

## Well Being and Biological Standards of Living: The Mexican Case

*“Well-Being and Biological Standards of Living: The Mexican Case”*

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### RESUMEN

Este trabajo explora la evolución del nivel de vida biológico de la población mexicana para las generaciones nacidas entre el Porfiriato y las primeras cuatro décadas del periodo Post-Revolucionario a través de la estatura de soldados y personas que solicitaban pasaportes. Con miles de datos de reclutas que ingresaron a las fuerzas armadas mexicanas a partir de 1910 aproximadamente y con los datos de todas aquellas personas que solicitaron pasaportes entre 1918 y 1934 se construyeron series de estaturas para hombres y mujeres y se discuten algunas hipótesis sobre los factores determinantes de su evolución. Para verificar las relaciones entre altura y bienestar, las series se contrastan con información sobre crecimiento económico, mortalidad y fertilidad. La evidencia aportada demuestra una variación mínima en las estaturas promedio de la población. La desigualdad en la distribución de la riqueza, aunada a tasas de fertilidad sistemáticamente elevadas en un periodo en que la mortalidad estaba disminuyendo sustancialmente explican el estancamiento de las estaturas de la población mexicana a pesar del crecimiento y desarrollo económico que México experimenta durante el mismo periodo.

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## **Introduction**

The importance of the long-run evolution of living standards and their correlation to economic growth in Mexico is only matched by our ignorance of what actually happened. Since their independence from Spain, one of Mexico's central concern has been to further the improvement of living standards of their populations. Today, this is still a priority issue in the governments' agenda. One wonders why, in almost two centuries of constant concern for the well being of the population, the issue has not been solved yet. In addition, in 1910 there was a social Revolution where the victors claimed that the Revolutionary goal was to raise the living standards of the population. There is prolific documentation on what it was intended to do but, other than some studies that offer "snapshots" of the living standards of a particular group of people, in a specific place at some point in time, and some isolated pieces of anecdotal evidence, the impact of what was actually done remains unclear. We know that, during the last hundred years, Mexico industrialized and has enjoyed some periods of sustained economic growth. However, the alleviation of poverty is a problem that remains to be solved. We do not think of Mexico as poor or a rich country, but rather as an intermediate case of a modern nation full of contradictions.

This paper seeks to shed light on the evolution of living standards of the Mexican population during the period 1870-1940 using a biological standard of living approach. This approach uses the evolution of height and physical well being as proxies of the standards of living. By physical well being we understand the quality of health and nutrition of a population. The argument of this work is that the average heights of the Mexican population barely improved during the period, hence the average Mexican born in 1950 is not taller than the average Mexican born in 1870. There are however differences across social classes and regions. This argument is

based on the study of military and passport records using an anthropometric approach. These results are shocking for at least three reasons. First, this was the very period when Mexico industrialized and experienced rapid economic growth. Second, during this time infant mortality fell; life expectancy rose and yet there was no improvement in stature. And third, these results run against the history of heights of just about everywhere else they have been measured.

The causes of these shocking results lie on the demographic behavior of the Mexican population and its consequences on the quality of health and nutrition. A combination of public health initiatives, advances in medical knowledge, and --most likely-- rising incomes produced a decline in infant mortality and an increase in average life expectancy. For cultural reasons, however, Mexican families maintained their historical levels of fertility, thereby setting off a rapid growth in population. The result was that the diet of Mexican children did not improve. Mexico's population, while not calorically malnourished, was protein malnourished.

The remainder of this work proceeds as follows. Section II describes the sources of data. Section III presents the analysis of the evolution of heights of the Mexican population. Section IV elaborates on the causes of the unexpected evolution of heights. Section V concludes with a discussion of the results in the light of the proposed hypothesis.

## **II. The sources**

There were no official anthropometric statistics of the Mexican populations for the period of study. It is not until well into the twentieth century that most government institutions started gathering data on heights in a systematic way. Hence for this work it was necessary to construct the data series from the primary sources.

The primary sources I work with are the recruitment files of inducted soldiers from the archives of the Ministry of Defense (Secretaría de la Defensa Nacional) and the passport records

from the Ministry of Foreign Affairs (Secretaría de Relaciones Exteriores (SRE)). The data includes men and women. The samples contain information on heights, occupation, literacy, place of birth, place of recruitment (for soldiers) and, also for soldiers, information on health status. The information allows us to undertake a systematic study of the evolution of heights, controlling for intervening variables.

1. *Data from the military.*

The data from the military as drawn from the *Archivo de Concentración*, this contains the soldiers who are still alive (*Sección de Personal Activo*), which are closed to the public, as well as the *Sección de Cancelados* and the Personal Extinto. The *Sección de Cancelados* includes the files of deserters and dismissed personnel. The *Sección the Personal Extinto* contains the files of the deceased.<sup>1</sup> The sample on women was drawn from the *Sección de Personal de Sanidad*, which included nurses, doctors and janitorial personnel. Approximately ninety five percent of the male soldiers were draftees. There is no sample on the officers because the heights of incoming students in the *Colegio Militar* were not systematically recorded.

To give the reader an idea of potential systematic biases, the essential requirements to join the military were the following:

- I. Be at least 18 years old and not older than 45.
- II. Be Mexican by birth or by naturalization.
- III. Not being suspended from rights of citizenship
- IV. Not have any chronic or contagious diseases or any handicap that hinders the use of weapons.
- V. Not to have any physical defect “of monstrous or ridiculous appearance.”

VI. Not being deaf, idiot or monomaniac.

VII. Understand Castilian language.

VIII. Be at least 1.60 meter of height.<sup>2</sup>

Judging from these requirements we would expect to find a sample biased towards Mexican, healthy, adult, non-indigenous males. *De facto*, however, we do not find these biases in the sample. The reason for this is the low degree of enforceability on these requirements for most of the period of study. The analysis of the data from the recruitment files will show that height was the least enforced requirement, followed to a lesser extent by age and understanding of Castilian language (Spanish). The lack of enforcement will show more frequently in the sample drawn from the *Cancelados* section.

