

## **Prices and wages in Argentina, Bolivia, Chile, Colombia, Mexico and Peru**

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### **Data appendix**

The data appendix includes the details about sources and methodology with respect to prices and wages. We have collected price and wage information on six regions: Mexico (especially the Mexico City area), Peru (Lima), Colombia (Bogota), Bolivia (Potosi), Chile (Santiago) and Argentina (Buenos Aires). We provide a brief discussion of both the sources of our price and wage series as well as some methodological issues that arose during the processing of this data.

All series and the underlying estimates will be made available on the Global Prices and Income Website at University of California, Davis (<http://gpih.ucdavis.edu/>) and at the Historical Prices and Wages website of the International Institute for Social History ([www.iisg.nl/hpw/](http://www.iisg.nl/hpw/)).

### **Prices**

Most prices reflect transactions from official and private institutions. These organizations kept accounting records for transactions with merchants and suppliers. As a result, the data correspond to current consumer prices. An overview of our sources is given in Table A.1

For Mexico we were able to find price information for a long period of time, starting from the sixteenth century until the nineteenth century. The sources are public auctions, tribute collection offices, notaries, and public granaries. For the sixteenth century we used price quotations from Borah and Cook (1958) from the Mexico City area and neighbouring regions such as Coyoacán. This price source is a mix of retail, wholesale, and auction prices of wheat, maize, meat and some utility goods. Unfortunately, no price information was available for the seventeenth century. For the eighteenth century we compiled prices from Quiroz (2005), Florescano (1986) and García Acosta (1988). In addition, we added data points from primary sources from our own research at the Mexico City Archives, collected from accounting books of several hospitals in Mexico such as Hospital Juárez, Hospital San Lázaro, Hospital San Hipólito, and Hospital de dementes.

For Peru, Macera (1992) proved to be a very useful source. Covering the entire country, this work provides data for a large number of goods and regions from 1560 to 1820. We focused on the Lima region. Even though some gaps in the price data are present, this source gives a quite complete picture of price developments in this period. Some missing information was supplemented with price information from Gootenberg (1990).

In the case of Colombia, we used Pardo's study (1972) of prices and wages in Bogota. Despite the many gaps, it is the only data source for this country available to our knowledge. For Chile and Argentina, price data availability before the 18<sup>th</sup> century is limited. Ramon and Larrain (1982) is the main source for Chile. A few of these prices are quoted as five-year averages. We have calculated the intervening years by linear interpolation to increase the data frequency. We worked with a variety of sources to assemble price series for Buenos Aires (Argentina). For most of the eighteenth century, we used price information from the San Pedro Telmo convent

accounting books, collected by Cuesta and Conti (2007). To fill the gaps in the late 18<sup>th</sup> century, we worked with Johnson (1990). His sources are varied including hospitals, the royal army, and the local municipality. The extensive collection of prices compiled by Barba (1999) was used for the first half of the nineteenth century.

**Table A.1 Price sources.**

Source	Time period	Wheat	Maize	Beans	Beef / Meat	Utility goods	Region
<b>Argentina</b>							
Cuesta and Conti (2007)	1700-1800	X			X		Buenos Aires
Johnson (1990)	1775-1811	X			X		Buenos Aires
Barba (1999)	1810-1860	a)	X		X	X	Buenos Aires
<b>Bolivia</b>							
Tandeter and Wachtel (1990)	1676-1681, 1720-1812	X	X			X	Potosí
<b>Chile</b>							
De Ramon and Larraín (1982)	1659-1808	X		X	X	X	Santiago de Chile
<b>Colombia</b>							
Pardo (1972)	1635-1809	X (flour)	X		X	X	Bogotá
<b>Mexico</b>							
Borah and Cook (1958)	1531-1570	X	X		X	X	México City and neighbouring regions
Quiroz Florescano (2005) (1986)	1701-1811 1708-1810		X		X		México City México City
García Acosta (1988)	1655-1798	X	X	X			El Bajío oriental
Garner (1985)	1525-1819		X				Mexico city and other places
<b>Peru</b>							
Macera (1992)	1560-1820	X	X	X	X	X	Lima
Gootenberg (1990)	1800-1873		X	X	X	X	Lima

a) flour instead of wheat

### Wage sources

The salaries series assembled here imply the assumption of contact with Europeans. The fluidity of the labour market was conditional on a variety of royal restrictions as discussed on the main text. In general, the sources are similar to the price data. Wage information is generally more sparsely available than price information. As can be observed elsewhere, nominal wages were often rather sticky remaining invariant during relatively long periods of time. We used this fact also to interpolate between observations of nominal wages when there were gaps in the available series.

