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WIDER Working Paper 2019/23

Self-selection of Mexican migrants in the presence of random shocks

Evidence from the Panic of 1907

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March 2019

United Nations University World Institute for Development Economics Research
wider.unu.edu

Abstract: Using height as a proxy for physical productivity of labour, this paper estimates the selection of Mexican migration to the United States at the beginning of the flow (1906–08), and it exploits a natural experiment of history to evaluate the impact of random shocks on short-run shifts in selection into migration. The results suggest that the first Mexican migrants belonged to the upper ranks of the height distribution of the Mexican working class. Additionally, the financial crisis of 1907, an exogenous labour demand shock in the United States, significantly modified local migrant self-selection. Before the crisis, migrants were positively selected relative to the military elite of the time. During the crisis, migrants became negatively selected, but returned to a stronger positive selection after the crisis. The shift to a less positive selection was influenced by the absence of the *enganche*, an institution that neutralized mobility and job-search costs. The stronger positive selection in the post-crisis period was partially driven by persistent droughts in Mexico that increased the population at risk of migration.

Keywords: labour migration, Mexico, migrant self-selection, Panic of 1907
JEL classification: F22, J61, N36, O15

Acknowledgements of DEG: I am especially grateful to my PhD supervisors Eric Schneider and Joan Rosés for their guidance and invaluable comments. I also want to thank Daniela Gutiérrez and Marco Villeda for their assistance on the data transcription. This research was developed with the support of: the Mexican National Council for Science and Technology (2015–18) (Scholarship No. 409165); the Mexican Ministry of Education Scholarship (2015–16); the Radwan Travel and Discovery Fund (2016), London School of Economics; the Pre-Dissertation Exploratory Grant (2017), Economic History Association; and the Research Fund for Graduate Students (2017), Economic History Society. This research benefited from my academic visit to El Colegio de México in 2016. I am especially grateful to Graciela Márquez and Gerardo Esquivel for their support during this period. I am grateful to Fernando Pérez and León Fernández for their comments during my fellowship at the Bank of Mexico in 2018. I am grateful to Miguel Niño-Zarazúa for his mentorship during my fellowship at UNU-WIDER in 2018. All remaining errors are mine.

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This study has been prepared within the UNU-WIDER Visiting PhD Fellowship programme.

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ISSN 1798-7237 ISBN 978-92-9256-657-9 https://doi.org/10.35188/UNU-WIDER/2019/657-9

Typescript prepared by Gary Smith.

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The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

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1 Introduction

Since Borjas (1987) formalized the Roy model (Roy 1951), migrant selection has become a prolific topic in labour economics, because it provides a framework to study migrant 'quality' in contemporary and past migration episodes (Abramitzky et al. 2012; Borjas et al. 2018; Chiquiar and Hanson 2005; Kosack and Ward 2014; Spitzer and Zimran 2018; among others). While the literature on migrant self-selection acknowledges that the decision to migrate depends on systemic and idiosyncratic reasons, the factors that may explain shifts in selection patterns over time remain empirically unexplored (Abramitzky and Boustan 2017: 1325).[1] Therefore, for more than a century, we have implemented immigration policies without understanding completely the mechanics behind selection into migration. In this paper, we quantify the selection of Mexican migration to the United States at the beginning of the flow (1906–08) and we exploit a natural experiment of history to evaluate the impact of random shocks on short-run shifts in migrant selection.

To estimate selection into migration, we use heights (as a proxy for physical productivity) of migrants, soldiers, and passport holders. The migrant sample consists of individual border crossings from 1906 to 1908. The soldiers sample consists of military records of average soldiers and elite forces. The former is a proxy for the lower ranks and the latter for the upper ranks of the Mexican working class. The passport holders sample consists of passport applications and represent the Mexican upper social class. We use the military and passport records as comparison samples to determine from which part of Mexico's height distribution the first migrants were drawn. To obtain the best results possible, we control for the individuals' region and year of birth—factors that might have influenced height across space and over time.

The results suggest that the first Mexican migrants were positively selected relative to the average labourer: they belonged to the upper tail of the height distribution of the Mexican working class. Indeed, migrants were 2.2 cm taller than the average soldier; 0.5 cm taller than the military elite forces; and 2.1 cm shorter than the passport holders. Additionally, we observe considerable variation in the degree of regional selection across Mexico: migrants from poorer regions were disproportionately drawn from the upper tail of the working class height distribution. We also document that Mexican migrants likely ended up in the upper ranks of the height distribution of a pool of migrant workers from different source countries that competed for low-skill jobs in the United States. In fact, the tallest Italian migrants were 165.6 cm tall (Spitzer and Zimran 2018: 231), 2.4 cm shorter than the average Mexican migrant. Therefore, following the basic Roy–Borjas model, the beginnings of the Mexico–United States migration were characterized by a positive selection of Mexican migrants on the basis of height.

To evaluate whether random shocks can influence short-run shifts in selection into migration, we use the Panic of 1907 as a natural experiment of history. Following Odell and Weidenmier (2004), the Panic of 1907 was determined by the 1906 San Francisco earthquake, and it was one of the most severe financial crises in the United States before the Great Depression (Frydman et al. 2015: 928; Moen and Tallman 1992: 611; Odell and Weidenmier 2004: 1003). During this crisis, the credit system of the American economy was severely affected. Banks and financial institutions of many cities limited or suspended their cash payments (Andrew 1908: 497), and around 2,000 firms and over 100 state banks failed (Markham 2002: 32). The Panic of 1907 was confined to the United States (Johnson 1908: 455), and it negatively impacted the industries where most Mexican immigrants were employed. This crisis occurred during a period in which Mexicans could migrate to the United States without restrictions, making it possible to quantify selection patterns without capturing any immigration policy effect. Therefore, the Panic of

[1] An exception is the research of Spitzer and Zimran (2018). They evaluate the impact of the imposition of a literacy requirement on changes in migrant self-selection.

1907 represents a unique opportunity to understand how random shocks in the destination country could modify migrant self-selection in the short run.

The results suggest that, in the pre-Panic period, migrants were positively selected relative to the military elite (0.7 cm taller). During the Panic, migrants became negatively selected (0.2 cm shorter), but returned to pre-Panic levels after the crisis. We focus on two mechanisms to explain the short-run changes in selection: institutions and climate shocks.

We argue that Mexican migrants became less positively selected during the Panic period, partially because the *enganche* was drastically reduced during this period. The *enganche* was a search-matching labour institution used by American recruiters to transport and allocate labourers in the United States. Indeed, the share of migrants recruited in Mexico went from 36 per cent in the pre-Panic period to 1 per cent during the Panic. We provide evidence that American recruiters were rational agents that chose the tallest labourers, and thus influenced the selection of Mexican migration. On average, *enganche* migrants were 0.9 cm taller than migrants who crossed the US border without using this labour institution. We show that in the pre-Panic period, the *enganche* effect accounted for 23 per cent of the difference in height between migrants and the military elite. When the Panic of 1907 hit the American financial system, companies were not able to finance the recruitment of labourers. The absence of this labour institution in combination with other unobserved forces explain the less positive selection during the Panic. When we control for unobserved factors across states, our results reveal that in the pre-Panic period, the *enganche* effect could have accounted for 46 per cent of the local (state-level) selection into migration; and that post-Panic migrants became more positively selected relative to their pre-Panic peers.

To explain the more positive local selection observed in the post-Panic period, we exploit the presence of climate shocks in Mexico. Contreras (2005: 123), Clark (1908: 473), and Mayet et al. (1980: 757) document the presence of regional droughts in Mexico during 1907 and 1908. As a consequence, there were important crop losses in some areas (Cardoso 1980: 12), which increased the share of population at risk of migration. Our results show two things. First, migrants whose last residence was a municipality experiencing droughts were 0.8 cm taller than their counterparts coming from locations not affected by this climate shock. Second, the presence of droughts accounted for 28 per cent of the differences in height between pre-Panic and post-Panic migrants. Thus, the stronger positive selection after the Panic of 1907 was the result of two overlapping forces: the reactivation of the American financial system and the persistence of regional droughts in Mexico.

The contributions of this paper are three-fold. First, it extends our knowledge about the selection of Mexican migration to the United States. In contrast to migrants from the European periphery, who were negatively selected in the Age of Mass Migration (Abramitzky et al. 2012; Cohn 1995),[2] the first Mexican migrants were positively selected relative to the average soldier/labourer. Moreover, Mexican migrants might have displaced European immigrants in diverse sectors of the American economy (Clark 1908). This finding lines up with literature arguing that Mexican migrants were not drawn from the lower tail of the educational, ability, or height distribution (Chiquiar and Hanson 2005; Kosack and Ward 2014; Orrenius and Zavodny 2005). In other words, in the beginnings of the twentieth century, Mexico sent its best labourers to the United States, who in fact might have been key for the American Southwest economic expansion (Gratton and Merchant 2015: 528).

Second, to our knowledge, this paper is the first to show that, in the absence of legal immigration restrictions, random shocks can change migrant selection in the short run. Shifts in our measure of selection are higher when controlling for unobserved factors across states: the effects derived from the Panic of 1907 and droughts in Mexico operated at the local level. This result supports previous research arguing that selection into migration is determined within sub-national environments (Abramitzky and

[2] See Abramitzky and Boustan (2017) for a review.

Boustan 2017; Spitzer and Zimran 2018), and it suggests that the decision to migrate could be very responsive to modifications in local conditions. We observed adjustments to migrant self-selection in a matter of months.

Third, our natural experiment allows us to confirm that institutions involved in the immigration process can influence migrant selection (Abramitzky and Boustan 2017: 1325). We speculate that the persistence of institutionalized mechanisms neutralizing migration costs might explain the stickiness of migrant selection patterns over time, despite changes in immigration policy. In this sense, Jenkins (1978: 526) argues that after the bracero programme (1942–64),[3] the Mexico–United States migration flow was characterized by a contractor system with the same objective as the *enganche*: recruit, transport, and allocate Mexican labourers. However, this system was based on undocumented migration. As the early twentieth-century recruiters, contractors had the incentive to choose the best labourers.[4] Therefore, to assess the 'quality' of documented and undocumented migrants, we should consider the persistence of institutionalized mechanisms used to emigrate, which have been shaping the selection into migration in Mexico for over 100 years.

The paper is organized as follows, the next section presents the debate on the self-selection of Mexican migrants. Section 3 describes the Panic of 1907 in a historical perspective. Section 4 presents the characteristics of the data we use. Sections 5 and 6 present the identification strategy to estimate the selection patterns and the interpretation of the results, respectively. Section 7 develops the adjustment mechanisms of migrant self-selection. We conclude in Section 8.

2 Selection Patterns of Mexican Migrants

Borjas (1987) presents the first estimation of the selection of Mexican migration to the United States. According to his cross-country analysis, Mexican migrants earned about 33 per cent less than the average American native, and by 1980 Mexican migrants earned 40 per cent less than the same native base. This negative selection was the result of high returns to skill and high wage dispersion in Mexico. Since then, diverse literature has been developed to test this negative selection hypothesis and study other factors influencing the selection of Mexican migrants.

Chiquiar and Hanson (2005) argue that such negative selection does not hold when comparing counterfactual wage densities for migrants and residents of Mexico. They find that, under a common price for observable skills, Mexican migration was characterized by an intermediate or positive selection. Similarly, Orrenius and Zavodny (2005) argue that undocumented Mexican migrants were drawn from the middle of the educational distribution. McKenzie and Rapoport (2010) observe the same selection pattern but only in communities with weak migrant networks. In contrast, using Mexican panel data, Ambrosini and Peri (2012), Kaestner and Malamud (2014), and Moraga (2011) find that migrants earned lower wages than their non-migrants peers—that is, they support the negative selection hypothesis. As argued by Abramitzky and Boustan (2017), these differences could be due to the measure of selection used and/or under-enumeration of undocumented Mexican migrants. Besides Mexico's wage distribution, other factors such as migration costs, migrant networks, improvements in the economic

[3] The bracero programme was an administrative network of public and private organizations which, between 1942 and 1964, coordinated the seasonal movement of over six million Mexican workers for short-term agricultural employment (Jenkins 1978: 525). Like the *enganche*, the programme recruited, transported, and allocated Mexican braceros or field hands.