The recruitment files contain information on age, height, place of birth, place of recruitment, literacy, occupation before joining the military, and health status.<sup>3</sup> Age is a self-described variable because birth certificates were not widely issued until the 1930s and parishes did not issue copies of baptismal records. Heights were measured with the metric system, which was officially adopted in Mexico in the 1880s.<sup>4</sup> The samples are cross-sectional because soldiers were measured only at the time of recruitment. The heights were rounded off to the nearest centimeter. The place of birth is also self-described. The place of recruitment allows us to check if there are certain patterns of migration and the impact of the process of urbanization, and, most importantly draw a comparison of the quality of life between rural and urban dwellers. There is a risk of making an overestimation of the urban soldiers because it was often the case that if

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<sup>1</sup> *Personal Extinto* included all soldiers who had served in the military and died while in service or retired and then died.

<sup>2</sup> The minimum height requirement was not established until the twentieth century and it is not clear when exactly this practice began. At least for the period of study I did not find any record of soldiers rejected for not meeting the minimum height.

<sup>3</sup> By health status I mean if soldiers had any disease and died of it, and if so at what age.

someone were from a very small town, community or rancho near a city this person would say he was from the nearby city.<sup>5</sup> This information enables one to see the regional composition of the sample that is useful to draw a comparison across regions. Literacy was decided on whether or not the recruits could sign their name at the time of recruitment. The military had programs to teach illiterate soldiers to read and write, so in theory all non-deserters eventually became literate.

The information on occupation before joining the army is the variable that allows me to know the social class of the soldiers. Literacy is also a relevant variable during this time for it can be employed as a proxy for education. It also works as a good way to determine social class too because the Mexican population showed high percentages of illiteracy up until the 1920s. Unfortunately, not all the files had this information systematically recorded. The advantages and disadvantages of the quality and quantity of information contained in these samples are discussed below.

There are two limitations to the deserters and dismissed personnel sample (*cancelados*). One is that the size of the sample is very small with respect to the total of this category. I have a sample of 2,600 deserters while there are 110,000 files of *cancelados*; this is for all cohorts born between 1870-1950. The other is that it does not provide any information on health or information on length of life. The average length of stay of the deserters was just a few months.<sup>6</sup>

The information on dismissed personnel is the same as the information on deserters. The permissions for dismissal most commonly demanded were the ones to arrange family affairs. Even though the dismissed personnel served in the army for an average of three years, once they

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<sup>4</sup> Maximilian of Habsburg first introduced the metric system in Mexico in the 1860s during the French invasion.

<sup>5</sup> This phenomenon is very common even today.

left the army there was no follow up of them because they were not entitled to a retirement pension or to medical services. Thus the biases we encounter are the same for both the deserters and the dismissed personnel.

The *non-deserters*. The sample of soldiers (*Personal Extinto*) who served and retired or were killed in action or died of disease is more complete because it provides information on health status of the soldiers and life expectancy. It is the most similar sample to the ones used for studies in the United States and Europe. Hence, we can draw more information from it. There are 2,500 soldiers in this sample, which are approximately 40 percent of the total in the non-deserters category during this period (5,800 soldiers).<sup>7</sup>

*Women in the military*. I also retrieved data on women. My sample of women is an attempt to take into account all sectors of the population. With the opening of the school of nurses in the second decade of the twentieth century, women were officially included in the army. Unfortunately, during the first years of the school's existence, the admission files did not record the stature of female recruits. It was not until the end of the 1930s that statures began to be recorded in a systematic basis. At the same time, women were recruited as soldiers to work as office clerks and in the cleaning and cooking services. The sample for the female population is therefore reduced with respect to the male population. However, this sample covers a wide spectrum of the society because it contains information on women who came from the countryside but had no education, to women who had some skills, to women who were aiming to have a career. Throughout this period there was no minimum height requirement for women.

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<sup>6</sup> Most of the time soldiers were not captured after they deserter, but if they were, they were imprisoned for a while and then were re integrated into the service.

*Heights and social class.* Until the 1930s, the height of the boys entering the school of officers (Colegio Militar) was not recorded. Once they graduated, their recruitment files did not record their height either; there is information only on their age, civil status, military rank and place of birth. The absence of data on heights of the school of officers leaves the sample without information on the heights of the upper classes.

*Race.* The issue of racial composition is difficult hard to disentangle. There is no reliable way to differentiate race in Mexico with the military the way it is done for the nineteenth century military of the United States. Most Mexican soldiers were mestizo. There likely was a significant number of indigenous recruits, but it is difficult to determine the percentage because this particular information was not included in the recruitment files.

## 2. *The passport records*

Given that the data obtained from the military archives provided too small a sample of the better off strata of the population, it was necessary to search for an alternative to fill out this missing part of the picture. The passport records were the solution. SRE has microfilmed records of all passports issued since 1910. Assuming that people who requested passports were people who the means to travel abroad for business, study or leisure, we consider these records an appropriate source to gather data on heights for the middle and upper classes. The data series has 3838 observations, of which 2549 are male and 1289 are females. As with any historical data, these series have advantages and disadvantages.

On the one hand, this data set has substantial advantages. First, since these are records of all people who were going to travel at a time, the sample includes men, women and children. Second, we can detect the social stratum an individual belonged to. For adult men we know their

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<sup>7</sup> I should point out that I revised ninety percent of the files in the *personal extinto* section, not all the files had

profession, which enables us to define where they were located in the social spectrum. We cannot do this for women because most Mexican women at the time did not have a profession. We can, however, infer their social class by searching in their birth certificate for the profession of their fathers. The same can be done for children, teenagers, and young adults who are listed as students. Therefore, for similar ages in students and schoolchildren and for adult women, we can draw comparisons of heights across social classes.

On the other hand, there are three basic disadvantages to working with these records. First, although the microfilms are available for the period starting in the 1910s, heights were not recorded in numerical figures until the late 1910s and the change to numerical figures was gradual. Hence what we have for height in the early part of the 1910s is a description like tall, medium, short (*alta, mediana, baja*). This creates a problem of accuracy because there were no rules to specify how tall is tall or how short is short. It was not until *circa* 1923 that all statures were recorded in numbers. This was mainly in meters and centimeters but it was not rare to find some heights given in inches and feet. Second, these figures are self-reported. Unlike the military there was not independent verification. Third, these records reflect all the passports that the (SRE) issued but not all permits to travel to a specific place. There were those states of the republic that were too far away from Mexico City to make it practical to come to the capital just to have a passport issued. We have no record of these permits, which presumably are located in state archives. Thus our sample undercounts people from the frontier states (see table II.1).

