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MEXICO'S REAL WAGES IN THE AGE OF THE GREAT DIVERGENCE, 1730-1930[1]

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ABSTRACT

This study builds the first internationally comparable index of real wages for Mexico City bridging the eighteenth and the early twentieth century. Real wages started out in relatively high international levels in the mid eighteenth century, but declined from the late 1770s on, with some partial and temporal rebounds after the 1810s. After the 1860s real wages recovered and eventually reached eighteenth-century levels in the early twentieth century. Real wages of Mexico City's workers slid behind those of high-wage economies to converge with the lower fringes of middle-wage economies. The age of the global great divergence was Mexico's own age of stagnation and decline relative to the world economy.

KEY WORDS

Real wages, prices, welfare ratios, standards of living

RESUMEN

Este trabajo construye el primer índice de salarios reales comparable internacionalmente que comprende del siglo XVIII a principios del siglo XX. Los salarios reales se redujeron sustantivamente a partir de los 1770s, con alguna recuperación parcial y no duradera después de los 1810s. A partir de los 1860s éstos comenzaron a recuperarse para casi alcanzar hacia principios del siglo XX, los niveles de mediados del siglo XVIII. Los salarios reales de los trabajadores de la ciudad de México cayeron en relación a los de economías de salario alto, convergiendo hacia el umbral bajo de las economías de salario medio. La era de la gran divergencia, fue para México un periodo de estancamiento y declive en relación a la economía global.

PALABRAS CLAVE

Salarios reales, precios; índices de bienestar, niveles de vida.

JEL CLASSIFICATION

N30, N36, E31, J31.

1. INTRODUCTION

Were working-class Mexicans better off after the country's independence or did they have higher standards of living under Spanish domination? How did the late 19th century's first wave of economic modernization and globalization affect the livelihoods of Mexican workers and their families? Today Mexico lags behind compared to the most advanced economies of the world, but was it always the case? If not, when did Mexico start to fall behind? This article seeks to find answers to these simple but fundamental questions about Mexico's economic history by reconstructing trends in real wages in Mexico City from the mid eighteenth to the early twentieth century. Real wages (the purchasing power of wages in term of a representative basket of goods and services) serve as an indicator of both material welfare and economic productivity.

Our period of study encompasses the foundational moment of the Mexican nation. During the second half of the eighteenth century, the Spanish crown sought to gain a tighter rein of the colony through economic and political initiatives known as the Bourbon reforms. In the 1970s and 1980s, historians indicated that living standards declined in this period (Coatsworth 1978; Florescano, 1969; Tutino 1986; Van Young, 1987), but more recently, revisionist positions have problematized the use of evidence and highlight the undergoing process of economic growth led by the mining sector and trade (for an overview of the revisionist arguments in Rafael Dobado's

article in this issue.) The political crisis unleashed by the French invasion of Spain brought widespread insurrection in the 1810s and the destruction of the most productive mines. The ensuing decades of recurrent instability, civil and foreign wars are truly a *terra incognita* in Mexican economic and social history (McCaa 1993). The economy reoriented, peasants gained more autonomy and perhaps political leverage, but the overall trends in productivity and welfare remain hard to decipher (Cárdenas 2003; Dobado, Gómez Galvarriato and Williamson 2008; Sánchez Santiró 2009; Tutino 1986). The economic landscape changed in the 1870s when the triumph of liberalism and the Porfiriato (as Porfirio Díaz's aegis is known) ushered policies geared to modernize economic institutions, integrate Mexico in the global economy and industrialize. Historians who examined general economic and social trends have emphasized the growth of the economy, yet the deterioration of living conditions for the majority of the population (Coatsworth, 1978, Katz 1981, Knight 1990). However, empirical studies suggest either stagnation or a small improvement of real wages of the working classes during the Porfiriato (López-Alonso 2012, Gómez-Galvarriato 2013). Our period concludes with the Mexican Revolution (1910-20) and its aftermath characterized by price spikes, increased leverage of organized labor and improvements in the earnings of industrial workers (Bortz and Haber 2002; Gómez-Galvarriato 2013). In sum, from Mexico's perspective these 200 years were nothing short of Polanyi's Great Transformation experienced throughout the western world, but we know very little how it correlated with living standards and productivity.

From a global perspective, this is the period when modern disparities in economic welfare and productivity widened (Pomeranz, 2000). Economic historians working on real wages emphasize that this variable provides a better gauge of "the great divergence" because GDP estimates are unrepresentative aggregates (of land, capital and labor) based on dubious

assumptions at least before the twentieth century. By contrast, real wages allow the comparison of the differences in productivity as experienced in the compensation of workers. In particular, Robert Allen's methodology has enabled comparisons encompassing different regions of the world by systematizing measurements, wages, and prices, and devising a standard metric of economic welfare (Allen 2001; Allen et al. 2011). Studies have applied Allen's methodology to certain cities in Latin America during the colonial and early national periods (Allen, Murphy and Schneider 2012; Arroyo, Davies and van Zanden 2012; Arroyo 2013 and 2014). These works show that real wage levels in non-European regions were comparable to northern European countries before 1800, but that by the second half of the nineteenth century the divergence in incomes became noticeable.

Our study builds the first internationally comparable index of real wages for Mexico City bridging the eighteenth and the twentieth century. We used the income of unskilled construction workers and weighed price indexes of thirteen products including food, fuel, and other needs of life. Mexico City, the capital and a city that surpassed half a million inhabitants by the early twentieth century, is a good case for an in-depth study of living standards because of the availability of information throughout the period (Miño Grijalva, 2004, 2006, and INEGI 2009). Moreover, broader conditions in the populous central region influenced labor and goods markets in the city. Mexico city's population fed from migration from rural communities and towns in the surrounding region and beyond throughout the period (Guerrero 1902, 161; Pérez Toledo and Klein 2004; Pescador 1992, 108; Piccato 2001, 21-26; Scardaville, 2004). The large size of the city also meant that it drew supplies from surrounding areas. For these reasons Mexico City was a barometer of labor markets and good markets in the central region of the country. Similar studies from other regions will be necessary to establish representative trends for the country.

The article builds long-term series of unskilled real wages based on construction workers' wage rates, and two alternative consumer price indexes, following Robert Allen's welfare ratio methodology. Section I outlines the procedures and sources, and discusses the pitfalls and advantages of the methodology. Section II discusses the evolution of real wages in connection to other trends in the economy and the country. Section III compares the trends to other economies of the time. In the conclusion we discuss the broader implications of our empirical findings.

2. METHODOLOGY AND SOURCES

The building of real wage indexes across time and countries requires data on wages and prices, as well as a household basket to weight the relative importance of items in the overall household budget. In order to build internationally comparable welfare ratios it is necessary to rely on assumptions that do not generate long-term or country-specific biases. These assumptions are simplistic, yet they provide a reliable broad comparative framework. It is our purpose to provide a general measure of material constraints in everyday life that allow historians to benchmark economic welfare at different points in time. This analysis is not a substitute for more historically rich studies of work, diet, and welfare.

2.1 Wages

Our wage sources are hundreds of weekly receipts of construction works that report the daily pay rates of laborers (*peones*) in Mexico City. Through the mid nineteenth century, the origin of the reports is varied: churches, convents, hospitals, jails and other public and religious institutions. From the 1830s most observations originate in the construction work contracted by

the Vizcaínas school to repair their facilities.[2] Regardless of the source, the format is the same: the overseer reported the names, days worked, pay rates and total weekly compensation. For all weekly reports we collected information on the number of days worked and daily pay rates, from which we obtained weighed averages of daily wages. In all, we have data of over 240,000 days-men with an annual average for two thirds of the years.

Our payrolls indicate very little change in the way laborers were paid, their hierarchies, technologies or work descriptions.[3] The *peones* (laborers) were at the bottom of the hierarchy in construction work. The guild of *albañiles* (masons) regulated construction work during the colonial period, yet *peones* were not part of it. Guilds were formally abolished in January 1814, but they remained a guiding principle in labor relations until at least the mid nineteenth century (Carrera Stampa 1954, 276-277). Guild-member *albañiles* (masons) hired the *peones* at a customary (but not fixed) rate. While guild exams were expensive, peons could aspire to become low-rank masons if trained by a *maestro* and passed a basic examination of their skills (92, 101). In our payrolls, less than ten percent of peons became masons.

