Title: Latin American Anthropometrics, Past and Present–an Overview

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Latin American Anthropometrics, Past and Present– an Overview

Latin American anthropometrics interests modern researchers, because there is significant variation in economic development across and within countries, both over time and by social and ethnic categories. During the 19th century, welfare levels were impressively high in some countries, with real wage levels coming close to those of Europe. However, during the 20th century, Latin America fell considerably behind European countries. For example, 19th century living standards were high in Argentina and Uruguay, and both countries fell far behind Europe and North America during the 20th century. In contrast, contemporary evidence can be used to study more recent health problems, such as obesity. In the following, we review the existing literature on the long-run development of Latin American heights. We conclude by putting the contribution of the present volume in this context.

Latin American physical stature varied over time and the differences between social and ethnic groups were substantial. For example, Mesoamerican and Andean ethnic-social differences were so large that national income averages may not be informative to address welfare developments. Similarly, there was considerable inequality in Brazil and Cuba, two countries that until the late 19th century, relied on slave labour. In contrast, Southern Cone countries —south of the Tropic of Capricorn — had a reputation for low levels of late 18th and early 19th century inequality, whereas this was no longer the case during the late 20th century (Vicario 2010). Today, these inequality differences have a large impact on Latin American economic development, and economists who seek to improve 21st century Latin American incentive systems need to understand the historical development that influences today's political and economic environments.

In spite of recent attempts by Latin American historians to expand our understanding of this region, available development data remains limited. For example, GDP per capita estimates for Argentina only extend back to 1870, for Brazil to 1850, and for Peru to 1900. Other countries are even less well documented. Estimates for prior to these dates are rough approximations or averages from neighbouring countries. Similarly, Latin America's inequality is typically told using qualitative examples. Quantitative assessments before 1900 are restricted to a handful of Gini coefficients on Chile, Argentina, and Brazil (Bértola 2009).

Previous literature on the anthropometric history of Latin America

In such a situation, anthropometric history provides important insights. For example, in a series of papers, Ricardo Salvatore assesses the late 19th and early 20th century welfare trends in of Argentina, which is well-known for its rapid growth of GDP per capita. However, Salvatore finds that heights did not increase much before the 1920s. He argues that increasing inequality, urbanization, and problematic intra-family nutrient distribution resulted in height stagnation.

The anthropometric history of Mexico, which until the 19th century had the largest population in Latin America has been studied by Lopez-Alonso and Condey (2003) find that height differences by social groups were large, which is illustrated by the difference in height between lower class infantry soldiers and higher class passport applicant: the gap was at least 6-7 cm. Moreover, Mexican heights also stagnated between 1870 and 1930, and lower class heights declined during the dictatorship of Porfírio Diaz (1877-1911), who increased average income and schooling, but also reinforced Mexico's social inequality. Carson (2005) finds that among Mexicans who ended up in U.S. prisons, the mid-19th century stature decline was relatively mild; lower class Mexicans in US prisons were about two cm shorter than U.S. born prisoners.

In terms of population, Brazil overtook Mexico during the 19th century. However, its anthropometric history receives considerably less attention. Recently, Baten, Pelger, and

Twrdek (2009) consider the Brazilian case, and find marked regional height differences between the large South-eastern states of Minas Gerais, Sao Paolo (but not in urbanized Rio de Janeiro) and the Northeast. They also find a rapid height increase between the 1850s and 1870s, after the slave trade was abolished.

Which height estimates are available?

The Latin American secular height increase was much lower than Europe's, around 10 cm during the last century (Baten and Blum 2010). This is seen from existing height estimates (Figure 1). These are reasons in the statistical sense but not in substantial sense.

Before considering 19th century Latin American heights in detail, we first discuss a number of caveats (Figure 1). For example, as in the case of Guatemala (1890s-1930s), some of the evidence only refers to indigenous populations. Mexican height estimates refer to migrants to the U.S., and poor migrants were frequently taller than their counterparts who could not afford to migrate. In fact, Challu (2009) estimates that early 19th century Mexican army soldiers may have been as short as 161 cm.