For the earlier periods, we compiled the wage stipulated by the government for forced labour. For Mexico, we used the *repartimiento* compensation (ca 1530-1630), in particular, the wages set for unskilled labour in the cities (Gibson 1964: 249-251) in combination with the wages actually paid out from other sources (cf

Borah and Cook 1958 and Tandeter and Wachtel 1990). For the late colonial period, we included data from primary sources from the Mexico City Archives from the “empleados en general” section. For Potosi (Upper Peru), we resorted to the wage set for *mita* work before the late 17<sup>th</sup> century, but for a few years also have information about the wages paid to free labourers (Bakewell 1984).

As in comparable studies on prices and real wages in Europe and Asia, we only consider payments to workers in low-skill occupations. Two groups of labourers are included: *unskilled construction labourers* (the ‘standard’ also used in other studies) in Mexico, Peru (1680-1820) and Argentina, and *miners* in Bolivia (Potosi), Peru (1597-1603) and Chile. Despite the unskilled nature of these types of jobs, the remuneration varied due to working conditions. Because work was much harder in the mines, life expectancy was reduced and skill levels were probably higher, miners probably earned a higher wage than unskilled construction workers. We do not know how large this wage gap may have been. It should, however, not be overestimated, as the *mita* system used in Potosi and Peru recruited a share of the Indian rural population without much training. Hatcher (1993: 399-402) has documented that wages of English miners in the early modern period were about 50% higher than those of unskilled construction workers in the same region. In Mexico the difference may have been higher: the few observations available in the literature wages in Zacatecas (in northern Mexico) suggest that in 1550 and 1600 nominal wages of miners were between 3 to 4 times the level of that of unskilled labourers in Mexico City (Bakewell 1971). In the 18<sup>th</sup> century this gap had fallen by one-third however: miners earned on average 4 reales per day, construction workers in Mexico city 3 reales per day, and hacienda peons 1,5 tot 2 reales (Brading 1971: 147). These figures do not include the share in the ore that the workers received as well, implying that the total wage gap was probably as large as in the 16<sup>th</sup> century (Brading 1971: 148).

Given the variety within unskilled occupations, it raises the question what kind of labour payment we are measuring here. The wage set by the state was probably the wage actually received by the (coerced) labourers involved in the various systems, but the marginal value of their work may have been higher. In Potosi, for example, *mita* workers were traded at substantial prices, indicating that such a ‘surplus value’ existed. We showed that wages of free labourers were often much higher than those of *mita* workers (Bakewell 1984). In both cases – Mexico between 1530 and 1630 and Potosi during in particular the 17<sup>th</sup> century – our wage data tend therefore to underestimate the marginal product of labour, but may have been a correct measure of the money received by the majority of workers. We will return to this issue when discussing trends in real wages.

**Table A.2 Sources of wage data**

Source	Time period	Occupation	Region
<b>Argentina</b>			
Johnson (1990)	1775-1810	Construction workers	Buenos Aires
Barba (1999)	1810-1860	Government officials, bricklayers	Buenos Aires
<b>Bolivia</b>			
Bakewell (1984)	1574-1716	Unskilled miners	Potosi
Tandeter & Wachtel (1990)	1716-1813	Unskilled miners	Potosí
<b>Chile</b>			
Carmagnani (1963)	1690-1799	Ore cutting and transportation	El Norte Chico
<b>Colombia</b>			

Pardo (1972)		Unskilled labourers	Bogotá
<b>Mexico</b>			
Borah and Cook (1958)	1531-1570	Construction workers	México city and neighbouring Coyoacán region
Gibson (1964)	1530-1800	Construction workers	Mexico city
Garner (1990)	18 <sup>th</sup> century	Unskilled construction labourers (probably Indians)	Mexico city
Quiroz (2005)	1719-1767	Construction workers	México City
<b>Peru</b>			
Stern (1982)	1597-1603	Mita worker	Huamanga
Macera (1992)	1625-1760	Porters	Lima

### Data processing

To calculate the cost of the basket of goods, it was necessary to convert the historical units of the quoted prices into metric equivalents. Often these units varied between regions and over time. Early in the colonial experience, Spain mandated the use of royal uniform weights and measures. Just as in the motherland, these efforts fell short of achieving standardization. At the verge of independence, merchants still complained about the diversity of units used (Carrera Stampa 1949). It is safe to conclude that there was no widespread metrological system in Hispanic Latin America until the adoption of the metric system well into the 19th century. Fortunately, other sources have supplied metric conversions allowing us to compare the colonial data across regions.