The daily wage was the only compensation since there were no payments in rations. According to an anonymous construction treatise written in the late eighteenth century, overseers discounted the "*real de comidas*" for the meals that had been given during the week (Schuetz 1987, 89), showing that whenever rations were provided it was discounted from the total salary.[4] One real (one eighth of a peso) roughly represented the weekly costs of food for one person in

[2] While most of our sources are from our original archival research, cited in online Appendix A, we complemented them with Quiroz (2005, 239-241) and the datafiles of the Global Price and Income History Group (GPIH) (http://gpih.ucdavis.edu).
[3] Only after 1925 we found the introduction of concrete and materials that exceeded the usual use of bricks, sand, lime and wood; still, the pay rates were comparable.
[4] A large-scale construction work only accounts for the rations of workers who did not collect their wages at the end of the week; see *El Monitor Republicano*, 17 January 1863.

the colonial period.

It is likely that laborers lived in between the rural and urban worlds. Granados (2008) has shown that construction workers were the single most important occupational group among the indigenous people, representing sixteen percent of workers in a tributary list of 1800, compared to about three percent in the whole population (Pérez Toledo and Klein 2004). While many lived in the *traza* (the Spanish city), one third of the Indian construction workers, and perhaps many more, lived in the *barrios* and peripheral areas of the town where subsistence agriculture remained an important activity.[5] Moreover, we rarely found workers employed more than 150 days at any time in our period, and work tended to slow down during the harvest and sowing time. As we approach the twentieth century, such seasonal pattern becomes less evident, suggesting a greater integration of workers into urban labor markets, as the city population quadrupled between 1895 and 1930.

Given their social background and unregulated compensation, the daily pay rates of construction *peones* were relatively homogenous in the city and were representative of the earnings of other unskilled workers, who were more than half of the labor force in the city (Piccato 2001, 23; Dirección General de Estadísticas 1898). Reported wage rates of construction *peones* and other unskilled, entry-level workers were often the same and at most diverged in 15 percent without a systematic bias.

2.2 Prices

Our calculations of cost of living rest on the most extensive combing of prices that we are

[5] We are thankful to Luis Fernando Granados for sharing this information with us.

aware of in the economic history literature of Mexico. We collected information on nineteen items that appeared prominently in the expenditures of working class urban households: maize and tortillas; bread, flour and wheat; frijol beans; sugar; pulque; beef, lamb, pork, ham and lard; soap; candles and tallow; charcoal and firewood; and coarse cloth. We converted all prices to silver grams per liter (pulque), squared meter (cloth), million British thermal units or BTUs (charcoal and firewood), and kilograms (all the rest). We used regression analysis to sort out systematic biases of the different sources, types of transactions, and seasonality. [6]

For each product we calculated annual prices by year, proceeding in three stages. First, we averaged annual prices by three types of local prices: institutional, retail, and wholesale. Institutional sources comprise purchases in convents, hospitals, prisons, and schools. Retail prices included *posturas* from the colonial period, which were prices set by city authorities for a variable period of time (every two years in the case of the *abasto* of beef and lamb, annual for lard and candles, quarterly for flour and bread, and daily for maize sold in the *alhóndiga*).[7] More surprisingly, we found that after independence the authorities of the Federal District regulated prices (*tasas de efectos)* in several years (1832, 1833, 1841, 1856, 1859, 1860, 1867, 1892, 1909, and 1914). By the 1880s, authorities collected information on retail prices in the different municipalities of the Distrito Federal and reported them to the Secretaría de Fomento, and later to the Departmento del Trabajo and the Departamento de Estadística Nacional. Wholesale prices typically included market updates published in newspapers, and some governmental reports. We also identified scattered sales from haciendas and factories in Mexico City. We found that

[6] Online Appendix A reports the additional information and analysis that guided our procedures.
[7] Colonial regulations established that any retailer had to sell these goods at the authorized price. Still Ouweneel (1996, pp. 118-120) argues that regulated prices were not always the actual final consumer price.

seasonality did not have a significant effect on price levels, hence we did not apply any seasonal corrections.

Because not a single source spans the entire period, we sought to maximize the use of all available information with procedures that were simple and easy to reproduce. For this reason, we averaged the observations of the three types of sources to obtain a single annual price by product. Overlapping observations in some years (288 intersections of year-products distributed throughout the period) did not show the existence of any systematic biases except for a 5.2 percent markup of retail relative to wholesale prices that we applied to correct the latter.

Finally, we imputed missing annual entries using the prices of correlated products and markets. Although we collected 1,237 annual average prices, we lacked local, direct prices for many years: from three quarters of the years in the case of candles, charcoal and pulque, to less than one quarter for maize and sugar. Whenever possible we imputed prices from their inputs (e.g. candles from tallow, charcoal from firewood, and cloth from yarn), from other products that shared the same inputs (ham, lard, pork and soap), from substitutes (lamb and beef), or from markets that supplied Mexico City (e.g. cloth from Puebla, sugar from Atlacomulco) or experienced similar market conditions (bean prices from Valladolid, Michoacán, and cloth prices from Zacatecas). In the case of tortilla and bread prices, we predicated them from maize, and wheat and flour, respectively. We obtained the correction factors from years with common observations. The imputations allowed us to add 336 additional annual entries, and did not change trends and the variation in the series.

Even after this broad canvassing of sources, we lack information for more than a third of all possible annual price observations. Data are scarcer in the mid eighteenth century and the mid nineteenth century, as indicated in Table 3. In order to fill in missing data, we followed a

modified version of Drelichman's (2005) construction of price indexes for early modern Spain: in any given year in which a product's price was missing, we calculated a high and low band of prices corresponding the 75th and 25th percentiles of the prices in a ten- or twenty-year window. In the case of pulque and soap, products with scarce data but relatively stable prices, we used wider time windows.

2.3 The consumer basket and the consumer price indexes

We build two Laspeyres consumer price indexes based on two consumer baskets.[8] The quantity for each item is fixed throughout the duration of the series, with the exception of rent (see Table 1). The advantage of using this type of index is that it establishes a fixed subsistence or poverty line measured in calories, heating units, clothing, etc., that allows standard comparisons across regions and time periods. The energy represented in the food component of the baskets is constant and meets minimum daily dietary requirements (1,940 calories). However, a Laspeyres index does not account for changes in quantities through time, which could be particularly relevant when analyzing a long period of time.

[8] The Laspeyres index is defined as $IPL = \Sigma p_1 q_0 / \sum p_0 q_0$, where p_1 is the new price, p_0 the old price and q_0 the old quantities. Alternative price indexes could be used, yet as Diedre McCloskey has pointed out, there does not exist a price index that would not introduce some kind of bias in the calculation(see McCloskey, 1985, pp. 184-186). In online Appendix C we contrast the results using alternative CPIs based on fixed shared of consumption rather than fixed quantities.

TABLE 1

CONSUMER BASKETS
(Rent excluded)

Item	Measure	Bare bones	Respectable Mexico	Respectable London
Beef	kg	5.0	31.5	33.8
Pork/Other animal	kg		7.7	
Lard/butter	kg	3.0	4.1	5.2
Bread	Kg		31.0	182.0
Maize	kg	165.0	45.2	
Tortillas	Kg		47.2	
Beans	kg	20.0	40.1	52.0
Pulque/beer	lt		76.6	182.0
Sugar	kg		6.1	
Fuel	M BTU	2.0	4.2	5.0
Candles and lamp oil	kg	2.6	3.4	5.2
Cloth	mt	3.0	5.0	5.0
Soap	kg	1.3	2.6	2.6
Rent	%	5.0	5.0	5.0
Energy/day	kcal	1,936	1,941	1,941
Cost *circa* 1750	silver g	234.0	548.1	558.6

Sources: Allen (2001); Allen, Bassino et al. (2011); Allen, Murphy and Schneider (2012). See text for construction of Mexican baskets.
Notes: The bare bones basket is entirely based on Allen, Murphy and Schneider (2012). For the respectable basket, see text and online Appendix B.