In spite of these potential biases, considerable insight is gained from the above studies. For example, we learned that Argentina had reached impressive anthropometric values during the early 19th century, but declined around mid-century and stagnated for several decades, thereafter, before recovering during the 1920s.[1] The shortest populations so far found are

[1] The evidence on Argentina 1820-1860 comes from a prison sample of the Dolores prison discussed in Baten (2010). The prisoner's height was recorded in centimeters between 1869 and 1896. They were all born in Argentina, mostly in Buenos Aires province between the 1820s and 1860s. 90% of their occupations was either unskilled or and semiskilled, whereas Argentina as a whole had around 80% unskilled and semiskilled occupations in comparable age groups (according to the Census of 1895). Therefore, average height might have even been slightly higher in early 19th century Argentina, but the overall height differential between lower and middle/upper class was only around 1 cm. Their height level and the decline after the 1830s are actually confirmed if we compare with the height data in Salvatore and Baten (1998). Note that the authors used the English inch for transforming the feet measures of the Argentine army into centimeters. It turned out in the

Guatemalan Indios, followed by the Peruvians discussed by Twrdek and Manzel in this volume, and the Bolivians (Figure 1). Brazilians were initially shorter, but experienced a slow and continuous increase after 1850. During the 1970s and 1980s, Brazilians and Colombians were the tallest, but those were still some 5-10 centimeters below comparable European and North American levels (Baten and Blum 2010).

In sum, we find that Latin American anthropometric welfare indices were relatively high during the 19th century, even though the period was characterized by the independence wars, political instability, and civil wars. Clearly, without these events, welfare would have been even higher. Nevertheless, sparse 19th century population densities combined with a nutritional intake that contained a substantial amount of protein, at least in Southern Cone countries (including Southern Brazil). Other countries such as Guatemala and Peru clearly had lower anthropometric values, and the 20th century Latin American secular height increase was limited.

What might have caused these height differences? We briefly compare three variables that are frequently mentioned in the existing literature, namely national income, the disease environment, and proximity to protein production. National Income is influential, because a nation's purchasing power affects food consumption as well as expenditures on health-related goods. In contrast, a problematic disease environment should have a negative effect. We, therefore, use infant mortality as an indicator for the disease environment, because the mortality during the first year of life tends be least correlated with income, and is sensitive to Public Health, breast feeding, and other health-related parental behaviours (Komlos 1996).

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studies of Challu (2009), Lopez-Alonso and Condey (2003) and Cámara Hueso (2006) that actually the French foot measure was widely used in Spanish and Latin American military units during the early 19th century. Only during mid-century and thereafter, was it replaced in the armies by national measures and later metric units. Applying this French measure to the Argentinean soldiers and the centimeter measure to the Argentinean prisoners, the level of the two samples is almost identical.

Finally, we use the amount of cattle per capita as an indicator for proximity to protein production, because this factor has been identified in earlier studies as an important determinant of average height (Baten and Blum 2010). As a caveat, it is acknowledged that 'cattle per capita' does not capture productivity increases per livestock, which have been considerable during the 20th century.

National income, disease environment, and nutritional values are aggregated by country and half century to remove short-term fluctuations. National income is measured by real GDP per capita as estimated by Maddison (2001). The observations with highest GDP and tallest stature considered here are from Argentina in the later 20th century (Figure 2). However, observations with the lowest GDP per capita such as Brazil in the second half of the 19th century do not have the lowest anthropometric value. Some observations in Guatemala and Peru represent lower values, which may be partly biased by ethnic selectivity.

There is a slightly closer, negative relationship with infant mortality (Figure 3). We again aggregate by country and half century. The values for Argentina, Colombia and Mexico during the late 20th century are all situated in the upper left quadrant of Figure 3. Compared to what we expect based on its infant mortality values, early 20th century Guatemalans have slightly lower height values.

Finally, the correlation between cattle per capita and height appears to be quite significant (Figure 4). Argentina had the highest cattle per capita values, and the highest average height. The opposite is true for Guatemala, followed by Peru. The correlation is as high as 0.67 (p-value 0.00). The most important deviation is Argentina during the late 19th century, when heights were somewhat lower than the cattle per capita variable predicts.

