saddler (Talabartero)	Skilled
Weaver (Tejedor)	Skilled
Tailor (Sastre)	Skilled
Machine Operator (Operario)	Skilled
Blacksmith (Herrero)	Skilled
Carpenter (Carpintero)	Skilled
Tanner (Curtidor)	Skilled
Merchant (Comerciante)	Skilled
Baker (Panadero)	Skilled
Chauffeur (Chofer)	Skilled
Musician (Filarmonico)	Skilled
Typist (Mecanografo)	Skilled
School Teacher (Profesor de instruction primaria)	Skilled
Book Keeper (Tenedor de libros)	Skilled
Federal Employee (Empleado Federal)	Skilled
Landowner (Propietario)	Professional
Physicians (Medico)	Professional
Lawyer (Abogado)	Professional
Engineer (Ingenierio)	Professional

Source: Occupational classifications follow Lopez-Alonso (2000) in order to make proper comparisons across data sources.

References

- Abramitzky, Ran, Leah P. Boustan, and Katherine Eriksson. (forthcoming). Europe's Tired, Poor, Huddled Masses: Self-selection and Economic Outcomes in the Age of Mass Migration. *American Economic Review*.
- Abramitzky, Ran, Leah P. Boustan, and Katherine Eriksson. (2012). A Nation of Immigrants: Assimilation and Economic Outcomes in the Age of Mass Migration. Working Paper 18011, National Bureau of Economic Research.
- Bodenhorn, Howard, Timothy W. Guinnane, and Thomas A. Mroz. (2012). Sample-selection Bias in the Historical Heights Literature. Unpublished Manuscript. http://pantheon.yale.edu/~Guinnane/heights_SSB.pdf.
- Borjas, George J. (1987). Self-Selection and the Earnings of Immigrants. *American Economic Review*, 77(4), 531-553.
- Bloch, Louis. (1929). Facts About Mexican Immigration Before and Since the Quota Restriction Laws. *Journal of the American Statistical Association*, 24(165), 50-60.
- Cardenas, Gilberto. (1975). United States Immigration Policy toward Mexico: An Historical Perspective. *Chicano Law Review*, 2(1), 66-91.
- Case, Anne and Christina Paxson. (2008). Stature and Status: Height, Ability, and Labor Market Outcomes. *The Journal of Political Economy*, 116(3), 499-532.
- Clark, Victor S. (1908). *Department of Commerce and Labor. Bulletin of the Bureau of Labor. Volume XVI, 1908*. Washington, DC.
- Collins, William J. (1997). When the Tide Turned: Immigration and the Delay of the Great Black Migration. *Journal of Economic History*, 57(3), 607-632.
- Ettinger, Patrick. (2009). *Imaginary Lines: Border Enforcement and the Origins of Undocumented Immigration, 1882-1930*. Austin, Texas: University of Texas Press.
- Feliciano, Zadia M. (2001). The Skill and Economic Performance of Mexican Immigrants from 1910 to 1990. *Explorations in Economic History*, 38(3), 386-409.
- Foerster, Robert F. (1925). *The Racial Problems Involved in Immigration from Latin America and the West Indies to the United States: A Report Submitted to the Secretary of Labor*. Washington: GPO.
- Gilly, A. (2005). *The Mexican Revolution*. (P. Camiller, Trans.). New York: The New Press. (Original work published 1971).

- Humphries, Jane and Timothy Leunig. (2009). Was Dick Whittington Taller than Those He Left Behind? Anthropometric Measures, Migration and the Quality of Life in Early Nineteenth Century London? *Explorations in Economic History*, 46(1), 120-139.
- Komlos, John. (2004). How to (and How Not to) Analyze Deficient Height Samples. *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 37(4), 160-173.
- Lieuwen, Edwin. (1968). *Mexican Militarism: The Political Rise and Fall of the Revolutionary Army, 1910-1940*. Albuquerque: University of New Mexico Press.
- Lieuwen, Edwin. (1984). *The Modern Mexican Military, A Reassessment*. Ronfeld, D.F. (Ed.). San Diego: Center for U.S.-Mexican Studies, University of California.
- López-Alonso, Moramay. (2000). The Military Option: Health, Nutrition and Living Conditions of Mexican Soldiers, 1870-1940. Unpublished Manuscript.
<http://lasa.international.pitt.edu/Lasa2000/Lopez-Alonso.pdf>.
- López-Alonso, Moramay. (2003). Height of Mexican Men and Women from Military Passport Records, 1870-1950. [Computer file]. ICPSR version. Mexico City, Mexico: Secretaria de la Defensa (SDN) [producer]. Ann Arbor, MI: Inter-University Consortium for Political and Social Research [distributor].
- López-Alonso, Moramay. (2007). Growth with Inequality: Living Standards in Mexico, 1850–1950. *Journal of Latin American Studies*, 39(01), 81-105.
- López-Alonso, Moramay and Raul P. Condey. The Ups and Downs of Mexican Economic Growth: The Biological Standard of Living and Inequality, 1870-1950. *Economics and Human Biology*, 1(2), 169-186.
- Ngai, Mae M. (1999). The Architecture of Race in American Immigration Law: A Re-examination of the Immigration Act of 1924. *Journal of American History*, 86(1), 67-92.
- Ngai, Mae M. (2003). The Strange Career of the Illegal Alien: Immigration Restriction and Deportation Policy in the United States, 1924-1965. *Law and History Review*, 21(1), 69-108.
- Persico, Nicola, Andrew Postlewaite, and Dan Silverman. (2004). The Effect of Adolescent Experience on Labor Market Outcomes: The Case of Height. *The Journal of Political Economy*, 112(5), 1019-1053.
- Schick, Andreas and Richard H. Steckel. (2010). Height as a Proxy for Cognitive and Non-Cognitive Ability. Working Paper 16570, National Bureau of Economic Research.
- Schultz, T. Paul. (2002). Wage Gains Associated with Height as a Form of Health Human Capital. *American Economic Review*, 92(2), 349-353.

- Steckel, Richard H. (1995). Stature and Standard of Living. *Journal of Economic Literature*, 33(4), 1903-1940.
- Steckel, Richard H. (2009). Heights and Human Welfare: Recent Developments and New Directions. *Explorations in Economic History* (Special Issue on Heights and Human Welfare), 46(1), 1-23.
- Stolz, Yvonne, and Joerg Baten. (2012). Brain Drain in the Age of Mass Migration: Does Relative Inequality Explain Migrant Selectivity? *Explorations in Economic History*, 49(2), 205-220.
- Thomas, Duncan and John Strauss. (1997). Health and Wages: Evidence on Men and Women in Urban Brazil. *Journal of Econometrics*, 77(1), 159-185.
- United States Bureau of Immigration. (1908; 1920; 1932). Annual Report of the Commissioner General of Immigration to the Secretary of Labor.
- United States. Cong. H.R. (1921). *An Act to Limit the Immigration of Aliens into the United States*. 67th Cong., 1st sess. H.R. 4075. Washington: GPO.
- United States. Cong. H.R. (1924). *Immigration Act of 1924*. 68th Cong., 1st sess. H.R. 7995. Washington: GPO.