Argentine biological welfare: a case of convergence?

A study about inter-/intra-regional differences in the interior provinces during Argentina's Golden Age (1875-1905)

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(Work in Progress)

Abstract

Few studies have attempted so far to get a clearer understanding of the backwardness of Argentina's interior regions in the picture of a stunning export performance during its Golden Age. The case was quite obvious: while the coastal region attracted foreign capital and immigrants in large quantities, the interior lagged behind. Even though, the provinces were aware of their comparative advantages and started building up their own economies with a focus on national trade, hence less participating on international markets. This study about three Argentinean regions, the Northwest, Northeast, and Cuyo, with the use of height data, seeks at detecting regional and social inequalities in the interior. With regard to growth theory, the process of convergence is analyzed within and between provinces.
The picture is not too clear: ß convergence in all regions was evident for the whole period, whereas we found σ divergence from the 1885 onwards. We relate this phenomenom to the influence of the Baring crisis in 1890, the 1901/02 recession at Buenos Aires, and contribute to the discussion that ß convergence is a necessary, but not sufficient condition for σ convergence.

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Introduction

Economic historians have largely neglected the analysis of regional welfare distribution in Argentina so far. The tendency has been to focus on the coastal region which attracted foreign capital and immigrants and has been the the driving force for generating economic growth. This successful development of the Pampa region has been well analyzed and accounts mostly for the Argentinean Golden Age during the years 1875 to 1914. However, there might be more to that story than the obvious claim of an uneven regional development between the rich coastal region and the poor interior. Focussing on living standards measured with the stature of individuals, since economic variables are hardly available and often tell another story, might reveal disparities in regional well-being that are by far more significant than has been acknowledged until now. At the same time, we could expect inter-regional convergence because of similar economic and social experiences, the interior being pushed backward from the littoral region.

In the process of economic development regions are adjusting differently to new economic structures, some even failing to adjust at all. Market integration plays the key role in this process. Moreover, the agro-export development is said to produce more regionally disparities, since investments tend to concentrate near seaport areas (Salvatore 2009) and benefit the population living there. We can therefore revert to the key economic issue of whether poor countries or regions tend to grow faster than rich ones (Barro and Sala-i-Martin 1991, 1992) to study the extent of the interior provinces catching up to or diverging from one another.

This study seeks at examining the growth and dispersion of adult stature in the interior regions of Argentina during a period not analyzed before, the years ranging from 1875 to 1905, and relate the behavior of regions to the ongoing debate of the backwardness in the interior of the country in terms of biological welfare. Once having accomplished all data gathering, the study will consist of all thirteen provinces from the Northwest, Northeast, and Cuyo region in Argentina. Until now, we have seven provinces covered for all three interior regions. This exercise is meant to reinforce the importance of regional inequalities, an aspect which leads to doubt studies about a successful welfare development in a country known for its stunning export performance during that time.

In a previous study about regional development in the Northwest of Argentina, Salvatore (2004) found a clear process of convergence of biological welfare within the Northwest during the period 1916-1951. Initial differences decreased over time and stature as a whole even grew 2.1 centimeters during those years. Aditionally, Salvatore (2007) has been

analysing regional differences in a cross-section with data compiled by Juan S. López and concludes that the contrast between the Pampa and the Interior was still important in 1924. Living conditions revealed greater inequality within the interior provinces, whereas the distribution of human welfare was more even in the Humid Pampa.

This regional study contains a period before those analysed by Salvatore (2007). The following chapter discusses briefly the implications of using heights as a welfare measure; later the new data found on Argentine well-being is presented and analyzed in terms of social inequalities. We then describe traditional differences of the interior regions of Argentina, before dealing with the main concepts of convergence adopted from growth theory. The last section concludes.

Heights and their welfare implications

Stature is by now widely accepted as a useful measure of living standards, and most scholars are presumably at least somewhat acquainted with the height literature, because numerous studies have appeared in the last two decades[1]. What we generally find is that height data are much better suited for the study of well-being than data about income, since they contain a broader range of information about the actual compliance of basic necessities, such as food, clothing, and housing (see for example Steckel 1995, Komlos 1998). Given this information, we are able to compare different social groups, in terms of racial or occupational classifications, as well as regions, and we can even assess inequalities within these categories. A previous study by Baten and Fraunholz (2004) reveals, for example, that within country inequality, measured with the coefficient of variation of heights, is higher in time periods of greater openness, which ascertains the usefulness of this measure.

It is quite advantageous that this indicator is widely available, either from recruitment lists or prisoner's records amongst other things, which allows going even further back into the past than other common measures of living standards. Additionally, this measure covers not only wage recipients, but also self-employed people, the unemployed, and other groups who may not be participating in the market economy. The limitations of other variables used to measure living standards are not apparent due to the fact that heights rather reflect an output indicator than inputs to health. Stature can be seen as a function of proximate determinants such as diet, disease, and work intensity during the growing years (Steckel 1995).

However, we have to admit, that certain problems arouse when using heights, such as minimum height standards in the military recruitment process, age and height heaping or

[1] For an overview about recent height studies see Steckel (2009)

ethnic differences in growth potential, and those have been discussed from all different angles in the past. Komlos (2004) addresses the problem of truncated military samples and simulates various experiments to find the most adequate method for estimations, the Truncated Regression using maximum likelihood procedure. Fogel et al. (1983) have been evaluating heaping techniques and simulation models suggested that even-number heaping did not introduce a systematic bias; hence these aspects were relatively minor for estimates of sample means, primarily because their effects are largely self-cancelling. When it comes to genetics, most of the individual variation in height is attributable to it, thus it cannot be neglected in general. However, even if an individual's genes may determine adult height potential, whether that potential is realized or not depends on the economic and disease environment in which the individual grows up (Eveleth and Tanner 1976). Therefore, differences in average height between populations are almost entirely the product of the environment. It then happens more than often that height data refer to the lower social strata of a society, but those are particularly most affected by changes of the environment in crises, and therefore reflect a great deal of the ongoing events. In this context, Schubert (2008) finds a significant decline in the biological standard of living in eighteenth century France. Especially those born in the revolutionary decade of the 1780s had to account for the greatest decline in heights, with two mayor crop failures which led to long-lasting malnutrition.

Living standards measured with stature are quite sensitive to changing conditions of work intensity, public health or income distribution, and, if disaggregated sufficiently, can even provide a clearer picture of the spatial dispersion of living standards. In a study about regional differences in Italy, Arcaleni (2006) finds a clear gap between heights in the South and those observed in central and northern Italy, which the author correlates to the existing socio-economic disparities within the country. Colombian regions in the twentieth century are clearly differentiated in terms of their culture, economic development, and even ethnic composition (Meisel and Vega 2007). However, during the period under observation, the authors ascertain a story of success from the point of view of the reduction of inequalities that existed initially. In the following, we want to focus upon assessing living standards in Argentinean interior regions, evaluating the nutritional gaps and testing for convergence.

The data, its potential problems, and social analysis

The data in this study stem from a census taken in 1927 by the Argentine military, which can be found in the 'libros de registro de enrolamiento y reclutamiento' in the 'Servicio Histórico del Ejército' located in the city of Buenos Aires. In those books, all Argentines and

(going to be) naturalized Argentines born in the years 1820 to 1915 from all provinces were registered. A similar census has taken place in 1911, which is why those registration books contain the information of whether the same person has been enrolled before in 1911, or has been registered for the first time in 1927. The sample (until now) includes 27,183 individual cases from seven interior provinces[2], and only the ones who were born between the years 1875 to 1905 to exclude from the first any potential bias because of age issues. The army did not impose minimum height requirements for the draft; the whole male population was registered, so we took a convenient sample from several districts in each province in a time space of a quinquennium, especially from those districts where case numbers were adequate for an analysis. Figure 1 shows the normal distribution of the whole data set.

The process of populating the Argentine territory consisted of three streams, one from the east, coming directly from Spain, another one from the north, stemming from the Incan empire, and the last one from the west, which consisterd mostly of Chileans (Lattes 1980). Those formed the today present structures in the interior provinces. In those military registers, the information about the place of birth was not given. However, we can draw some conclusion about it since we do have the information about a prior enrollment in 1911. If we take for given that an individual migrated only once in his lifetime, we can assume that the prior enrollment place gives us a hint about where the person was born or is coming from. Since internal migration was quite common in nineteenth century Argentina, we find many individuals being enrolled the first time (1911) in a different place than the second time (1927). This current study does not contain an analysis so far about the migration issue, it only considers presumable birth places, but a further analysis is to follow in future work.

