Tracing the reversal of fortune in the Americas. Bolivian GDP per capita since the mid-nineteenth century

Alfonso Herranz-Loncán and José Alejandro Peres-Cajías

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Abstract

In the centuries before the Spanish conquest, the Bolivian space was among the most highly urbanised and complex societies in the Americas. In contrast, in the early 21st century Bolivia is one of the poorest economies in the continent. According to Acemoglu, Johnson and Robinson (2002), this disparity between precolonial opulence and current poverty would make Bolivia a perfect example of “reversal of fortune” (RF). This hypothesis, however, has been criticised for oversimplifying causal relationships by “compressing” history (Austin, 2008). In the case of Bolivia, a full contrast of the RF hypothesis would require a global approach to the entire postcolonial period, which has been prevented so far by the lack of quantitative information for the period before 1950. This paper aims at filling that gap by providing new income per capita estimates for Bolivia in 1890-1950 and a point guesstimate for the mid-nineteenth century. Our figures indicate that divergence has not been a persistent feature of Bolivian economic history. Instead, it was concentrated in the second half of the 19th century and the catastrophic episodes of the second half of the 20th century. By contrast, during the first half of the 20th century, the country converged with both the industrialised and the richest Latin American economies. The Bolivian postcolonial era cannot therefore be described as one of sustained divergence associated to a bad institutional setting, and an adequate understanding of Bolivian present poverty levels requires more specific and complex explanations.

Preliminary version

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* Department of Economic History and Institutions, University of Barcelona.
1. Introduction

In the centuries before the Spanish conquest, the Bolivian space was among the most highly urbanised and, arguably, most complex and developed societies in the Americas. According to the estimates reported in Acemoglu, Johnson and Robinson (2002), the urbanisation rate in the Bolivian area ca. 1500 was, together with those in Mexico, Ecuador and Peru, the highest in the continent. The economic prominence of the Bolivian space consolidated after the conquest due to silver discoveries. Thanks to these, the Bolivian city of Potosi became one of the most important economic centres in the Americas during the colonial era. For a long period of time, Potosi silver production was critical for the world economy (Pomeranz, 2000: 269-274), for regional economic integration (Assadourian, 1982) and for the Spanish administration’s sustainability (TePaske and Klein, 1982). Despite its gradual loss of positions in favour of other areas of the Empire, Potosi remained an important economic centre until the collapse of the Spanish colonial power (Tandeter 1993; Grafe and Irigoin, 2006).¹ Not surprisingly, today, almost 500 years after its arrival to the region (1548), Spaniards still use the expression “vale un Potosí” (it is worth a “Potosi”) as equivalent to “it is worth a fortune”.

In stark contrast with its prosperity during precolonial and colonial times, in the early 21st century Bolivia is one of the poorest economies in the Americas. In 2012, according to the World Bank, its income per capita (PPP-adjusted) was the sixth lowest in the continent, just ahead of Haiti, Guyana, Nicaragua, Honduras and Guatemala, and the country ranked 108th in Human Development Index (UNDP). The HDI figure becomes substantially worse if it is corrected for inequality: Bolivia is one of the most unequal economies in one of the most unequal regions of the world (SEDLAC).

This contrast between precolonial and colonial opulence and current relative poverty would make Bolivia a perfect example of the so-called “reversal of fortune” (Acemoglu, Johnson and Robinson, 2002). According to this hypothesis, among the countries colonised by European powers since 1500, those that were relatively rich at the

¹ The economic importance of Potosí was higher at the beginning of the colonial period (1570-1630) than thereafter (Bakewell, 1984; Tandeter, 1993). Recent works by Arroyo-Abad et al. (2012) and Allen et al (2011) and show the relative decline of Potosi relative to other economies in the Americas and the world since the second half of the 17th Century.
beginning of the colonial era are now relatively poor and vice versa. The reversal of fortune would be the result of an institutional reversal created by the colonisers, which were more prone to establish extractive institutions in rich areas, and institutions that encouraged investment in poor regions. After independence, the continuity in the rent-seeking and investment-discouraging character of the institutional framework in previously rich areas would have prevented them from taking advantage of the opportunities to grow and industrialise, and would have condemned them to sustained divergence.

Actually, Acemoglu, Johnson and Robinson (2002: 1266) explicitly mention Potosi among the examples of territories where the Europeans established an institutional framework that would have hindered growth and investment in the long term. According to them, “(...) the area now corresponding to Bolivia was seven times more densely settled than the area corresponding to Argentina; so on the basis of [our] regression, we expect Argentina to be three times as rich as Bolivia, which is more or less the current gap in income between these countries” (ibid., p. 1248). In the same vein, Dell (2010) identifies a number of channels through which the negative effects of the mining mita, a forced labour system instituted by the Spaniards in Peru and Bolivia in 1573, persisted over time and affected the current development levels of the areas where it was established.

The “reversal of fortune” hypothesis, however, has been criticised for oversimplifying causal relationships by “compressing” history. For instance, in the case of Sub-Saharan Africa, Austin (2008) stresses the difficulty of providing general explanations for a region with wide variations in economic growth experiences over time and across countries. In the case of Bolivia, the available official series of income per capita, which starts in 1950, clearly indicates that the second half of the 20th century was a period of divergence from the core economies of the world. More specifically, according to New Maddison Project database, Bolivian pc GDP represented 20 percent of US pc GDP in 1950 and only 10 percent in 2010. However, that divergence was not constant over time, but was associated with two specific economic catastrophes: i) the depression that followed the 1952 Revolution, and ii) the debt crisis and the structural adjustment programs of the 1980s. Moreover, economic growth in Bolivia since the late 1950s has not been significantly lower than in neighbouring Argentina, a country which, according
to Acemoglu, Johnson and Robinson (2002: 1248), would have benefited in the long term, through the institutional channel, from the low levels of population density and urbanisation of its territory ca. 1500.  

Therefore, far from being a sustained process, Bolivian divergence during the second half of the 20th century seems to have been associated to certain conjunctures and countries. The available research on the period before 1950 also seems to suggest an alternation of cycles of stagnation and economic dynamism. For instance, instability, de-urbanization, export stagnation and (since 1870) the decrease in silver prices and the Bolivian terms of trade would have reduced the country’s potential for economic growth and convergence during the second half of the 19th century (Huber, 1991; Pacheco, 2011; Langer, 2004; Mitre, 1981; Klein 2011; Bértola, 2011). By contrast, the boom in rubber and, specially, tin exports since the early 20th century would have boosted a sustained growth process at least until the Great Depression of 1929 (Mitre, 1993; Bértola, 2011), a crisis which, in addition, would have had a relatively mild impact in Bolivia, compared with other Latin American countries (Bértola, 2011: 262).

Unfortunately, so far the lack of information on the main magnitudes of the Bolivian economy has prevented from testing any hypotheses on the country’s relative performance since independence. Indeed, analyses of Bolivian long-term economic growth have suffered so far, either from being constrained to the second half of the 20th century (e.g. Mercado et al., 2005; Humérez et al., 2006; Grebe et al., 2012; Machicado et al., 2012; Pereira et al., 2012), or from lacking an homogeneous indicator of economic performance for the whole postcolonial period (see e.g. Morales and Pacheco, 1999; Mendieta and Martin, 2009; Bértola 2011; Peres Cajías, 2012).