For example, the dry measure *fanega* was, according to Borah and Cook (1958), 54.52 litres in 16<sup>th</sup> century Mexico; however, Barba (1999) finds it to be 137.19 litres in 19<sup>th</sup> century Argentina. If no conversion for a unit in a specific region was found, we assumed that the size of this unit was equivalent to the one in a proximate region. If no specific conversion of units was given in the price source, the conversion sheets provided by the Global Price and History Group used instead.<sup>1</sup>

**Table A.3 Metric conversions of the most commonly quoted units in our sample.**

	<i>Mexico</i>		<i>Peru &amp; Chile</i>			<i>Argentina</i>		<i>Bolivia</i>	
			<i>Colombia</i>						
vara	0.84	m	0.84	m	0.84	m		0.84	m
fanega (dry)	54.52	l	54.52	l	54.52	l	137.19	l	
arroba (liquid)	16.13	l							
arroba (weight)	11.502	kg	11.502	kg	11.502	kg	11.485	kg	
pound / libra	0.45354	kg	0.45354	kg	0.45354	kg	0.45354	kg	
carga <sup>2</sup>	23	kg	45.44	kg				45.44	kg
	138	kg	138	kg					
quintal (dry)			45.94	kg	45.94	kg			45.94

From a monetary perspective, although the monetary unit used throughout the period was the peso of eight reales, debasements did occur throughout the

<sup>1</sup> See “Latin American colonial metrology”, <http://gpih.ucdavis.edu/Converting.htm>, accessed on 24 October 2010.

<sup>2</sup> Several conversions of the *carga* were used. According to Borah and Cook (1958) a *carga* equaled two *arrobos* in sixteenth century Mexico. Other sources, relating to later centuries, indicate that a *carga*, when used for goods such as sand or wood, equalled to 12 *arrobos*, which corresponds to 138 kg.

colonial period. Moreover, depending on the mint in question, the silver content varied. For converting wages from pesos and reales to silver grams, we used the yearly exchange rates compiled by Burzio (1958). In the case of Mexico we applied these rates through 1731 and used White Romano (1998) for the rest of the period.

### **Linking price series and missing data**

One particular problem of compiling welfare ratios is that price and wage data can be quite patchy: there are several gaps in price series and gaps in the price series of one good do not always correspond to gaps in a price series of another good. Hence, sometimes the dataset is balanced, but in other years, no data for sundry items such as textiles, lamp oil, or fuel are available. To overcome this problem, we have used different estimation techniques.

- To account for changing relative prices of goods over time, we created two price index series to bridge the gap: one indexed series based on the relative price at the start of the gap and one indexed series based on the relative price at the end of the gap. A weighted average was taken of these two series, with the weight of the first price series decreasing linearly over time and the weight of the second price series increasing linearly over time. This method is used in particular for covering gaps of short periods (i.e. several years) and not for larger periods of time.
- Price movements for most imported commodities in Peru, Potosi, and Chile were very similar, although the price levels were usually distinct. The best example is the price of imported textiles, which shows the same long-term trend in all regions: a strong decline between the middle of the 17<sup>th</sup> century to the 1760s, followed by a modest increase afterwards. Therefore, we filled gaps in the price series of textiles in one region with prices from another region. In a similar way, we used Peruvian prices to interpolate missing price data for Potosi.
- Potatoes were an important part of the Indian diet. Only for two regions, Arequipa (Peru) and Santiago (Chile) do we have very limited price data of this crop. In Chile, potato prices (per *fanega*) are higher (17<sup>th</sup> century) or only marginally lower (18<sup>th</sup> century) than those of wheat (Larrain 1990). That makes them an unattractive nutritional alternative, as their caloric content is only about one-fourth of that of wheat (data from USDA). In Peru, the relative price of the potato is much lower, about one-third to one-half of the price of the same quantity of maize. In terms of calories their price is slightly lower than that of beans. Consequently, in the case of Peru, we used beans in place of potatoes as part of the budget when the data on bean prices were available (in 1670 - 1687 and 1723 - 1767 from Brown (1990): 176-178).
- In the case of various 'small' commodities such as candles and soap, the absence of price data could not always be mended by using prices from other locations or from the same region but a related product. For those cases we have estimated stylized budgets on the basis of data for Peru (1690-1710 and 1780-1800) and Argentina (1837-1850) - periods for which we could establish full budgets of all items of consumption; the stylized budget are: foodstuffs 70%, of which the staple food (maize or wheat) accounted for 40%; other products: textiles: 12%, soap 4%, candles 3%, lamp oil 4%, fuel 7% (total non-food 30%). When, for example, the price of candles was lacking, we calculated the total costs of the bare-bones basket without them, and added an extra 3% (or in fact 3/97) to account for the missing product. In this way, gaps in the dataset could be covered.