In order to measure differences between social classes, we divided the data into six occupational groups, which we later combined to working (lower) class, middle and upper class. Emerging differences of stature within these groups were probably related to inequalities in the levels of income, which had an impact on the nutritional status of the population. Admittedly, the occupation of an adult would not have had an effect on his height during his growing years. Nonetheless, it is legitimate to include this variable insofar as social mobility was not very pronounced in the eighteenth and nineteenth centuries in the developing world, and therefore, the individual's occupation can serve as a proxy of his family's status during childhood and adolescence.

The greatest part of the society (around 55 percent) could be defined as unskilled people. Those were occupations in which the person had not received any formal training for

[2] Catamarca, Corrientes, Chaco, Jujuy, Mendoza, Salta, San Juan

their specific job situation. It was composed of all those who labored with their hands or performed menial services. Most were day-laborers and peons; employees (with no further specification) or apprentices were also included in this group. Second in the social hierarchy were artisans who had acquired a certain level of skills after usually a formal training, e.g. official craftsmen like carpenters, technicians and cabinet makers. Modern tasks such as drivers were also considered as a superior acquirement and were hence put in this group. Farmers were separated from the rest because we can safely assume that they might have benefited from protein proximity or their land-ownership. Those working in offices and commerce might have profited from increasing trade and be therefore better off. The upper class consisted of professionals in occupations such as doctors, students, or teachers, but they constituted only a small part of the population (around two percent in the sample). Proprietors and industrialists were considered being one of the better-off groups in the social hierarchy and are also classified as upper class. The remaining part was categorized as having no occupation and is therefore not considered in the analysis.

The data shows large differences between the social groups. While the gap between working and upper class grew up to more than 3 centimeters from 1875 to 1885, this gap was decreasing slightly in the following quinquennium, but only because of the fact that heights of the upper class were falling quite sharply until 1890. Especially proprietors and industrialists seemed to have accounted for this decline, clearly the most affected by the ongoing Baring crisis from the 1890s. The recovery started at the turn of the century, with hardly any improvement to the beginning of the period. The middle and working class instead seemed to have lost during the whole period under observation, half a centimeter each, with hardly any change in their overall positions. Regression analysis supports results from Figure 2 (see Table 2 (I+III)). Social differences were well pronounced during the period under observation and support previous studies about social inequality in Argentina (see for example Salvatore 2004).

The data is quite representative of the Argentine population and therefore a good indicator to measure differences in the social and regional development (for a general overview of the sample, see Table 1).

Argentinean regions and traditional inequalities

To learn about the impact of inequality, we first have to understand in what way Argentinean regions were differing from each other. The purpose of this chapter is therefore to highlight possible influencing factors of welfare development in the Northwest (the

provinces of Catamarca, Jujuy, and Salta), Northeast (the province of Corrientes and the national territory of Chaco), and Cuyo (the provinces of Mendoza and San Juan) region. Figure 3 describes mean height trends for regions and clearly demonstrates that differences were significantly important. In 1875, people from the Northwest were 1.5 cm smaller than people from the other two regions and the difference remained the same throughout the whole period. In constrast, people from the Northeast were performing the best, although they lost in height after the 1890s. The Cuyo was somewhat converging to heights in the Northeast, but remained at an intermediate position. These results are supported in an OLS dummy variable regression analysis when we control for the three regions (see Table 2 (II)).

Traditionally, empirical studies about inequality concentrate on Kuznets' hypothesis. The inverted u-shape is the result of growing inequality during the process of economic development, which at some point recedes. In his presidential address, Kuznets (1955) accounts for this non-linearity that a very small output excludes high inequality, because otherwise the poorer social classes would fall below subsistence level. In the early phases of industrialization and urbanization, when the transition was most rapid, the gap in income structure tended to widen; it stabilized later for a while and then narrowed down in the later phases. Applying this mechanism to heights would mean that mean heights of a region are typically smaller if inequality is high. If inequality is declining, the population should be profiting from a more equal distribution and heights should therefore be increasing again. Figure 4 describes inequality measured with the coefficient of variation within regions for each quinquennium in our three regions. The period is characterized as one of growing inequality, mean heights are declining and the CV is rising from 1875 to 1905. The start of the economic boom phase in Argentina seems to have raised inequalities within regions, and we cannot observe a turning point during the period under observation.

It took Argentina more than seventy years to form a national state after gaining independence which accentuated the isolation of the interior's economy because of distant and heterogeneous regions. During that time, the coast and the interior, the towns and the countryside steadily drew apart from each other, not only in economic interests but also in way of life, customs, and culture (Scobie 1964). With the connection by railroad of most interior provinces with Buenos Aires from 1857 onwards, imports easily reached the interior and destroyed shaky local industries. Then, with all railroads leading from the peripheral zone to the littoral center, the regions remained with little communication, and their reciprocal trade declined even further. The rapid economic expansion in the period from 1870-1914 favoured mostly the Pampa region, whereas the interior of the country lagged behind, a fate

all provinces had shared in common. Hence, the critical element in this process was transportation and its impact on existing commercial and agricultural interests. However, new activities arose in some provinces producing first for local demand and later expanding nationally since their natural resources allowed for a comparative advantage. Still, any possible growth in the interior was primarily caused by external influences and resulted in a dependency on Buenos Aires harbour.

The north-western part of Argentina has been traditionally known as the busiest region in terms of population and economic activities during the colonial period, but fell into neglect as soon as independence was gained. It has been known since as the most backward region in the whole territory, which our results of stature analysis support. Working conditions on mostly sugar cane plantations frequently resembled outright slavery[3]. Hence, it was not surprising that the latter led the nation in illiteracy, infant mortality, and worst living conditions (Scobie 1964). With the arrival of the railroad in 1891, commerce had declined precipitously compared with that enjoyed 20 or 30 years earlier, when the region was dominating a flourishing trade with northern Chile, Bolivia, and Peru. The competition introduced by relatively cheap freight rates for merchandise coming from Buenos Aires linked the development of the region to commercial business in Buenos Aires (Scobie 1988). Imported products were favored in this region, and a newspaper in 1909 even noted that, in the absence of a dairy industry in the city of Salta, shortages occurred because the demand was so high (Scobie 1988). In a previous study about the Argentine Northwest in the first half of the twentieth century, Salvatore (2004) addresses several problems about the peripheral conditions of the underlying provinces. The author reaches the conclusion that the nutritional status in the Northwest improved significantly between 1916 and 1951, which fits into the description from above, that heights were increasing while inequality between the different provinces was declining. Still, the Northwest could not catch up with the Pampa region.

The Cuyo region, in contrast, displayed a different pattern in terms of economic development. With the coming of railroads in 1884, vineyards developed rapidly in Mendoza and San Juan and family labor could meet most of the needs of the harvest, with benefits being distributed more evenly than in other regions of the country. In line with this development, we can observe a slight positive trend in biological well-being from the 1885 up to 1895. With its comparative advantage in viticulture, the provinces of Mendoza and San Juan offered a prime example for the coastal-national view of what happened to the domestic economy of the country as a result the building of foreign-owned railsroads and the growth of

[3] Unfortunately, the study until now lacks the information about the sugar center Tucumán, but further analysis with this province included might reveal a much bigger effect than the one here.

exports (Fleming 1986)[4]. The local economy prospered and was shifted away from the transandine commerce toward the provisioning of Buenos Aires with wine and grapes. As a result the economy grew only in concert with the externally dependant littoral economy, and the prosperous wine industry became a good target for national taxation, which the mendocinos fought successfully, but later they imposed their own tax. A tariff imposed by Chile in 1897 on cattle imports from Argentina was responsible that the previous trade of cattle with northern Chile ceased completely and prices were falling drastically. However, the region continued to produce sufficient supplies of agricultural and lifestock products for its own needs. The subsequent drop in grape prices produced a commercial panic between 1901 and 1902 that temporarily depressed the wine industry. Part of the problem lay in the insecurity of littoral markets, where a drop in cattle exports, financial depression, and a scarcity of foreign capital restrained commercial activities. It was claimed that rising property values, easy credit, and high profits had generated a wave of speculation in the wine industry during the 1880s and 1890s that finally broke in 1900 (Fleming 1986).