This paper aims at filling this gap by providing estimates of the Bolivian income per capita from the mid nineteenth century to 1950. More precisely, we present new yearly income per capita figures for 1890-1950 and a point guesstimate for the mid-nineteenth century. The new series may help to find out when Bolivia left its ancient colonial centrality and became a marginal space in the Americas, and to identify the main periods of Bolivian economic divergence after independence. The results of our

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2 The yearly growth rates of Argentinean and Bolivian pc GDP between 1950 and 2010 were 0.9 and 0.8 percent respectively, according to the New Maddison Project database.
estimation indicate that divergence, which originated before the mid-19th century, has not been a persistent feature of postcolonial Bolivian economic history. Instead, it seems to have been concentrated in the second half of the 19th century and the catastrophic episodes of the second half of the 20th century. By contrast, during the first half of the 20th century, economic growth was not low by international standards, and Bolivia converged both with the core countries and with the richest economies in the region. It is therefore difficult to describe the postcolonial era in Bolivia as one of sustained divergence associated to a bad institutional setting. An adequate understanding of Bolivian present poverty would require instead more specific explanations, in order to understand the reasons why the country was unable to take advantage of the available growth opportunities in certain specific periods.

This is the first attempt to estimate the long term evolution of Bolivian pc GDP before 1950. There are, however, some antecedents for some specific periods or benchmark years. More precisely, Mendieta and Martín (2009) have estimated yearly GDP figures for 1929-1950 through a regression with three independent variables: exports, public expenditure and money supply (real M3). Morales and Pacheco (1999) report average GDP growth rates for some subperiods between 1900 and 1945, and yearly GDP figures for 1928-1936, although without giving information on their estimation methodology. Finally, Hofman (2001) provides GDP estimates for 1900, 1913 and 1929, also without indicating sources or estimation methods. The next section presents the sources and methods that we used to carry out our own estimation of the evolution of Bolivian GDP between the mid nineteenth century and 1950, and compares it with these alternative estimates.

2. Bolivian pc GDP between 1890 and 1950: sources and estimation methods

This paper provides yearly estimates of the Bolivian GDP for 1890-1950 and a point “guesstimate” for the mid 19th century. In this section we present the sources and methods used to obtain the yearly series from 1890 onwards, whereas the next one describes the assumptions that underlie the guesstimate.

Our GDP series is based on the production approach. In order to grant the link with the current GDP figures, the starting point of the estimation is the value added of each
Bolivian economic sector in 1950, taken from the official national accounts (Table 1). We have then estimated a series of real gross output for 1890-1950 for each of the sectors considered in that classification, which we have used to extend backwards each 1950 sectoral value added figure. Finally, we have taken the sum of the resulting sectoral value added series as the yearly estimation of the Bolivian GDP.

Table 1. Sectoral composition of the Bolivian GDP (1950)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Value added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrarian Sector</td>
<td>31.21</td>
</tr>
<tr>
<td>Mining and petroleum industry</td>
<td>15.48</td>
</tr>
<tr>
<td>Mining</td>
<td>14.94</td>
</tr>
<tr>
<td>Petroleum industry</td>
<td>0.54</td>
</tr>
<tr>
<td>Manufacturing industry</td>
<td>14.08</td>
</tr>
<tr>
<td>Urban industry</td>
<td>13.12</td>
</tr>
<tr>
<td>Rural artisan production</td>
<td>0.96</td>
</tr>
<tr>
<td>Utilities</td>
<td>1.39</td>
</tr>
<tr>
<td>Construction</td>
<td>2.36</td>
</tr>
<tr>
<td>Services</td>
<td>35.48</td>
</tr>
<tr>
<td>Government</td>
<td>5.36</td>
</tr>
<tr>
<td>Transport</td>
<td>6.67</td>
</tr>
<tr>
<td>Trade</td>
<td>11.32</td>
</tr>
<tr>
<td>Housing rents</td>
<td>4.93</td>
</tr>
<tr>
<td>Financial and other services</td>
<td>7.20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Sector percentages (in 1958 prices, the earliest available) have been taken from the ECLAC webpage, and the importance of the subsectors within each main sector comes from CEPAL (1958).

Notes: We have introduced two modifications on the original ECLAC data. First, we have corrected the sectoral percentages to account for the fact that financial services were not included in the ECLAC database before 1962 (the series included instead a non-classified "statistical difference" up to that year, which we took as a basis for our estimation of the weight of the financial sector). Second, we have corrected the percentage of construction to account for the fact that the 1950 figure was a clear outlier; we took instead the average percentage for 1950-1955 and recalculated the relative importance of the remaining sectors accordingly.

The quality of our results is affected by the absence of information for some sectors, which is especially serious in the case of agriculture, manufacturing industry before 1925, and domestic trade services, and may have introduced biases of unknown direction in the level, fluctuations and composition of the series. In addition, our estimation also suffers from the lack of information on the evolution of prices and productivity in each sector. The importance of this problem is reduced by the low technological dynamism of an exceedingly large share of the Bolivian economy during the period under study. However, due to both those potential biases and the gradual reduction in the amount and quality of the available empirical information as the series...
go back into the past, it is necessary to allow for relatively large error margins in the case of the earliest observations.

The following paragraphs describe in detail the sources, methods and assumptions applied in the estimation of each sectoral series of output volume. Before that, however, we describe the population figures that we have used to express the GDP in per capita terms, and also as an index for the evolution of some of the output series.

Population

The available information on the historical evolution of the Bolivian population is very scarce. For the 19th century there is no official census, but only a bunch of estimates published for different benchmark years (1825, 1831, 1835, 1846, 1854, 1865 and 1882). These seem to have been obtained with different methodologies and are mutually inconsistent, involving huge and unlikely demographic changes in different directions over short periods of time (Barragán, 2002; Urquiola, 1999: 216). In the case of the first half of the 20th century, apart from a few incomplete estimates for some intermediate years, which do not cover the whole territory of the country, there are only two national censuses available, which were carried out in 1900 and 1950. The estimates for the 19th century, together with the national census totals, are reproduced in Table 2.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1825</td>
<td>1,100,000</td>
</tr>
<tr>
<td>1831</td>
<td>1,088,768</td>
</tr>
<tr>
<td>1835</td>
<td>1,060,777</td>
</tr>
<tr>
<td>1846</td>
<td>1,378,896</td>
</tr>
<tr>
<td>1854</td>
<td>2,326,126</td>
</tr>
<tr>
<td>1865</td>
<td>1,813,233</td>
</tr>
<tr>
<td>1882</td>
<td>1,172,156</td>
</tr>
<tr>
<td>1900</td>
<td>1,766,451</td>
</tr>
<tr>
<td>1950</td>
<td>2,704,165</td>
</tr>
</tbody>
</table>

Source: Barragán (2002) and National Censuses of 1900 and 1950.

Our estimation of the Bolivian population since the late nineteenth century is based on a geometric interpolation between the three national estimates that we consider as the

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We have excluded from the 1900 figure the population from the old Bolivian coastal areas (*Litoral*), which were still included in the census despite having being lost in the Pacific War.
most reliable among the available ones: the 1900 and 1950 national censuses and the 1846 figure. The latter comes from Dalence (1851), and is usually preferred in Bolivian historiography, because it was elaborated in the context of an exhaustive and detailed survey of the Bolivian economy. The main shortcoming of the 1846 estimation is the uncertainty on the size of the so-called “infidel” population, which seems to account for those indigenous communities that were not fully integrated in the Bolivian state institutional structure yet. These communities, which the 1900 and 1950 National Census estimated in 91,000 and 87,000 individuals respectively, were considered by Dalence in the mid 19th century to amount to approximately 700,000 people, i.e. 34 percent of the total Bolivian population. This figure, however (which is not included in the 1846 total population reported in Table 2), seems to be an overestimation, because it would involve a substantial net demographic decrease in Bolivian population of more than 200,000 inhabitants throughout the second half of the 19th century, a period of demographic expansion in all Latin American countries (Yáñez et al., 2012). The 1950 national census also considers this figure as unrealistic and suggests that the “infidel” population would amount instead to 100,000 individuals by the mid 19th century.