*Other sources.*

I worked with some data published by official sources. These sources were the population censuses published by INEGI. The disadvantage of the INEGI data is that it only covers the

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information on heights only the 2,500 mentioned.

information gathered by the State's health institutions and these leaves us without information on the important portion of the population who do not have access to health care services.

### 3. *The basic features of the sample*

*The military sample.* Most of the recruits came from the Center and the Bajío (Center/North) regions. The males were mainly recruited between the ages of 18 and 30.<sup>8</sup> The centers of

	<b>Sample</b>	<b>1900 census</b>	<b>1921 census</b>
North	7.85	12.77	14.63
Bajío	24.37	28.04	25.51
Center	60.43	41.96	41.58
South	7.34	17.23	18.28

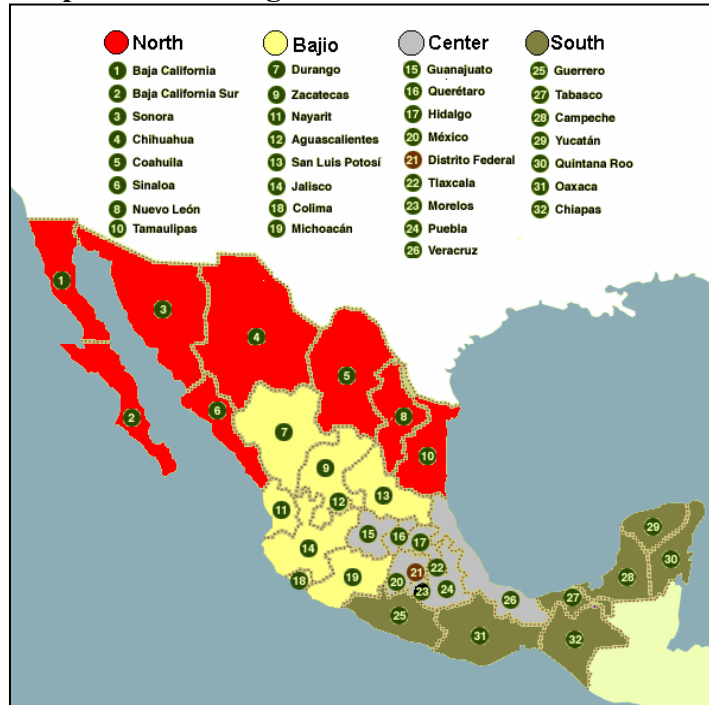
Source: INEGI.

recruitment changed over time according to the needs of the military. Unfortunately there is no information on the recruitment centers or how they changed over time. What we do see is that over time the number of recruits from the South is low and stable while the number of recruits from the North declined. The percentage of soldiers from the center remained constant while that of the Bajío increased. Most of the draftees were working class males, mainly unskilled workers. The percentage of illiterate recruits is higher for those soldiers born during the first two decades of the study but it decreases over time.<sup>9</sup> This is an unusual feature given that the sample covers mainly working class males, thus we can rule out the possibility that the sample over-represents the indigent portion of the working class. This is, we are not measuring the poorest of the poor.

<sup>8</sup> Although we do see that there were males recruited that were not within this age range.

<sup>9</sup> To define literacy I use the UNESCO convention that considers literate an individual who can sign its name.

**Map II. 1 Four Regions of Mexico**



*The passport and female samples.* The passport sample is composed of skilled manual workers, white-skilled collar workers and elite. Literacy is universal in this sample. The same features are true for the sample of women in the military.

**Table II.2 Female Passport Distribution by Social Class (% of total)**

Unskilled	12.77
Skilled Manual	58.89
Skilled White Collar	23.49
Elite	4.85

<b>Occupational Group</b>	<b>Dummies</b>
Labrador (farm worker/farmer)	Unskilled
Campesino (peasant)	Unskilled
Jornalero (laborer)	Unskilled
Obrero (worker)	Unskilled
Minero (miner)	Unskilled
Albañil (construction worker)	Unskilled
Zapatero (shoemaker)	Skilled Manual Laborer
Talabartero (saddler)	Skilled Manual Laborer
Tejedor (weaver)	Skilled Manual Laborer
Sastre (taylor)	Skilled Manual Laborer
Operario (machine operator)	Skilled Manual Laborer
Herrero (blacksmith)	Skilled Manual Laborer
Carpintero (carpenter)	Skilled Manual Laborer
Curtidor (tanner)	Skilled Manual Laborer
Comerciante (merchant)	Skilled Manual Laborer
Panadero (baker)	Skilled Manual Laborer
Chofer (chauffeur)	Skilled Manual Laborer
Filarmónico (musician)	Skilled White-Collar
Mecanógrafo (typist)	Skilled White-Collar
Profesor de Primaria (school teacher)	Skilled White-Collar
Tenedor de libros (book keeper)	Skilled White-Collar
Empleado federal (federal employee)	Skilled White-Collar
Propietario (landowner)	Elite
Médico (Physician)	Elite
Abogado (lawyer)	Elite
Ingeniero (engineer)	Elite
Estudiante (student)	Students were assigned the social class according to what their parents' occupation was.