The northeast region had no magic product such as wine to tie their local economy to the agricultural-export economy of the pampas, but used their fertile lands to raise cattle and produce wheat, which might explain their superior position in comparison to the other two regions. The proportion of cattle per km² was even higher in Corrientes than in Buenos Aires province, with 34 heads per km² in 1895 (compared to 25.5 heads). Even though the population seems to have gained in biological welfare up to 1890, the crisis of the littoral had a detrementing effect on well-being. In this vein, Scobie (1988) states that any economic crisis in the agricultural-export economy tended to be reflected directly in the local provincial economies in terms of tightening credit and lessening government expenditures. Corrientes immediately felt the effects of the major Buenos Aires depression of 1890 in sharply restricted credit. In Mendoza and Salta, on the other hand, the full impact of this depression was not felt until 1893/4, which might be related to their remoteness to the littoral market. More immediate was the impact of the 1901-4 recession at Buenos Aires, perhaps because regional economies had grown more closely integrated by that time with the economy dominated by the federal capital.

Due to inadequate housing and malnutrition, the interior provinces lagged behind the coastal region with high infant mortality rates and a shorter life expectancy. Starvation was far more prevalent than on the meat- and grain-producing coast, unhealthy diets and a precarious

[4] Despite the predominance of wine in commerce, Mendoza continued to ship agricultural goods (alfalfa seeds), hides, and wool to other provinces.

disease environment[5] affected the population in a great way (Scobie 1964). In comparison with the coast, the interior as well suffered from poor educational facilities, since most efforts in Argentina's educational campaign were concentrated on the coastal cities. In 1895, most provinces accounted for more than 70 percent of the male population being illiterate, while the province of Buenos Aires had already reached a reduction to only 50 percent being illiterate. To resume, the competition stemming from the coastal region ruined many of the interior's local industries which lacked capital, equipment, or entrepreneurs, and the resultant stagnation held down living standards and consumption levels throughout large areas of the interior and accentuated the disproportionate advance of the Pampa region – a fact which we can confirm with our data about living standards in the interior. Heights were more or less stagnating during the period under study, and no improvement in living standards has been achieved.

Evidence on convergence for the interior regions

The driving forces behind convergence from the late nineteenth century, typically the years starting in 1870 and ending with World War I, can be seen in open economy policies and mass migration (O'Rourke and Williamson 1999). In terms of world economies, a process of first globalization phase and convergence characterizes this period, deglobalization and divergence is noticed for the phase up to 1950. Whereas until now mostly industrialized countries have been studied, Argentina is definitely a case worth to be looked at, since it was quite famous for its allurement of mostly European immigration and its open frontier policy. With the fall of transport costs, the country entered successfully the world economy, and benefited largely from commodity trade; capital and labor flowed across national frontiers in unprecedented quantities. However, it is well known that the country was dismantled in two realms, the rich pampas and the poor interior; hence the question arises whether this apparent prosperity actually was favorable for all regions. Convergence apparently did take place in terms of real wages for the littoral region, a catching up to high-wage and industrial Britain at the end of the nineteenth century (O'Rourke and Williamson 1999). But can we assess beneficial circumstances in terms of convergence measures for inter-/intra-regional differences?

Growth theory suggests that economies tend to grow faster in per capita terms when they are further below the steady-state position. In this sense, Barro and Sala-i-Martin (1991,

[5] Scobie (1964) mentions that malaria and tapeworm were endemic in most of the northern provinces; goiter afflicted the inhabitants of Mendoza and Santiago del Estero; and tuberculosis and influenza flourished. Typhoid fever and dysentery were widespread among the lower social classes.

1992) study the concept of ß-convergence for U.S. states over various periods from 1840 to 1988 and find that poor states indeed tend to grow faster in per capita GDP and per capita personal income than rich states at an approximate rate of two percent per year. Similar results apply to the seven European countries studied with the conclusion that there is no evidence that poor regions are being systematically left behind in the growth process.

There are two concepts of convergence in the growth literature, one where poor countries tend to catch up to rich one in terms of per capita income (ß-convergence). A second one concerns cross-sectional dispersion. In this context, convergence occurs if the dispersion –measured by the standard deviation of the logarithm of per capita income or product across a group of countries or regions- declines over time (σ-convergence) (Barro and Sala-i-Martin 1991, 1992). The following questions therefore arise: Did the gap in living standards between rich and poorer regions in Argentina fall over time (σ -convergence)? And did poorer regions grow faster than rich ones in terms of biological welfare (ß-convergence)? How great was the extent of those differences?

In this study, convergence is approached by the stature of individuals instead of per capita income, and it is used to describe and clearly define the evolution of average height differences and welfare implications across the Argentine territory, with data available on a district level for seven Argentine provinces, accumulated in three regions.

We follow Komlos' (2007) approach of measuring spatial convergence in the Habsburg Monarchy, where he uses two measures of spatial variability and its changes, the CV of heights and the change in heights over time as a function of the initial level of heights. We expect that the CV would decline over time if convergence in the Argentinean interior provinces took place. It should be noted that the CV contains σ –convergence measured as the unweighted coefficient of variation (standard deviation/mean height). The second convergence measure, ß-convergence, can be confirmed if initially shorter populations display higher growth rates than those experienced by taller populations. The null hypothesis that shorter populations converge on the taller ones from below cannot be rejected in this case and we can assume favorable living standards for the underlying populations.

The measure of ß-convergence is derived from the growth literature, where the rate of convergence, λ, can be estimated as follows:

$$\lambda = 1 / t \ln (\beta+1) \quad (1)$$

and β is the coefficient in convergence equation on initial heights, and t is the time span (Williamson, 1996).

In this study the logarithmic specification for heights is given by:

$$(1/T)\,\Delta \ln H_{i,t-T} = (1/T)\,(\ln H_{i,t} - \ln H_{i,\,t-T}) = \alpha + (1/T)\,(\lambda \ln H_{i,t-T}) + \varepsilon_{i,t-5} \quad (2)$$

where $H_{i,t-5}$ is the average height in district i at the beginning of the period and T is the length of the period.

Therefore, with the rate of convergence taken from above, ß follows to be:

$$ß = -\ln (1+\lambda) / 5 \quad (3)$$

In the following analysis we use stature data for identifying the patterns of σ and ß regional convergence as well as personal convergence for the Argentine Interior as a whole. To first indicate the differences between regions, we consider again the development of mean heights for the period under study, which clearly showed a slight downward trend for all regions (Figure 3). The Northwest performed the worst, whereas people from the Northeast were the tallest ones, with a peak height of 167.8 cm in 1890 and a 2 cm differences to the Northwest. Still, all regions had lost in size in 1905.

Table 3 reports the least squares estimates for 81 districts in three regions for three decades and the whole period. The econometric specification is based on equation (2) above. The dependent variable is the growth rate in height over a ten-year period beginning in year t, and the independent variable is the natural logarithm of initial average height in year t. Each cell contains the resulting estimate of ß, the p-value and the R-squared.

Convergence in the interior regions of Argentina is evident in all three sub-periods, although the period from 1875-1885 shows the most rapid convergence process, which in the following two periods slowed down. The coefficient on the logarithm of initial height is negative and significant indicating that on average, the gap between the Northwest, Northeast, and Cuyo region was closing slightly. Still, we have to be careful when interpreting this process because taking a look at Figure 5 (a-d) leaves the impression that this convergence was peculiar in the growth theory sense. More than half of the underlying districts were actually falling back in heights, meaning that initially tall districts began to experience larger height declines than initially short districts. This negative absolute convergence describes the pattern that the tall states converged on the short states from above; thus the new steady state was one of overall shorter stature, which we could already observe from the development of mean heights in Figure 3.

How can we explain the regional convergence in biological welfare that occurred in the Interior during 1875-1905? It is likely that the integration of the national market brought by the reduction of transportation costs played a major role. The railway was determining the

area of cultivation, although trade mostly took place with Buenos Aires harbour and interregional exchanges relied often on subsistence economies. Even though, the presence of ß-convergence indicates that more general and diffused factors, such as improvements in transportation, communications and sanitation, helped convert the provinces into a more homogeneous region in terms of nutrition and health. At the same time, Figure 5 (a-d) suggests not to rely on the hypothesis of converging too heavily, for a number of districts deviated significantly from the convergence path. Reasons can be seen in local conditions mattering more than general tendencies. We know, for example, that the capital of Salta was one of the unhealthiest places in the whole country for its problems of sewers and water system at the end of the nineteenth century (Scobie 1988).

Using additional information taken from the census from 1914 we as well can test for conditional convergence to find out which variables might have influenced the convergence process. If conditional convergence were present, poor short regions would grow faster than rich tall ones but only after controlling for other variables that influence the steady state differences, e.g. regional location, urban-rural differences (Chanda et. al. 2007). These conditional growth models have been much more successful in explaining the real world (see for example Barro and Sala-i-Martin 1995). Thus additional variables are included in the analysis, such as regional dummies, the structure of production, or literacy rates in each region, to find out for example whether the ability to read and write played a minor/major role in accounting for convergence. These conditional growth models still have to be studied in future work.