Given that uncertainty, we have estimated two population series. One includes all individuals that were adequately accounted by the Bolivian State, and the other also includes the population of the “infidel” or “non-subjected” (as the 1900 Census calls them) communities. The former is the result of making a geometric interpolation between Dalence’s figure for 1846 and the National Censuses of 1900 and 1950. In the latter we add an almost stagnant series of “non-subjected” population that decreased monotonously from 100,000 individuals ca. 1854 to 91,000 in 1900 and 87,000 in 1950.

4 The 1900 national census distributed this population as follows: 27% in the Department of Tarija, 21% in the Department of Santa Cruz, 16% in the “Territorio de Colonias”, 16% in the Department of La Paz and less than 10% in each of the Departments of Beni, Cochabamba and Chuquisaca. The distribution of this population in 1950 was similar, and is consistent with the history of the Bolivian State expansion (Barragán and Peres-Cajías, 2007), since the “infidel population” would be mostly located in the tropical lowlands and the Chaco, i.e. mostly at the northern and eastern areas of the country.

5 Neither migration nor the territorial loss associated to the Pacific War can explain that decrease. The population of the areas that were lost to Chile in the early 1880s may be estimated in ca. 74,000; see Yáñez et al. (2012: 21). Likewise, net Bolivian migration might have involved even lower numbers. For instance, according to the official censuses of each country, by 1895 the number of Bolivian-born citizens living in Chile and Argentina, which were probably the main destinations of the Bolivian emigration, was 8,869 and 7,361 respectively, whereas the number of foreigners living in Bolivia in 1900 was 7,425.

6 In order to estimate this series, we have increased the 1950 Census figure by 0.7 percent, which is the estimated census omission for that year according to ECLAC; see Yáñez et al. (2012: 11). For 1900, the Census estimates an omission of 5 percent, which is also incorporated in the calculation. Following Yáñez et al. (2012), we also account in the series for the demographic effects of the Pacific War (1879) and the Chaco War (1932-1935).
In turn, the first series is divided between urban and rural population. We consider as urban the population living in cities with more than 2,000 inhabitants in each of the three benchmark years, and all the remaining population as rural. With this broad definition of cities, the Bolivian urbanisation rate is estimated to have increased from 11 percent in 1890 to 26 percent in 1950.\footnote{Maddison (2003) and Yáñez et al. (2012) provide alternative population series for Bolivia, which start, in the first case, in 1900, and, in the second, in 1826. Differences between those series and our own are not very large (always lower than 11 percent), with the exception of the last few years of the 19th century and the early 20th century in the case of Yáñez et al. (2012). The reason for that difference is twofold. First, Yáñez et al. (2012) assume a population figure for 1900 of 1,561,000, much lower than the total census estimate. This is apparently the result of the exclusion by those authors of non-censed population, non-subjected communities and census omissions. Second, for 1882 they accept the figure reported in Table 2, which we consider as a clear underestimate. As a consequence, our estimate of the Bolivian population for 1890 is 20 percent larger than these authors’ figure.}

### Agrarian sector

The available information on the Bolivian agrarian sector before the mid 20th century is extremely scarce. The first Agrarian Census was carried out in 1950 (see CEPAL, 1958). Before that year, there are no reliable agricultural production data for the whole country in the national official statistics, and the 1900 national census, for instance, considered impossible to provide even rough estimates of national agrarian production, due to the absence of statistical information (1900 National Census, p. LXVII). There is a total absence of national production data also in the historical literature (e.g. Larsson, 1988) and in the international statistical publications,\footnote{The League of Nations and UN yearbooks provide some data of agrarian production for Bolivia, but they are difficult to accept, showing huge changes between consecutive years and being inconsistent with the information reported in the Agrarian National Census of 1950.} with the only exception of a series of rubber exports (which would be barely equivalent to output, since practically the whole domestic production was exported) for 1890 onwards (Gamarra Téllez, 2007).\footnote{Actually, Bolivian foreign trade statistics might underestimate rubber production, since a lot of Bolivian rubber was moved to Brazil through the porous border line between both countries. Unfortunately, the importance of this smuggling activity is impossible to quantify.}

Leaving rubber production aside, for the rest of the agrarian sector we have chosen an indirect estimation strategy. First, we have estimated agrarian output in the mid 19th century on the basis of the information reported in Dalence (1851) and the assumption that the Bolivian import capacity at the time was relatively low and, therefore, domestic output is equivalent to total national output.
output should be enough to feed the Bolivian population.\(^\text{10}\) Second, we have linked the estimate for the mid 19\(^\text{th}\) century with 1950 on the basis of the evolution of rural population.

As has been indicated, our estimate of agrarian production for the mid 19\(^\text{th}\) century is based on the information provided by Dalence (1851), who indicated the value of the agrarian gross production in Bolivia in 1846 and its composition. He also offered an estimation of the produced quantities of different products which represented, overall, 96 percent of the total value of the sector. However, his estimation is not consistent with the nutrition needs of the Bolivian population in 1846. Under the assumption of a relatively low import capacity of the country during those years, that mismatch would be a consequence of an underestimation of food production (maybe due to the inability to account for self-consumption; see Langer, 2004). In addition, such underestimation would mainly affect agricultural produce, rather than livestock.\(^\text{11}\) Under these circumstances, we have re-estimated agrarian production in 1846 by assuming that: i) nutrient availability was 1,940 calories per male adult-equivalent per day;\(^\text{12}\) ii) animal products were correctly assessed by Dalence (1851); and iii) in the case of agricultural products, Dalence’s estimates correctly reflect the composition of output, but not its

\(^\text{10}\) According to Dalence (1851), Bolivian food imports in 1846 were rather limited, consisting of just 100,000 cargas of potatoes and chuño, “a lot of” ají and “many” arrobas of rice. A low level of Bolivian import capacity in the mid 19\(^\text{th}\) century would be consistent with the small size of mining output and exports at the time. This might have been partially overcome, however, by the depreciation of the Argentinean peso relative to Bolivian silver and the resulting increase in Bolivian terms of trade with Argentina (Irigoin, 2009). Nevertheless, the impact of this problem on Bolivian food import capacity would have been rather low, since legal imports from Argentina accounted only for 7\% of total Bolivian imports at the time, and only 12\% of these were compound by food –basically cows (Dalence, 1851, pp. 268-274). In addition, the value of the Bolivian currency in relation with the Argentinean peso was not stable over time and, given the persistent monetary heterogeneity in Argentina, probably not uniform across regions (see Irigoin, 2009, pp. 563-568). Finally, if our assumption on the low level of Bolivian food imports is too low, this would involve an overestimation of the agrarian production in the mid 19\(^\text{th}\) century, but this would be compensated by the underestimation of the relative value of silver exports.

\(^\text{11}\) Dalence’s estimation of meat consumption per person is very similar to that provided by the 1950 Agrarian Census, which is around 23 kilograms per year (CEPAL, 1958: 268). If Dalence’s figures for the whole agrarian sector were accepted, this would represent almost 20\% of the total nutritional output of the country (see the Appendix). This percentage is too high to be likely; for example, meat has been estimated as representing 12 percent of the total nutritional ingest in colonial times in Mexico, Peru, Bolivia and Colombia by Arroyo-Abad et al. (2012: 153).