In sum, comparing Latin American heights with potential explanatory variables based on the existing literature, we obtain a relatively strong correlation with proximity to protein production, and slightly lower correlations with GDP per capita and infant mortality.

Contributions of this volume

How does the current volume contribute to Latin American antropometrics? The study by Twrdek and Manzel offers a pessimistic view on Peru's average anthropometric development during the 19th century. The authors argue that, based on its natural resource endowment, Peru had the potential for considerable welfare improvements. A large amount of Guano was exported to Europe, and the revenues were immense. However, the unequal distribution of income was a high hurdle for additional welfare improvements.

Part of modern Mexico developed economically by exploiting regional resource endowments and by emphasizing different industrial sectors. Leatherman, Goodman, and Stillman consider how Mexico's tourism-led growth were related to changing 20th century biological markers in the Yucatan Península. Yucatan children's height varied little between 1938 and 1987. However, between 1987 and 1998, average male and female height increased by nearly 3 cms. Moreover, Yucatan children were short for their ages, and 40% of males and 64% of females were obese, suggesting that modern Yucatan childhood statures are stunted, and these children grow into obese adults.

An on-going question in Latin American economic development studies is the importance of formal land titling and its corresponding relationship with economic efficiency and development. Gandelman studies the effect of granting formal property rights in Uruguay on modern health outcomes and finds that land titling may reduce the likelihood of hypertention, diabetes, and possibly asthma and rheumatism.

Considerable effort is made toward linking anthropometric measures and cognitive ability. Jürgen Maurer investigates the relationship between height, early life conditions, education, and later-life cognitive function and finds a positive relationship between Latin American height and later-life cognitive ability. Moreover, he finds this effect is larger for females than males.

Maria Eugenia Peña Reyes, Guillermo Bali Chavez, Bertis B. Little, and Robert M. Malina study children's height in a large number of villages in Southern Mexico. In particular, they assess the amount of explanatory power that poverty indices have on heights, weights, and BMI. While there is some influence on height, the weight and BMI influences are quite limited. Even in the height regressions, the share of explained variance indicates there may have been other factors not included in the indices that have an impact.

Jounghee Lee, Robert F. Houser, Aviva Must, and Odilia I. Bermudez are interested in the simultaneous appearance of modern Guatemalan child malnutrition and maternal overweight status. Some 18 percent of households faced this dual burden. The authors argue that Guatamala is in the middle of a transition phase, in which child under-nutrition is still present, whereas the parental overweight phenomenon is already caused by more limited physical activity than in earlier times, and more access to unhealthy, heavily processed foodstuffs.

The final contribution considers the relationship between health and geography. Recent research suggests that there may be a relationship between residence altitude and height, working through a height and vitamin D channel. Wehby, Castilla and Lopez-Camelo extend this discussion to Andean birth weight and altitude and find a significantly negative relationship between altitude and birth weight.

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In sum, past research on Latin American anthropometrics, as well as the studies in the present volume, have increased our understanding of how economic processes led to an improvement or deterioration of the well being of Latin Americans depending on the specific socio-economic factors at work. Anthropometric history contributes to the understanding of long-run living standards, whereas the empirical studies using contemporary material address current problems, such as obesity and marginalization.