In the following, we focus on the second measure of convergence, σ. Figures 6 and 7 show the dispersion of heights within and across regions, measured by the coefficient of variation of the logarithm of heights. The pattern of σ-convergence is characterized by a declining trend of the CV until 1885 for within and across Argentine regions, thereafter by increasing values. The rise in the CV, an increase of inequality within and across regions for most of the period, might reflect the crisis of development of maladministration, over-borrowing and falling world prices (Ford 1956) which took place 1890/1. Export values failed to expand sufficiently to meet debt-service charges, which brought about the collapse of Barings. After the 1890 crisis the economy started to expand again, this time with relative macroeconomic stability under the gold standard regime[6] (Cortés Conde 2009). This is when the coefficient of variation slightly declines again from 1890 to 1895. Still, in 1901/02, Buenos Aires entered a recession, which might have affected our three regions in different

[6] The international gold standard was imposed in Argentina in 1899.

ways. The process of divergence after 1885 can presumably be attributed to the fact that the efforts of each region to specification were diverging strongly. The Northwest was mainly going back to subsistence economy, whereas the Cuyo region took actively part in trade with its specialization on vineyards, and the Northeast profited from wheat and partly meat production. Another possible explanation of the observed σ-divergence is the growing importance of the here excluded Pampa region, which attracted a great part of the incoming European labor force because of rising real wages and put pressure on the interior provinces. Those were either falling behind or catching up slowly with the gains of Argentina's most prosperous region, leading to a rise in inequality within and across our regions.

Both concepts of ß and σ convergence reveal different stories for the Argentine interior provinces. We find ß convergence across our three regions, but we as well detect σ divergence from the 1885 onwards. In this sense, Quah (1993) has argued that there is no simple causal relationship between those two concepts, that only by considering the issues of growth and distribution simultaneously can we understand their underlying dynamics. The reasons for why σ convergence might not be accompanying ß convergence can be seen in the following: In a study about convergence in OECD countries, Epstein et. al (2003) suggest adopting distribution dynamics analysis since σ convergence tells too little about the dynamics of income distribution over both time and space and conceals important historical issues. Their main findings imply that the timing and incidence of convergence processes for leading OECD economies is not as straightforward as had been presented before since period dynamics point to a relatively low degree of distributional mobility before 1914. Again, we have to keep in mind that the estimated ß values reveal a slow down in convergence after 1885, which implies that whereas 3.7 percent of the gap between current height and the final level of height was eliminated annually between 1875-1885, the speed of convergence fell down to 2.7 and 2.2 percent respectively in the following two periods, with several districts being not too close to the convergence path.

The literature has acknowledged so far that a negative ß coefficient is not a sufficcient condition for σ convergence, and it outlines that the dispersion of a distribution of income is of greater interest since it shows more clearly whether economies are becoming more equitable during a period of time. A study by Young et al. (2007) detects statistically significant σ divergence U.S. county-level data during the period from 1970 to 1998 in spite of evident ß convergence already found by several other authors as well (see for example Higgins et al. 2006, Barro and Sala-i-Martin 1992). The authors suggest that there may be an underlying σ convergence for most of the U.S. counties but that there are fewer counties that

evolve into a long right-hand tail of the distribution that may prevent σ convergence in the aggregate.

Conclusion

Relying on a new database of regional time series of height for seven interior provinces in Argentina, this paper investigated convergence and divergence forces for inter-/intra-regional differences, and analyzed changes in social inequalities between 1875 and 1905. The main findings can be summarized as follows: social inequalities were well pronounced during the period under study and might have reinforced the backward position of the interior. There was a statistically significant ß-convergence for all three regions, with a slowdown in the convergence process to the end of the period. On the other hand σ-divergence measured with the coefficient of variation of height has been detected for within and across regions after 1885. The negative ß coefficent across the three interior regions in Argentina might be explained by the fact that all regions in the aggregate faced the same problems during the agricultural-export growth of the Pampa region, whereas the growing dispersion might speak for the different ways the regions were facing those problems, and expanding their economies on a national basis. The impact of closer ties to Buenos Aires, brought about by the expansion of the railroad, led to important changes in all three regions, which were different in each case, but the outcome was similar: a small deterioration in living standards for all regions is observed.

The new evidence presented here suggests that the interior indeed was suffering from economic developments on the coastal region. The provinces in the Northwest located far from Buenos Aires was the worst off. The results demonstrate that stature is an adequate measure for evaluating regional differences in welfare.

Future work with additional social and economic variables is needed to underscore the current results. It is essential to compare the ranking of heights with indicators such as disease, mortality, economic structure, political turmoils etc. to answer further questions about the formation of regional differences in nutrition.

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Figure 1: Frequency distribution of the sample