The first index is based on a "bare bones" or subsistence basket, similar to Allen's basket for Milan (Allen, Murphy and Schneider, 2012).[9] It includes food products that minimize the total price per calorie and supplies minimum nutritional requirements. It also provides minimum heating, lightning and clothing needs. It includes eight items and represents the minimum cost of subsistence, below which individuals could hardly survive—a concept similar to Adam Smith's price of subsistence or Karl Marx's cost of reproduction. The basket relies heavily on corn and beans, a consumption pattern that responds to the usual depiction of the customary Mexican diet. Yet, corn was consumed mainly in the form of tortillas, which demanded over twenty hours of

[9] Arroyo, Davies and van Zanden (2012) use an alternative barebones basket based on South American budgets. These observations as well as our findings do not change regardless of the specification.

weekly work per family (Bauer 1990). Moreover, the urban working classes consumed a remarkable amount of more expensive, but still affordable food that was adapted to the constraints and lifestyles of the city (Miño Grijalva 2006; Moncada 2013; Quiroz 2005).

Our second index better captures the complexity of the urban working-class diet, while keeping the caloric output, services and cost comparable to the "respectable" price indexes in the literature (Allen 2001; Bassino and Ma, 2005; Cvrcek 2013). This basket includes fourteen products that were considered more appealing by urban workers. We based our basket on average expenditures observed in working-class family budgets from the early twentieth century and in the expenses of a convent and school for indigenous peoples from the early nineteenth century discussed in the online Appendix B. The share of expenditures in our stylized respectable basket is roughly comparable to "respectable" budgets in Beijing and London (see Table 1 and Table B1). The basket includes bread, more allowance for beans and meat, maize tortillas, sugar and pulque (a fermented beverage that contributed more than 4 percent of the daily calories). It does not include chili peppers, chocolate (or coffee), and salt, items that were present in the observed budgets but were not comparable with other baskets, did not provide any calories, or were untraceable over time. The food items were not necessarily the cheapest per calorie, but still add up to the minimum energy requirements (1,940 calories); clothing, lightning and fuel are 60 to 100 percent higher than in the subsistence basket. We can consider this basket as a poverty, rather than a subsistence line, necessary to maintain a "respectable" but still very limited livelihood.

In order to make the results internationally comparable, we consider rent as a constant five percent of all other expenses in the basket, following Allen (2001). Our research on housing costs suggests that the rent of a room ranged from 15% to 18% of other living expenses. Research in large cities, with the exception of London, indicates housing costs similar to Mexico

City's, suggesting that housing affects the comparison in levels.[10] Like Allen (2001, p.12) we justify this seemingly low allowance in the fact that many workers did not pay for housing costs, and on that using higher estimates would not affect significantly the trends presented in the paper.[11] Nonetheless, we consider actual rental costs that range between 15 and 18 percent of other expenses in the elaboration of an alternative visualization of the cost of living.

2.4 The welfare ratio

We calculate two welfare ratio indexes based on the two baskets described above, both estimates rest on assumptions about the unit of analysis, employment, and the composition of the basket of goods and services. Research in real wages treads a thin line between being accurate to the population being analyzed and assuring that the results are comparable with other international experiences and time periods. Robert Allen devised a simple methodology to calculate real wages across the world (Allen 2001; Allen et al. 2011; Allen, Murphy and Schneider, 2013) as welfare ratios that indicate the number of household consumer baskets that could be purchased with a wage-earner's annual income. The price and wage observations of a given year are combined with a series of multipliers that result in an annual real wage index constructed as:

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[10] On changes in housing costs in Mexico City, see Calderón (2009), Piccato (2001, 17, 27), Secretaría de Hacienda (1911). Other studies in other areas of the world support housing costs comparable to Mexico City's: Cvrcek (2013); Horrell (1996); Johnson (2011, 196); Kok and Mandemakers (2005); Smith (1990, 103-107).

[11] "Las oscilaciones del costo de la vida en la República Mexicana," *Estadística Nacional*, vol 4 February 28, 1925, pp.1-13; and vol 4, March, 15, 1925, pp. 1-21, estimates housing expenses as 16.6% of the total budget of industrial workers and masons, but rural and mining laborers faced no housing costs.

WELFARE RATIO = (DAILYWAGE * DAYS) / (BASKET * HOUSEHOLD)

The numerator (the daily wage multiplied by the number of days worked in one year) is the annual income estimate of the reference working-class household, typically urban construction workers. The denominator corresponds to the expenses needed to satisfy minimum consumption needs. The composition of baskets may vary across countries, but they all yield the same caloric output, fuel energy, and lighting. To obtain household consumption, the basket is multiplied by the number of adult-equivalent members of the household.

Allen assumes that laborers worked 250 days per year. Although guild regulations support this number as an upper bound figure (Carrera Stampa 1954, 163-167), the social history of this time period indicates that job insecurity and constant mobility were regular features in the work experience of the urban poor (Guerrero 1901; Haslip-Viera 1999, 29). In the Vizcaínas payrolls, in which we have systematic records by name, non-eventual workers worked on average 108 days per year before 1910; after 1913, Vizcaínas relied on fewer workers working more days in the year, but still they worked an average of 165. Given that construction work is not a steady form of employment and there was a high turnover, it is likely that workers at Vizcaínas had other jobs through the year. However, if the alternative employment (e.g. subsistence agriculture) was not the equivalent to the construction wage rate, then it is likely that we are introducing an upwards bias in our calculations.

We scale all budgets to represent a nuclear family of two adults and two young children living under one adult income. The ratio of dependents to consumers is three to one assuming that young children consume half an adult basket of goods. Some studies support this choice of household size (Pescador 1992, 183-190; Dirección General de Estadísticas 1898). However, the

single-family household with children was far from being the majority. In 1811, 38 percent of the households of unskilled and skilled workers were of this kind, but multi-family or extended family households represented almost the same proportion (Brun Martínez 1979; Vera Bolaños 2004). In Guadalajara (1821-22) and Oaxaca (1930), households were similarly varied with the nuclear-family structure being the most frequent but not representing the majority.[12] Moreover, control of the household size was a common economic strategy of the poor in Mexico City (Scardaville 2004). These adjustments are a predicted consequence (as the welfare ratio dips below one, households need to boost income or cut costs to the extent of their possibilities), the ranges of possibilities and aggregate choices made by different societies may have varied in substantial ways.

Overall, Allen's specifications of household size, days worked and rent values are reasonable in relation to our empirical findings, and their use is crucial to allow an international comparison of welfare ratios. However, in order to account for the greater complexity of working-class livelihoods we constructed an alternative representation of welfare: the number of days of work in a year were required to buy the basket that supports a four-person annual household budget (see Figure 3).

3. GENERAL TRENDS IN PRICES, NOMINAL AND REAL WAGES

The evolution of welfare ratios follows three well-defined patterns: the erosion of high real

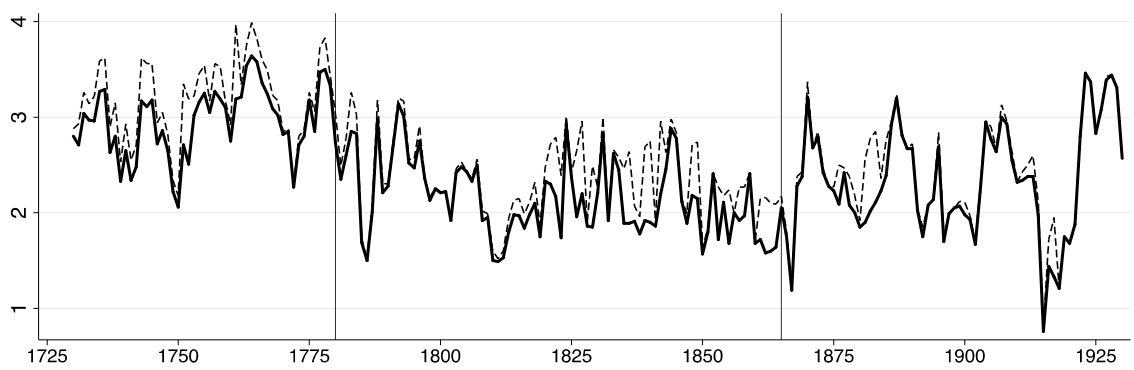
[12] In Guadalajara, a third of the households were composed of nuclear families, but a similar percentage lived without children. Multi-family and extended-family households were also very common (with or without children). We obtained the figures from Guadalajara Censuses Project (Anderson 2012), in the frequency tables under the Research folder. In the southern city of Oaxaca, the average household size integrated by a construction worker was close to four members, but the variability was remarkable as well. Only one third of the 45 households in the sample were of a nuclear structure. We are thankful for Robert McCaa's generous contribution of the Oaxaca information.

wage levels during the last decades of the colonial period, low levels and stagnation through the mid 19th century, and partial recovery with great volatility during the Porfiriato and early 1920s. In the long run the most noticeable feature of the trend is that of stagnation. The bare bones basket indicates that the high initial eighteenth century levels were never reached again, while when using the respectable basket these levels were recovered--at least briefly--during the Porfiriato and during the 1920s.