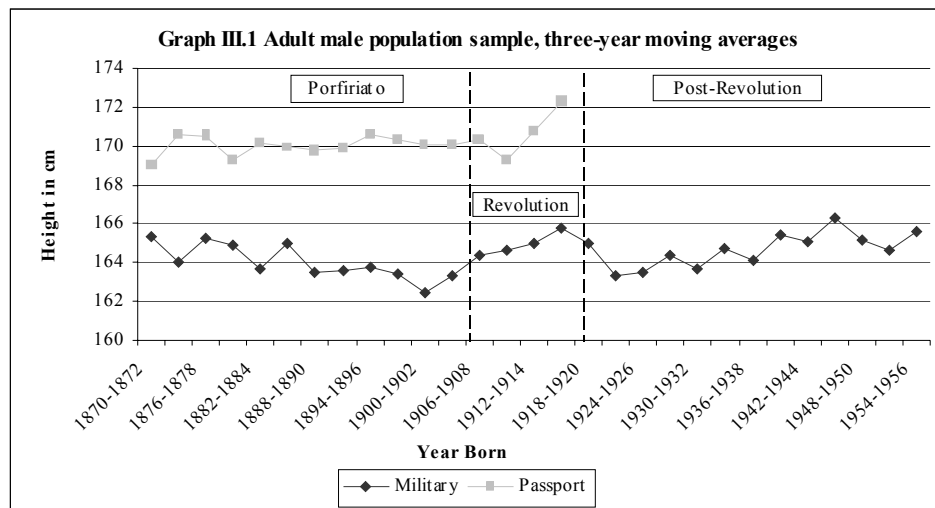
### **III. Trends in heights**

In order to study the evolution of heights of the Mexican population it is necessary to observe the trends in heights across regions, across socio-economic levels, and between men and women. This will allow us to know if the gap across regions, social classes and genders narrowed over time or if the differences persisted.

Once we have shed light on the evolution of heights by regions, class, and gender, we will turn our attention to the factors that determined the evolution of heights. In particular we are

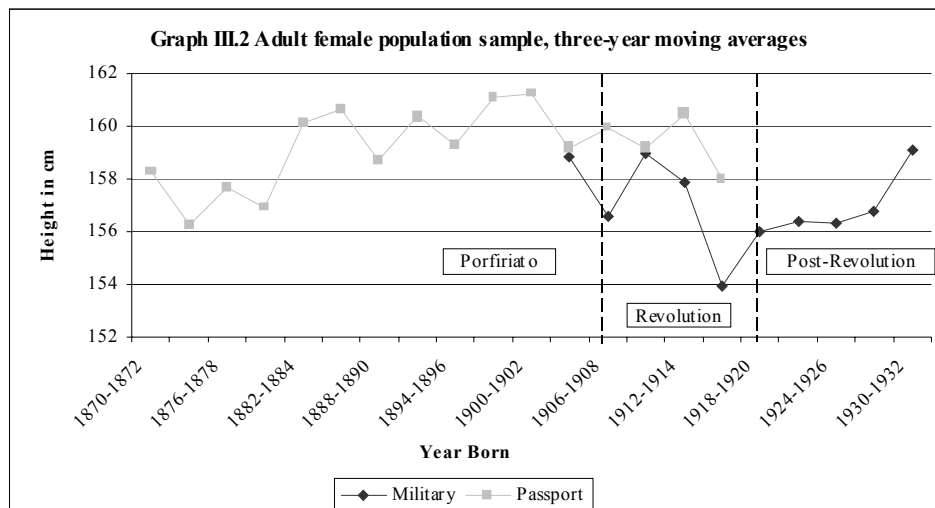
interested in finding out if the evolution of living standards reflected the growth of the Mexican economy and thus find out if the benefits of urbanization, industrialization, and education spilled over to the popular classes.

The trends in heights in graph III.1 show that the males in the passport sample are significantly taller than the males in the military sample.<sup>10</sup> The passport sample does not reverse its trend at least for the period we are covering. For the military sample that covers a longer period of time the general trend is that there is not much of a trend. There is an oscillation of average heights of two centimeters. There is a decline in heights for cohorts growing up in the midst of the Porfirian era and then a recovery for the cohorts who grew up during the years of the Revolution. There is yet another decline for the cohorts who grew up during the two decades of the post-revolution. There is no sign of an upward trend in the average heights until the 1940s, meaning that heights did not recover their early Porfiriato levels until the period of sustained growth in the mid-twentieth century.



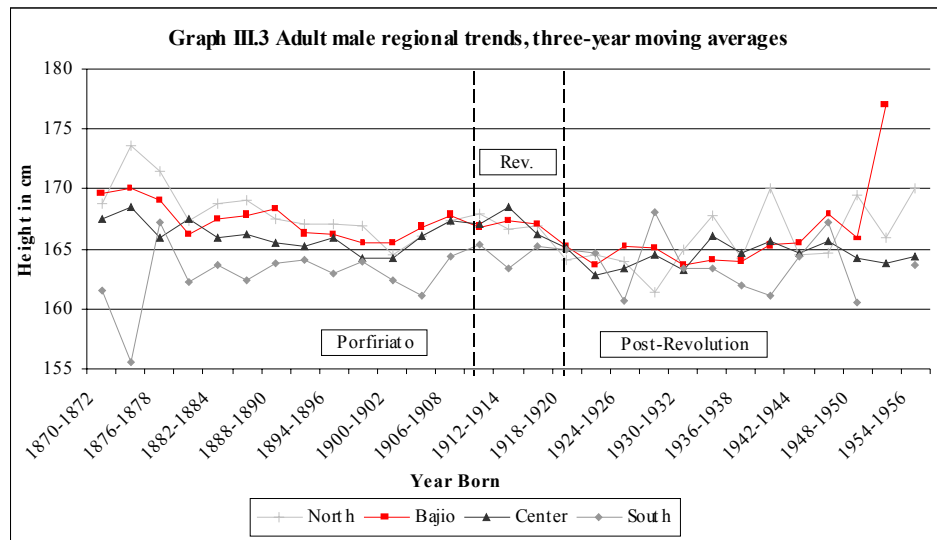
<sup>10</sup> For smoothing purposes the trends are presented as three-year moving averages.

For women the results are quite different (see graph III.2). Let us remember that this sample is biased towards literate urban women. In this graph we present the data of the two sub samples. As expected, we observe that women in the passport sample are not significantly taller than the women in the military sample. The passport sample shows an upward trend beginning in the mid-1870s. Heights for this group then remain fairly stable up to the first decades of the Post-Revolution. The military sample shows an upward trend in the first years for which we have observations, and then a decline of approximately 3-cm that stays fairly stable for two decades and we do not see a reverse in the trend until the end of the period. The sharp drop in the decade of 1900-04 is driven by several observations of nurses that recorded very low heights but that were most likely typos. This suggests two things. First, that there was an increase in heights of the well to do and middle class women growing up during the Porfiriato and the years of the Revolution; and second, that there was a decline in heights for middle class women who grew up during the Post-revolutionary period. Heights do not begin to reach the Porfirian levels until the early 1930s.