\(^\text{12}\) This is the nutrient availability level used by Arroyo-Abad et al. (2012: 153) in their bare-bones basket for Latin America during the colonial era. Although this amount is rather low in comparative terms, we have preferred to use it here in order to account for the possibility that Dalence underestimated the level of food imports (see above, footnote 7). We have excluded the “non-subjected” population from the calculation of the nutritional needs of the Bolivian society because we estimate the subsistence production of this population separately from the rest (see below).
level (see the Appendix). As a result of those assumptions, we obtain an estimate of agrarian product in 1846 that is 46% higher than the value proposed by Dalence.

In order to compare that estimate with the output of the sector in 1950, we have taken a sub-group of goods for which price and quantity data were available both for 1846 and 1950, and which represented 82 percent of the total gross production in 1846 and 74 percent in 1950. We have expressed the production of those goods in both years in 1950 prices, and have added up in each case the total value of the products for which unit prices and quantities were not available for both years (with the exception of rubber, see below). Finally, we have increased gross production in each year by 11 percent to account for forestry production. According to these calculations, the gross output of the agrarian sector in 1950 was approximately twice as high as in 1846. This difference has been used to construct an index of output volume that, due to the lack of additional information, is assumed to have grown in line with rural population. Finally, we have increased that index by the value added of rubber (at 1950 prices), under the assumption that all rubber production was exported, and by an additional amount to account for the food production of the “non-subjected” population.

Although the paucity of empirical information on the sector prevents from drawing any detailed conclusions on the evolution of the output series, our estimates would indicate that the agrarian value-added per rural inhabitant would have increased just by 23% in a century. This extremely low progress is consistent with the very low levels of Bolivian agrarian productivity in the mid 20th century (CEPAL, 1958: 54) and, together with the gradual increase in urbanisation, it would help to explain the substantial growth in Bolivian food imports that took place since the 1920s.

13 This was the percentage in 1950 (CEPAL, 1958); Dalence (1851) does not present data for this sector for 1846.
14 Rubber exports were negligible until 1890, when they started growing at a very high pace. In the 25 years before 1915 they amounted, on average, to around one third of total Bolivian exports. After 1915, due to Asian concurrence, and with the exception of the Second World War years, rubber exports became marginal. Export data come from Gamarra (2007) for 1890-1926 and from the official trade statistics afterwards. The relative price of rubber in 1950 has been taken from the Christopher Blattman database: http://chrisblattman.com.
15 Under the oversimplifying assumption that these communities lived at subsistence level and all their economic activity was food production, we assume their per capita agrarian (and total) GDP to be 300 Geary-Khamis dollars of 1990. This is the subsistence minimum assumed by Milanovic et al. (2010: 262).
Mining and petroleum industries

Unlike population or agriculture, the available information on output and prices of extractive industries (mining and the oil industry) is abundant and allows reconstructing the evolution of the production of silver, tin, copper, gold, antimony, lead, tungsten, zinc and petroleum and its derivatives. Since, in most cases, all output was exported, we have often assumed exported quantities to be representative for production.\(^{16}\)

Our series of silver production is based, up to 1907, on Klein’s (2011: 304) decennial estimates, which have been annualized on the basis of Haber and Menaldo’s (2011) database.\(^{17}\) After 1907, we use silver exports figures, taken from the official trade statistics. When these were not available, we used Haber and Menaldo’s (2011) data. The tin output index is based on export data taken from Haber and Menaldo (2011) up to 1903, Peñaloza Cordero (1985) for 1904-1924, and CEPAL (1958) for 1925-1950. Silver and tin were the two main minerals produced in Bolivia, and accounted for more than three quarters of total mining production in the century before 1950. We have also estimated the evolution of the output of six other minerals of lower importance: copper (from Haber and Menaldo, 2011), gold (from the official trade statistics), and antimony, lead, tungsten and zinc (from the official trade statistics for 1908-1930 and Haber and Menaldo, 2011, for 1931-1950).\(^{18}\)

We aggregated the resulting eight production indices by using the structure of prices in 1846, 1908, 1925 and 1950, obtained from information in Haber and Menaldo (2011) and the Blattman’s database. Finally, we have calculated a single series through weighted averages of each couple of aggregate indices, in which the relative weight of each series depends on the distance to the year of the price structure of that series. We have then used the average volume series as representative of the evolution of mining value added (assuming therefore a constant ratio between value added and gross production).

\(^{16}\) On this assumption, see Gómez (1978) and Mitre (1986, 1993).

\(^{17}\) For this section, we actually rely on the complete mining production data estimated by Haber and Menaldo and which were kindly provided to us by the authors.

\(^{18}\) We assume that the relative importance of the production of the last four minerals was negligible before 1908.
Finally, the value added series of the petroleum industry is based on two volume indices, of raw and refined oil production, that start in 1925 (when this industry was established in Bolivia) and are taken from CEPAL (1958: 193). Once more, due to the scarcity of information, we have assumed a constant ratio between oil value added and gross production between 1925 and 1950, which is 75 percent higher for refined oil than for raw oil.

Manufactures

Following ECLAC, we divide the manufacturing sector into four subsectors: registered industry, non-registered industry, urban artisan production and rural artisan production. Together with the importance of each of those subsectors in the total manufacturing value added in 1950,\textsuperscript{19} CEPAL (1958) also provides a series of gross production of the registered industry and some of its main branches for 1938-50. We have assumed that the non-registered industry and the urban artisan production grew at the same pace as the registered industry during those years, and have extended backward the sum of the output of those three subsectors until 1925 on the basis of a series of volume of imports of raw materials (CEPAL, 1958: 54).\textsuperscript{20} Assuming a constant ratio between manufacturing gross production and value added, this series has been used as representative of the evolution of the value added of Bolivian manufacture (always excluding rural artisan production) between 1925 and 1950.

Unfortunately, there is no systematic information on the evolution of the manufacturing sector before 1925, and we can only make a very rough guesstimate on the basis of Dalence’s (1851) description of Bolivian industry in 1846. With this information, and under the assumption that in 1846 the value added in manufacturing was ca. 50 percent of gross production (as in 1950), we can estimate the value added of urban industry in 1846 as approximately 26 percent of its level in 1925, and link those two benchmark years according to the evolution of urban population.\textsuperscript{21} The growth of the resulting series is very low until the 1920s, which is consistent with the extremely slow Bolivian

\textsuperscript{19} Registered industry: 33.5%; non-registered industry: 29.3%; urban artisan production: 30.4%; and rural artisan production: 6.8%.
\textsuperscript{20} For each year we have taken the average of the imports of that year and the previous one, in order to account for the time lag between the purchase of the raw materials and the commercialization of the industrial product.
\textsuperscript{21} A similar procedure is followed in Alvarez-Nogal and Prados de la Escosura (2007) for the early modern Spanish economy.
industrialisation process before that decade (Rodriguez, 1999) and the delay in the arrival of modern industrial companies to the country (Tafunell and Carreras, 2008: Table 8). It is also consistent with the assessment of the sector included in the 1900 National Census, according to which the Bolivian industrial sector was composed almost exclusively by artisans, among which 95 percent were textile producers. In addition, on the textile industry, the 1900 Census stated that it was: “(...) still in an embryonic state. There is no information about any factory or establishment with the features of a stable and improved company. The only factory of this nature in Bolivia is one established in the city of La Paz” (1900 National Census, p. LXVII- our translation).