Figures 1 and 2 show the high and low boundaries of annual welfare ratios of laborers using the bare bones and the respectable price indexes, while Table 3 summarizes prices, wages and welfare ratios by quarters of a century. The scale is the number of bare bones or respectable household annual baskets (welfare ratios) that could be purchased with 250 days of laborers' income. Both indexes show a similar wide U-shaped trend, although they differ, expectedly, in their levels and volatility, and the trend of "respectable" welfare ratio is even flatter.

FIGURE 1

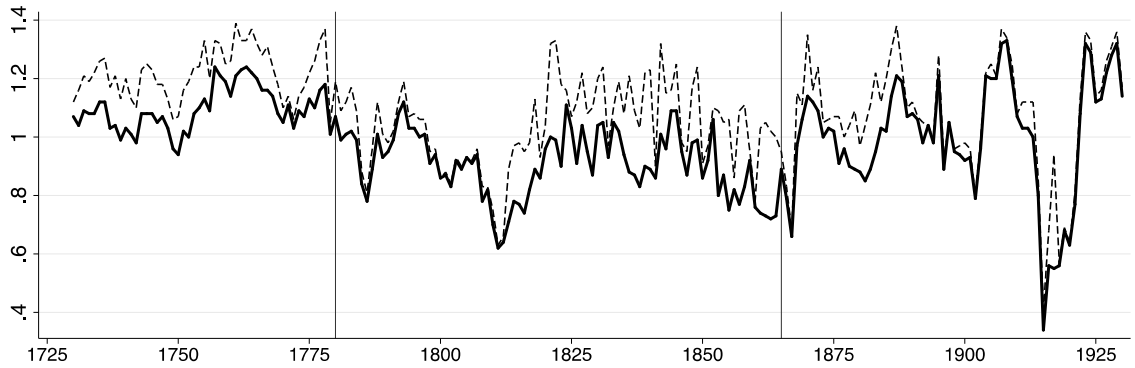
REAL WAGES OF LABORERS USING THE SUBSISTENCE CPI
(Welfare ratio)



Sources: See Appendix.

FIGURE 2

REAL WAGES OF LABORERS USING THE RESPECTABLE CPI
(Welfare ratio)



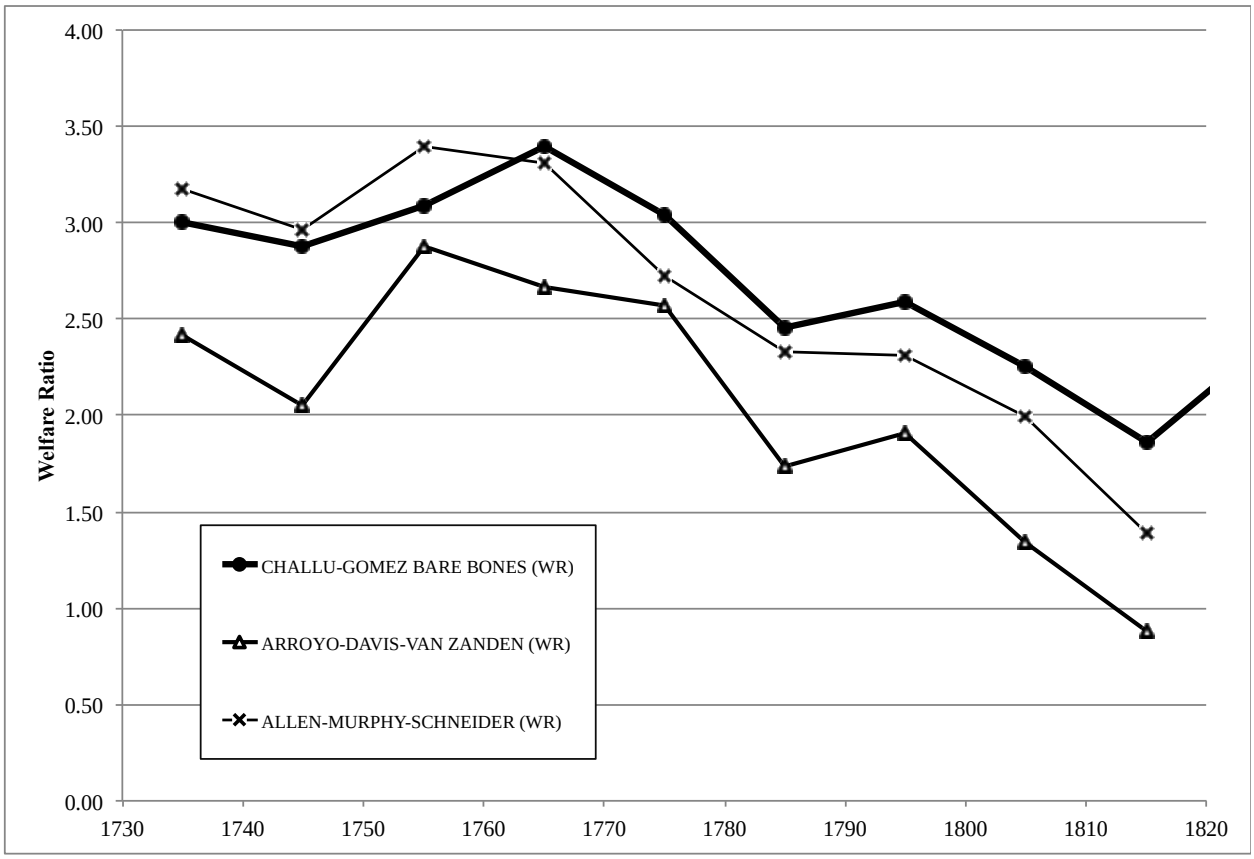
Sources: See Appendix.

Our barebones price and real wage indexes are highly correlated with those of Allen, Murphy and Schneider, and Arroyo, Davis and Van Zanden, resulting in the similar trends shown in Figure 3. Yet the levels and the magnitude of changes were different. Our barebones welfare ratios are above Allen, Murphy and Schneider's by a small difference (2.7 vs. 2.6) and above Arroyo, Davis and Van Zanden's by a larger difference (2.7 vs. 2.1). Our series has a smaller range of variation, hence showing a less pronounced, yet significant decrease in real wages from the 1750s to the 1800s. The correlation with price indexes and real wages for the Porfirian and revolutionary periods are also high and significant (see Figure C2).[13]

FIGURE 3.

[13] A more detailed explanation of comparison to other series of prices, wages and real wages is provided in online Appendix C.

COMPARISON OF REAL WAGE SERIES IN THE COLONIAL PERIOD
(Average real wages of the decade).



Sources: Allen, Murphy and Schneider (2012); Arroyo, Davis and van Zanden (2012), and Appendix.
Notes: We thank the authors for facilitating the data at the annual level.

During the colonial period there was an increase in welfare ratios towards the 1760s, followed by steep decline that began in the late 1770s that reached a nadir during the early 1810s. Between 1760 and 1815 real wages decreased by 40% according to the respectable index and by 50% according to the bare bones index.