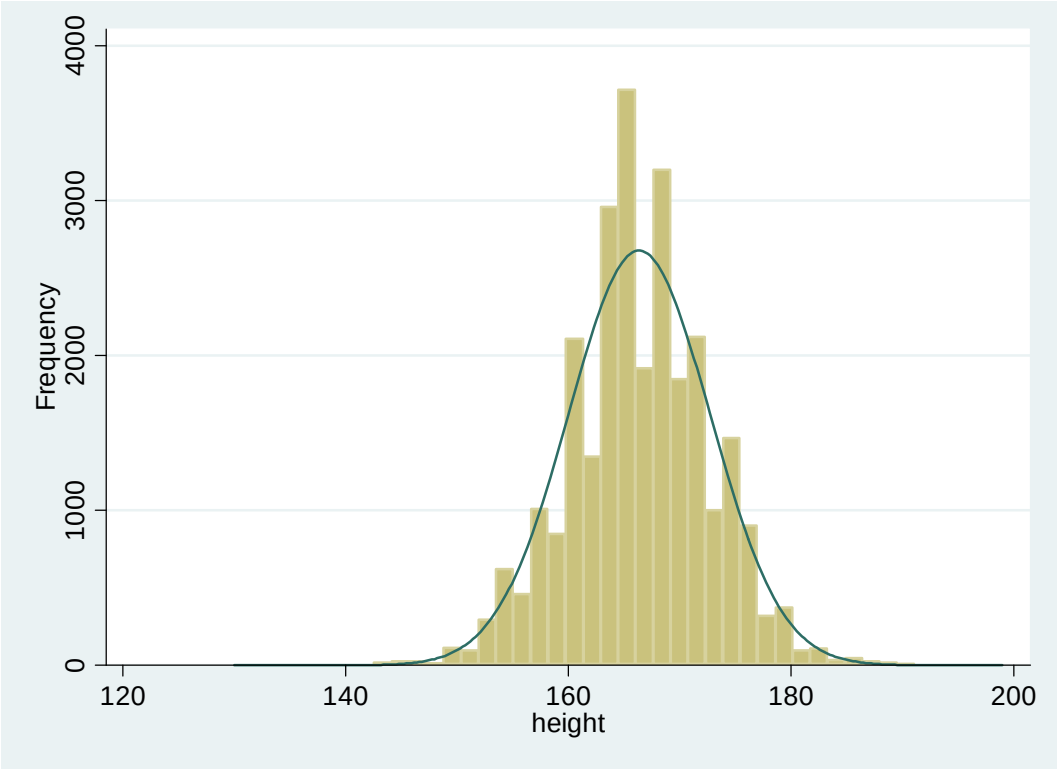


Figure 2: Mean height trend of social classes

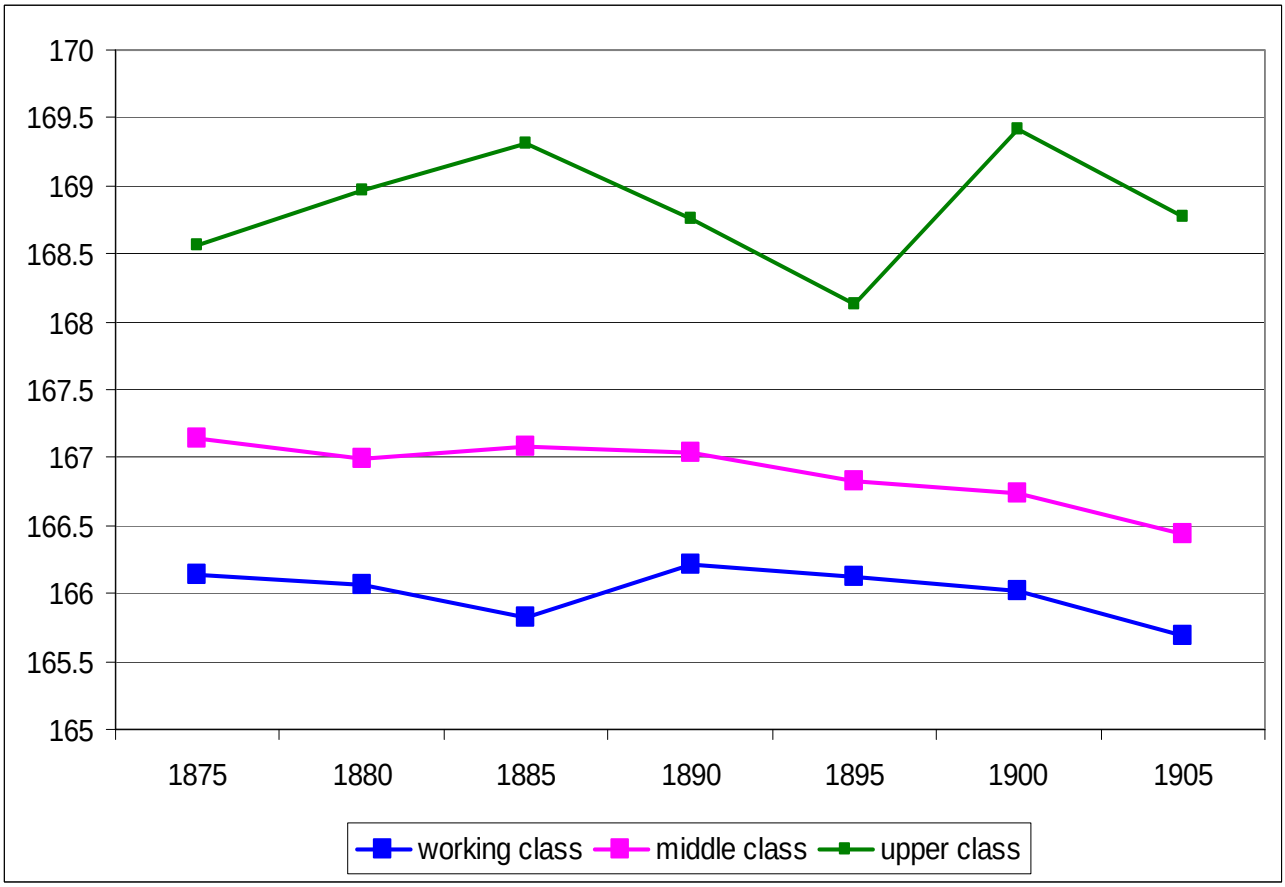


Figure 3: Mean height trend of regions