*Region.*

Graph III.3 presents the regional differences of the male sample. We observe a slight downward trend in all four regional samples. The average height of the males from the Bajío and the northern region is higher than that of those from the center and southern regions of the country. For the north there is a downward trend in heights throughout the period. Although the Bajío does show an increase in heights towards the mid-1930s, it does not reach its early Porfirian levels. The same holds true for the center. The lowest height levels are those of cohorts who grew up during the first decades of the Post-Revolutionary period.



The south consistently has the lowest average heights of all regions. It also shows more variations. There is a substantial increase in the average heights during the early part of the Porfiriato followed by a sharp decline towards the end of the nineteenth century. There is a recovery of approximately two centimeters and it stays in the same levels until the 1930s when there is again a decline in heights. We should be cautious with the results of the trends of the south because the size of the variations in heights may be overstated. The sharp variations are

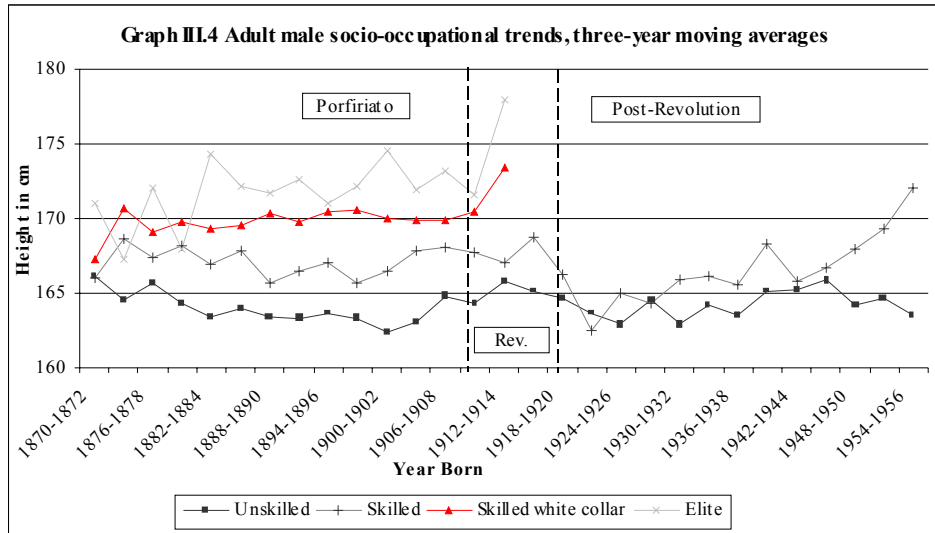
likely to be driven by the fact that there are years with a small number of observations. Both the passport and the military samples have a low number of observations with respect to the other regions. What can be stated with confidence is that the heights of the southern population are the lowest of the country.

*Social class.*

Graph III.4 shows the heights by socio-occupational status. We broke the sample into four different occupational statuses: unskilled workers, skilled manual workers, and white collar skilled workers and elite. Table II.3 shows the occupations that are assigned to each category. We observe that the trends of the different occupations of the male sub samples are quite different. There are three basic features to comment in this graph. The first feature is that there is a wide difference in average height between the working classes (unskilled and skilled manual workers) and the middle upper classes (skilled white collar and elite). There is at least a 3-cm difference between the average height of the working classes and that of the upper class, which in practical terms is a substantial difference and reflects very unequal standards of living across socio-occupational distributions. The gap does not narrow over time. Unfortunately we cannot draw a cross class comparison for the whole period given that our elite and skilled white collar samples do not cover the whole period of study. But what we can infer from these two sub samples is that they do significantly better in heights with respect to the working class.

The second feature is the evolution of heights of the well to do classes. The elite and the skilled white collar follow a similar trend: they show a slightly upward trend from the 1880s on. Regarding the trends in the 1870s it is hard to make an assessment because the number of observations for this decade's sub sample is too small to warrant a conclusion. The divergence in trends between the two sub samples of the well to do classes is driven by the fact that the sample

of white-collar workers is very small. We can state that the elite follows an upward trend, making the case of this particular sub sample more similar to that of the developed countries in a comparable period of industrialization.



The third feature is the difference in trends between unskilled and skilled workers. The sample of unskilled workers, which represents the majority of the population, has a stagnant trend. There is a decline in the average heights during the first thirty years of the study of approximately 2-cm. This represents male cohorts who grew up during most of the Porfirian era, and it reaches its lowest level for the cohort born in the turn of the century. This decline is followed by a recovery period that lasts a decade, which corresponds to the cohorts who grew up during the last years of the Porfiriano and the years of the Revolution, and reaches the early Porfirian levels. There is again a decline that lasts three decades, this will represent people growing up during the first decades of the Revolution and does not recover its 1870 levels until the mid-twentieth century, well into the golden era of the Mexican economy.

The skilled manual workers sample has a slightly different trend than unskilled workers. The first feature we observe is that the skilled workers are taller in average than the unskilled workers. They show a lower decline in heights during the first decades of the Porfiriato, then they do show an increase in heights during the first decades of the Post-Revolution and then a sharp decline in heights for cohorts born during the first half of the 1920s. Heights begin to recover soon after and reach levels superior to the early Porfiriato. The trend in heights of the skilled manual workers shows an improvement for the period of study.

The regional trends are consistent with the development levels of the different regions of Mexico. The north is the region where people are taller while this is also the region that during this period developed faster. It is also a region with a lower density of population and where the livestock production is higher. The Bajío is the region with the next highest average heights. This is consistent with the observation that the Bajío is an important grain producer. The south has the shortest people; it is also the most backward region of Mexico and has the highest proportion of low-income groups.