[4] Using data of 52 communities in Mexico, Orrenius and Zavodny (2005) argue that undocumented immigrants are not negatively selected with regard to education.

environment, and changes in border enforcement have been explored as drivers of the selection into migration.

Even though the Mexico–United States migration is the most intense and persistent flow of the twentieth century, most of the literature covers recent periods. The exception is Kosack and Ward (2014), who use heights to assess the selection patterns of Mexican migrants at the beginning of the twentieth century.[5] In addition, for the Mexico-US flow and in general, two topics have been missing in the literature on migrant selection. First, the degree of variation in selection within sub-national environments (i.e. research à la Spitzer and Zimran (2018)) is missing in the discussion. Second, the literature has focused on the systemic drivers of migrant self-selection, leaving unexplored the role of random shocks. This paper intends to fill this void in the labour economics literature.

3 Historical background

By the end of the nineteenth century, the United States emerged as the world's leading manufacturing nation and its economy experienced average growth rates of 4.5–5 per cent (Balke and Gordon 1989; Rhode 2002; Romer 1989). Two factors are key to understanding this robust economic growth.

First, the United States received a constant labour supply from international migration flows. From 1820 to 1920, about 36 million Europeans migrated to the United States looking for better living conditions. Mexicans joined this mass migration from the 1880s, but during the 1900s Mexican migration increased sharply and expanded its geographic range of settlement (Gratton and Merchant 2015: 521, 528).[6] This was possible due to the immigration policy at the time: Mexicans were not considered immigrants who sought to settle permanently, but temporary aliens who moved back and forth, supplying labour without restrictions (Fogel 1978: 10; Samora 1982).[7]

Mexican migrants were employed mainly in farms, mines, and the construction of railroads across Arizona, New Mexico, and Texas (Clark 1908).[8] They were mostly rural unskilled labourers moving from the northern states and the central plateau of Mexico. The initial push and pull factors of the flow varied across regions, but living standards at the origin and immigrant networks at the destination were the main determinants at the time.[9] Overall, Mexican migrants represented an inexhaustible source of cheap labour for the US economy.

Second, the American financial system was expanding rapidly by the end of the nineteenth century, facilitating investment for the creation of new firms in all economic sectors. Indeed, in 1907 there were 16,000 financial institutions, which facilitated capital for the economy's buoyant growth (Bruner and Carr 2007: 116).[10] These institutions were small unit banks, fiduciary trust companies, clearing houses, and exchange houses that provided financial services at the local level. Most of these financial institutions were supported by small companies and some others by the Bank of England and/or the

[5] Feliciano (2001) addresses the assimilation of Mexican migrants in the United States. She estimates wage differentials between Mexican immigrants and native whites from 1910 to 1990.

[6] In 1910, the stock of Mexican migrants in the United Stated was about 222,000, and it had doubled by the end of the Mexican Revolution (1910–20) (Garcíay Griego 1983).

[7] Mexican migration was unrestricted before 1917.

[8] By 1909, Mexicans migrants represented 17 per cent of the labour force of the American railway industry (Verduzco 1995).

[9] See Escamilla-Guerrero (2018) for a review.

[10] To dimension the size of the US financial system at the time, in 2007 there were 7,500 financial institutions in existence.

United States Treasury. Furthermore, this fractioned financial system operated without a central bank (Bruner and Carr 2007). This condition, along with the increasing optimism engendered by the robust performance of the economy, fuelled the tendency of the public to take on more risk and invest in companies from dynamic industries, such as the railways and mining. Therefore, access to capital was relatively unconstrained for the US economy.

3.1 The Panic of 1907: a natural experiment of history

The US economic growth was accompanied by fierce financial speculation in the first years of the twentieth century. As a sign of this phenomenon, the Dow Jones index doubled from 1904 to 1906, and at the end of 1905 the call money rates were 25 per cent which were foreseen to increase to 60 per cent the following year (Markham 2002: 29). This speculative process occurred within a period of increasing long-term investments. National and state banks increased their bond and stock assets from 50 million in 1892 to 487 million in 1907 (Johnson 1908: 457).[11] This environment made the financial system fragile and limited the liquidity of the economy (Bruner and Carr 2007: 115).

In April 1906, an earthquake devastated the city of San Francisco, causing damages equal to more than 1 per cent of the American gross national product (GNP). As a consequence, extraordinarily large amounts of gold flowed from London to the United States, because most of the city's insurance policies were underwritten by British companies. This was followed by defensive measures (increase of discount rates and discrimination against American finance bills) by the Bank of England and other European banks to sharply reduce the flows of gold to the United States (Odell and Weidenmier 2004: 1003, 1021). This sequence of events along with the increasing fragility of the American financial system made a market crash almost inevitable.

In March 1907, the demand for liquidity produced a wave of panic, leaving losses of $2 billion in stocks. Major players like the railway company Union Pacific saw their shares devalued by 29 per cent.[12] The Panic also caused the temporary suspension of dividend payments by major mining companies such as the United States Steel Corporation (Markham 2002: 29). To neutralize the panic, companies and city governments increased their bonds' interest rates. However, the wave of selling continued, pushing down stock prices.[13] As the process developed, most fiduciary institutions saw their 10 per cent required reserve deposits reduced. In October, the Knickerbrocker Trust Company, the third largest trustee in New York, went into bankruptcy. This event increased the panic among the public and finally sank the financial market. Throughout August to December 1907, 2,000 companies went bankrupt as did 100 state banks and 30 national banks (Markham 2002: 32).

This financial crisis, known as *The Panic of 1907*, was one of the most severe financial crises in the United States before the Great Depression (Frydman et al. 2015: 928; Moen and Tallman 1992: 611; Odell and Weidenmier 2004: 1003). In fact, contemporaries argued that it was 'probably the most extensive and prolonged breakdown of the country's credit mechanism which has occurred since the establishment of the national banking system' (Andrew 1908: 497). The suspension of payments constrained basic transactions in all sectors, and as a consequence some industries curtailed operations and

[11]Similarly, trust institutions increased their holdings of debt securities by more than 500 per cent, reaching a value of $785 million in 1907 (Johnson 1908: 457).

[12]In January 1906, the average price of the railroad stock was $138. In March 1907, the price fell to $98 (Johnson 1908: 456).

[13]This phenomenon was record by the American press throughout 1907. For instance: 'New York. Aug. 12 – The wildest break in the stock market since the present wave of selling occurred today. I carried stocks down from 1 to 17.5 points. In some cases to new low records. About one-half of the entire number of issues dealt on the exchange rate were sold at new low prices for the year.' (*Washington Post* 1907).

trade was considerably depressed (Frydman et al. 2015: 912; Johnson 1908: 454).[14] To contain the impact of the Panic, substitutes for cash were emitted and rationalized to the population (Andrew 1908), but full convertibility of deposits by the nation's banks was not restored until January 1908 (Frydman et al. 2015: 912).

The fact that the Panic of 1907 was confined to the United States (Johnson 1908: 455), and that it was influenced by the 1906 San Francisco earthquake, provides us a unique opportunity to understand how random shocks affecting the demand for immigrant labour could modify migrant self-selection in the short run. Additionally, these events occurred in a period when Mexicans could migrate to the United States without restrictions, making it possible to quantify selection patterns without capturing any immigration policy effect.

4 Data

4.1 Migrant sample

The registration of aliens arriving at Mexican-US land border ports began in 1906. American authorities used different types of documents to collect information about immigrants. These documents are known as *Mexican Border Crossing Records*, and at the time were conducted by the Bureau of Immigration and Naturalization. The immigrant sample used in this research comes from Publication A3365,[15] which contains two-sheet manifests that provide rich and diverse information about immigrants. Characteristics such as age, sex, marital status, occupation, ability to read and write, citizenship, and race were reported. The manifests include anthropometric data on the immigrant (height, complexion, and colour of eyes and hair), and geographical information regarding his/her birthplace, final destination, and last residence. In addition, these documents recorded information regarding the immigrant's current and previous migration spells.

We reviewed the five rolls of the publication to identify the total data (population size) in the microfilms.[16] Data from 1909 were not considered to guarantee capturing only labour migrants and not refugees from the Mexican Revolution (1910–20). Therefore, we delimited the transcription process to the period from July 1906 to December 1908. Using as reference the port of entrance, the data were transcribed following a stratified random sampling strategy. The final sample size was 9,083 individuals. Figure A.1 shows the eight ports of entrance along the Mexico-United States border that were identified in the microfilms.

A concern about these manifests is that they record only immigrant crossings in official entrance ports. Estimations of undocumented Mexican migration are scarce for the period, mainly because Mexicans were not considered immigrants at the time (Durand 2016). Yet, these data can be considered unique since they are the only migration data at individual level for the Porfirian period (1876–1911).[17] Hence,

[14]The American industrial production peaked in July 1907 and then fell 30 per cent in the second half of the year (Hansen 2014: 555).

[15]The title of the publication is 'Lists of Aliens Arriving at Brownsville, Del Rio, Eagle Pass, El Paso, Laredo, Presidio, Rio Grande City, and Roma, Texas, May 1903–June 1909, and at Aros Ranch, Douglas, Lochiel, Naco, and Nogales, Arizona, July 1906–December 1910'.

[16]We did not find data for years prior to 1906 or for entrance ports in California.

[17]From 1877 to 1911, Mexico was ruled by General Porfirio Díaz (CosíoVillegas and Bernal 1973). This dictatorship is known as the *Porfiriato*.

it allows us to know who migrated before the Mexican Revolution, and to identify the initial dynamics of the Mexican mass migration.[18]

To estimate the selection of Mexican migrants, this study uses as core data the immigrant's age, height, birthplace, and occupation. The anthropometric data was recorded by a sworn physician and surgeon, who examined each immigrant at the port of entrance. However, the immigrant's age, birthplace, and occupation were self-reported, and consequently subject to bias.

4.2 Comparison samples: military and passport holders

We use military recruitment files and passport records to compare migrants with the population that chose to remain in Mexico. These data are the result of extensive archival work completed by López-Alonso (2015), who uses height to study secular trends of living standards in Mexico from 1850 to 1950.[19] We believe that these comparison samples capture different parts of the height distribution of the Mexican population, allowing us to identify to which part migrants might have belonged.

The military recruitment files consist of two samples that capture two extreme points of the height distribution of the Mexican working class. On the one hand, the *federales* were average soldiers of the Mexican army (cavalry, infantry, and artillery), who served and retired, lost their lives in the line of duty, or left their service without authorization before the ending of their contracts (deserters). At the time, there were minimum requirements to enlist in the army. Recruits had to be between 18 and 45 years of age, be at least 160 cm tall, be able to understand Spanish, be a Mexican citizen, and other health requirements. While these requirements might have introduced systematic biases to the sample, López-Alonso (2015: 112) shows that none of these requirements were enforced during the period.[20] The sample size is 7,088 males born between 1840 and 1950 that proxy for the average labourer/peasant in Mexico, that is the lower ranks of the Mexican working class. The source of these data are the archives of the Ministry of National Defense (*Secretaría de la Defensa Nacional*—SEDENA).

On the other hand, the rural police, known as the *rurales*, was a militia created in 1860 as an armed group loyal to the president. The members of this militia received a higher salary than the federales, and in its beginnings they had to bring their own horse and weapons. The rurales often received additional monetary rewards and political favours to maintain the stability in the country. The sample size is 6,820 individuals born between 1840 and 1900.[21] This sample covers all the enlistment records of this militia, and the source of these data is the General National Archive, Public Administration Section (*Archivo General de la Nación*—AGN).

We considered the previous samples separately because clearly the rurales were not representative of the average Mexican soldier. The fact that they received a higher salary and had to bring their own equipment suggests that they might have been relatively richer than the average soldier. Moreover, they received extra monetary and non-monetary rewards for their service. Hence, the rurales could be considered as the military elite of that time, and they proxy for the upper ranks of the Mexican working class (López-Alonso 2015: 156).