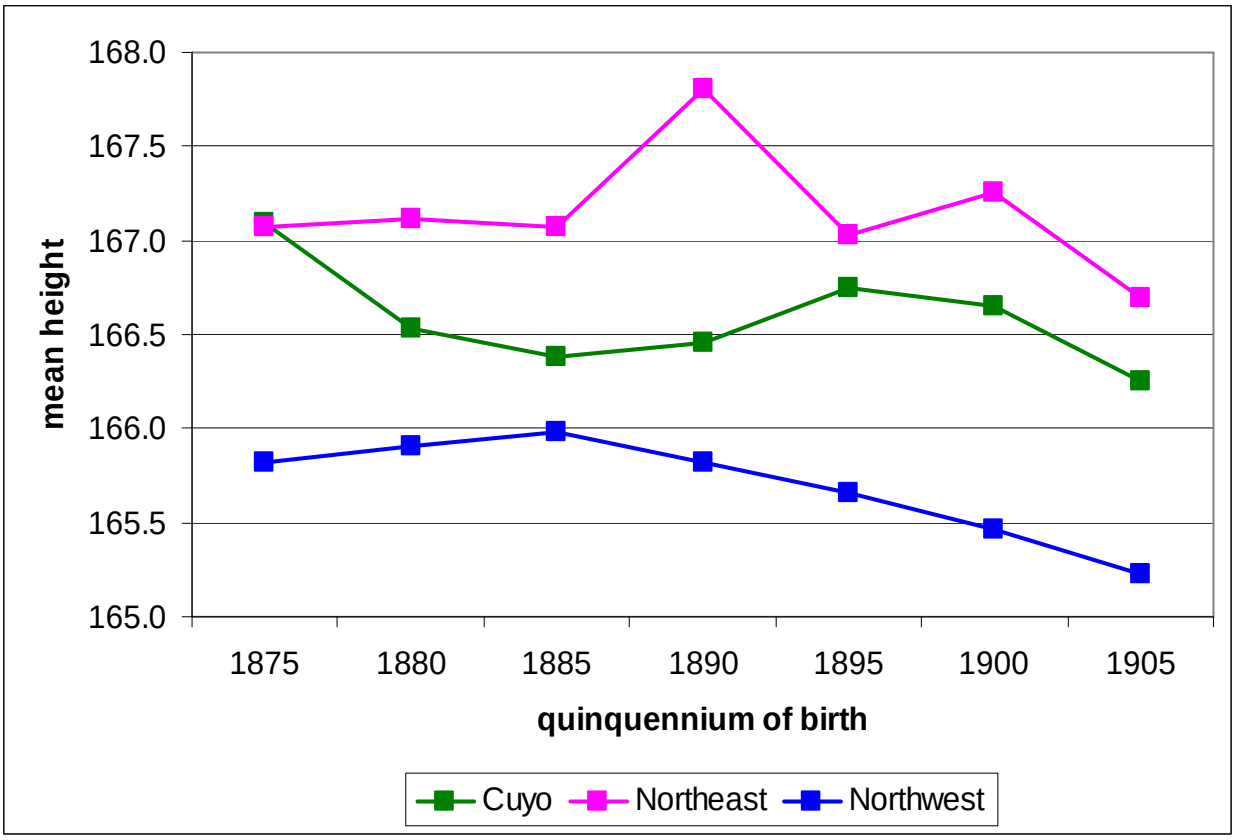
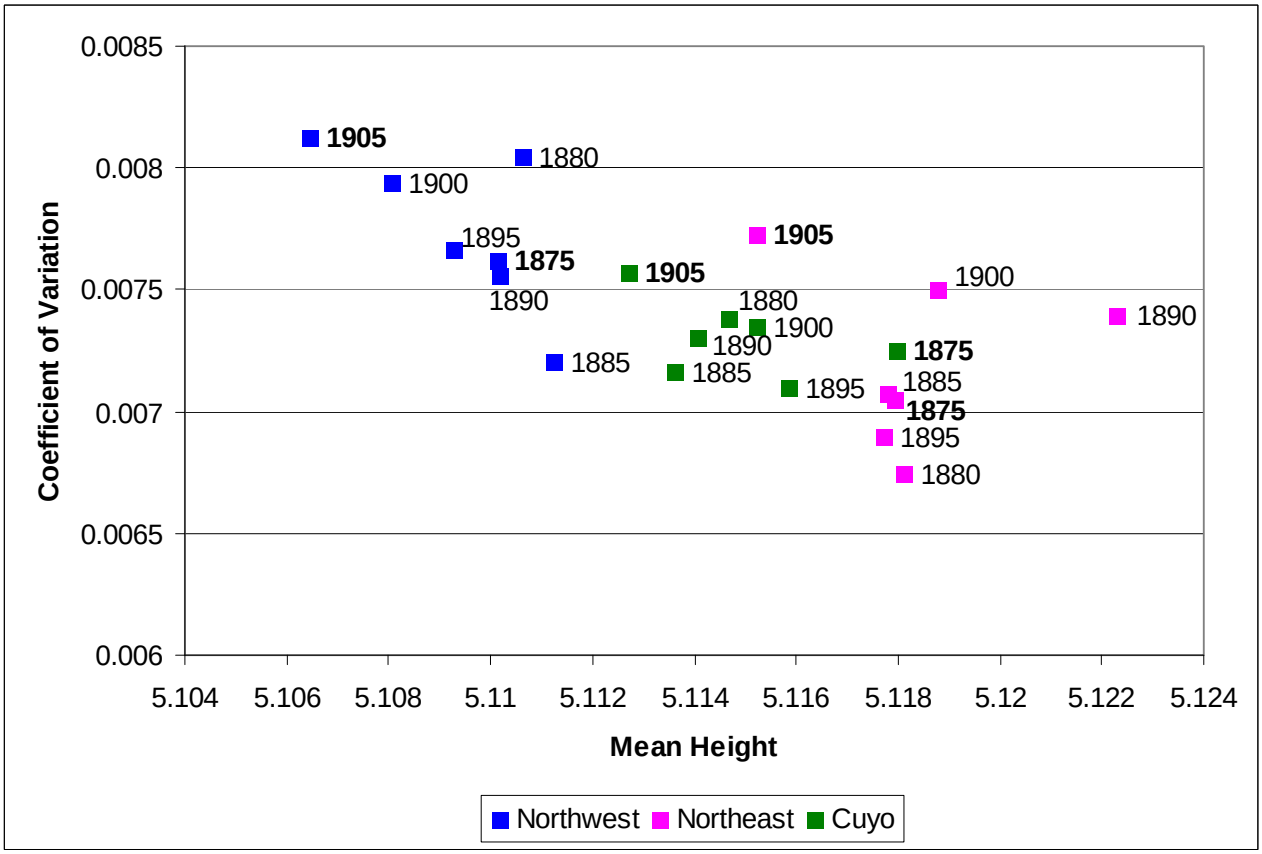
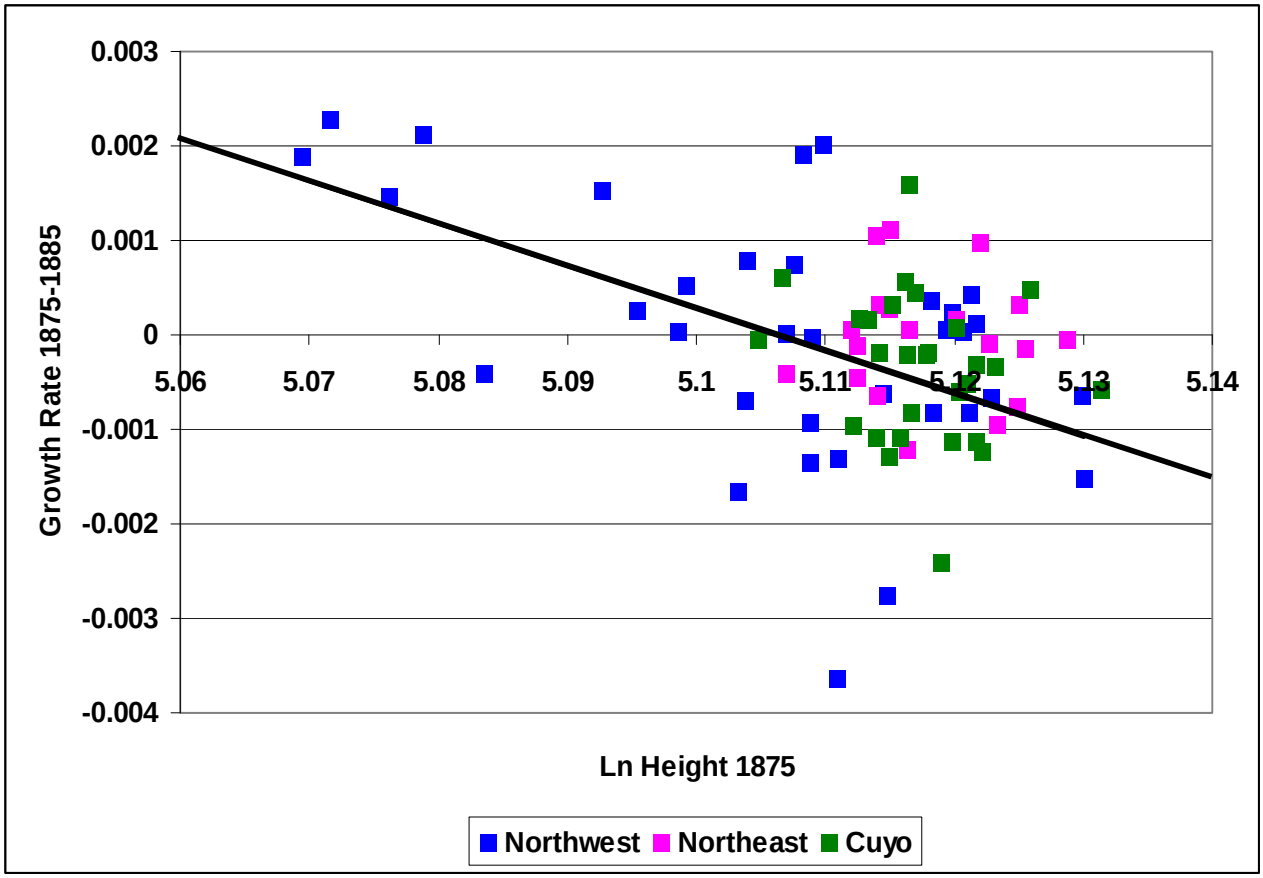
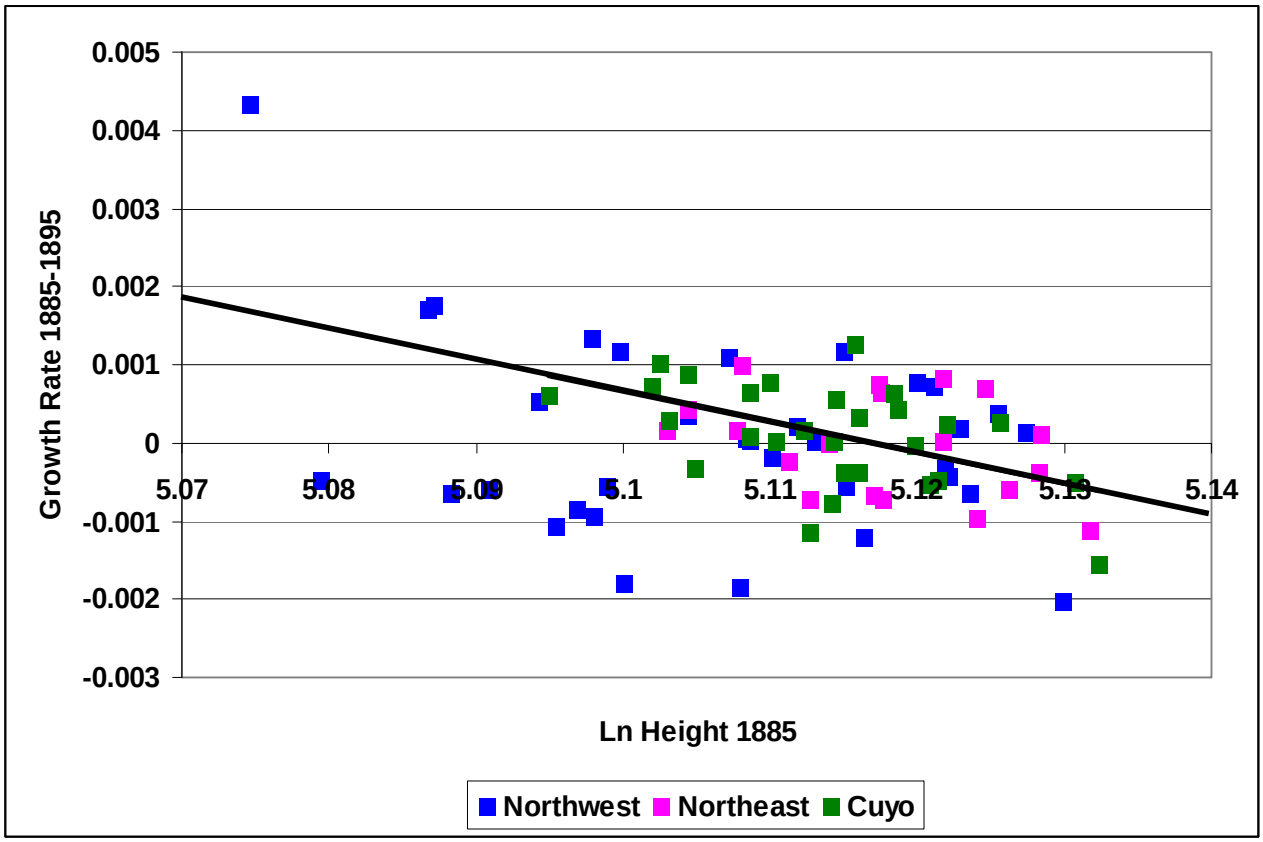