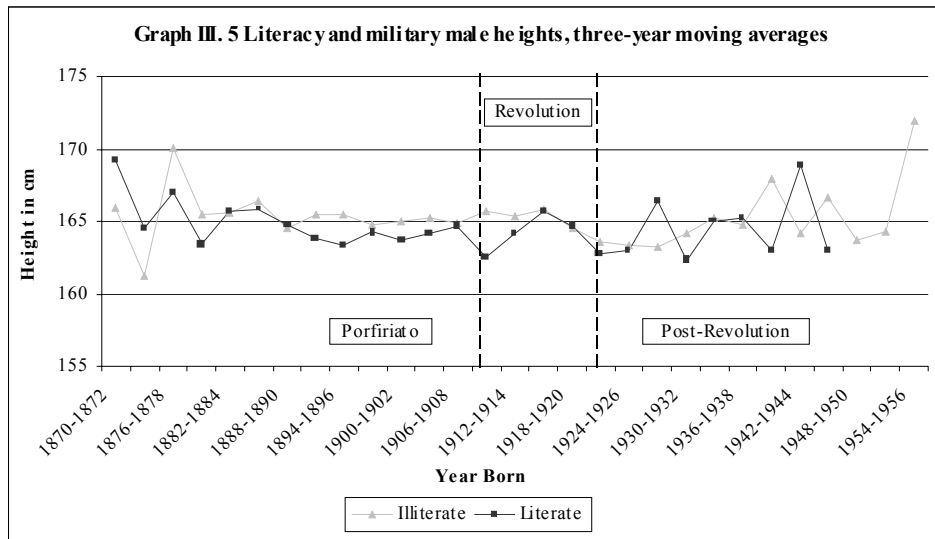
### *Height and literacy*

According to results of anthropometric studies of other populations there is a positive relationship between heights and education.<sup>11</sup> Therefore we need to see if this relationship holds in Mexico. Hence it is necessary test if the men in our sample who were literate were taller in average than those who were illiterate. Because all males in the passport sample as well as all women in both of our samples are literate, it is only possible to test the evolution of heights of the literate vis-à-vis the illiterate for the military sample. In graph III.5 we observe that, as expected, literate men were taller than illiterate men, thus there was an advantage on being

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<sup>11</sup> Weir, David R. (1998).

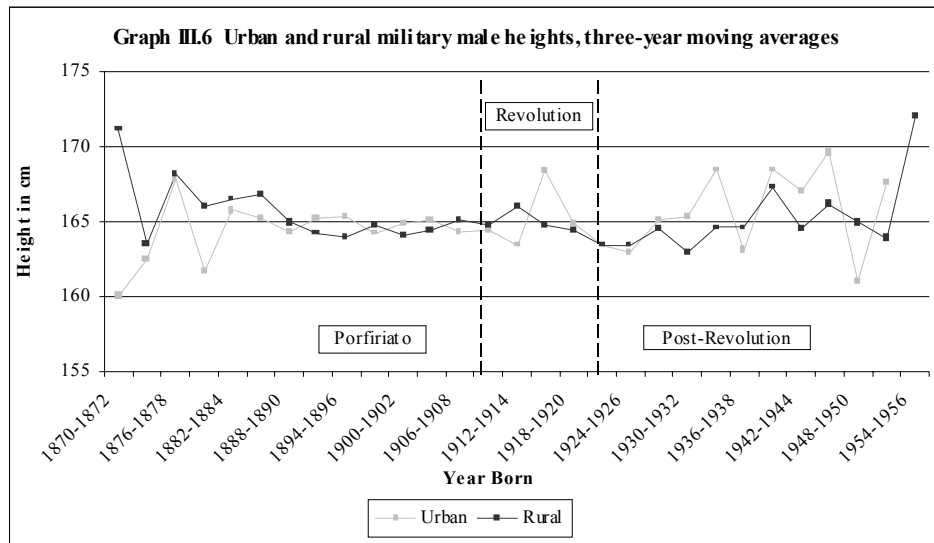
literate. We observe however the same downward trend in heights that we have seen in most of our samples. There is a steady decline in heights from the 1870s, and the trend does not reverse until the mid-1920s. This finding is consistent with the endemic inequality of the Mexican economy.



*Height and region*

Another common test in anthropometric studies is the influence of place of residence on height. Prior to the twentieth century people from urban populations tended to be shorter than people living in the countryside due to poorer and less balanced nutrition and because by living in higher densities of population they had a higher exposure to disease. The twentieth century brought a number of innovations and construction of public utilities in the cities that made them healthier places to live. Mexico City and the main cities of country were not exceptions to this phenomenon. We want to know if this had any effect by testing our samples for potential differences in height between the urban and rural population. Unfortunately we cannot run this test for all of our samples because, all observations on women are for urban women, and all

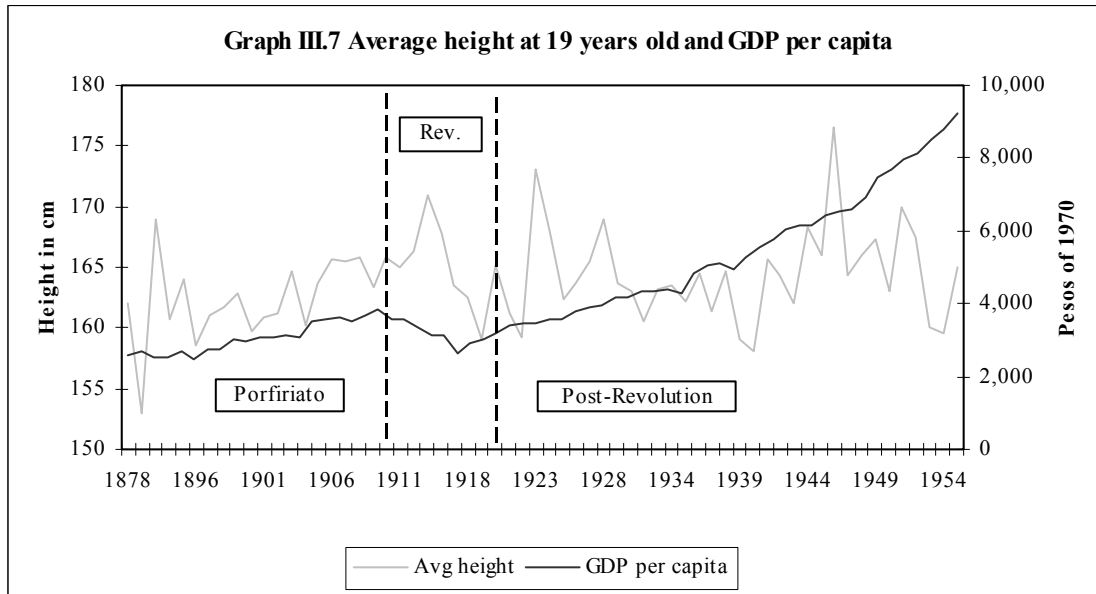
information on passport records for male are for urban males. Thus we can only do the test for the males from the military sample. It will give us an idea of the differences in living standards between urban and rural males from the working class. In graph III.6 we observe that the heights of urban and rural males follow the same trend. Also, there does not seem to be much difference in heights of rural and urban males. This lack of difference suggests that the quality of life was not significantly better in either place, thus cities could have been unhealthy places to live but the countryside was so impoverished that was not a much better option in terms of living standards.