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[18] Gratton and Merchant (2015) argue that mass migration of Mexicans started from 1900.

[19] López-Alonso (2015: 107) provides a detailed description of the archival worked involved.

[20] Moreover, it is not clear if the enrolment into the army was completely voluntary. Although the military did not require service until 1939 (Kosack and Ward 2014), there is evidence that forced recruitment mechanisms might have been implemented at the time (Durand 2016).

[21] The desertion rates in this militia were high since its members could sell their equipment at any time and locating deserters was costly López-Alonso (2015: 117–21).

Finally, the passport records consist of all the passport applications made from 1910 to 1942 that contain the height of the applicant. We believe that this sample represents the Mexican upper social class since the passport holders might be individuals with the economic means to travel abroad for business, leisure, or education purposes (López-Alonso and Condey 2003). Nevertheless, two important characteristics of these data should be noted. First, the height was self-reported by the applicant. Second, the records capture all the issued passports but not all the travel permits issued by other regional offices for applicants who could not travel to Mexico City. The sample size is 6,746 male individuals born between 1860 and 1922. The source of these data are the archives of the Ministry of Foreign Affairs (*Secretaría de Relaciones Exteriores*—SRE) (López-Alonso 2015: 121–22).

Besides the potential sources of bias described above, we acknowledge that the three comparison samples could be selected for different reasons.[22] For example, since the military samples record volunteers rather than conscripts, they contain only individuals who chose to enlist in the military. Following Bodenhorn et al. (2017: 201), the decision to join the army reflects the individual's evaluation of his future based on his accumulated human health capital (height). Thus, the decision to enlist in the military becomes less attractive for taller individuals, especially in a growing economy.

To test for the presence of selection, we performed the Bodenhorn et al. (2017) test for the three comparison samples.[23] We found that our samples might present height-based selection considering the individual's year of birth and year of registration. This might imply that our samples are not representative for the Mexican population. However, the objective of this research is not to estimate secular trends in height of the Mexican population, but to use the comparison samples to identify whether the individuals that emigrated were taller or shorter relative to the average soldier (federales), the average elite military (rurales), and the average passport holder.

4.3 Data refinements and descriptives

To obtain the best results possible, we impose a series of refinements on the data. We keep only males reporting their town and state of birth in Mexico.[24] This allows us to estimate accurately the migrant selection at the regional level. In addition, we keep individuals that have reached their terminal height at the moment of registration: individuals between 22 and 65 years old. This avoids capturing growing and shrinkage effects (Spitzer and Zimran 2018: 231).

To avoid capturing effects of the Mexican Revolution in the comparison samples, we keep military and passport holders that had passed their pubertal growth spurt before the Mexican Revolution regardless of their year of registration: individuals 18 years old or older before 1911. In other words, we keep individuals that had reached their peak growth velocity before the conflict. We decided to apply this partial refinement because keeping only those individuals registered before the revolution (the ideal comparison sample) reduces significantly the sample sizes. Therefore, some effects of the revolution might be captured.

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[22]Despite their limitations, these data arise as the most suitable information to measure living standards during the Porfiriato. For the Mexican case, long-term data series on income, wages, prices, and mortality are unreliable and scattered (López-Alonso 2007).

[23]The test consists of including all possible interactions of birth year and recruitment-year effects in a regression in which height is the dependent variable.

[24]The sample was constrained to males because the female military sample (comparison group) does not come with any geographic information.

As a result of the refinement process, the sample sizes shrink relative to the raw data. Table 1 presents the main characteristics of the final samples. On average, migrants were 168 cm tall, 3.6 cm taller than the average soldier, 1.4 cm taller than the military elite, and 2.1 cm shorter than the passport holders. The kernel density estimates of the samples confirm that the federales were the shortest individuals (Figure 1). This initial finding suggests that migrants did not belonged to the lower tail of the height distribution of the Mexican working class.

Table 1: Summary statistics: migrant, military and passports samples (males)

	Migrant	Federales	Rurales	Passport
Average Height (cm)	168.0	164.4	166.6	170.1
Average Age (years)	31.2	35.3	29.7	48.3
Labour class (%)				
Unskilled	89.1	73.3	47.8	3.7
Skilled	7.7	24.1	49.3	34.2
Professional	2.2	2.6	3.0	61.3
Literacy rate (%)				
Literate	38.4	45.3	49.5	100.0
Marital status (%)				
Married	58.9	na	na	na
Single	38.8	na	na	na
Widowed	1.8	na	na	na
Region of birth (%)				
North	45.5	18.7	2.9	13.4
Bajio	52.5	27.3	60.6	30.0
Centre	1.8	42.8	33.0	47.3
South	0.3	11.3	3.5	9.3
Cash on hand—US dollars (median)				
North	10.0	na	na	na
Bajio	1.0	na	na	na
Centre	20.0	na	na	na
South	10.0	na	na	na
Observations	3,609	1,249	5,300	1,339

Note: the migrants' regions of birth and occupations were classified following López-Alonso (2015: 127–28). The sample was constrained to males because the female military sample (comparison group) does not come with any geographic information. We consider individuals that had reached their terminal height at the moment of registration—those between 22 and 65 years old.

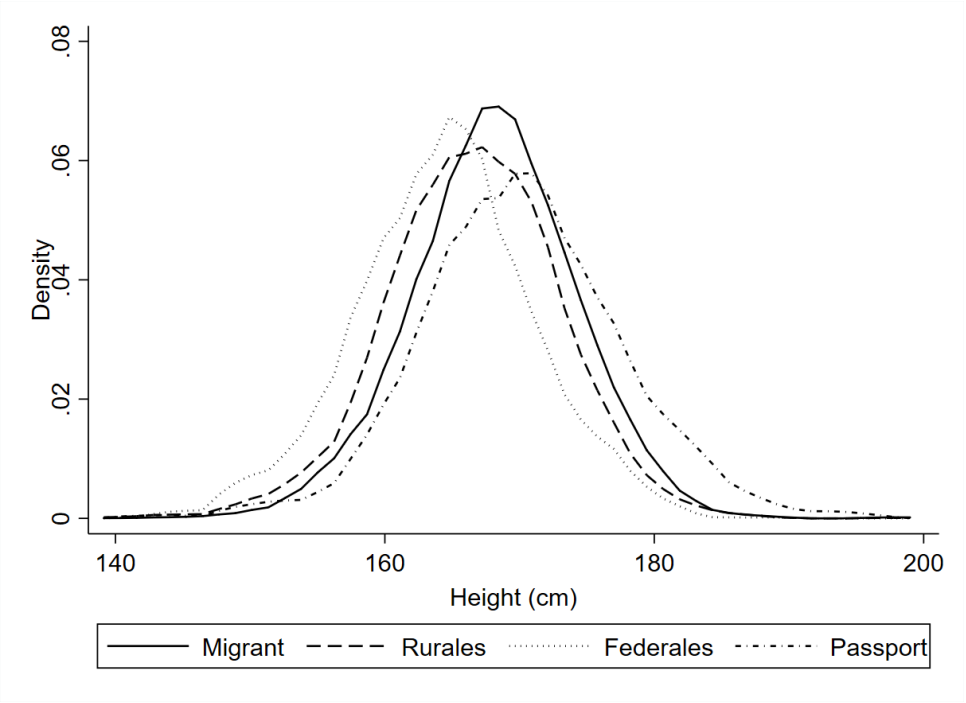
Source: authors, based on migrant sample from the Mexican Border Crossing Records—microfilm publication number A3365. Military and passport samples are from López-Alonso (2015).

Moreover, following Schneider and Ogasawara (2018: 64), a similar average height might indicate that two groups (rurales and migrants) faced equivalent conditions of health care, nutrition, disease environment, and work assignments some 10–50 years before being observed.[25] To some extent, this suggests that those individuals who decided to emigrate and those that enlisted in the military elite could have belonged to the same social class. Conversely, the average height of the federales is lower than the migrant average. Therefore, the average Mexican soldier was exposed to worse early nutrition/health conditions than the rest of the individuals, meaning that they might have belonged to the lowest social class in Mexico.

However, almost all migrants were unskilled labourers and had the lowest literacy rates among the samples, implying that they might have emigrated to perform activities with high returns to physical productivity. In fact, Clark (1908: 477, 486) documents that most Mexican immigrants were confined to track maintenance in the railways, and that they were employed as drillers, wood choppers, coke pullers,

[25]Schneider and Ogasawara (2018) argue that disease environment, proxied by infant mortality rates, have economically meaningful effects on child height at ages 6–11.

Figure 1: Kernel density estimates of heights



Source: authors, based on migrant sample from the Mexican Border Crossing Records—microfilm publication number A3365. Military and passport samples are from López-Alonso (2015).

and surface men (strip mining). All of these occupations required physical strength.[26] In contrast, 62 per cent of the passport holders reported to be professionals, confirming that they belonged to the upper social class.

The regional distribution of the samples shows that migration occurred mostly from the North and Bajio regions, while military recruitment took place mainly in the Bajio and Centre regions (Table 1).[27] The passports sample concentrates in the Centre region, reaffirming that most passport holders might have lived in Mexico City or nearby states, where the social elite resided. Table 2 shows that the differences in height between migrants and federales widens in the Centre and South regions. Based on the amount of cash held at the crossing (Table 1), migrants from the Centre region were considerably richer than the rest. They reported to have $20, twice the amount reported by the migrants from the North. Bajio migrants had $1 at the crossing; thus, they might have been the poorest, as argued by Durand (2016). These initial descriptives suggest the existence of substantial variation in selection into migration across regions (Abramitzky and Boustan 2017: 20).

[26]Certainly, Mexicans were employed as cotton pickers during the harvest season. This activity required nimble fingers rather than physical strength. However, complete Mexican families were employed in the cotton fields since children often picked as much as adults (Clark 1908: 482).

[27]Considering the population levels in 1907, the Bajio states were among the most populated. The states of Guanajuato, Jalisco, and Michoacan were more populated than Mexico City. Therefore, the recruitment of soldiers would have been common in this regions.

Table 2: Average heights (cm) across regions (males)

	North	Bajio	Centre	South
Migrant	169.2	167.0	167.9	165.4
	(6.0)	(5.9)	(7.2)	(5.4)
Rurales	167.4	166.8	166.0	166.3
	(6.39	(6.3)	(6.4)	(5.7)
Federales	166.8	165.2	163.7	161.3
	(6.9)	(6.6)	(5.9)	(5.7)
Passports	171.3	171.1	169.4	168.9
	(7.3)	(7.5)	(7.3)	(7.1)
Observations	2,208	5,850	2,978	461

Note: standard deviations in parenthesis. The migrants' regions of birth were classified following López-Alonso (2015: 127). The sample was constrained to males because the female military sample (comparison group) does not come with any geographic information. We consider individuals that had reached their terminal height—individuals between 22 and 65 years old.

Source: authors, based on migrant sample from the Mexican Border Crossing Records—microfilm publication number A3365. Military and passport samples are from López-Alonso (2015).

5 Empirical strategy

To estimate the selection of Mexican migration to the United States, we regress the height of individual i ($height_i$) on a dummy variable that takes the value of 1 if the individual belongs to the migrant sample and zero otherwise ($migrant_i$). We also consider a vector of individual characteristics ($\mathbf{X}_i$) that includes region of birth and skill-level categories. Additionally, we control for year of birth fixed effects (α_c):

$$height_i = \beta + \Phi migrant_i + \mathbf{X}_i'\theta + \alpha_c + e_i. \quad (1)$$

We estimate Equation 1 by pooling the migrant sample with each of the comparison samples separately, hence the estimated coefficient Φ reflects the average difference in height between migrants and federales, rurales, or passport holders, respectively. The region of birth categories (North, Bajio, Centre, and South) control for environmental factors such as food availability, dietary patterns, or presence of diseases that might influence height at the regional level. Also, the region of birth categories factor out composition effects of the sample. The regional classification was taken from López-Alonso (2015: 127). We include skill-level categories (unskilled, skilled, and professional) to control for the potential relationship between cognitive abilities acquired in early childhood and stature (Bleakley et al. 2014: 124).[28] Finally, the year of birth fixed effects control for any factor influencing height across years, such as structural and idiosyncratic shocks affecting the living standards of the population over time.