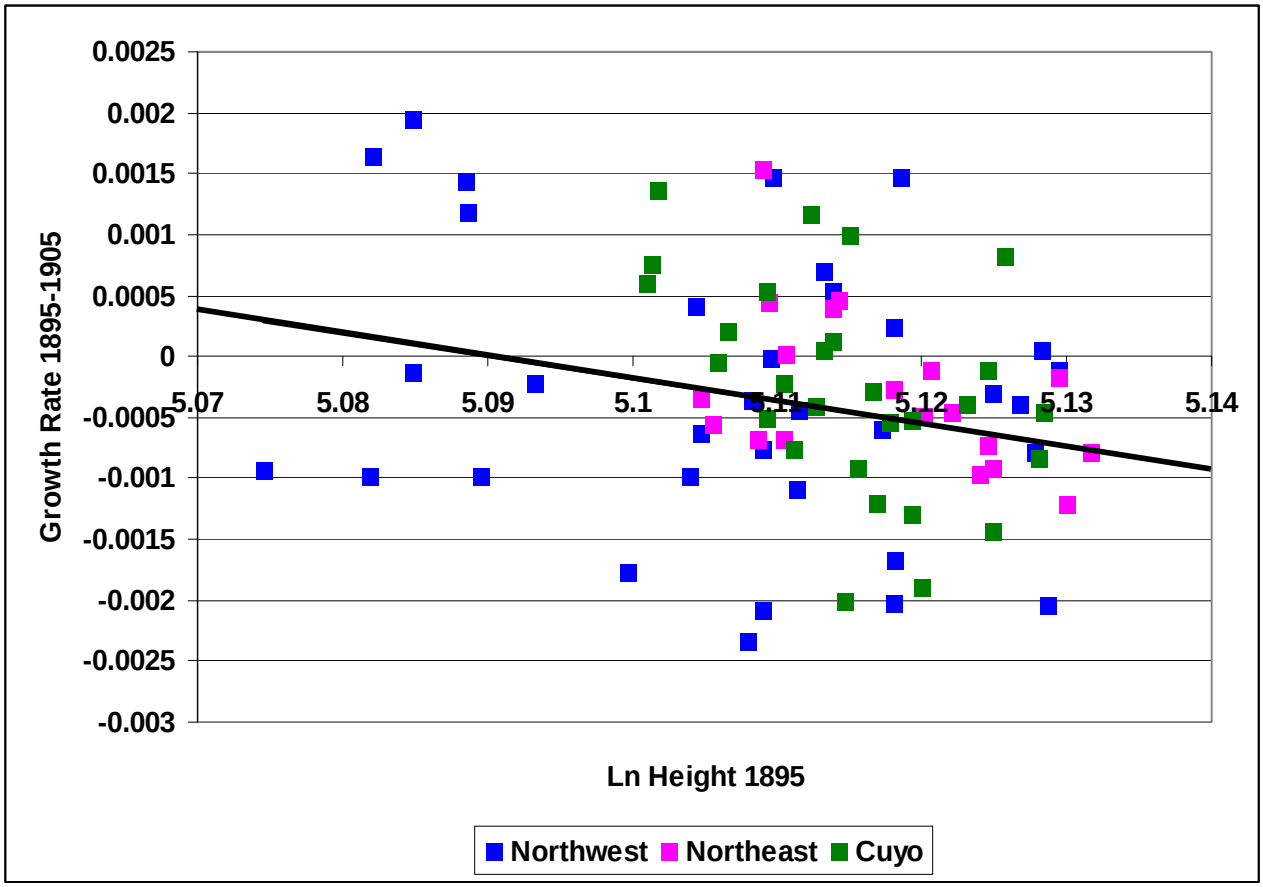
Figure 4: Kuznets' hypothesis and inequality within regions



Figures 5 (a-d): Convergence in Argentinean regions



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0.002
0.0015
0.001
0.0005
0
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-0.001
-0.0015
-0.002
-0.0025
-0.003
Growth Rate 1895-1905
5.07
5.08
5.09
5.1
5.11
5.12
5.13
5.14
Ln Height 1895
Northwest
Northeast
Cuyo

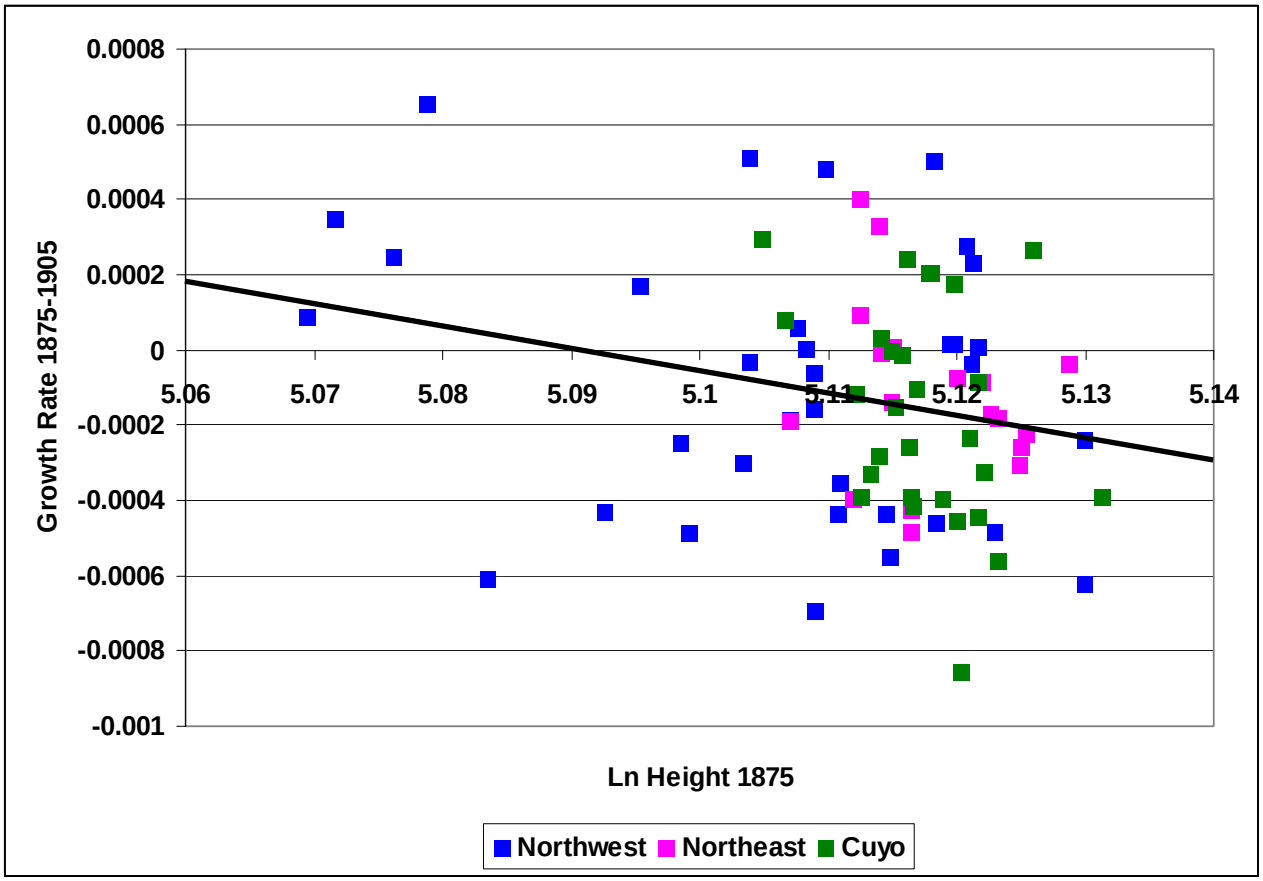
0.0008
0.0006
0.0004
0.0002
0
-0.0002
-0.0004
-0.0006
-0.0008
-0.001
Growth Rate 1875-1905
5.06
5.07
5.08
5.09
5.1
5.11
5.12
5.13
5.14
Ln Height 1875
Northwest
Northeast
Cuyo