In the case of rural artisan production, and given the total absence of information, we have assumed that the value added of the subsector grew at the same pace as rural population between 1890 and 1950.

Utilities

Due to the absence of information on water distribution services, our estimation of the evolution of the value added of the utilities sector is only based on the production of electricity. For 1891-1930, we assume that electric power capacity grew in line with the imports of electric material, which are available in Tafunell (2011). After 1930, CEPAL (1958: 171-179) provides the total amount of electric production in Bolivia for several benchmark years (1938, 1947 and 1952) and the yearly output of the main producers since 1945. This data allow estimating a yearly series of electricity production between 1938 and 1950. Finally, we link the 1930 and 1938 estimates by using the increase in Bolivian electric production between 1929 and 1937, provided by ONU (1952), and the fluctuations of industrial production.

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22 We do not consider gas production and distribution because this sector was negligible in Bolivia before 1950.
23 We assume the value added of the electricity sector to be zero before 1891. This is consistent with the historical description of the main Bolivian cities at the time.
24 In order to approach the yearly changes between 1938 and 1945 we use the fluctuations in industrial output.
Construction

The value added of the Bolivian construction sector in the mid 20th century has been projected backwards on the basis of different indicators. For 1928-1950 we have taken the geometric average of two variables: apparent consumption of cement and imports of construction materials. The former has been estimated, for 1938-1950, on the basis of domestic production (taken from CEPAL, 1958: 161), under the assumption (also suggested by CEPAL, 1958) that it completely replaced imports during those years. For 1928-1938, we have carried out a geometric interpolation between cement imports in 1927 (when domestic production was almost inexistent; see Tafunell, 2006: 15) and domestic production in 1938. Imports of construction material since 1928 have also been taken from CEPAL (1958:54). For 1912-1927, we have assumed that the value added in the sector grew in line with the imports of construction materials (cement included), which have been taken from the official trade statistics. Finally, for 1890-1912 we have used the geometric average of urban population and an index of railway construction, which has been estimated by distributing the railway mileage that was open each year (Sanz Fernández, 1998) between the five previous years.

Government services

The value added of government services has been assumed to grow in line with government expenditure expressed in real terms. Data on government expenditure comes from Gamarra (2007: 142) for 1890-99, and from our own estimation on the basis of official fiscal statistics for 1900-1950 (see Peres-Cajías, 2012). In order to express those figures in real terms, we have used, for 1931-1950, the CPI estimated by Gómez (1978). Before 1931, given the absence of information on price changes, we have assumed, on the basis of the PPP hypothesis, that the annual increase in domestic prices in Bolivia were similar to the three year moving average of the product of the British CPI (Clark, 2013) and the Bolivian peso/sterling pound exchange rate. (Gamarra, 2007: 142).25

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25 Moving averages have been introduced to avoid abrupt yearly changes in the price index. The validity of the methodology described in the text has been tested by comparing the Chilean and Peruvian available CPI for the early 20th century (taken from Braun et al., 2000; and Portocarrero et al., 1992) with an alternative CPI for those countries, estimated as is indicated in the text. Both series are very similar in both cases.
Transport services

The value added of transport services has been estimated on the basis of information on two sub-sectors: railways and roads. First, we have distributed the value added of the transport sector in 1950 between those two subsectors according to their respective revenues in 1951, as estimated by CEPAL (1958). Railway value added has then been projected backwards until 1930 on the basis of the evolution of railway ton-kms and passenger-kms (taken from www.docutren.com), weighted according to their respective unit transport prices in 1955 (estimated from price information in CEPAL, 1958: 226-227). Before 1930, we have assumed that the value added of railway transport grew in line with mining exports, corrected for the evolution of railway mileage.

The value added of road transport has been projected backward, for 1926-1950, according to the evolution of gasoline consumption. This is available in CEPAL (1958: 199) for 1938-50 and has been projected backwards until 1926 using information on gasoline imports (taken from the official trade statistics) and gasoline production, which started in 1931 (also taken from CEPAL, 1958: 197). Before 1926 gasoline consumption was very low, reflecting the fact that truck diffusion was not complete until that year. Therefore, for 1890-1926 we have used the sum of (deflated) imports and exports to approach the evolution of the value added of road transport.

Banking services

The estimated value added of the services of the financial sector in 1950 has been projected backwards on the basis of a deflated series of bank deposits. This series is available since 1869, when the first Bolivian bank (“Banco Boliviano”) was established. Information on deposits has been taken from the Extracto Estadístico de Bolivia (1935) for 1890-1935 and from Gómez (1978: 199-200) for 1936-1950.

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26 Due to its marginal importance during the period, air and river transport services have been ignored.
27 According to CEPAL (1958), by 1951 railway revenues were 57% of road transport revenues. There is, however, a high error margin in the latter, due to the low quality of the available information.
28 For 1933-37 it is impossible to obtain data on gasoline imports from the trade statistics and we have estimated it from information on total fuel imports, taken from CEPAL (1958: 54).
29 Imports and exports are available in real terms since 1925 in CEPAL (1958: 54). Before 1925 we have used our estimated CPI to deflate imports and have used our volume index of mining output (see above) as indicator of the evolution of exports in real terms.
Other services

Information on other services is virtually inexistent. We have then used indirect indicators to project backwards their value added in 1950. In the case of trade services, as has been done by other authors (see e.g. Prados de la Escosura, 2003), we have assumed that their value added grew in line with the evolution of the commercialised physical product, which is estimated as the sum of: i) a percentage of agrarian output equivalent to the relative importance of urban population on total population; ii) the overall production of the extractive and manufacturing industries; iii) total imports. We have used two-year moving averages in order to account for stocks. Finally, we have assumed that housing rents and other services evolved as urban population, just allowing, in the case of housing rents, for a 0.5% annual increase in quality (see also Prados de la Escosura, 2003).

Graph 1 present our series for 1890-1950 and compares it with the alternative available estimates. The long term trend of our series is very similar to the others, with the exception of Morales and Pacheco’s (1999) figure for 1900. The main deviations are observed in the short-run fluctuations and, more specifically, in the Great Depression. According to Morales and Pacheco (1999), Bolivian GDP fell by more than 50 percent between 1929 and 1935, and fully recovered in 1936, whereas our estimates would indicate a much milder crisis (a 20% fall between 1929 and 1932) and a much more gradual process of recovery of the 1929 GDP levels, which would have taken 5 years. Differences with Mendieta and Martín’s estimates are much smaller, although they consider the consequences of the Great Depression to have been even less serious (just a 7% fall between 1929 and 1931) and the growth of the early 1930s much more intense than in our series. A possible explanation of that difference is the influence on their estimation of the evolution of M3 and public expenditure, which grew at high rates between 1933 and 1935 due to the financial costs of the Chaco War.

30 Apparently (although they do not indicate it explicitly), Morales and Pacheco (1999) assumed that Bolivian GDP and exports grew at the same pace between 1900 and 1929. This may partially explain the deviation between their series and our own figures in 1900, since we estimate the ratio exports/GDP to have grown substantially between 1900 and 1913.