The estimated coefficients of Equation 1 are average estimates of the period October 1906 to December 1908. However, as mentioned above, from August 1907 to January 1908 the US economy suffered one of the most severe financial crises before the Great Depression (Moen and Tallman 1992: 611).[29] To capture shifts in selection into migration as a consequence of this crisis, we extend Equation 1 by interacting the migrant indicator variable with dummy variables for the Panic ($panic$) and post-Panic period ($panic^{post}$):

[28]We assume that skilled and professional occupations at the time demanded more training or education relative to unskilled occupations.

[29]There is no consensus in the literature about the ending month of the crisis. Yet, the scholarship on the matter agree that normalcy in the financial market was restored in January 1908 (Frydman et al. 2015: 937).

$$
\begin{aligned}
height_i &= \beta + \Phi_1 migrant_i + \Phi_2 migrant_i \times panic + \Phi_3 migrant_i \times panic^{post} \\
&\quad + \mathbf{X}_i'\theta + \alpha_c + e_i.
\end{aligned} \tag{2}
$$

The estimated coefficients Φ_2 and Φ_3 capture the difference in height of individuals that emigrated during the Panic period (August 1907 to January 1908) or after the Panic (February 1908 to December 1908), respectively. These estimates are relative to those individuals that emigrated before the Panic (October 1906 to July 1907). The difference in height between pre-Panic migrants and the different comparison samples (non-migrants) is reflected in Φ_1. Holding everything else equal, the estimated selection pattern during the Panic of 1907 is $\Phi_1 + \Phi_2$.

6 Results

6.1 Self-selection of Mexican migrants before 1910

Column 1 of Table 3 shows that migrants were positively selected relative to the average soldier: migrants were 2.2 cm taller than the federales. The difference in height between migrants and rurales was 0.5 cm, implying that migrants were slightly taller than the military elite forces (column 2). Regarding the passport holders, migrants were 2.1 cm shorter. In other words, migrants were negatively selected relative to the Mexican upper class (column 3).

Table 3: Self-selection of Mexican migrants: dependent variable is height (cm)

	1	2	3	4	5
	Federales	Rurales	Passports	Rurales	Passports
Migrant	2.209***	0.557***	–2.143***	0.514***	–2.103***
	(0.350)	(0.187)	(0.508)	(0.194)	(0.513)
Skill-level categories					
Skilled	0.928***	0.077	0.634*	0.136	0.766**
	(0.267)	(0.160)	(0.333)	(0.160)	(0.333)
Professional	0.481	1.091***	1.540***	1.172***	1.573***
	(0.552)	(0.403)	(0.440)	(0.402)	(0.442)
Region of birth					
North	5.500***	2.506***	3.365***		
	(0.528)	(0.453)	(0.660)		
Bajio	3.349***	0.515	1.372**		
	(0.521)	(0.419)	(0.651)		
Centre	2.407***	–0.269	0.526		
	(0.520)	(0.433)	(0.658)		
Observations	4,822	8,860	4,901	8,860	4,901
R-squared	0.117	0.053	0.059	0.063	0.077
Birth year FE	Yes	Yes	Yes	Yes	Yes
Birth state FE	No	No	No	Yes	Yes

Notes: * significant at 10 per cent level; ** significant at 5 per cent level; *** significant at 1 per cent level. Robust standard errors in parentheses. The omitted categories are individuals born in the South region and unskilled workers.

Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365 and López-Alonso (2015).

We acknowledge that the federales sample is selected because these individuals were not conscripts but volunteers; and it is expected that in a growing economy, as was the Profirian Mexico, the outside option of military service becomes less attractive for productive and tall individuals (Bodenhorn et al. 2017: 173). Therefore, the federales might have belonged to the lower ranks of the population height distribution. The rurales were volunteers as well; however, the estimated Φs provide strong evidence

that they were well above the federales in the population height distribution. Since migrants were taller than the rurales, we can argue that migrants belonged to the upper tail of the height distribution of the Mexican working class.

As argued by Bleakley et al. (2014: 124) and Kosack and Ward (2014: 1023), height is strongly correlated with wages in countries where large sectors of the economy rely on the physical productivity of labour.[30] Even though the military samples are not representative of the Mexican population by themselves, jointly they allow us to infer that the migrants' potential wage was very close to that of the military elite. More importantly, those individuals that decided to emigrate had unobserved individual-specific factors that reveal even higher human capital accumulation (Bodenhorn et al. 2017: 201). Therefore, it is unlikely that the first Mexican migrants were negatively selected relative to the average labourer.

As a robustness check, we include state of birth fixed effects instead of region dummies in the models for which more disaggregated geographic data are available (rurales and passports). This helps us to rule out that the results are driven by unobserved factors across states of birth. Columns 4–5 of Table 3 show that our initial results hold in significance and magnitude.

The region categories show that individuals from the North and Bajio were considerably taller than the rest, confirming that regional environmental factors influenced height in Mexico. Did the magnitude of selection vary across regions? To answer this question, we estimate separately Equation 1 for each region. We only present results for the North and Bajio because these regions concentrate 98 per cent of the migrant sample. Columns 4–5 of Table 4 show that there was considerable variation in the degree of regional selection across Mexico. The positive selection relative to the average soldiers (Panel A) was stronger in the Bajio than in the North. By 1910, salaries and living standards in the Bajio were considerably lower than those in the North (Campos-Vázquez and Vélez-Grajales 2012: 613; Rosenzweig 1965: 450). Therefore, migrants from poorer regions were disproportionately drawn from the upper tail of the working class height distribution. This pattern does not hold relative to the rurales because the enlistment requirements to the military elite implied a more selective screening in the Bajio.

Finally, in the Borjas (1987) framework a positive selection implies that the best persons emigrate, and when they get to the destination country they outperform the native population. We believe that this might have been the case of Mexican migration before 1910. To corroborate this argument, it is necessary to know if Mexican migrants ended up in the upper or lower tail of the US height distribution. However, using the American population height distribution would not be appropriate because in the United States most migrants faced different levels of labour discrimination relative to native whites (Clark 1908: 478)—that is, the US labour market was segmented by ethnic or racial characteristics which were penalized.

In fact, Mexican migrants belonged to a pool of migrant workers from different source countries that competed for underpaid low-skilled jobs. We found evidence suggesting that Mexicans migrants might have ended in the upper tail of the height distribution of such a pool of migrants. Clark (1908: 479–501) extensively describes that Mexican migrants were preferred to Greeks or Italians, and were just next to Americans in the railways industry. Similarly, from 1900 Mexicans started to displace the Japanese workforce in California, and in the beet and melon fields (New Mexico) Mexican migrants were as preferred as Russian and Japanese labourers. Furthermore, in domestic-service jobs, Mexicans gradually displaced the African-American labour force in Arizona, New Mexico, and Texas (Fuller 1928: 66).

[30]Schultz (2002) estimates that a 1 cm increase in height leads to an 8–10 per cent increase in wages in Brazil and Ghana. Mexico was basically an agrarian country in the beginning of the twentieth century (Rosenzweig 1965), thus physical strength was the principal source of human capital for the average labourer.

Table 4: Regional self-selection of Mexican migrants: dependent variable is height (cm)

	1	2	3	4	5
	Complete sample			North	Bajio
Panel A. Federales					
Migrant	3.259***	3.386***	2.209***	1.273**	2.490***
	(0.306)	(0.308)	(0.350)	(0.630)	(0.609)
Observations	4,858	4,822	4,822	1,848	2,227
R-squared	0.077	0.080	0.117	0.061	0.041
Panel B. Rurales					
Migrant	1.604***	1.633***	0.557***	1.114*	0.437**
	(0.152)	(0.163)	(0.187)	(0.608)	(0.214)
Observations	8,896	8,860	8,860	1,769	5,087
R-squared	0.038	0.039	0.053	0.049	0.033
Panel C. Passports					
Migrant	–1.993***	–0.815*	–2.143***	–2.282*	–2.849***
	(0.327)	(0.461)	(0.508)	(1.178)	(0.880)
Observations	4,948	4,901	4,901	1,793	2,286
R-squared	0.033	0.036	0.059	0.047	0.080
Skill-level categories	No	Yes	Yes	Yes	Yes
Region of birth categories	No	No	Yes	No	No
Birth year FE	Yes	Yes	Yes	Yes	Yes

Notes: * significant at 10 per cent level; ** significant at 5 per cent level; *** significant at 1 per cent level. Robust standard errors in parentheses. For columns 1–3, the omitted categories are individuals born in the South region and unskilled workers.

Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365 and López-Alonso (2015).

To the authors' knowledge, the only quantitative benchmark for our estimates is the research of Spitzer and Zimran (2018). They also use migrants' heights to study the selection into migration of Italians to the United States between 1907 and 1925. According to their statistics, the average stature of the Italian migrants was 163.8 cm, but northerners were taller (165.6 cm) (Spitzer and Zimran 2018: 231). In our sample, the average Mexican migrant was 168 cm tall, but migrants from the North region were 169.2 cm tall. These average estimates suggest that Mexican migrants were considerably taller than their Italian peers, and might explain the substitution of the Italian workforce described by Clark (1908). Consequently, Mexican migrants might have been positively selected based on the Borjas (1987: 533) model.

6.2 The effect of the Panic of 1907

Columns 1–3 of Table 5 show the effect of the Panic of 1907 on migrant self-selection. Individuals that migrated during the crisis were approximately 0.9 cm shorter than their pre-Panic counterparts—that is, migrants became less positively selected during this period. However, the estimated selection during the post-Panic period is close to zero and not statistically significant, meaning that those who migrated after the crisis had a stature similar to pre-Panic migrants.

Column 1 of Table 5 reveals that before the Panic, migrants were positively selected relative to the average soldier (2.4 cm taller). This pattern changes during the Panic, when migrants were less positively selected (1.4 cm), but it returns to pre-Panic levels afterwards. Columns 2–3 show the same 'U' pattern relative to the rurales and passport holder samples. Therefore, the findings suggest that in the beginnings of the twentieth century, when migrants were able to cross the border without restrictions, the composition of the Mexican migration adjusted to short-run changes in the demand for migrant workers.

However, when controlling for unobserved factors across states, the selection into migration changes in the post-Panic period. Columns 4–5 of Table 5 show that migrants became more positively selected

Table 5: Impact of the Panic of 1907 on migrant self-selection: dependent variable is height (cm)

	1	2	3	4	5
	Federales	Rurales	Passports	Rurales	Passports
Migrant	2.400***	0.731***	–1.953***	0.412*	–2.204***
	(0.364)	(0.204)	(0.518)	(0.213)	(0.524)
Migrant × Panic	–0.976***	–0.994***	–0.958***	–0.644**	–0.675**
	(0.288)	(0.289)	(0.288)	(0.291)	(0.290)
Migrant × Post-Panic	–0.111	–0.060	–0.092	0.870***	0.622**
	(0.251)	(0.246)	(0.253)	(0.279)	(0.291)
Observations	4,822	8,860	4,901	8,860	4,901
R-squared	0.119	0.054	0.061	0.065	0.079
Skill-level categories	Yes	Yes	Yes	Yes	Yes
Region of birth categories	Yes	Yes	Yes	No	No
Birth year FE	Yes	Yes	Yes	Yes	Yes
Birth state FE	No	No	No	Yes	Yes

Notes: * significant at 10 per cent level; ** significant at 5 per cent level; *** significant at 1 per cent level. Robust standard errors in parentheses. The omitted categories are individuals born in the South region and unskilled workers.