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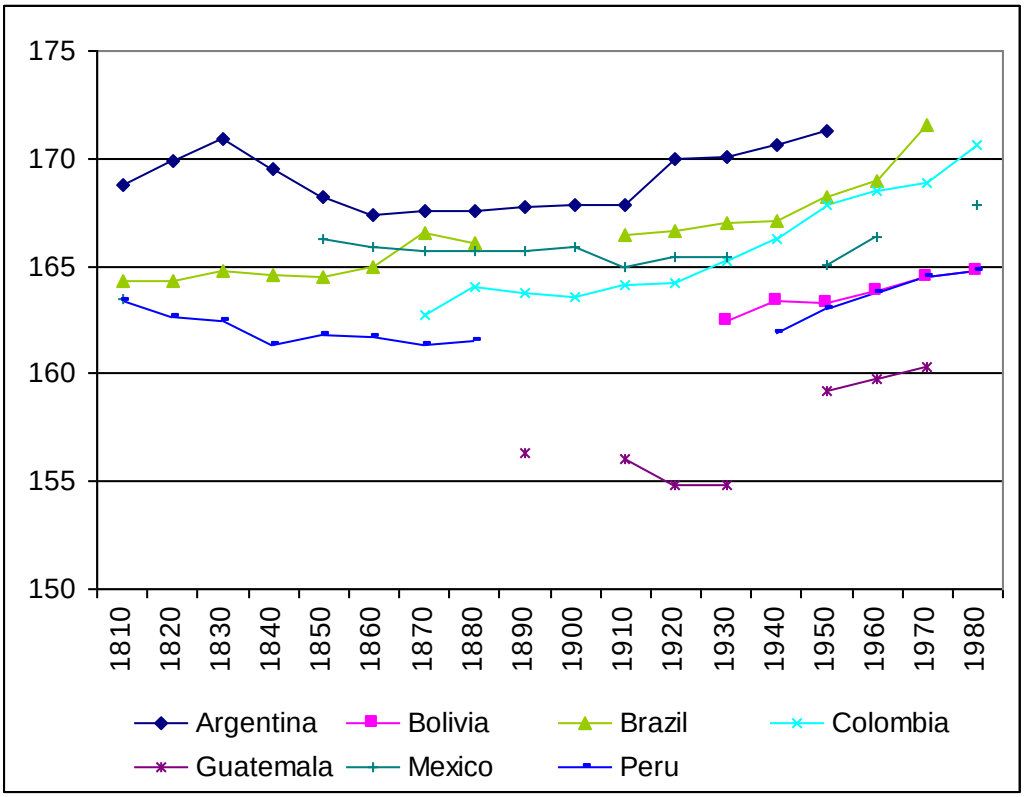

Figure 1: Height estimates for selected Latin American countries

Sources as compiled by Baten and Blum (2010): Argentina (AR) 1870s-1940s: Salvatore (2007), Baten et al. (2009). AR 1820s-1860s: Baten (2010). AR 1810s: Salvatore and Baten (1998), but using Paris foot. Bolivia (BO) 1930s: Godoy et al. 2006. BO 1940s-1980s: Demographic and Health Surveys (DHS). Brazil (BR) 1810s-1880s: Baten et al. (2009); BR 1910s-1920s: Monasterio and Signorini (2008); BR 1930s/1940s: Strauss and Thomas 1998; BR 1950s-1970s: DHS. Colombia (CO) 1870s-1940s: Meisel and Vega (2007); CO 1950s-1980s: DHS. Guatemala (GT) 1890s and 1910s: Faulhaber (1970), GT 1920s/1930s: Russell (1976); 1950s-1970s: DHS. Mexico (MX) 1810s, 1850s-1890s: Carson (2007), see also Challu (2009). MX 1900s-1930s: Lopez-Alonso and Condey (2003); MX 1950s/1960s: Rubalcava and Teruel (2006); MX 1980s; Hossain Lestrel Ohtsuki 2005. Peru (PE) 1810-1880s: Twrdek Manzel (2010); PE 1950s-1980s: DHS; All the DHS data relates to women and has been converted into male equivalents as described in Baten and Blum (2010).