31 Due to the lack of information on Morales and Pacheco’s estimation methodology it is not possible to know the reasons for that difference, which might be associated to the high weight of certain variables (such as public revenues) in these authors’ calculation. On the relatively low impact of the Great Depression in Bolivia, see Bértola (2011: 262).
3. **Bolivian income per capita ca. 1846: a guesstimate**

As has been shown in the previous section, the available statistical information on the Bolivian economy becomes increasingly scarce as one goes back in time. As a consequence, the error margin of our series is higher for the earlier periods, up to the point, around 1890, in which the scarcity of data has prevented us from extending our estimation to previous years. Although we have some evidence on the long term trends of some of the GDP components, it is impossible to capture differences in growth rates among periods or to describe the successive growth cycles of the country. For instance, the lack of information makes impossible to account for the effects of the growth of the Bolivian coastal areas (the current Chilean region of Antofagasta) since the late 1850s (Klein, 2011: 123, 140-143), or for the consequences of their loss to Chile in 1879, in the course of the Pacific War.\(^{32}\)

\(^{32}\) Before the 1850s, the Bolivian coast was a marginal space from an economic point of view. For example, population in that region was equivalent to 0.3% of the total Bolivian population in 1846. However, this space became increasingly important between the late 1850s and its conquest by Chile in the Pacific War, thanks to the guano, saltpetre and silver export booms.
However, in order to have a preliminary picture of the long term process of growth of the Bolivian economy since the first few decades after independence, in this section we suggest a very rough guesstimate of the level of its income per capita by 1846. This is mainly based on the aforementioned description of the Bolivian economy by Dalence (1851), which allows comparing the situation of the main sectors of the economy in the mid 19th century with their level of development by 1890. Actually, Dalence’s description has already been used in the previous section to capture the long term trends of those series, such as population, agrarian production, or manufactures before 1925, for which information is scarcer for the late 19th and early 20th century.

Our guesstimate of Bolivian income per capita in 1846 follows, as far as possible, the same sectoral division as the series described in the previous section. As has been indicated there, we have estimated the value added of the agrarian sector in 1846 on the basis of the nutrition needs of the Bolivian population. We assume that animal products were correctly assessed by Dalence (1851) but that, in the case of agricultural products, his estimates correctly reflected the composition of output, but not its level. The result of these assumptions is an agrarian output figure in 1846 that amounted to 76 percent of the production of the sector in 1890. We have increased that amount by an estimate of the food production of the “non-subjected” population.33

Mining output in 1846 is estimated on the basis of the decennial data of silver production provided by Klein (2011: 304) for the period 1840-1909 and the yearly fluctuations in the production of silver in Potosí, as presented by Mitre (1986). For the volume of tin, copper and gold produced in 1846, we have used Dalence’s data on their value in 1846 and information on the relative prices of these minerals coming from Haber and Menaldo (2011) and the Blattman’s database. The resulting amounts have been expressed in 1908 prices and they represent 17% of the production of this sector in 1890.

33 On these calculations see the previous section and the Appendix. As has been indicated, Dalence (1851) estimates the “non-subjected” population to amount to 700,000 people in 1846, but this is inconsistent with the level of the Bolivian population in 1900. Here we follow the 1950 Census suggestion that the size of these communities in 1846 was 100,000, i.e. very similar to their size in 1900 and 1950, which is consistent with the low demographic dynamism of traditional communities. Changing this assumption has very little effect on the estimates (see below).
Manufacturing value added is also estimated on the basis of Dalence’s information, as has been described before. For government services, we use the data of government expenditure in 1846-72 that is published by Huber Abendroth (1991). And, finally, estimates for other sectors (rural artisan production, construction, transport, trade, housing rents and other services) are based on the evolution of the same indirect indicators that have been used to estimate the series for 1890-1950.

The result of those calculations is a GDP “guesstimate” for 1846 which amounts to 76 percent of the 1890 GDP. In per capita terms, it would represent 84 percent of the Bolivian pc GDP in 1890, which is a first indication of the extremely low growth rate of the Bolivian economy during most of the second half of the 19th century. It is important to stress, however, that this figure constitutes just a very preliminary approach with a very high error margin. Changes in the basic assumptions would involve some variations in the estimate although not large enough to allow rejecting the hypothesis of a virtually stagnant economy between 1850 and 1890.

4. The Bolivian economy in the long term: growth and divergence since the mid 19th century

Graph 2 and Table 3 summarise the evolution of the Bolivian economy between the mid 19th and the early 21st century. Graph 2 presents the GDP series (including the 1846 benchmark observation) in per capita terms up to the present, and Table 3 provides information on GDP sectoral composition.

34 Imports, exports and rural and urban population for 1846 have also been taken from Dalence (1851).
35 For instance, if “non-subjected” population were assumed to be twice as high as in 1900, the resulting pc GDP in 1846 would be 4 percent lower than our estimates. If we assumed that industrial output was twice as large as indicated by Dalence (as we do in the case of agriculture), the increase in the 1846 GDP pc would be just 6 percent.
Graph 2. Bolivian pc GDP ($ Geary-Khamis of 1990), 1846-2010

Source: New Maddison Project database and, before 1950, our own figures.

Table 3. Sectoral composition of the Bolivian GDP, 1846-2008

<table>
<thead>
<tr>
<th></th>
<th>Agrarian sector</th>
<th>Mining and petroleum industries</th>
<th>Manufactures</th>
<th>Utilities and construction</th>
<th>Services</th>
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<tbody>
<tr>
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<td>1</td>
<td>8</td>
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<td>1890-1899</td>
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<td>7</td>
<td>1</td>
<td>17</td>
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<tr>
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<td>7</td>
<td>1</td>
<td>19</td>
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<tr>
<td>1910-1919</td>
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<td>12</td>
<td>8</td>
<td>2</td>
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<tr>
<td>1920-1929</td>
<td>48</td>
<td>16</td>
<td>9</td>
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<td>25</td>
</tr>
<tr>
<td>1930-1939</td>
<td>45</td>
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<td>12</td>
<td>3</td>
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</tr>
<tr>
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<td>15</td>
<td>13</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>1960-1970</td>
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<td>11</td>
<td>14</td>
<td>6</td>
<td>43</td>
</tr>
<tr>
<td>1970-1980</td>
<td>18</td>
<td>19</td>
<td>15</td>
<td>6</td>
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</tr>
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<td>1980-1990</td>
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<td>14</td>
<td>13</td>
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<td>48</td>
</tr>
<tr>
<td>1990-2000</td>
<td>16</td>
<td>7</td>
<td>17</td>
<td>6</td>
<td>54</td>
</tr>
<tr>
<td>2000-2008</td>
<td>14</td>
<td>11</td>
<td>14</td>
<td>6</td>
<td>55</td>
</tr>
</tbody>
</table>

Sources: Own estimations (see text) and, since 1950, ECLAC database.
Notes: Some rows do not add to 100 due to rounding. After 1950, we have used the “subtotal” provided by ECLAC and distributed the statistical discrepancies among all sectors, in proportion to their size.

Graph 2 and Table 3 show the gradual process of economic growth and structural transformation undertaken by the Bolivian economy since the first decades after independence. Income per capita in the early 21st century is 4 times as high as around 1850 and the agrarian sector, which accounted for three quarters of GDP in the mid 19th
century, has experienced a sustained decrease in relative terms, being replaced by services as the main sector of the economy since the 1950s. Mining, manufacturing, utilities and construction also increased their importance from the mid 19th century onwards, although the GDP percentages they accounted for reached their maximums in the central decades of the 20th century and stagnated thereafter. As a consequence, the industrial share of the Bolivian GDP is still today among the lowest in the region.