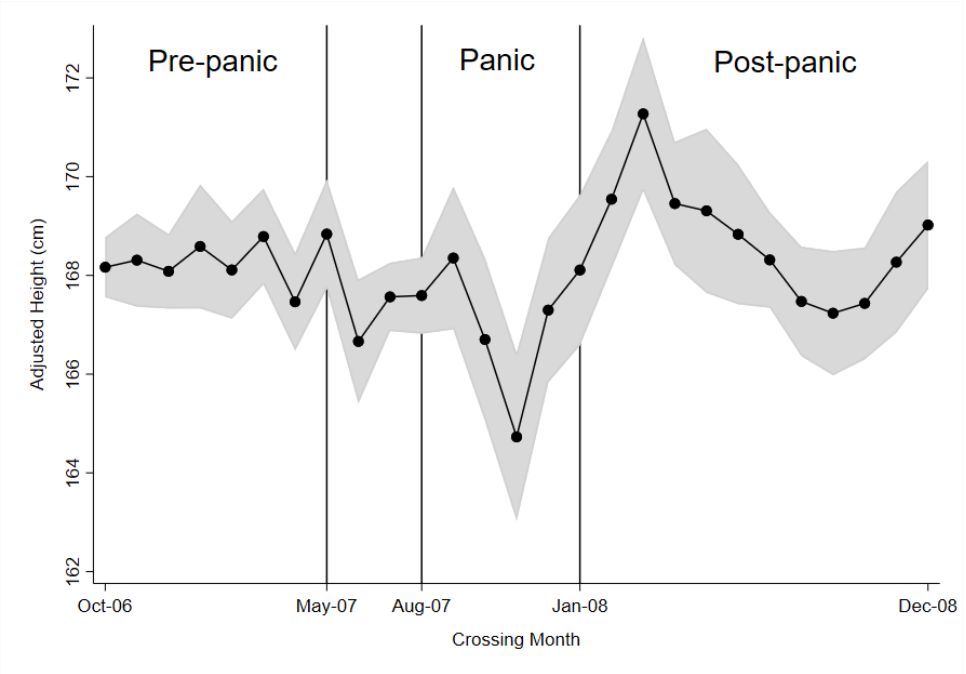
Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365 and López-Alonso (2015).

than their pre-Panic peers. This can be appreciated more clearly in Figure 2, which depicts the adjusted height of migrants during the complete period under analysis (October 1906 to December 1908). To estimate the adjusted values in each month, we regress the migrants' height on skill level, state of birth, year of birth, month of crossing, and port of entrance fixed effects. There are two things to note.

First, in March 1907 the first strong drop in stock prices occurred. In the following months, the speculation and uncertainty continued and by May 1907 the United States had fallen into a short but severe recession (Odell and Weidenmier 2004: 1003). This might explain the fall in the adjusted height from May to August 1907. However, in August 1907 the Secretary of the Treasury announced the deposit of $28 million to banks across the United States for relieving the expected stringency in money supply and to bring back confidence in the financial system (Markham 2002: 31). This measure only delayed the financial crash of October, but along with substitutes for legal currency and the creation of 'legal holidays', prevented even more bankruptcies during the Panic period (Andrew 1908: 516). These events might explain why the adjusted height slightly increased after August and fell later on.

Second, the adjusted height increased significantly after January 1908, when the payments to depositors of commercial banks were fully restored. After May 1908, the adjusted height returns to pre-Panic levels. The results in columns 4–5 suggest that additional factors at the state level might have influenced the selection into migration across the periods under analysis. The next section addresses this matter by identifying two potential adjustment mechanisms.

Figure 2: Effect of the Panic of 1907: adjusted heights of migrants



Note: the estimates correspond to individuals over age 24, born in the South region and unskilled workers (year of birth and state of destination fixed effects were included). The predicted values were estimated for each individual based on year–month fixed effects. **May-07:** By May 1907, the United States had fallen into a short but severe recession. **Aug-07:** In August 1907, the Secretary of the Treasury announced the deposit of $28 million to banks across the country for relieving the expected stringency in money supply and to bring back confidence in the financial system. **Jan-08:** In January 1908, the payments to depositors of commercial banks were fully restored.

Source: authors, based on Mexican Border Crossing Records (1906–08).

7 Adjustment mechanisms of migrant self-selection

We have presented evidence showing that Mexican migrants were positively selected at the beginning of the twentieth century, and that the Panic of 1907 sparked short-run changes in the selection into migration. This section addresses the mechanisms through which migrant self-selection might have adjusted during and after the Panic.

7.1 Labour institutions

At the end of the nineteenth century, the *enganche* was still used in Mexico to allocate labour in isolated regions (Durand 2016: 50–51). This labour institution consisted of recruiting or 'hooking' labourers, who were paid in advance in exchange for future work (Brass 1990: 74). The *enganche* operated in contexts in which the labour demand was temporal and/or geographically dislocated from the supply.[31]

When the railways connected the American and Mexican markets, the *enganche* was adopted by farming, mining, and railway companies in the United States. In this sense, the *enganche* was a search-matching labour institution used by American recruiters to transport and allocate seasonal labourers in the United

[31]Durand (2016: 53) argues that recruiters came to the Bajio to hook and transport labourers to plantations in Oaxaca or to the Yucatan Peninsula. Moreover, the *enganche* was mainly practised in Michoacan, Jalisco, and Guanajuato, states with high population densities and low salaries (Rosenzweig 1965).

States (Clark 1908; Durand 2016; Gamio 1930). While emigrating through the *enganche* eliminated mobility and job-search costs, Durand and Arias (2000) argue that recruiters often took advantage of the migrants' precarious social conditions and limited labour options. The *enganche* was also characterized by false promises and coercive indebtedness methods implemented once the labourers arrived at their destination. Therefore, the *enganche* could have represented a mechanism to reduce migration costs in poorer regions, but a suboptimal option to emigrate in richer regions.

Previous literature suggests that recruiters commonly hired between 30 and 400 migrants depending on the nature of the jobs and season of the year (Clark 1908: 470, 476; Durand 2016: 56, 63). These figures coincide with 20 *enganche* advertisements that we found in different Mexican and American newspapers of the period. To identify the *enganche* migrants in the sample, first we quantify the size of each migration flow based on the migrants' port of entrance, year and month of crossing, location of origin (Mexican municipalities), and location of destination (American counties). Second, we estimate z-scores for each migration flow using the mean and standard deviation of each corridor (municipality–port–county). By standardizing the size of the flows, it is possible to identify unusual monthly crossing peaks in each migration corridor. Finally, we consider as *enganche* migrants those individuals belonging to a flow of at least 30 migrants, and for which z-score was greater than 1. This criteria allows us to identify flows that were actually different, in size, from the average flow of the same migration corridor, which proxies for the presence of *enganche*. A formal expression of this methodology can be consulted in Appendix B.

Table 6 shows the main characteristics of the migrant sample in the pre-Panic (October 1906 to July 1907), Panic (August 1907 to January 1908), and post-Panic (February 1908 to December 1908) periods. We can observe that the *enganche* was almost non-existent during the Panic of 1907. The share of migrants recruited in Mexico went from 36 per cent in the pre-Panic period to 1 per cent during the Panic (Table 6). We believe that the recruiters or *enganchadores* were rational agents that chose the best labourers (the tallest individuals among those willing to emigrate) to maximize productivity at US destinations. When the liquidity of the US economy was constrained due to the Panic of 1907, the American companies were not able to finance the costs associated with the *enganche*. Therefore, the recruitment of labourers with higher physical productivity stopped and the selection patterns observed before the crisis changed.

In addition, we do not observe significant changes in the migrants' locations of birth during the Panic. Figure 3 shows that in both periods (pre-Panic and Panic), the migrant sample was concentrated in the south of the Bajio (Guanajuato, Jalisco, and Michoacan) and in the northern states of Sonora, Nuevo León, and Tamaulipas (see Figure A.1). Hence, the less positive selection during the crisis did not arise from changes across regions of origin.

To test if the *enganche* influenced selection into migration, we first expand Equation 1 as follows:

$$height_i = \beta + \Phi_1 migrant_i + \Phi_2 enganche_i + \mathbf{X}_i'\theta + \alpha_c + e_i \tag{3}$$

where $enganche_i$ is a dummy variable that takes the value of 1 if the migrant crossed the border through the *enganche* and 0 otherwise. The estimated coefficient Φ_2 captures the difference in height between *enganche* and *non-enganche* migrants. Column 2 of Table 7 corroborates that American recruiters chose the tallest labourers: on average, *enganche* migrants were 0.6 cm taller than migrants who crossed the US border without using this labour institution.

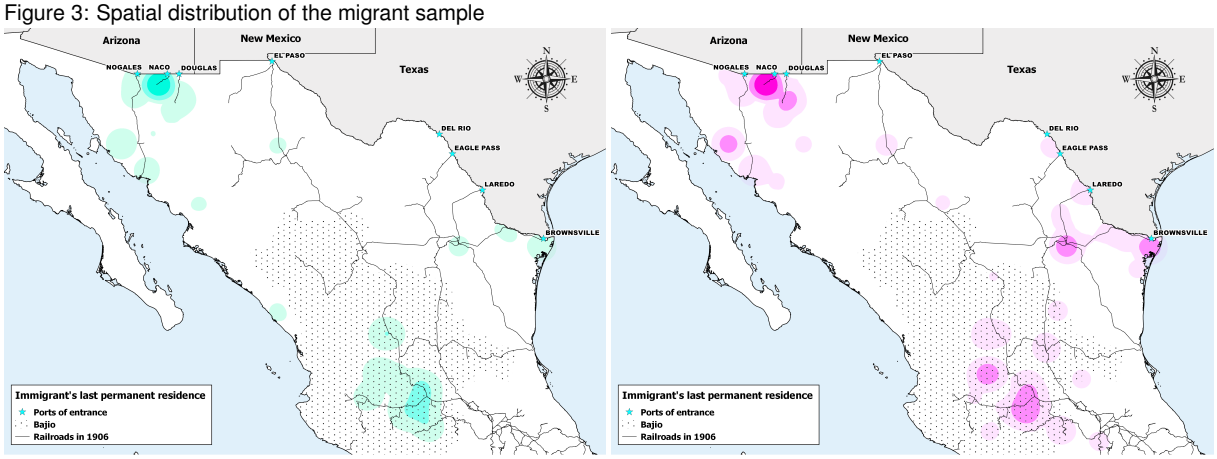
Table 6: Composition of Mexican migration across periods

	Pre-Panic October 1906 to July 1907	Panic August 1907 to January 1908	Post-Panic February 1908 to December 1908
Panel A. Complete sample			
Average height (cm)	168.1	167.3	168.4
Average age (years)	30.5	31.8	32.3
Labour class (%)			
Unskilled	91.6	88.3	83.8
Skilled	5.4	7.8	12.8
Professional	2.0	2.8	2.6
Enganche (%)	36.2	1.2	13.2
Observations (%)	58.0	16.0	25.8
Panel B. Bajio			
Average height (cm)	166.9	166.6	167.6
Average age (years)	30.5	31.5	31.7
Labour class (%)			
Unskilled	96.7	94.3	86.9
Skilled	2.2	3.6	10.7
Professional	0.7	1.4	2.1
Enganche (%)	42.7	0.7	10.2
Observations (%)	64.9	14.8	20.1
Panel C. North			
Average height (cm)	169.8	168.2	168.9
Average age (years)	30.4	32.1	32.8
Labour class (%)			
Unskilled	86.2	85.0	82.6
Skilled	9.5	11.1	14.0
Professional	2.5	2.2	2.1
Enganche (%)	27.3	1.8	15.5
Observations (%)	50.0	17.0	32.5

Note: the migrants' regions of birth and occupations were classified following López-Alonso (2015: 127–28). We consider individuals that had reached their terminal height—individuals between 22 and 65 years old.

Source: authors, based on the Mexican Border Crossing Records—microfilm publication number A3365 and López-Alonso (2015).

Figure 3: Spatial distribution of the migrant sample



(a) Pre-Panic (October 1906 to July 1907) (b) Panic (August 1907 to January 1908)

Note: we consider individuals that had reached their terminal height—individuals between 18 and 65 years old.

Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365.