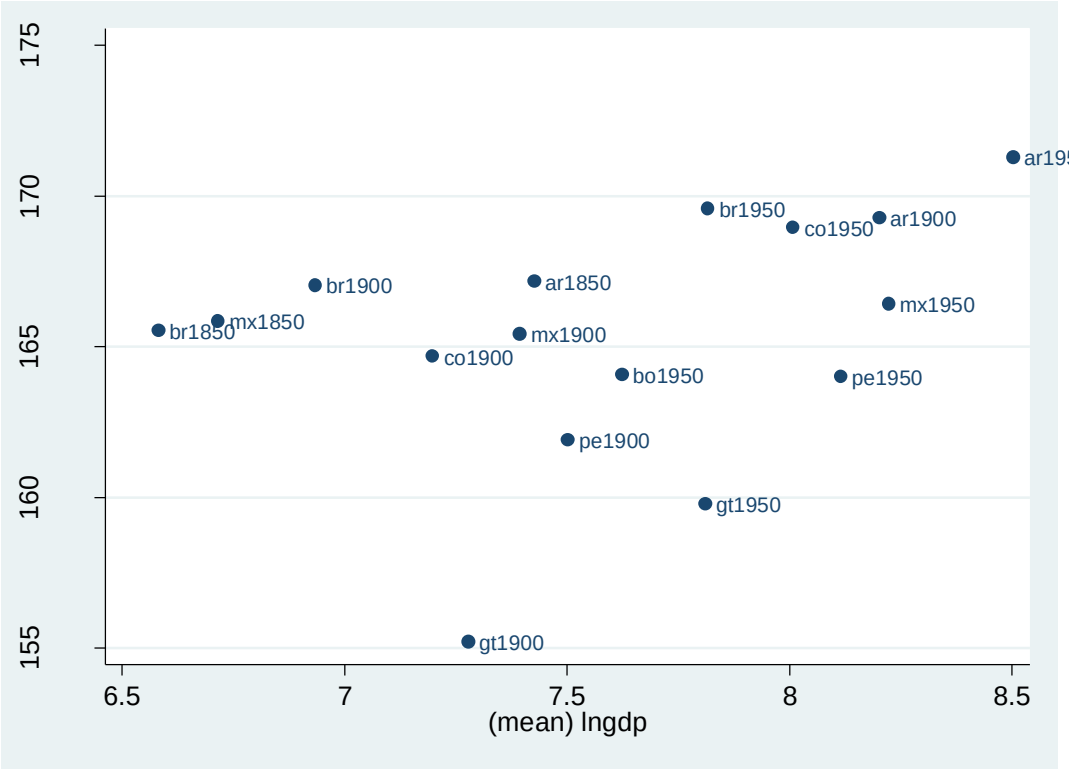

Figure 2: Height and GDP per capita (in logs), by half century

Note: The year indicates the start year of a half century ('1850' for the 1850-99 etc). Country abbreviations: See notes to Figure 1. Source of GDP per capita evidence: Maddison (2001)