From 1750 to 1812 laborer nominal wages were pegged at three reales per day (slightly more than nine silver grams), with some spread in wage rates noticeable since the 1780s that produced tiny annual variations (lower than 2 percent) that did not correlate with price changes (see Table 3, and Table 6 at the end of the article). From the third quarter of the eighteenth

century to the first in the following century, prices increased by 53%. While prices rose to historical highs during the insurrection, inflation was not negligible during the previous decades (average annual inflation of 2% from 1775 to 1809). The trends are remarkably similar in our two price indexes and in other price indexes, indicating a high degree of certitude that prices, both in nominal and real terms, experienced a sustained decline.

Given the stability of nominal wages, the rise of prices eroded the welfare of workers since *circa* 1780. It was only in 1813 when nominal wages began to increase reaching four reales by 1817. The demand of labor placed by forced levies and steep price inflation during the insurrection (1810-1821) were the likely causes of the spike. However, real wages kept falling due to the disruptions in the city's supply lines and harvest losses that increased prices to historical records. In sum, these findings reinstall the traditional notion of a significant and generalized increase in prices in the late colonial period and a decline in living standards (Florescano 1969; García Acosta 1995; Tutino 1986; Van Young 1987) that has been the subject of recent revisionism (Dobado and García 2010, 2014; Quiroz 2005; Silva Riquer 2008).

In the decades after independence, real wages rose from 1820s to the 1840s, and declined sharply in the 1850s and 1860s. Nominal wages gradually receded from the high rates of the 1810s and stabilized around 3.25 reales (10 silver grams) per day for most of the nineteenth century (the typical annual variation being less than 4 percent, without a trend). After 1825 prices declined slightly, but they tended to remain higher than in the second half of the eighteenth century. Welfare ratios recovered ground during the 1820s, but the uncertainty of the information leads to some caution in interpreting the magnitude of the recovery. The most likely scenario is that the real wages of Mexico City remained below the high levels of the mid eighteenth century and comparable to those of the turn of the nineteenth century. This picture

supports the case of secular stagnation presented by Coatsworth (1978) and, in a more nuanced way, by Salvucci (1997). However, the alternative thesis of a strong recovery, and even improvements in living standards (McCaa, 1993; Tutino, 1986), cannot be entirely ruled out since the upper-level estimates of the respectable approached the lower boundary levels of the mid eighteenth century. Regardless of the strength of the rebound following independence, as Sánchez Santiró has argued (2009), the intense civil war of the 1850s and its continuation into the 1860s had ruinous consequences for the economy and the welfare of workers.

Once peace was restored after 1867, welfare ratios began to increase once again although with great volatility. The recovery continued into the end of the period with pronounced swings. Nominal wages started an upward trek in the last quarter of the century and by the turn of the twentieth century they increased sharply to almost 5 reales (15 silver grams) and beyond (see Table 3). This evolution of Mexico City nominal unskilled wages bears strong relationship with similar data from other regions of the country.[14] In the mid and late nineteenth century the price trend flattened but during the early twentieth century prices increased at higher rates, particularly during the most violent years of the Mexican Revolution (1914-1918) and surrounding years. From the eighteenth to the late nineteenth century the relative prices of manufactured and processed products decreased in relation to food and charcoal prices.

For sustained periods (1868-72, 1885-91, 1904-7, and then 1922-27) real wages reached and even surpassed the high marks of the colonial period, yet there were periods when real wages dipped well below those levels (1880-85, 1900-1903). The Mexican Revolution (1911-

[14] See Gómez Galvarriato (2013), INEGI (2009, Table 5.8.1) and Van Young (1987). In comparison to wages in a textile mill in Orizaba (1900-1930), our wages increased 2.7 times, CIVSA's three times; see Archive of the Compañía Industrial Veracruzana S.A. (Orizaba), Records of "Talleres, Edificios y Terrenos." On the colonial period, see wages reported in Garner (1993) and Van Young (1987).

1920) strongly hit welfare ratios that reached their lowest value in 1915 even if our data exaggerates the decline due to monetary anarchy.

The increase of real wages during the last decades of the nineteenth century and the beginning of the twentieth century could be explained by the pacification of the country, its integration to the global economy, and the introduction of new technologies and forms of organization. Still, it shows that the modernization process was not deep or wide enough as to increase welfare levels above those of the eighteenth century. In conclusion, the significant and real gains in productivity represented in the growth of GDP per capita only partially contributed to a greater wellbeing of unskilled workers in Mexico City.

Along with the characteristics of each period, war and climatic disasters are major factors behind the dramatic falls in welfare shown in the series. The deepest plunges occurred in years of both civil wars and climatic disasters: 1810-13, 1867 and 1915-18. In general, years of harsh climatic conditions and agricultural disasters (such as 1785-86, 1801-2, 1874-77, 1902) were years of low real wages that went well below average. In these periods, higher unemployment likely reduced the welfare of the working classes below what is represented in the welfare ratio. These episodes were as frequent and intense in the late nineteenth and early twentieth century as they were in the colonial period, indicating that the Mexican economy was still subject to structural constraints in its food supply.

TABLE 3

AVERAGE PRICES, AND CONSUMER PRICE INDEXES (CPI)
(Silver grams per kilogram)

Products	**1730-49**	**1750-74**	**1775-99**	**1800-24**	**1825-49**	**1850-74**	**1875-99**	**1900-30**
Maize	0.69	0.61	0.80	1.13	1.13	1.15	1.12	2.09
Bread	0.98	0.87	1.14	1.61	1.60	1.63	1.59	2.98

Beans	3.02	2.83	2.96	3.46	3.39	3.34	3.43	6.93
Beef	1.20	1.33	1.19	1.73	2.09	1.89	1.76	4.06
Meat	1.00	0.88	1.34	2.59	3.24	3.79	3.82	12.90
Pork	2.58	2.33	3.50	4.89	3.87	4.40	4.04	13.60
Lard	8.40	7.36	8.54	10.86	8.15	7.32	6.35	18.75
Sugar	10.27	8.99	10.48	13.25	9.97	10.48	10.35	20.31
Pulque (l)	6.38	4.92	4.67	4.79	5.26	5.62	4.61	6.62
Soap			1.11	1.46	1.21	1.21	0.79	0.88
Candles	4.99	5.89	7.45	7.58	4.84	5.51	5.61	9.15
Charcoal (mbtu)	12.98	13.34	13.58	14.85	16.06	19.05	21.47	53.74
Cloth (m)	7.47	9.95	7.36	9.27	8.77	5.00	3.36	5.76
CPI, bare bones	243-265	232-249	274-286	371-398	344-397	358-392	340-365	625-649
CPI, respectable	622-699	599-659	672-721	859-958	749-881	759-884	737-804	1600-1678
Missing	95%	72%	20%	48%	72%	32%	32%	10%
Daily Wage	9.25	9.29	9.07	10.14	10.62	9.65	10.14	21.56
Welfare Ratio, bare bones	2.81-3.06	3.02-3.25	2.63-2.76	2.07-2.21	2.16–2.5	2.03-2.21	2.24-2.41	2.40-2.47
Welfare Ratio, respectable	1.05-1.18	1.12-1.24	1.01-1.09	0.85-0.95	0.96-1.13	0.88-1.03	1.00-1.10	1.00-1.05

Sources: See Appendix and online Appendix A.
Notes: The CPI values reflect the upper and lower bound in the cost of living. The price of tortillas and bread were derived from maize and wheat (or flour) as described in the text. The percentage of missing data is the missing observations relative to the total number of possible observations (e.g. 12 products x 25 years = 300 possible observations).

Throughout all the period, with the exception of 1915, a laborer living on a barebones budget earned enough to acquire the basic requirements of a nuclear family to survive. In the years with the highest ratio (1760s and 1920s), a laborers' income could easily afford three baskets, translating into a capacity to spend in a less austere standard of living or to work fewer days. With a respectable budget, the income of a laborer was just enough to be above the poverty line, but in many years (1795-1817; 1856-1867; 1896-1903; 1914-1921) it was not enough. Under these conditions, households had to work more days (or increase the number of workers), lower housing costs, or switch to a basket more similar to the bare bones. We seek to shed light on these accommodations by presenting an alternative representation of real wages.