The estimated coefficient Φ_1 is the difference in height between *non-enganche* migrants and each comparison sample. For example, column 2 in Panel B of Table 7 shows that *non-enganche* migrants were 0.3 cm taller than the military elite (neutrally selected), while *enganche* migrants were 1 cm taller ($\Phi_1 + \Phi_2$)—that is, positively selected. These results hold when including state fixed effects (column 6), suggesting that this labour institution had the potential to influence selection into migration at the local level.

Table 7: Impact of the *enganche* on self-selection patterns: dependent variable is height (cm)

	1	2	3	4	5	6	7	8
Panel A. Federales								
Migrant	2.209***	2.065***	2.400***	2.235***				
	(0.350)	(0.354)	(0.364)	(0.375)				
Migrant × Panic			–0.976***	–0.822***				
			(0.288)	(0.300)				
Migrant × Post-Panic			–0.111	–0.007				
			(0.251)	(0.258)				
Enganche		0.631***		0.474*				
		(0.236)		(0.249)				
Observations	4,822	4,822	4,822	4,822				
R-squared	0.117	0.119	0.119	0.120				
Panel B. Rurales								
Migrant	0.557***	0.394**	0.731***	0.562**	0.514***	0.373*	0.412*	0.219
	(0.187)	(0.198)	(0.204)	(0.226)	(0.194)	(0.205)	(0.213)	(0.234)
Migrant × Panic			–0.994***	–0.841***			–0.644**	–0.474
			(0.289)	(0.301)			(0.291)	(0.302)
Migrant × Post-Panic			–0.060	0.040			0.870***	0.978***
			(0.246)	(0.253)			(0.279)	(0.285)
Enganche		0.617***		0.457*		0.513**		0.513**
		(0.234)		(0.247)		(0.236)		(0.247)
Observations	8,860	8,860	8,860	8,860	8,860	8,860	8,860	8,860
R-squared	0.053	0.054	0.054	0.055	0.063	0.064	0.065	0.066
Panel C. Passports								
Migrant	–2.143***	–2.252***	–1.953***	–2.096***	–2.103***	–2.216***	–2.204***	–2.381***
	(0.508)	(0.509)	(0.518)	(0.523)	(0.513)	(0.514)	(0.524)	(0.528)
Migrant × Panic			–0.958***	–0.807***			–0.675**	–0.486
			(0.288)	(0.299)			(0.290)	(0.300)
Migrant × Post-Panic			–0.092	0.010			0.622**	0.740**
			(0.253)	(0.260)			(0.291)	(0.296)
Enganche		0.618***		0.466*		0.627***		0.594**
		(0.237)		(0.249)		(0.241)		(0.251)
Observations	4,901	4,901	4,901	4,901	4,901	4,901	4,901	4,901
R-squared	0.059	0.060	0.061	0.062	0.077	0.078	0.079	0.080
Skill-level categories	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region of birth categories	Yes	Yes	Yes	Yes	No	No	No	No
Birth year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth state FE	No	No	No	No	Yes	Yes	Yes	Yes

Notes: * significant at 10 per cent level; ** significant at 5 per cent level; *** significant at 1 per cent level. Robust standard errors in parentheses. The omitted categories in columns 1–3 are individuals over age 24, born in the South region and unskilled workers.
Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365 and López-Alonso (2015).

However, the previous results are average estimates for the complete period of the sample (October 1906 to December 1908). To identify whether the absence of the *enganche* explains the shifts in selection patterns, specifically during the Panic period, we expand Equation 2 as follows:

$$\begin{aligned} height_i &= \beta + \Phi_1 migrant_i + \Phi_2 migrant_i \times panic + \Phi_3 migrant_i \times panic^{post} \\ &\quad + \Phi_4 enganche_i + \mathbf{X}_i'\theta + \alpha_c + e_i. \end{aligned} \tag{4}$$

where $enganche_i$ is the same indicator variable previously defined. Equation 4 controls for the *enganche* effect (Φ_4) and provides estimates of Φ_1, Φ_2, and Φ_3 for *non-enganche* migrants. Basically, the estimated coefficient Φ_4 is the average difference in height between *enganche* and *non-enganche* migrants in the pre-Panic and post-Panic periods, because the share of *enganche* migrants was very small during the Panic.

Column 3–Panel B of Table 7 shows that migrants were 0.7 cm taller than the rurales in the pre-Panic period. When controlling for the *enganche* migrants, who were the tallest individuals in the migrant sample, we observe a less positive selection relative to the military elite (column 4, Panel B).[32] This effect accounts for 23 per cent of the average difference in height between migrants and rurales. A similar pattern is observed with the other comparison samples as well. Therefore, we can argue that the *enganche* influenced the selection into migration in the pre-Panic period.

During the Panic of 1907, the *enganche* effect towards a more positive selection is lost, because there were very few *enganche* migrants. Column 4 of Table 7 shows that *non-enganche* migrants became less positively selected: they were 0.8 cm shorter than their pre-Panic counterparts. This result reveals that unobserved forces in combination with the absence of the *enganche* effect could explain the less positive selection observed during the Panic. In addition, the estimated coefficient Φ_3 remains insignificant, implying that the *enganche* did not influence the selection of migrants in the post-Panic period. While the share of *enganche* migrants increased in the post-Panic period (from 1 to 13 per cent), it was far from pre-Panic levels (36 per cent). This suggests that the reimplementation of this labour institution might have been gradual and thus, its influence was not significant in the short-run after the Panic.

Finally, we regress Equation 4 including state of birth fixed effects to control for unobserved factors across states that might have influenced these shifts in selection into migration. Column 8 of Panel B shows that the *enganche* effect remains strong and statistically significant. Although the estimates for the pre-Panic period are not statistically significant, the coefficients' size suggests that the *enganche* accounted for 46 per cent of the average difference in height between migrants and the military elite. The results also confirm that in the post-Panic period, migrants became more positively selected than their pre-Panic peers (column 7). This difference of about 0.6–0.8 cm is captured in Figure 2. The next section addresses the mechanics behind this shift.

7.2 Climate shocks

Results in Table 7 show that the selection into migration of Mexicans changed after the Panic of 1907, and that this shift arose from unobserved factors across states. The forces explaining why migrants became more positively selected in the post-Panic period could come from either demand or supply side. On the one hand, as a result of the shock, the post-Panic labour demand in the United States could have been different. This new composition might have demanded a specific migrant profile. On the other hand, factors in Mexico might have pushed taller individuals to emigrate during the post-Panic

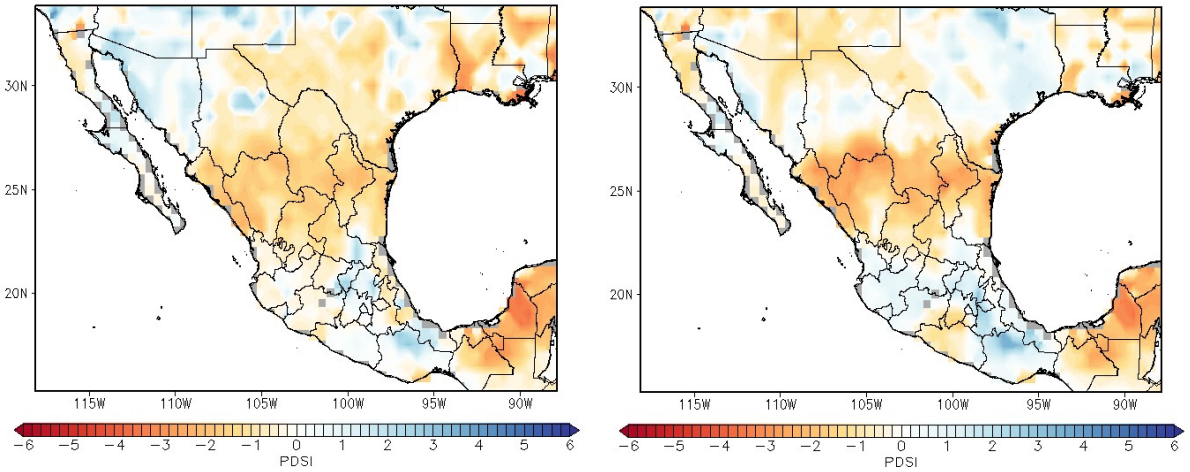
[32]Using the estimated coefficient Φ_4 to approximate the selection pattern of *enganche* migrants in each period would be inaccurate, because the share of *enganche* migrants varies across periods.

period. We explore the latter scenario looking at climate shocks that might have influenced migrant self-selection after the Panic of 1907. Contreras (2005: 123), Clark (1908: 473), and Mayet et al. (1980: 757) document that the states of Chihuahua, Nuevo León, Querétaro, San Luis Potosí, and Zacatecas experienced droughts in 1907 and 1908, causing important crop losses in some areas (Cardoso 1980: 12). Moreover, Figure A.2 in Appendix A shows that migrants came disproportionately from these states during the post-Panic period.

We identify the presence of droughts at the municipality level using the Mexican Drought Atlas (Stahle et al. 2016). It provides reconstructions of a self-calibrating Palmer Drought Severity Index (PDSI) on a 0.5° latitude/longitude grid centred over Mexico from AD 1400 to 2012. We consider that a municipality experienced droughts if the estimated PDSI was –2.0 or lower. According to Wells et al. (2004), these values represent moderate to severe droughts.[33]

Figure 4 shows that droughts affected specific states within regions: the northern Bajio, the eastern states of the North region, and the Yucatan peninsula. The PDSI estimates confirm the presence of droughts in the states mentioned by the historical literature except for Querétaro.[34] The PDSI also captures that municipalities of Coahuila, Durango, Sinaloa, and Tamaulipas were affected by these climate shocks. Precisely, the municipality level estimates allows us to identify droughts accurately in regions covering more than one state.

Figure 4: Droughts in Mexico 1907–08 based on the PDSI



(a) January to December 1907

(b) January to December 1908

Note: the PDSI uses temperature and precipitation data to estimate relative dryness. It is a standardized index that spans from –6 (dry) to +6 (wet). However, values below –2.0 represent moderate droughts while values above +2.0 represent moderate wet spells. The panel shows the presence of regional droughts in 1907 and continues in 1908. The average drought severity index (at the state level) in 1908 was –2.7 (Chihuahua), –2.3 (Coahuila), –2.4 (Durango), –2.4 (Nuevo León), 1.4 (Queretaro), –0.9 (San Luis Potosí), –2.3 (Sinaloa), –2.2 (Tamaulipas), and –0.8 (Zacatecas).

Source: Stahle et al. (2016).

[33]The PDSI uses temperature and precipitation data to estimate relative dryness. It is a standardized index that spans from –6 (dry) to +6 (wet). However, values below –4.0 represent extreme droughts while values above +4.0 represent extreme wet spells (Wells et al. 2004).

[34]The municipalities belonging to the states of San Luis Potosí and Zacatecas present PDSI estimates close to our threshold, and thus we considered them as municipalities that experienced droughts. However, the municipalities of Querétaro present a positive estimates (1.4), which imply the presence of mild wet spells.

To test whether droughts influenced the selection into migration, we expand Equation 2 as follows:

$$\begin{aligned} height_i &= \beta + \Phi_1 migrant_i + \Phi_2 migrant_i \times panic + \Phi_3 migrant_i \times panic^{post} \\ &\quad + \Phi_4 migrant_i \times panic^{post} \times drought + \Phi_5 enganche_i + \mathbf{X}_i'\theta \\ &\quad + \alpha_c + \gamma_s + e_i \end{aligned} \tag{5}$$

where *drought* is a dummy variable that takes the value of 1 if the migrant's location of last residence (municipality) experienced droughts (PDSI values of –2.0 or lower) and 0 otherwise. Since the *enganche* was restored after the Panic, we include an indicator variable for migrants that crossed the border through this labour institution ($enganche_i$). We estimate Equation 2 including state of birth fixed effects (γ_s) instead of birth region categories, because droughts did not affect states homogeneously. Moreover, large states were partially affected, thus we want to capture the effect of droughts on local selection. Everything else being equal, the estimated selection pattern in the locations experiencing droughts during the post-Panic period is $\Phi_1 + \Phi_3 + \Phi_4$.