Graph 2 confirms some of the ideas advanced by previous research on the long term evolution of the Bolivian economy. Firstly, Bolivian economic growth was extremely slow until the first years of the 20th century. According to our estimates, between 1846 and 1903 Bolivian GDP grew at an annual average rate of just 0.74 percent. In per capita terms, the yearly growth rate was even lower (0.43 percent). In other words, Bolivia seems to have largely missed the growth opportunities opened by the first globalisation to the Latin American economies. Growth only accelerated from 1903 onwards, thanks to the expansion of rubber and, specially, tin exports. As a consequence of that export boom, the annual average rate of economic growth reached a level of 2.79 percent in the case of GDP and 1.97 in the case of GDP capita between 1903 and 1929. The Great Depression put an end to this expansion, but the Bolivian economy achieved positive growth rates again in 1933 thanks to the renewed dynamism of tin exports, the increase in government expenditures and the expansion of the industrial sector.

The succession of two extremely destructive crises in the second half of the 20th century explains the slow progress of the Bolivian economy after 1950. The first one arrived after the National Revolution of 1952, which provoked a serious economic downturn, largely associated to the indirect costs of the reorganization of the economy and the inability to correct macroeconomic imbalances that have been generated by non-orthodox trade policies (Klein, 2011, pp. 213-222). After a new growth cycle between 1959 and 1978, once more linked to the traditional growth engine of the country -mining exports-, as well as to the consolidation of the oil industry and the agrarian production in the east lowlands, the external debt crisis represented a new economic catastrophe for the Bolivian economy. The incidence of the three crises of the 20th century was so serious that we can characterise the period from 1929 to 2000, in economic terms, as a succession of “lost decades”, due to the extremely long lag that the Bolivian economy took to recover the previous maximum level of its income per capita: 9 years in the case
of the Great Depression, 17 years after the 1952 Revolution, and 28 years after the 1978 shock. The recovery from the last two crises was especially difficult because they were contemporaneous of the country’s demographic transition.\textsuperscript{36}

Graph 3 and 4 shows the long-term evolution of the Bolivian economy compared with the average of the core countries, Argentina, Mexico and Peru. Whereas the comparison with the core provides a first assessment of the long term Bolivian divergence in global terms, the contrasts with Argentina, Mexico and Peru allows a preliminary test of the reversal of fortune hypothesis. According to Acemoglu, Johnson and Robinson (2002), Argentina, due to their low level of population and urbanisation at the beginning of the colonial era, would be among the Latin American countries with a higher growth potential after independence. By contrast, Mexico and Peru would be, like Bolivia, typical examples of relative affluent societies by 1500. They would have therefore received the worst institutions during the colonial period and this would have hindered their long-term growth prospects.

\textsuperscript{36} As a consequence of a steady reduction in mortality rates and the stagnation the birth rates—which were, according to CELADE’s estimates, around 45 per 1,000- the annual average growth rate of Bolivian population was around 2\% from the early 1950s to the late 1960s, and increased up to 2.3\% per year from the late 1960s to the early 1990s. It was not until the first years of the 21\textsuperscript{st} century when Bolivian population started growing at annual rates below 2\%. 
Graph 3. Bolivian pc GDP as a percentage of the average of the core countries and Argentina (1890-2010) (%)

Sources: New Maddison Project database, Johnston and Williamson (2013) and our own figures.
Notes: “Core” is the unweighted average of the US, UK, French and German pc GDP.

Graph 4. Bolivian pc GDP as a percentage of the Mexican and Peruvian ones (1890-2010) (%)

Sources: New Maddison Project database and our own figures.
Graph 3 and 4 clearly shows that the gap between Bolivia and the core countries or Argentina was very large in 1890. By contrast, differences with Mexico were much lower in the late 19th and early 20th century and Bolivia might have had a higher income per capita than Peru until the first years of the 20th century.37 On the other hand, and leaving aside the behaviour of the Peruvian economy in the 1890s and 1900s, the divergence of the Bolivian economy would be a fact of the second half of the 20th century and, to a large extent, it would be the result of the catastrophic economic crises of the Bolivian economy in the 1950s and (to a lesser extent) the 1980s. Actually, up to 1950 Bolivia managed to grow at similar rates as all other countries that are reported in the graphs, and even to converge with them in certain specific conjunctures. Indeed, by 1950 Bolivian income per capita represented a slightly higher percentage of the income per capita of the core countries, Argentina and Mexico than in 1890.

Finally, in the case of Argentina, Graph 3 shows that the relative distance between both countries has remained virtually constant after the crisis that followed the 1952 National Revolution. Actually, if the whole 20th century is taken together, it is not possible to detect any divergence process between the Bolivian and the Argentinean economies. Instead, their long-term growth rates seem to have been virtually identical, something that is not completely consistent with the predictions of the “reversal of fortune” hypothesis.

However, as has been indicated, although the first half of the 20th century was a period of slight convergence of the Bolivian economy, at the end of the 19th century its income per capita was already significantly behind, not only the global core, but also the richest Latin American countries, being approximately 35 percent of the income per capita of Argentina. Our rough pc GDP “guesstimate” for 1846 allows approaching the time in which that distance was open, by comparing it with the available income per capita figure for the mid 19th century. Table 4 presents the results of that comparison.

37 However, the comparison of Bolivia with Peru and Mexico is affected by the large error margins of the GDP figures for the three countries before the Interwar period. More specifically, the earliest Peruvian estimates (557 Geary-Khamis dollars of 1990 in 1896 and twice this level 15 years later) seem rather dubious.
Table 4. Bolivian pc GDP as a percentage of other Latin American economies and the US (%) (1850-2008)

<table>
<thead>
<tr>
<th></th>
<th>ca. 1850</th>
<th>1890</th>
<th>1950</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>60</td>
<td>35</td>
<td>38</td>
<td>30</td>
</tr>
<tr>
<td>Brazil</td>
<td>109</td>
<td>107</td>
<td>113</td>
<td>45</td>
</tr>
<tr>
<td>Chile</td>
<td>82</td>
<td>43</td>
<td>51</td>
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<td>Colombia</td>
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<td>88</td>
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</tr>
<tr>
<td>Cuba</td>
<td>96</td>
<td>56</td>
<td>92</td>
<td>78*</td>
</tr>
<tr>
<td>Mexico</td>
<td>114</td>
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</tr>
<tr>
<td>Uruguay</td>
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<td>40</td>
<td>41</td>
<td>27</td>
</tr>
<tr>
<td>Venezuela</td>
<td>102</td>
<td>98</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>US</td>
<td>40</td>
<td>25</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

Sources: New Maddison Project database and our own figures.
Note: (*) In 2008.

As may be seen in the table, in the mid-19th century Bolivian pc GDP was already clearly below the level of income per capita of Argentina, Chile, Uruguay and the US, i.e. those American economies which, according to the reversal of fortune hypothesis, enjoyed a higher growth potential when they started their history as independent republics. In other words, the gap between Bolivia and those economies can be traced back at least to the first decades after independence. By contrast, by 1850 Bolivia was not significantly poorer than most economies of the region, and it might actually have been much richer than some countries like Colombia and Venezuela.