Figure 4 presents this alternative visualization by describing changes in purchasing power

without assuming 250 days of work per laborer, and introducing variable housing costs.[15] This perspective allows a more intuitive interpretation of absolute levels of poverty or well being that construction workers in Mexico City faced through the period. According to these results, the number of work days required to purchase an annual household basket increased from the mid eighteenth (1730-1774) to the mid nineteenth centuries (1822-1876) and then declined. Laborers were able to afford the subsistence basket working around one third of the year throughout the period. However they needed to work most of the year, in some periods more than 250 days, to afford a "respectable" basket, which could be considered a poverty line. During some subperiods this required more days of labor than the 250 days previously assumed; and this was the case in the entire period if actual housing costs are factored in.

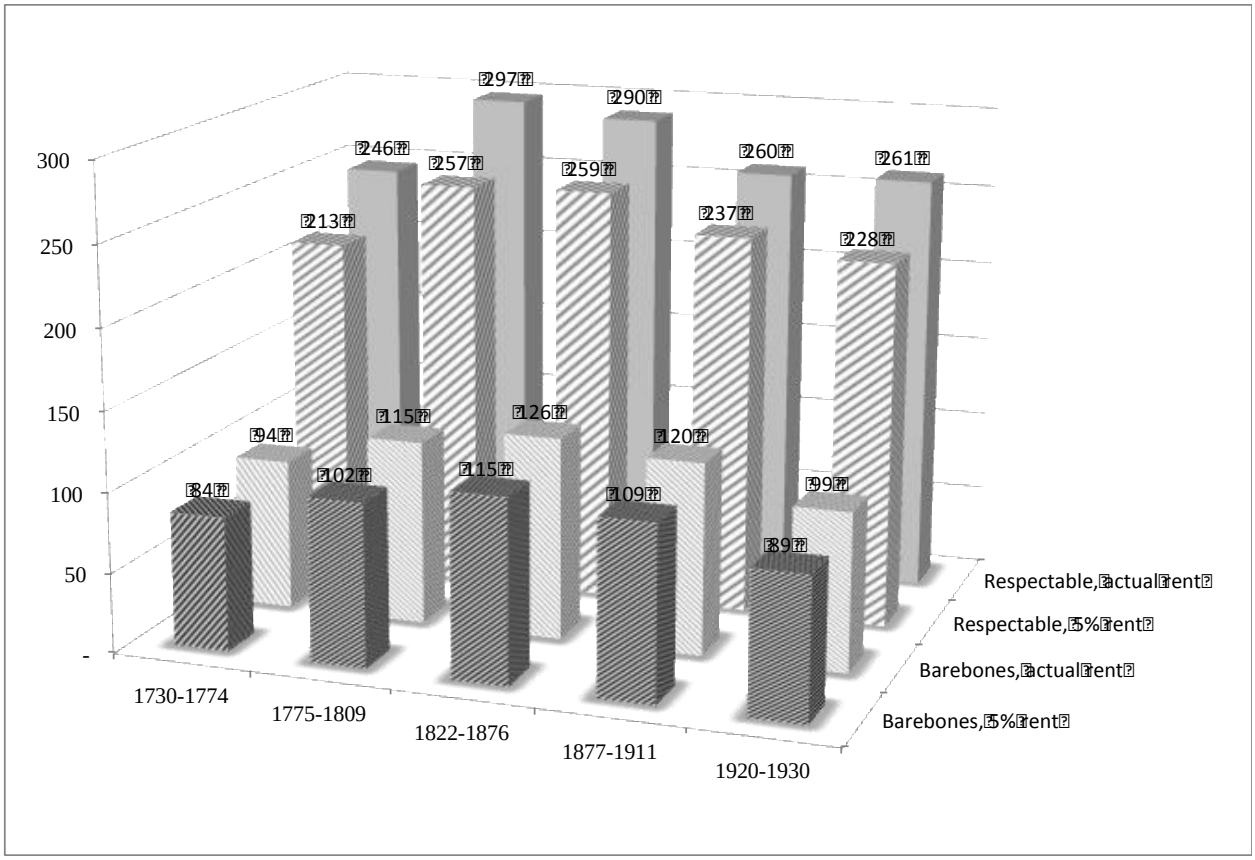
This representation also serves to highlight the flexible nature of the actual wellbeing of working-class households in Mexico City. It is plausible that laborers and their families farmed their own subsistence plots, particularly earlier in the period, in which case maintaining these levels of welfare would require fewer days of wage work. On the other hand, it is possible that laborers did not find work during all the days required, or carried out work that gave them a lower remuneration than the wages paid in construction. If this were the case their welfare would fall below the poverty line. Moreover, there were many expenses not included in these basic baskets, such as other goods (salt, chile, chocolate), rituals (baptisms, burials etc.), medical costs,

[15] We calculated actual housing costs as the percentage of the cost of a one room apartment relative to the other costs in the respectable basket. As a percentage of total costs housing costs were 17% in 1730-1774, 18% in 1775-1809, 15% 1822-1876, 13% 1877-1911, and 17% 1920-1930. The sources used to calculate housing were the working-class budgets cited in Appendix B, as well as monthly costs of rooms in *casas de vecindad* (the low end of the housing market) in: AGN, Hospitales, vol. 5, exp. 1: Hospital de San Lázaro,(1806-1813); AGN, Indiferente Virreinal, Box 538, Exp. 3: Convento de Santa Clara (1798-1806); CEHM, Arch. Hist. Prov. de Carmelitas, Sto Desierto, Libro Manuscrito 4 (1784-1818); Memoria Economica de la Municipalidad de Mexico (Mexico: Imprenta de Martin Rivera, 1830), p. 96: Finca de la Barata. Calderón's rates of *accesorías* and rooms in the Vizcaínas school (2009) served to control the trends observed in our sources.

and amusement. Although these costs were highly variable, Figure 4 helps visualize that in order to afford such expenses, a small working-class household in Mexico City had to expand the numbers of days worked by its members beyond 250 days to afford this type of expenses that in many ways were essential to their wellbeing.

FIGURE 4

DAYS OF WORK REQUIRED TO PURCHASE A HOUSEHOLD BASKET, 1730S-1920S



Sources: See Appendix and online Appendix B.

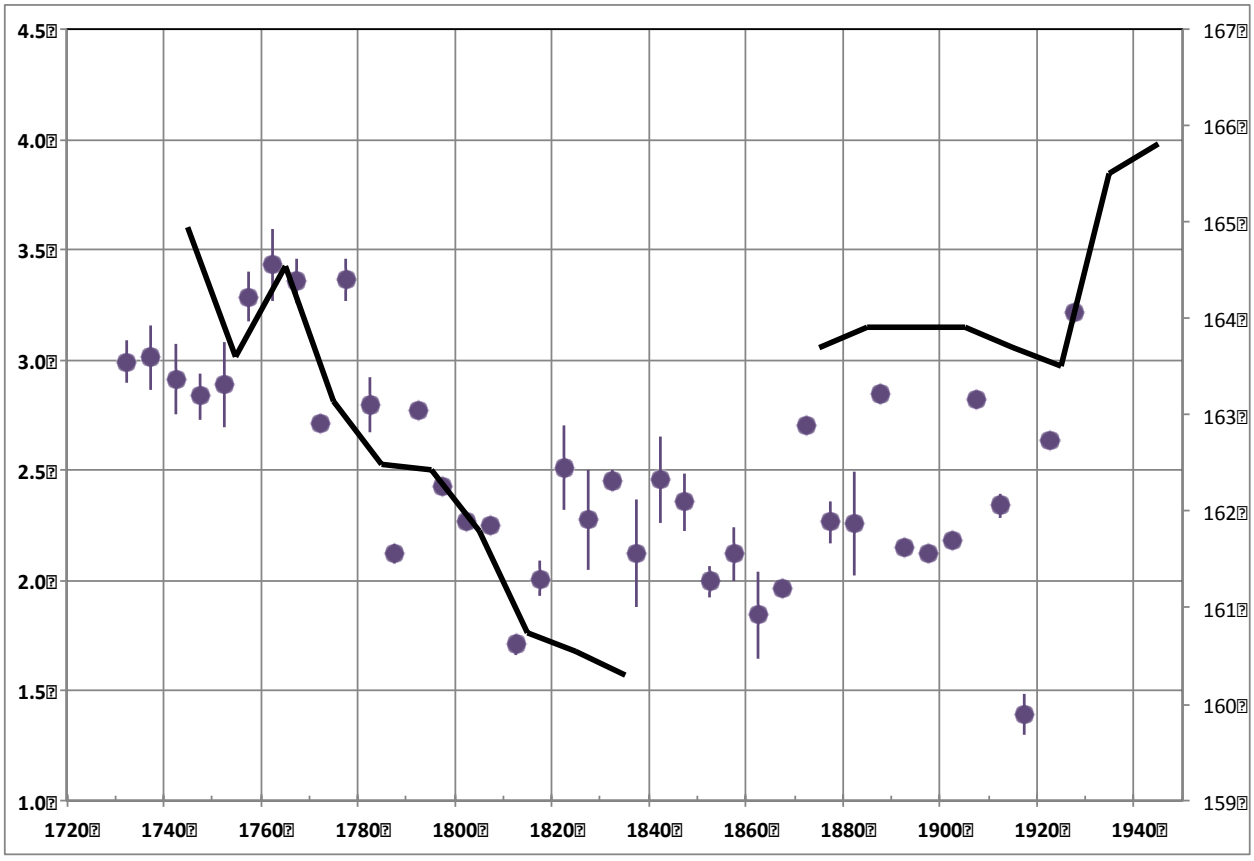
The trends in real wages correlate well with decadal averages of adult heights, an indicator of nutritional status and biological wellbeing (see Figure 5). Our comparison uses the long-term series of infantry heights by Challú (2010) and López-Alonso (2012). These are a fraction of a