*How do these trends compare to the trend in GDP per capita?*

Graph III.7 shows the trend in GDP *per capita* during the period of study contrasted with the evolution of heights. According to the official historical statistics it is an upward trend and it does not follow the same or even a similar trend to that of the average heights of 19 year old male recruits for instance. The lack of similarity between the trend in average heights and GDP *per capita* supports the hypothesis advanced in this work that the profits of industrialization and economic growth were unevenly distributed in the population. Hence the economic performance

of the Mexican economy had a limited influence in the standards of living of the majority of the population.

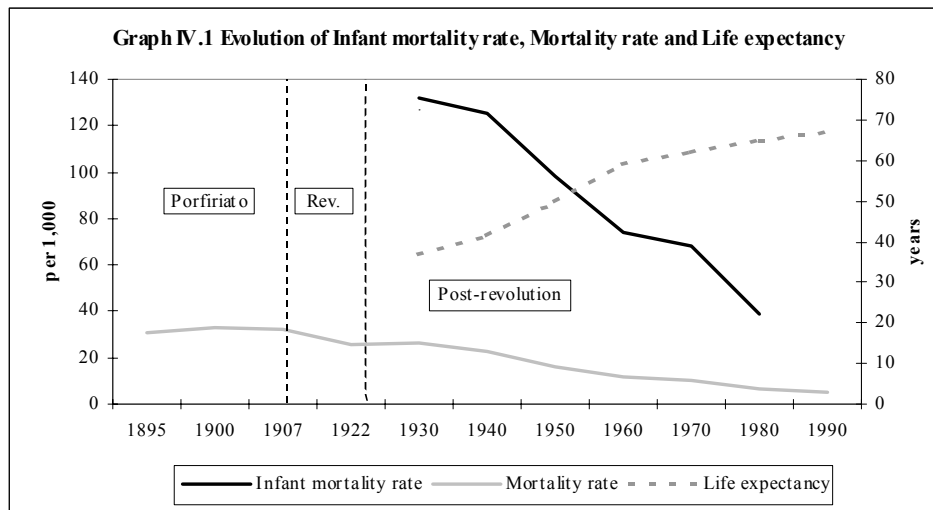


*How does this compare to other similar populations?*

There is data available on military heights for the same time period for Southeast Spain. This is an interesting data to compare Mexican heights with for two reasons. The Mexican population is the result of a mix between Spaniards and indigenous, thus it is very interesting to compare how the European population that gave the Mexican population half of its genetic inheritance was doing in terms of evolution of living standards. And second, “[Because of its economic and environmental characteristics the geographic area is considered representative of the Spanish economy of the nineteenth century].”<sup>12</sup> Martínez Carrión & Pérez Castrejón (2000) show that Spanish recruits did experience a significant improvement in their average heights (see Carrión 2001 in this compilation).

#### IV. Demographic Behavior and Living Standards

The disparity in the evolution of average heights and economic growth raises the question of what the effects did industrialization have on the well-being of the population. Heights showed a modest improvement while the economy was growing at a fast pace. Demographic behavior provides an explanation to this phenomenon. Mortality declined substantially since the last quarter of the nineteenth century thus life expectancy at birth increased dramatically during the first half of the twentieth century (see graph IV.1). This was the result of advances in medical knowledge coupled with public health initiatives and investments which were made possible by economic growth. Nonetheless, contrary to what has been observed in other societies, the decline in mortality was not followed by a decline in fertility rates.

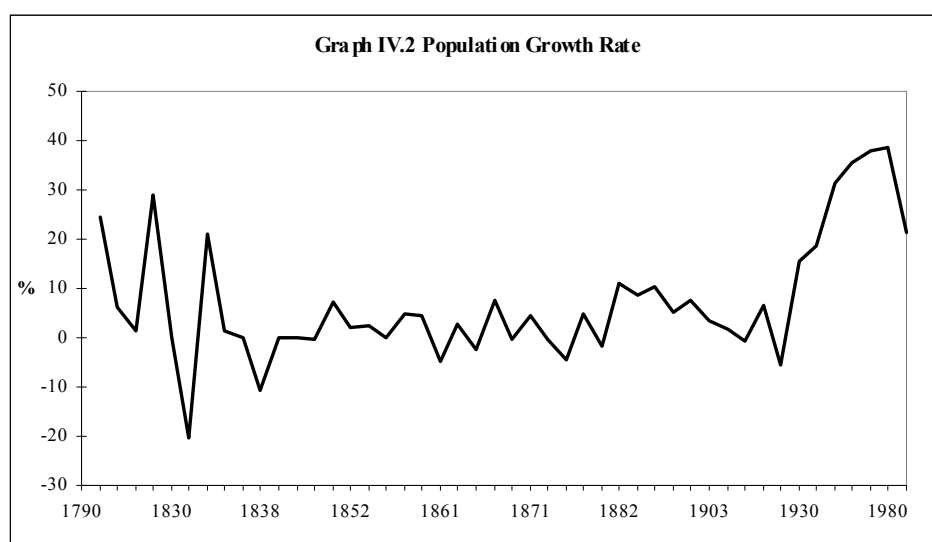


Source: INEGI.