Table 8 shows that migrants from municipalities experiencing droughts were taller (at least 0.7 cm) than their counterparts from non-drought municipalities (estimated coefficient Φ_4): they were more positively selected relative to the comparison samples. We can see that post-Panic migrants were 0.8 cm taller than their pre-Panic peers (column 1), but when controlling for the effect of droughts the coefficient size reduces (column 2). In other words, the presence of drought accounts for 28 per cent of the differences in height between pre-Panic and post-Panic migrants. Additionally, we control for the *enganche* effect to obtain the net effect: droughts accounted for 15 per cent of the stronger positive selection observed after the Panic of 1907. The same pattern holds relative to the passport holders; however, the estimates are not statistically significant, potentially due to sample size constraints.

Since droughts homogeneously impact the population of an affected location, it is likely that labourers/peasants relatively taller than pre-Panic migrants were pushed to emigrate during the post-Panic period due to the poor harvests. Hence, the observed positive selection might be a result of two overlapping forces: the reactivation of the American financial system and the persistence of regional droughts in Mexico.

Table 8: Impact of droughts on self-selection patterns: dependent variable is height (cm)

	1	2	3	4	5	6
	Rurales	Rurales	Rurales	Passports	Passports	Passports
Migrant	0.412*	0.409*	0.224	-2.204***	-2.212***	-2.382***
	(0.213)	(0.213)	(0.234)	(0.524)	(0.523)	(0.528)
Migrant × Panic	-0.644**	-0.627**	-0.465	-0.675**	-0.656**	-0.475
	(0.291)	(0.291)	(0.302)	(0.290)	(0.290)	(0.300)
Migrant × Post-Panic	0.870***	0.620**	0.736**	0.622**	0.396	0.524
	(0.279)	(0.314)	(0.321)	(0.291)	(0.321)	(0.327)
Migrant × Post-Panic × Drought		0.826**	0.789*		0.785*	0.736*
		(0.410)	(0.412)		(0.420)	(0.422)
Enganche			0.492**			0.574**
			(0.248)			(0.252)
Observations	8,860	8,860	8,860	4,901	4,901	4,901
R-squared	0.065	0.066	0.066	0.079	0.080	0.081
Skill-level categories	Yes	Yes	Yes	Yes	Yes	Yes
Region of birth categories	No	No	No	No	No	No
Birth year FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth state FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: * significant at 10 per cent level; ** significant at 5 per cent level; *** significant at 1 per cent level. Robust standard errors in parentheses. The omitted categories are unskilled workers and locations without droughts.

Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365 and López-Alonso (2015).

8 Conclusion

Using a unique data set consisting of individual border crossings, military recruitment records, and passport applications, we estimate the selection of Mexican migration to the United States at the beginning of the flow (1906–08). The results suggest that, on the basis of height, the first Mexican migrants were not drawn from the lowest ranks of the height distribution of the Mexican population. On the contrary, Mexico sent its tallest and most physically productive labourers to the United States. This positive selection relative to the Mexican working class continued in the early 1920s (Kosack and Ward 2014). Consequently, the persistent drain of high-quality labourers arises as a key element to understand the outstanding economic expansion of the American Southwest in the early twentieth century (Gratton and Merchant 2015: 528).

In addition, migrants from poorer regions were disproportionately drawn from the upper ranks of the height distribution. While this finding corroborates the importance of liquidity constraints in generating positively selected migration (Belot and Hatton 2012), we focus on institutions as mechanisms that can influence migrant selection (Abramitzky and Boustan 2017: 1325). We show that the *enganche*, a search-matching mechanism used by American recruiters to transport and allocate labourers in the United States, influenced the positive selection of Mexican migration, and the absence of this labour institution was associated with a less positive selection into migration. The persistence of institutions like the *enganche* may have unpredicted, long-lasting effects on migrant selection patterns, and therefore on the economic development of migrant-sending regions. We believe this is a crucial area of future research.

The main lesson to take from our research is that, in the absence of legal immigration restrictions, random shocks from both the demand and supply side can change migrant self-selection in the short run. The adjustment mechanisms that we explore operated at the local level, confirming that the decision to migrate is influenced by local conditions (Spitzer and Zimran 2018). While structural changes in the national economic environment would predict shifts in selection over time, we argue that unanticipated events such as financial crises and natural disasters have the potential to modify selection patterns very quickly at the local level. We join previous recommendations highlighting that to properly understand migrant self-selection, we must evaluate the quality of migrants relative to their local environments.

References

Abramitzky, R., and L. Boustan (2017). 'Immigration in American Economic History'. *Journal of Economic Literature*, 55(4): 1311–45.

Abramitzky, R., L.P. Boustan, and K. Eriksson (2012). 'Europe's Tired, Poor, Huddled Masses: Self-Selection and Economic Outcomes in the Age of Mass Migration'. *American Economic Review*, 102(5): 1832–56.

Ambrosini, J.W., and G. Peri (2012). 'The Determinants and the Selection of Mexico–US Migrants'. *The World Economy*, 35(2): 111–51.

Andrew, A.P. (1908). 'Substitutes for Cash in the Panic of 1907'. *The Quarterly Journal of Economics*, 22(4): 497–516.

Balke, N.S., and R.J. Gordon (1989). 'The Estimation of Prewar Gross National Product: Methodology and New Evidence'. *Journal of Political Economy*, 97(1): 38–92.

Belot, M.V., and T.J. Hatton (2012). 'Immigrant Selection in the OECD'. *The Scandinavian Journal of Economics*, 114(4): 1105–28.

Bleakley, H., D. Costa, and A. Lleras-Muney (2014). 'Health, Education, and Income in the United States, 1820–2000'. In L.P. Boustan, C. Frydman, and R.A. Margo (eds), *Human Capital in History: The American Record*. Chicago, IL: University of Chicago Press.

Bodenhorn, H., T.W. Guinnane, and T.A. Mroz (2017). 'Sample-Selection Biases and the Industrialization Puzzle'. *The Journal of Economic History*, 77(1): 171–207.

Borjas, G.J. (1987). 'Self-Selection and the Earnings of Immigrants'. *American Economic Review*, 77(4): 531–53.

Borjas, G.J., I. Kauppinen, and P. Poutvaara (2018). 'Self-Selection of Emigrants: Theory and Evidence on Stochastic Dominance in Observable and Unobservable Characteristics'. *The Economic Journal*, 129(617): 143–71.

Brass, T. (1990). 'The Latin American Enganche System: Some Revisionist Reinterpretations Revisited'. *Slavery and Abolition*, 11(1): 74–103.

Bruner, R.F., and S.D. Carr (2007). 'Lessons from the Financial Crisis of 1907'. *Journal of Applied Corporate Finance*, 19(4): 115–24.

Campos-Vázquez, R.M. and R. Vélez-Grajales (2012). 'Did Population Well-being Improve during Porfirian Mexico? A Regional Analysis Using a Quasi-Human Development Index'. *Journal of Human Development and Capabilities*, 13(4): 597–620.

Cardoso, L.A. (1980). *Mexican Emigration to the United States, 1897–1931*. Tucson, AZ: University of Arizona Press.

Chiquiar, D. and G.H. Hanson (2005). 'International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States'. *Journal of Political Economy*, 113(2): 239–81.

Clark, V. (1908). 'Mexican Labor in the US'. *Bulletin of the United States Bureau of Labor*, 17(78), 466–522.

Cohn, R.L. (1995). 'Occupational Evidence on the Causes of Immigration to the United States, 1836–1853'. *Explorations in Economic History*, 32(3), 383–408.

Contreras, C. (2005). 'The Droughts in Mexico during the XIX Century'. *Investigaciones Geográficas*, 58: 118–33.

CosíoVillegas, D., and I. Bernal (1973). *Historia Mínima de México*. Mexico City: El Colégio de México.

Durand, J. (2016). *Historia Mínima de la Migración México-Estados Unidos*. Mexico City: El Colégio de México.

Durand, J., and P. Arias (2000). *La experiencia migrante: iconografía de la migración México-Estados Unidos*. Tlaquepaque: Ucol.

Escamilla-Guerrero, D. (2018). 'Initial Determinants of Mexican Mass Migration'. Unpublished manuscript. London: London School of Economics.

Feliciano, Z.M. (2001). 'The Skill and Economic Performance of Mexican Immigrants from 1910 to 1990'. *Explorations in Economic History*, 38(3): 386–409.

Fogel, W. (1978). *Mexican Illegal Alien Workers in the United States*. Los Angeles, CA: Institute of Industrial Relations, UCLA.

Frydman, C., E. Hilt, and L.Y. Zhou (2015). 'Economic Effects of Runs on Early "Shadow Banks": Trust Companies and the Impact of the Panic of 1907'. *Journal of Political Economy*, 123(4): 902–40.

Fuller, R. (1928). 'Occupations of the Mexican-Born Population of Texas, New Mexico and Arizona, 1900–1920'. *Journal of the American Statistical Association*, 23(161): 64–67.

Gamio, M. (1930). *Mexican Immigration to the United States*. Chicago, IL: University of Chicago Press.

Garcíay Griego, M. (1983). 'The Importation of Mexican Contract Laborers to the United States, 1942–1964: Antecedents, Operation, and Legacy'. In P.G. Brown and H. Shue (eds), *The Border that Joins. Mexican Migrants and US Responsibility*. Lanham, MD: Rowman and Littlefield.

Gratton, B., and E. Merchant (2015). 'An Immigrant's Tale: The Mexican American Southwest 1850 to 1950'. *Social Sciences History*, (39): 521–50.

Hansen, B.A. (2014). 'A Failure of Regulation? Reinterpreting the Panic of 1907'. *Business History Review*, 88(3), 545–69.

Jenkins, J.C. (1978). 'The Demand for Immigrant Workers: Labor Scarcity or Social Control?' *International Migration Review*, 12(4): 514–35.

Johnson, J.F. (1908). 'The Crisis and Panic of 1907'. *Political Science Quarterly*, 23(3): 454–67.

Kaestner, R. and O. Malamud (2014). 'Self-Selection and International Migration: New Evidence from Mexico'. *Review of Economics and Statistics*, 96(1): 78–91.

Kosack, E. and Ward, Z. (2014). 'Who Crossed the Border? Self-Selection of Mexican Migrants in the Early Twentieth Century'. *The Journal of Economic History*, 74(4): 1015–44.

López-Alonso, M. (2007). 'Growth with Inequality: Living Standards in Mexico, 1850–1950'. *Journal of Latin American Studies*, 39(1): 81–105.

López-Alonso, M. (2015). *Estar a la altura. Una historia de los niveles de vida en Mexico, 1850–1950*. Mexico City: Fondo de Cultura Económica.

López-Alonso, M., and R.P. Condey (2003). '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.

Markham, J.W. (2002). 'The Panic of 1907'. In J.W. Markham, *A Financial History of the United States*, volume II: *From JP Morgan to the Institutional Investor (1900–1970)*. Armonk, NY: Sharpe.

Mayet, E.F., J.S. yCervera, and D.P.G. Arias (1980). 'Las sequías en México: historia, características y efectos'. *Comercio Exterior*, 30(7): 756.

McKenzie, D., and H. Rapoport (2010). 'Self-Selection Patterns in Mexico–US Migration: The Role of Migration Networks'. *The Review of Economics and Statistics*, 92(4): 811–21.

Moen, J., and E.W. Tallman (1992). 'The Bank Panic of 1907: The Role of Trust Companies'. *The Journal of Economic History*, 52(3), 611–30.

Moraga, J.F.-H. (2011). 'New Evidence on Emigrant Selection'. *The Review of Economics and Statistics*, 93(1): 72–96.

Odell, K.A., and M.D. Weidenmier (2004). 'Real Shock, Monetary Aftershock: The 1906 San Francisco Earthquake and the Panic of 1907'. *The Journal of Economic History*, 64(4): 1002–27.