broader anthropometric history literature, but they span a long time period with a relatively homogeneous population (infantry from the central region or the entire country) that encompass a broad swath of the Mexican working classes. [16] Real wages and height had parallel trends through the 1810s, evidencing high levels in the mid eighteenth century, followed by a decline. From the 1820s on, the trends do not track each other; still the rebound in average heights by the 1870s corresponds in broad strokes to the rise in real wages in the Porfiriato. Heights remained flat through the 1920s, as real wages did. It would be only until the mid-twentieth century that material wellbeing improved as policies and technology made food more accessible and affordable (López-Alonso 2012; Ochoa 2000). Overall, both anthropometric data and real wages stress that welfare throughout the period did not make substantial progress.

[16] The two series used regression analysis with similar control variables to build the series; we centered the averages to the central region and unskilled occupations. See Dobado's study in this issue for other regions of colonial Mexico, and Baten's aggregation of height series for the nineteenth and twentieth centuries (2012).

FIGURE 5

BAREBONES WELFARE RATIOS AND SOLDIER HEIGHTS IN MEXICO, 1730-1930



Sources: Challú (2010), López-Alonso (2013) and see Appendix and online Appendix A.
Notes: Soldier heights are represented by decade of birth. The constant in the original regression reports were changed to match unskilled workers and the central region.

4. MEXICO CITY'S REAL WAGES IN INTERNATIONAL PERSPECTIVE

Today, Mexico is considered an "upper middle-income" economy in the World Bank's classification, which in itself attests to the substantial divergence in incomes that has occurred since the turn of the nineteenth century. Table 4 breaks down the historical trends in respectable welfare ratios in Europe and Asia in income level groups. Figures 5 and 6 graph the bare bones and respectable welfare ratios. While the selection of cities and the levels in the two figures are

different, the overall picture is similar. We mostly follow the respectable version here as it provides a more representative gauge.

TABLE 4

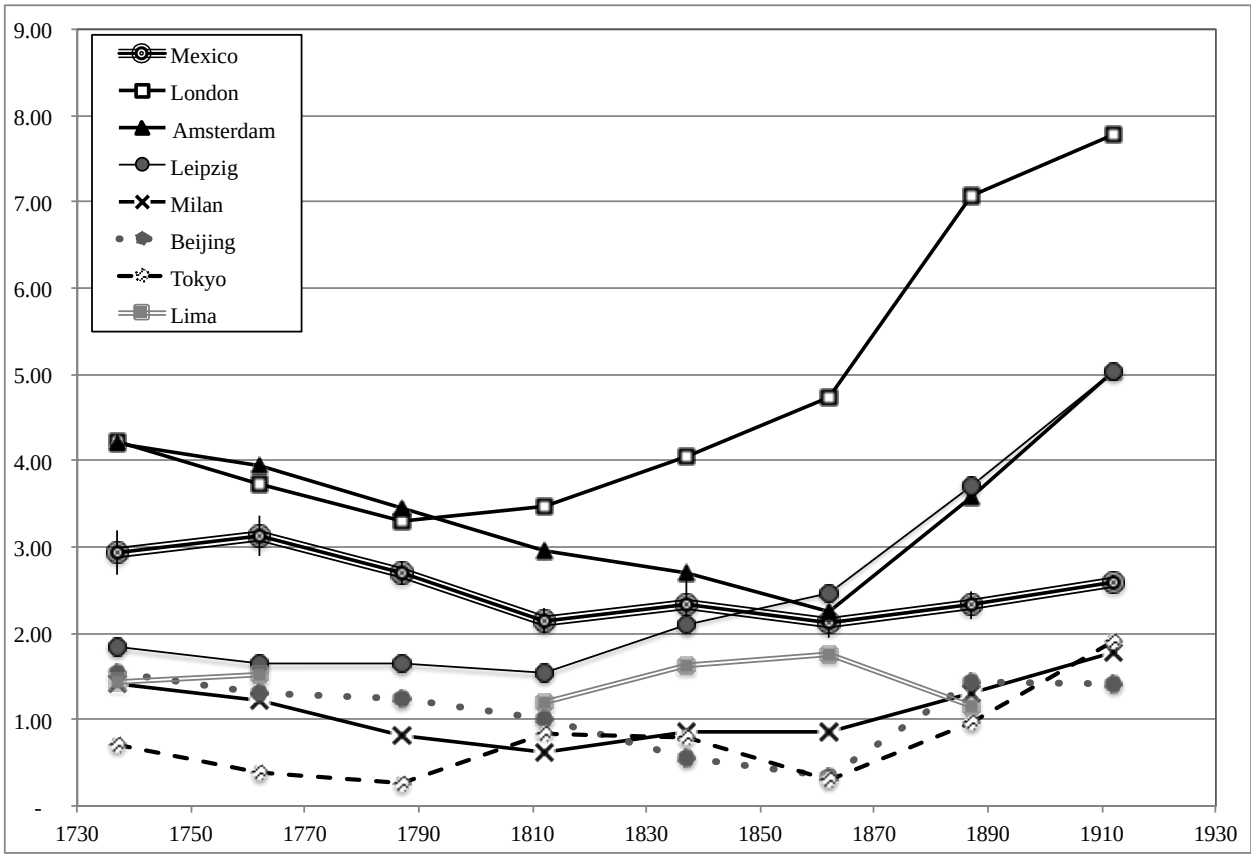
REAL WAGES IN SELECT CITIES RESPECTABLE CPI
(Welfare Ratios)

	1725	**1750**	**1775**	**1800**	**1825**	**1850**	**1875**	**1900**
Mexico	1.12	1.18	1.05	0.90	1.05	0.95	1.05	1.13
High Wage (Europe)			97%	98%	91%	92%	88%	65% 55%
Amsterdam	1.50	1.41	1.28	1.08	1.08	0.92	1.46	2.06
London	1.54	1.44	1.28	1.27	1.42	1.64	2.45	2.69
Mid Wage (Europe)								
Leipzig	0.71	0.61	0.61	0.77	0.76	0.89	1.33	1.81
Paris	0.69	0.70	0.73		1.03	1.03	1.46	1.77
Warsaw	0.62	0.91	0.86	0.94	1.19	1.24	1.35	1.77
Low Wage (Europe)								
Madrid	1.58	1.32	1.12	0.86	1.03	1.07	0.39	1.10
Milan	0.66	0.56	0.40	0.32	0.42	0.38	0.58	0.79
Vienna	0.83	0.69	0.66	0.51	0.59	0.75	1.01	1.29
Low Wage (Asia)								
Beijing		0.52	0.52	0.42	0.31	0.29	0.58	0.66
Kyoto/Tokyo	0.53	0.56	0.52	0.63	0.60	0.48	1.23	1.42

Sources: For Mexico, our Appendix C. For Beijing, our own calculations of Allen, Bassino et al. (2011)'s respectable budget using prices distributed in the GPIH website. For Vienna, Cvrcek (2013). For Kyoto/Tokyo we used Bassino and Ma (2005)'s real wages index adjusted to reflect earnings over 250 days, a basket for three adults, a 5 percent rent allowance, and a 9 percent allowance for fuel and soap (items excluded from Basino and Ma's calculation). For Madrid, we relied on Llopis and García (2011) and Reher and Ballesteros (1993), scaling their index values to Allen's welfare ratio for 1800 (the only common year in the three series). For all others, see Allen (2001).
Notes: In most cities (but not Mexico City), the last period ends in 1913.