In fact, trends in fertility in twentieth century Mexico are rather complex. For most of the Porfirian period demography was characterized by high fertility and high mortality rates. During the years of the Revolution fertility declined to recover in the 1920's, it stayed constant from the 1930's to the 1950's. There was then an imbalance between mortality and fertility rates that

<sup>12</sup> Martínez Carrión and Pérez Castejón (2000) p. 97

accelerated population growth (see graph IV.2). Social and political attitudes along with education deficiencies are the root causes of this behavior. From Porfirian times up to the late 1960s, the government promoted high fertility rates to populate the country, based on the notion that more people were needed to work for the country to stimulate economic growth. It was not until it became obvious that the country was experimenting a demographic explosion that would eventually bring harmful consequences, that the government stopped these policies. The lack of education of women furthered this phenomenon. “Women with more education are more likely to control their fertility, either because of their greater access to information and resources or because they choose to have fewer children.”<sup>13</sup> (see graph IV.3)

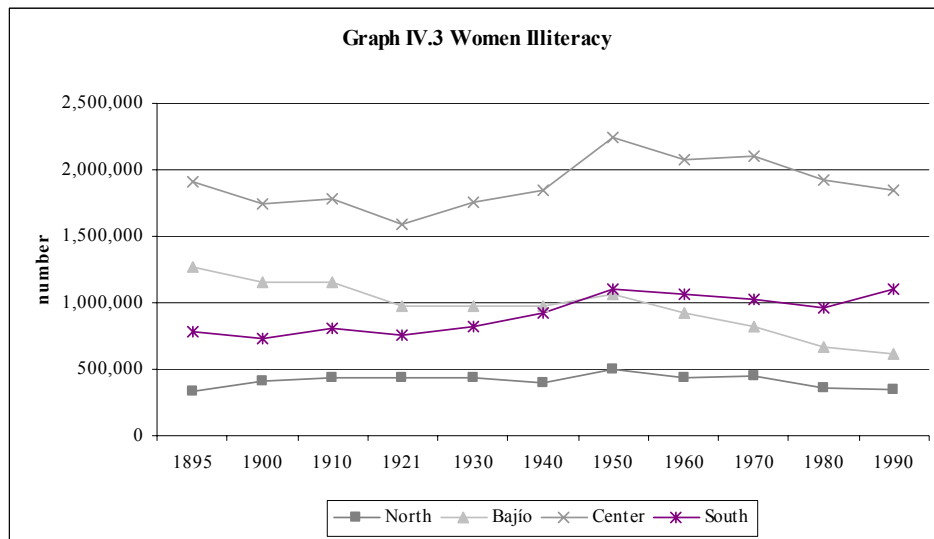


Source: INEGI.

The accelerated growth of population explains the disparity between GDP growth and the evolution of heights. High rates of population growth generated changes in family structure that were not necessarily beneficial to the working class. The number of children who survived in each household increased, thus the same wage had to feed more people. In Mexico the relative price of foods that contain protein from animal source, the kind of food that enhances growth in

<sup>13</sup> Feliciano (2000) in *A Population History of North America*.

stature, was and still is elevated.<sup>14</sup> Hence it was not surprising to find that the quality of diet of the popular classes, the great majority of Mexicans, did not improve over time or with economic growth. The dependency ratios continued to be very high, the fact that the average height of the Mexican population was 15 in the mid-twentieth century substantiates this argument.<sup>15</sup> Thus the lack of improvement in stature of Mexicans during the period of study is a result of the poor quality of nutrition given that population growth ate up all potential benefits of economic growth.



Source: INEGI.

## V. Conclusions

The standards of living of the Mexican population barely improved. There are however differences across regions, locations, and social classes. Although the overall improvements in heights was small with respect to what we would have expected, the differences across the different sub categories are worth noting. Across regions we find the same differences in average heights as we find in economic performance. We observe the north-south disparity that does not disappear over time. The people from the north and Bajío regions are systematically taller than

<sup>14</sup> Completeness and digestibility determine the quality of nutrition. A complete protein contains all the essential amino acids in relative the same amounts that human beings require. Generally protein derived from animals are complete. Proteins are important to restore bone tissue and to produce antibodies, essential to fight diseases. For a more complete discussion on the importance of protein intake for growth see López-Alonso 2000 chapter 6

the people from the center and south. The magnitude of the height differentials remains basically the same throughout the period of study. We can assert that the regional divergences in heights are a mirror image of the disparities of the economic performance: the north industrialized while the south stagnated.

The most profound difference in heights we find is across social classes. There is a wide difference in stature between the working classes and the upper middle and elite and the gap does not narrow over time. Between the working classes we do see that the average height of unskilled workers stagnates throughout the period while the average height of skilled manual workers does improve for cohorts growing up after the Revolution. This suggests that having a skill did make a difference, however, moderate, in the heights and living standards of the working class after the Revolution. The observations on upper middle class and elite do not cover the whole period of study, but for the period covered, we see a difference in heights with respect to the working class. Lastly we show that the consequences of the demographic behavior of this period are strong determinants of the low stature of the Mexican popular classes and of their minimal improvement during the period of study.

Mexico is a country in which, in spite of the economic and institutional transformation, the improvement in the standards of living is limited. Results show that the Kuznetsian hypothesis does not hold true for the Mexican case. Although there is a decline in heights at the earliest stages of industrialization, this is for cohorts born between 1890 to 1910, there is no substantial improvement not even as a result of institutional change brought by the 1910 Revolution and the 1917 constitution. Economic growth with systemic inequality is one key issue that can explain such puzzling result. Steckel & Floud (1997) have noted that “While the relationship between

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<sup>15</sup> INEGI, *Estadísticas Históricas de México*, 1994. Chapter on population.

height and income is nonlinear at the individual level, the relationship at the aggregate level depends on the distribution of income...[] one would expect average height at the aggregate level to rise, for a given per capita income, with the degree of equality of the income distribution.” The case of Mexico is consistent with this assertion as income distribution is quite unequal, one cannot expect average height at the aggregate level to rise. Interestingly, heights have not been used as a measurement of income distribution on studies to assess poverty and the results of programs to alleviate it.

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