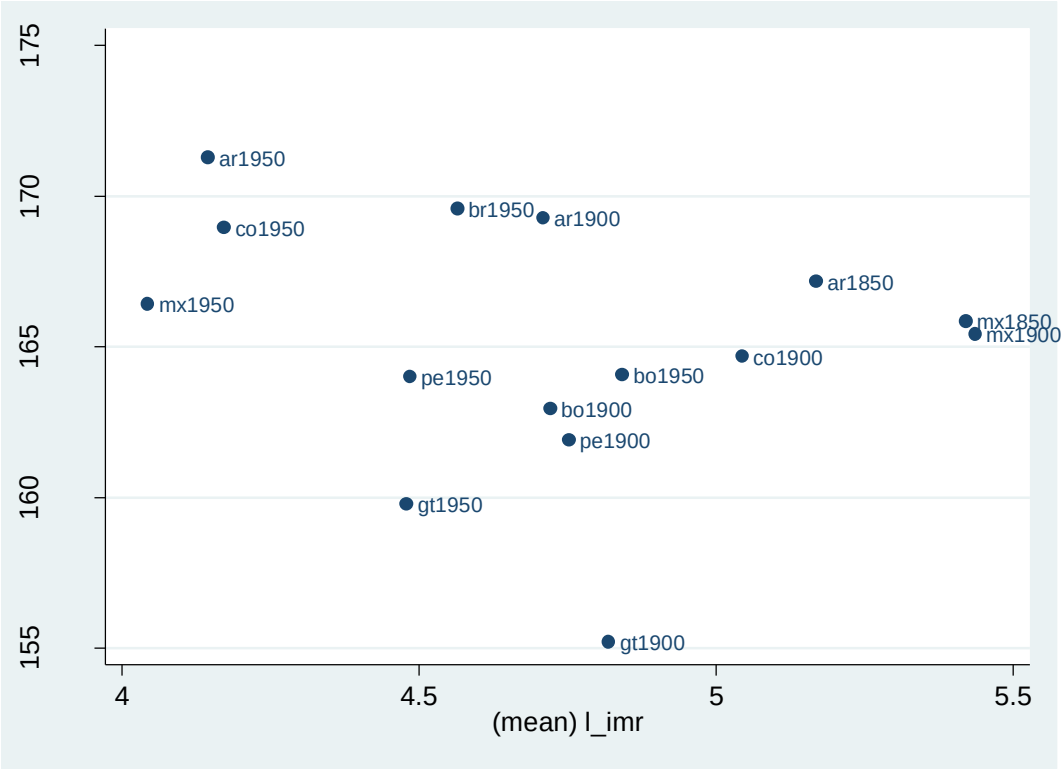

Figure 3: Height and infant mortality rate (in logs), by half century

Sources: for infant mortality, see Baten and Blum (2010).

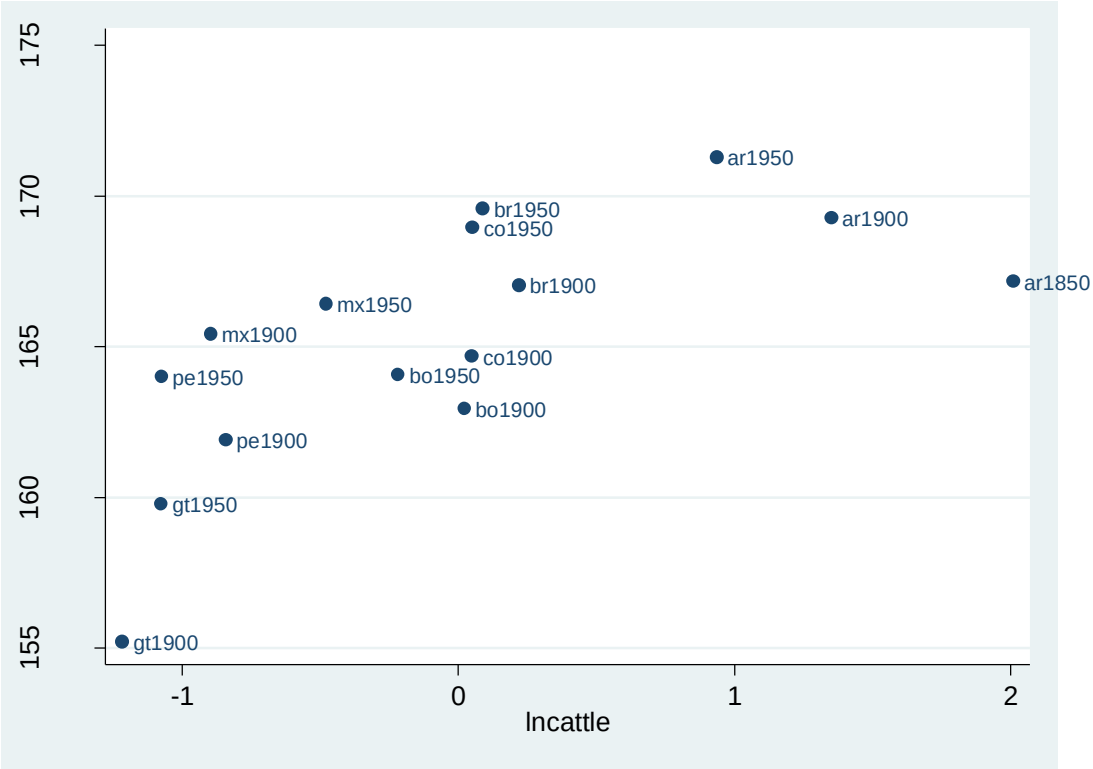

Figure 4: Height and cattle per capita (in logs), by half century

Sources: for cattle per capita, see Baten and Blum (2010).