Orrenius, P.M., and M. Zavodny (2005). 'Self-Selection Among Undocumented Immigrants from Mexico'. *Journal of Development Economics*, 78(1): 215–40.

Rhode, P.W. (2002). 'Gallman's Annual Output Series for the United States, 1834–1909'. Technical report. Cambridge, MA: National Bureau of Economic Research.

Romer, C.D. (1989). 'The Prewar Business Cycle Reconsidered: New Estimates of Gross National Product, 1869–1908'. *Journal of Political Economy*, 97(1): 1–37.

Rosenzweig, F. (1965). 'El Desarrollo Económico de México de 1877 a 1911'. *El Trimestre Económico*, 32(127(3)): 405–54.

Roy, A.D. (1951). 'Some Thoughts on the Distribution of Earnings'. *Oxford Economic Papers*, 3(2): 135–46.

Samora, J. (1982). *Los Mojados: The Wetback Story*. Notre Dame, IN: University of Notre Dame Press.

Schneider, E.B., and K. Ogasawara (2018). 'Disease and Child Growth in Industrialising Japan: Critical Windows and the Growth Pattern, 1917–39'. *Explorations in Economic History*, 69: 64–80.

Schultz, T.P. (2002). 'Wage Gains Associated with Height as a Form of Health Human Capital'. *American Economic Review*, 92(2): 349–53.

Spitzer, Y., and A. Zimran (2018). 'Migrant Self-Selection: Anthropometric Evidence from the Mass Migration of Italians to the United States, 1907–1925'. *Journal of Development Economics*, 134: 226–47.

Stahle, D.W., E.R. Cook, D.J. Burnette, et al. (2016). 'The Mexican Drought Atlas: Tree-Ring Reconstructions of the Soil Moisture Balance during the Late Pre-Hispanic, Colonial, and Modern Eras'. *Quaternary Science Reviews*, 149: 34–60.

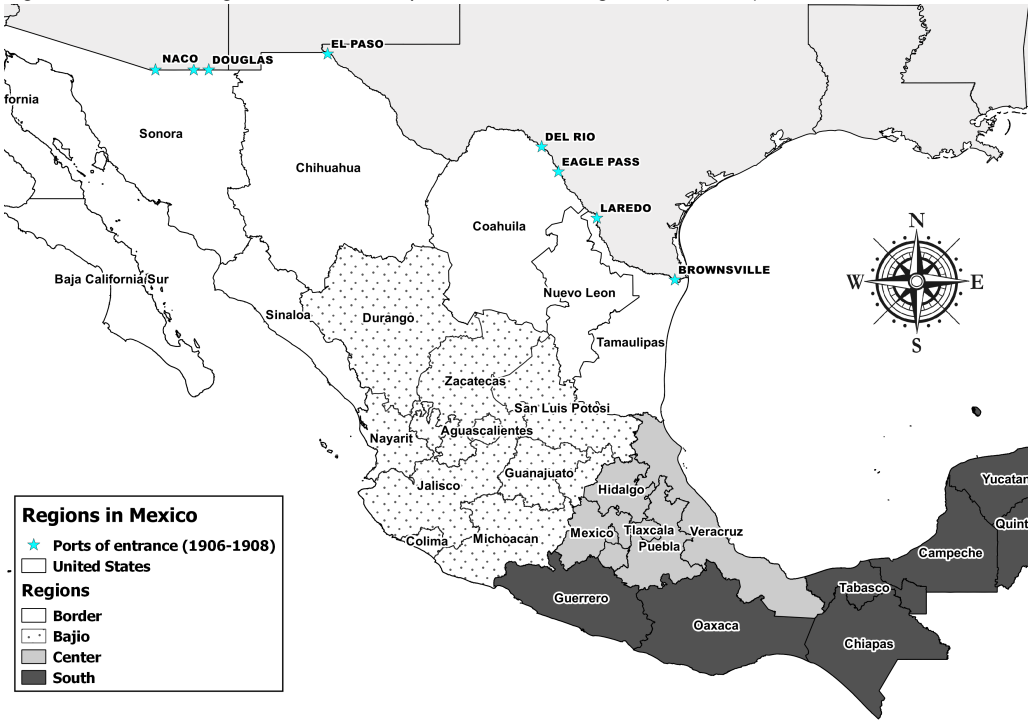
Washington Post (1907). Stocks thrown over. 13 August: 3.

Verduzco, G. (1995). 'La migración Mexicana a Estados Unidos: recuento de un proceso histórico'. *Estudios Sociológicos*, 13(39): 573–74.

Wells, N., S. Goddard, and M.J. Hayes (2004). 'A Self-Calibrating Palmer Drought Severity Index'. *Journal of Climate*, 17(12): 2335–51.

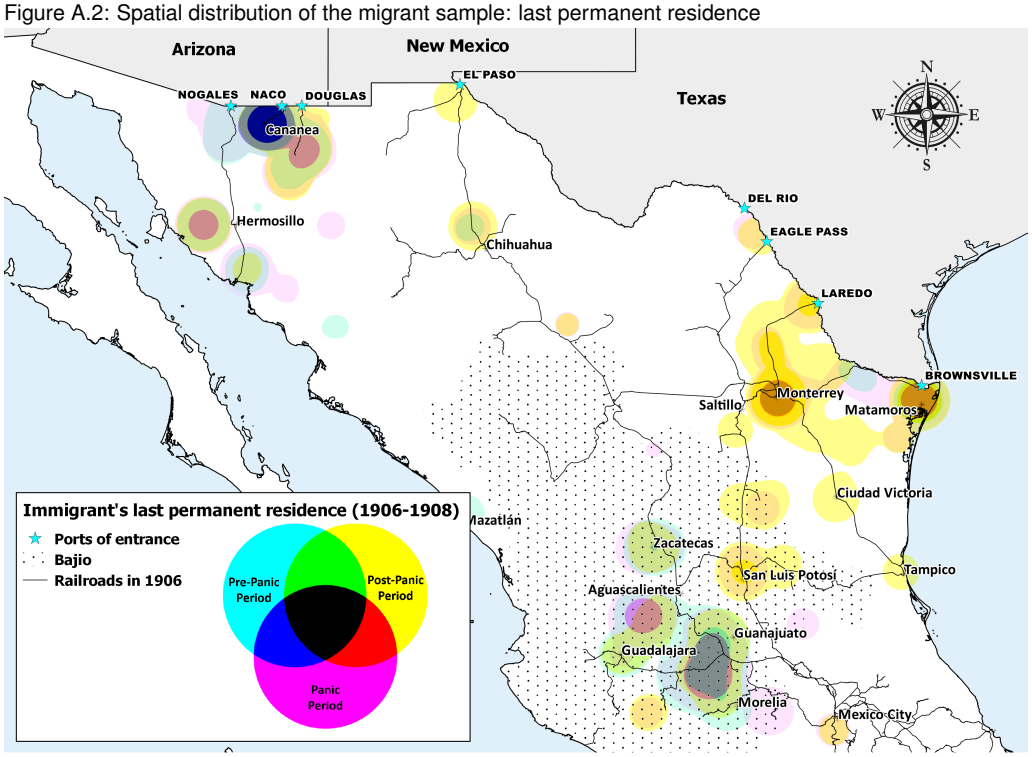
Appendix A

Figure A.1: Mexican regions and entrance ports of Mexican migrants (1906–08)



Source: authors, based on immigrant regions of birth classified following López-Alonso (2015: 127).

Figure A.2: Spatial distribution of the migrant sample: last permanent residence



Note: we consider individuals that had reached their terminal height—individuals between 18 and 65 years old. Pre-Panic (October 1906 to July 1907), Panic (August 1907 to January 1908), and post-Panic (February 1908 to December 1908).

Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365.

Appendix B

Identification of the *enganche*

To identify the *enganche*, we quantify the number of migrants (i) by port of entrance (p), year–month of crossing (t), municipality of origin (o), and county of destination (d):

$$w_{ptod} = \sum i_{ptod} \tag{6}$$

We standardize the size of each migration flow (w_{ptod}) using the mean (μ_{pdo}) and standard deviation (σ_{pdo}) of the corridor (w_{pdo}) to which the flow belongs:

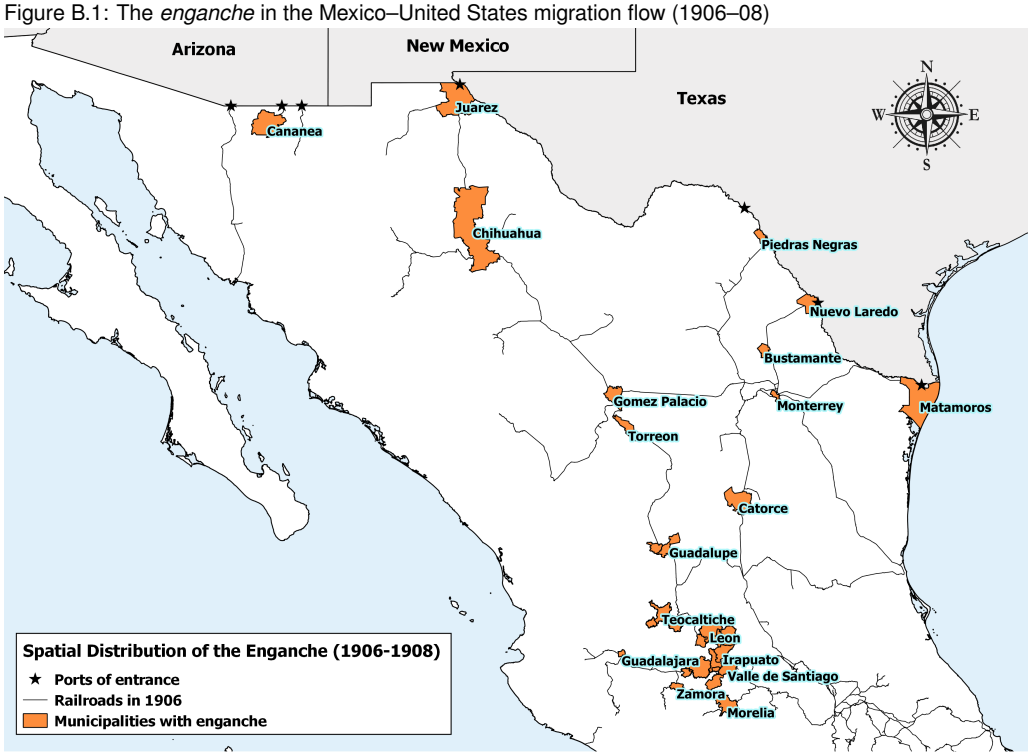
$$z_{ptod} = (w_{ptod} - \mu_{pdo})/\sigma_{pdo} \tag{7}$$

The *z-scores* (z_{ptod}) allow us to identify unusual monthly crossing peaks in each migration corridor. Following Clark (1908) and Durand (2016), American recruiters commonly hired between 30 and 400 migrants depending on the nature of the jobs and season of the year. Therefore, we identified the *enganche* flows with the following criteria:

$$enganche_{ptod} = \begin{cases} 1 & \text{if } w_{ptod} \geq 30 \text{ and } z_{ptod} \geq 1 \\ 0 & \text{otherwise} \end{cases} \tag{8}$$

We identify flows of at least 30 migrants registered at the same port of entrance, in the same specific month, reporting the same origin (Mexican municipality) and destination (US county) locations; and which size was at least one standard deviation above the average size of the flows in each migration corridor. Finally, we match the identified *enganche* flows with the final migrant sample: all individuals belonging to an *enganche* flow are considered *enganche* migrants. Figure B.1 displays the spatial distribution of this labour institution.

Figure B.1: The *enganche* in the Mexico–United States migration flow (1906–08)



Note: the polygons display the municipalities with presence of the *enganche*, a search-matching labour institution that reduced migration costs and information asymmetries. Recruiters or *enganchadores* covered the transportation costs of the migrant in exchange for future labour. We define *enganche* flow as flows of 30 or more migrants the size of which was at least one standard deviation above the average size of the migration corridor.

Source: authors, based on Mexican Border Crossing Records—microfilm publication number A3365.