In the forty years before 1890, however, the Bolivian economy seems to have lost track of most Latin American economies, with the exception of Brazil. This negative performance would have come to a halt in the late 19th or early 20th century, when the growth of the Bolivian economy was enough to keep or, in some cases, reduce distances with several economies of the region. As a result, by 1950 Bolivia had similar pc GDP levels to Brazil, Mexico and Colombia (although it was still much poorer than the US and the Southern Cone countries). Divergence with most of the region, however, was clearly resumed (as has been shown above) from the 1950s onwards, when those
economies’ dynamism could not be followed by Bolivia. It was therefore, only in the second half of the 20th century when Bolivia clearly joined the ranks of the poorest economies of Latin America. In other words, whereas Bolivia was already far away from the Southern Cone countries by 1850, the current Bolivian poverty levels relative to countries such as Brazil, Colombia or Mexico are to a large extent a consequence of the shrinking of the economy after the 1952 revolution and the longer duration of the Bolivian “lost decade”, and not of a sustained poorer record during the postcolonial period.\footnote{The main exception to that common pattern was Venezuela, due to its specific growth trajectory, which can be explained by the evolution of the Venezuelan oil industry. In that case, Bolivian divergence was sustained until 1950 but did not continue thereafter.}

5. Conclusions

The reversal of fortune hypothesis suggests that the European colonisers were more prone to establish extractive institutions in rich areas (including present-day Bolivia), and institutions that encouraged investment in poor regions. After independence, the persistence in the rent-seeking and investment-discouraging character of the institutional framework in previously rich areas would have prevented them from taking advantage of the available opportunities to grow and industrialise and would have condemned them to sustained divergence (Acemoglu, Johnson and Robinson, 2002; Dell, 2010). In the case of postcolonial Bolivia, according to this hypothesis, we should expect therefore systematically lower growth rates than in the highest income countries of the continent.

The picture that arises from the new estimates, however, is much more complex. Firstly, a very large share of the current distances between Bolivia and the US or the Southern Cone economies had already been opened up by the mid-19th century and is not, therefore, the result of long-term sustained differences in growth rates during the postcolonial period. And, secondly, Bolivian rates of economic growth since 1890 have not been very different from those of Argentina. Actually, during the first half of the 20th century, Bolivia performed better than the Southern Cone economies. This makes difficult to explain present-day income differences exclusively on the basis of the long-term consequences of bad institutional settings on growth.
As Austin (2008: 1013) reminds in the case of Sub-Saharan Africa, Bolivian growth record has not always been “tragic” and, echoing his own words, it may be worth asking which is more attributable to the institutional legacy of colonialism: the rapid growth of the first half of the 20th century or the slow growth and decline of the second halves of the 19th and 20th century. In addition, also as in the African case, the most negative shocks of Bolivian Economic History were associated to two institutional changes that would be supposed to have a long-term positive impact, such as the establishment of more inclusive political institutions in the 1952 Revolution and the implementation of Structural Adjustment programs which would give a much more prominent role to the markets. Probably, the long-term disadvantage of Bolivia relative to the Southern Cone can only be understood if we take a much more complex view of growth factors, and take into account aspects such as differences in the specific factor endowments and geography of those countries, as well as, in the case of the institutional factor themselves, the possibility of much more complex explanations that give room to the countries’ potential for institutional reversals throughout their development process.39

References


39 This would help to explain, for instance, the inability of the Argentinean economy to grow faster than the Bolivian one throughout the 20th century. On the possibility of a negative “institutional reversal” in Argentina in the early 20th century, see, for instance Araoz (2011) and Prados de la Escosura and Sanz (2009). In that context, the reversal of fortune hypothesis would only be applicable to the comparison between Argentina and Bolivia during the 19th century.


Dalence, J. M. (1851) [1975]. Bosquejo estadístico de Bolivia, La Paz, Universidad Mayor de San Andrés.


Appendix. Estimation of the nutrient content of the Bolivian agrarian production in 1846

As is indicated in the text, our estimation of the Bolivian agrarian production in 1846 is based in the following assumptions: i) nutrient availability was 1,940 calories per male adult-equivalent per day; ii) animal products were correctly assessed by Dalence (1851); and iii) in the case of agricultural products, Dalence’s estimates correctly reflect the composition of output, but not its level.

Table A2 indicates the indices of nutrient content of different products that are the basis of our calculation and the percentage contribution of each product to the nutrition of the Bolivian population that results from Dalence’s data.

Table A2. Food production and nutrient content of the Bolivian agrarian sector in 1846 according to Dalence (1851)

<table>
<thead>
<tr>
<th>Product</th>
<th>Calories per kilogram</th>
<th>Percentage contribution to the nutrition of the Bolivian population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>3,420</td>
<td>17.01</td>
</tr>
<tr>
<td>Maize</td>
<td>3,180</td>
<td>44.99</td>
</tr>
<tr>
<td>Potatoes</td>
<td>700</td>
<td>6.21</td>
</tr>
<tr>
<td>Rice</td>
<td>3,420</td>
<td>2.29</td>
</tr>
<tr>
<td>Peas</td>
<td>2,790</td>
<td>2.11</td>
</tr>
<tr>
<td>Quinua</td>
<td>3,680</td>
<td>1.90</td>
</tr>
<tr>
<td>Aji</td>
<td>400</td>
<td>0.34</td>
</tr>
<tr>
<td>Chuño</td>
<td>3,230</td>
<td>9.30</td>
</tr>
<tr>
<td>Ocas</td>
<td>670</td>
<td>0.58</td>
</tr>
<tr>
<td>Chickpea</td>
<td>2,920</td>
<td>0.01</td>
</tr>
<tr>
<td>Cañagua</td>
<td>3,400</td>
<td>0.66</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>260</td>
<td>0.29</td>
</tr>
<tr>
<td>Olives</td>
<td>1,060</td>
<td>0.00</td>
</tr>
<tr>
<td>Vegetables</td>
<td>233</td>
<td>0.19</td>
</tr>
<tr>
<td>Plantain</td>
<td>890</td>
<td>0.92</td>
</tr>
<tr>
<td>Nuts and coco</td>
<td>5,250</td>
<td>0.60</td>
</tr>
<tr>
<td>Grapes and sweet cane</td>
<td>1,780</td>
<td>1.14</td>
</tr>
<tr>
<td>Other fruits</td>
<td>430</td>
<td>1.17</td>
</tr>
<tr>
<td>Meat</td>
<td>2,482</td>
<td>10.29</td>
</tr>
</tbody>
</table>

Sources: Own elaboration based on Dalence (1851); the nutritional content has been obtained from Arroyo-Abad et al. (2012), Simpson (1989), Allen (2001), Allen et al. (2011) and the USDA National Nutrients Database.

Notes: i) Calories/person/day has been calculated in relation to the male-adult-equivalent population (see text); ii) the global calculation does not include imports.
In order to do the calculations, we have transformed the traditional weight units that were used by Dalence (*fanegas, cargas, arrobas* and *libras*) in kilograms. While Dalence does not offer a table with the equivalences, he presents the total weight in kilograms of an aggregate of different products that were expressed in several units. The following equivalences would be consistent with that information: 1 *libra*, 0.46 kgr; 1 *arroba*, 25 *libras*; 1 *carga*, 100 *libras*. The *fanega* is a unit of volume and its weight equivalence was different among products. Dalence used it—as it was usual during that period—to measure the production of wheat and maize. The present estimation has assumed the conversion used in Spain during the early modern period: 1 *fanega*: 94 *libras*. On the other hand, we assume a nuclear family of a father, a mother and two children consumed the same quantity as three male adults (Allen et al., 2011). Considering this relationship and the population structure of 1900—offered by the 1900 National Census—the total population in 1846 has been converted into total adult population. We have also accounted for the food imports reported by Dalence (1851: 236): 100,000 *cargas* of potatoes and *chuño*, “a lot of” *ají* and many *arrobas* of rice, and we have assumed that *ají* and rice imports had the same weight as potatoes and *chuño* imports. We have finally added up the nutritional contributions made by milk and eggs (taken from Allen et al., 2011).