Figure 6: Dispersion within regions: No σ convergence

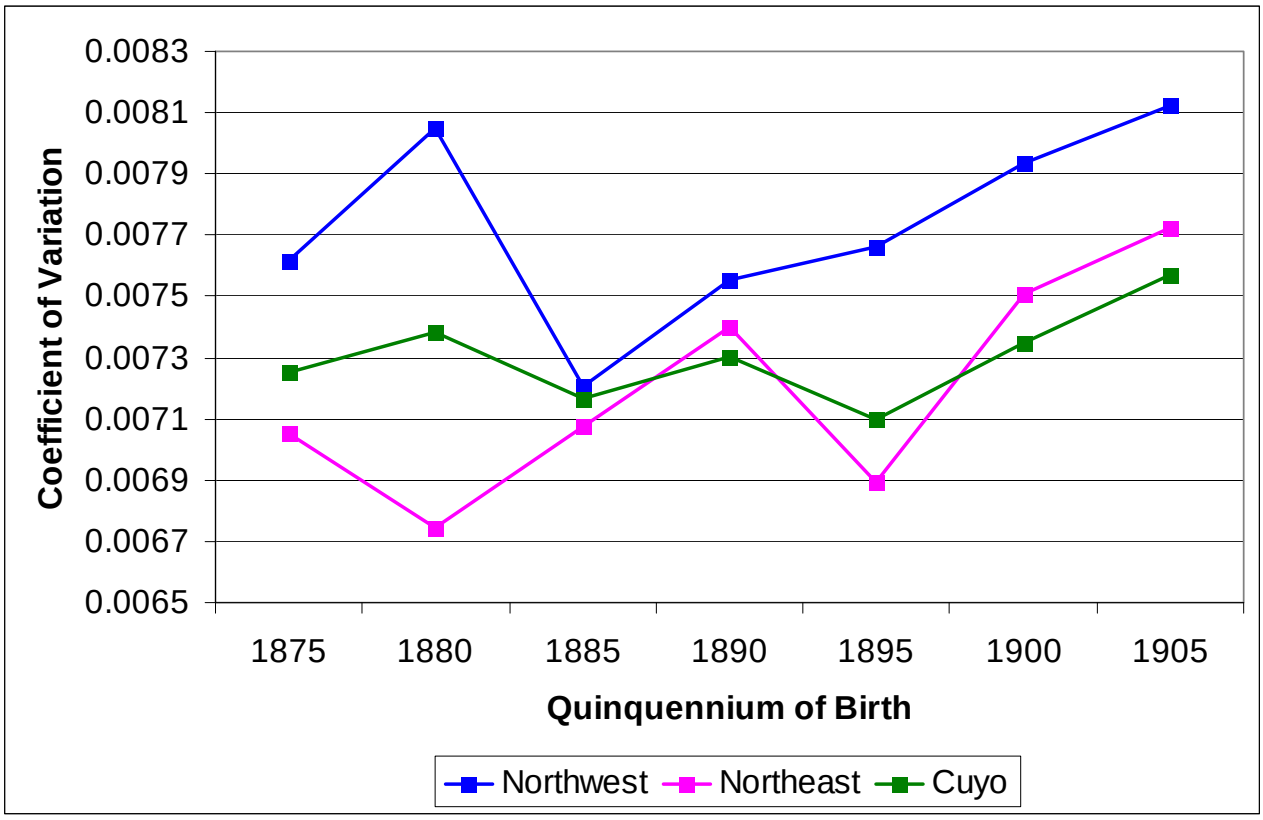

Figure 7: Dispersion across regions: No σ convergence

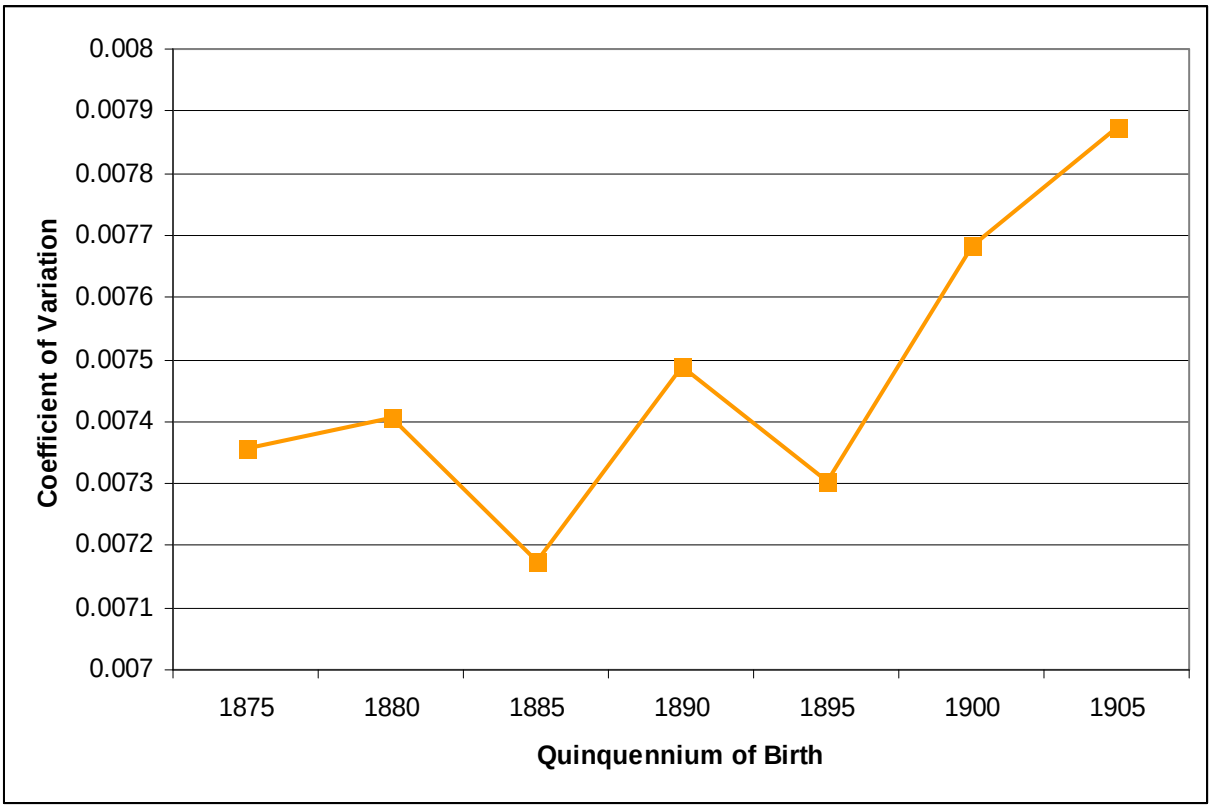

Table 1: Characteristics of the sample

Feature	Share in the Sample	Cases
Total data set	100	27,183
Cuyo	31.96	8,687
Northeast	28.95	7,869
Northwest	39.09	10,627
Riding	98	26,704
Swimming	44	11,946
Car driving	9.1	2,475
Literate	64.91	17,645
Working class	63.19	17,177
Middle class	32.87	8,936
Upper class	3.74	1,016

Table 2: OLS regression results, with dummy variable estimators

Coefficient	(I)	(II)	(III)
1875	0.73***	0.85***	0.69***
	(0.000)	(0.000)	(0.000)
1880	0.59***	0.66***	0.55***
	(0.000)	(0.000)	(0.000)
1885	0.44***	0.56***	0.41***
	(0.002)	(0.000)	0.003
1890	0.61***	0.69***	0.59***
	(0.000)	(0.000)	(0.000)
1895	0.42***	0.47***	0.41***
	(0.001)	(0.000)	0.002
1900	0.31**	0.35***	0.30**
	(0.017)	(0.006)	0.021
Literate	0.36***	0.65***	0.33***
	(0.000)	(0.000)	(0.000)
Swim	0.81***	0.35***	0.80***
	(0.000)	(0.000)	(0.000)
Ride	2.49***	2.50***	2.48***
	(0.000)	(0.000)	(0.000)
Drive	1.50***	1.72***	1.47***
	(0.000)	(0.000)	(0.000)
Middle Class	0.75***		
	(0.000)		
Upper Class	2.06***		
	(0.000)		
Cuyo		0.65***	
		(0.000)	
Northeast		1.27***	
		(0.000)	
Artisans			0.28*
			(0.056)
Farmer			0.75***
			(0.000)
Office and Commerce			1.02***
			(0.000)
Professional			1.62***
			(0.000)
Proprietors and Industrialists			2.47***
			(0.000)
Constant	162.46***	162.14***	162.49***
	(0.000)	(0.000)	(0.000)
Observations	27176	27176	27176
Adj. R squared	0.0249	0.0244	0.0252

Note: ***/**/* implies significance at 1; 5 or 10% significance level, respectively. P-values in parentheses. The constant refers to a man born in birth quinquennium 1905 from (I) working class, (II) Northwest region, (III) unskilled population.

Table 3: Absolute convergence in Argentinean regions

	1875-1885	1885-1895	1895-1905	1875-1905
Ln of Height 1875	**-0.0365406*** (0.000)**			
Ln of Height 1885		**-0.0268306*** (0.001)**		
Ln of Height 1895			**-0.02177** (0.010)**	
Ln of Height 1875				**-0.0065746** (0.019)**
R-squared	**0.1850**	**0.1244**	**0.0819**	**0.0677**
N	**81**	**81**	**81**	**81**