FIGURE 6

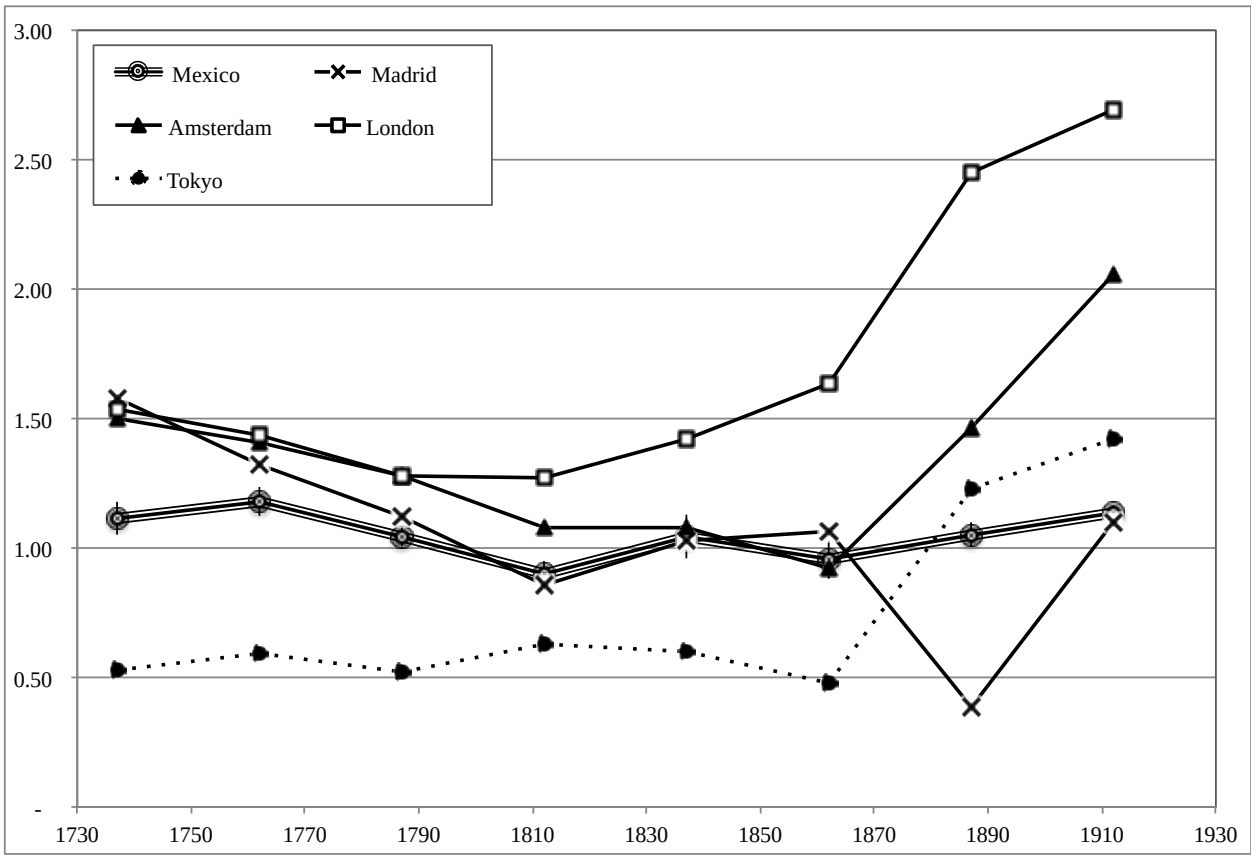
REAL WAGES IN COMPARISON, BARE BONES CPI, 1750-1930



Sources: Allen, Bassino et al. (2011); Arroyo (2014); Arroyo, Davis and van Zanden (2011); Appendix.
Notes: The year represents the center of 25-year periods.

FIGURE 7

REAL WAGES IN COMPARISON, RESPECTABLE CPI, 1750-1930



Sources: See Table 4.
Notes: The year represents the center of 25-year periods.

Table 4 and Figures 6 and 7 show that from the beginning to the end of the period there were sustained gaps in real wages, although the rankings changed as some cities grew more than others. The high-wage tier included Amsterdam, London and other English cities, although they were not homogeneous in trajectory. The slide of Amsterdam's real wages through the mid nineteenth century was remarkable, but well documented in the economic history of the country. Its welfare ratios rebounded in the second half of the nineteenth century; by the end of the period Amsterdam was below London but still experienced almost a 50 percent growth in real wages. Mid-wage cities such as Leipzig, Paris and Warsaw experienced solid growth; Leipzig gained parity to Amsterdam by the eve of World War I. Among the group of low-wage cities, Madrid's decline is remarkable: from levels comparable to London and Amsterdam in the eighteenth century, it steadily declined through the early nineteenth century. By the turn of the twentieth century, Vienna and Tokyo moved up in the ranks, while the other low-income cities increased their levels moderately and remained far below.

In the comparison, Mexico City started out with high real wages, almost at par with Amsterdam and London. The decline through the early nineteenth century was above-average rate and became more comparable to the mid-income group of cities. It was in the nineteenth and early twentieth centuries, however, when Mexico City's mild improvement in real wages was not match to the trajectory in any other city with comparable information. Kyoto/Tokyo, Leipzig, Paris, Warsaw were poorer than Mexico City, yet by the early twentieth century they all surpassed it. The three cities in the Hispanic world in this compilation, Madrid, Mexico City and Lima, stand out as the only ones that failed to experience growth in the long term. These data add one more dimension to the scholarship highlighting the connections and resemblances of the economic history of old Spanish empire (Dobado, Gómez-Galvarriato and Márquez 2007).

TABLE 5

MEXICO CITY REAL WAGES AS A PERCENTAGE OF OTHER CITIES
(Respectable CPI)

	1725-1749	**1750-1774**	**1775-1799**	**1800-1824**	**1825-1849**	**1850-1874**	**1875-1899**	**1900-1930**
High-Income Europe	74%	83%	82%	77%	86%	81%	57%	48%
Middle-Income Europe	167%	164%	146%	106%	109%	92%	76%	63%
Low-Income Europe	125%	157%	172%	187%	177%	155%	185%	111%
Low-Income Asia	211%	219%	202%	179%	257%	263%	133%	125%

Sources: See Table 4. The percentage results from dividing Mexico and the group average.

Mexico City's trajectory indicates a "reversal of fortune", but its timing does not match well the interpretation of the coiners of the expression. If Acemoglu, Johnson and Robinson (2002, 2010) focus on the colonial experience as the root of extractive and rent-seeking institutions that stifled growth, our trends indicate that Mexico City in the eighteenth century was closer to wealthy city than to other income tiers. The erosion of Mexico's position started during the late colonial period. Mexico City was 67 percent above middle-income cities in 1725-49, and only 6 percent ahead by 1800-24 (see Table 5). The fall was more pronounced at the very end of the nineteenth century when Mexico's welfare ratios even though they grew, they fell behind middle-income cities. By the early twentieth century Mexico City's welfare ratios became comparable to low-income cities in Europe and Asia. If a "reversal of fortune" took place it could only had been through lagged consequences that produced a failure to carry out the sort of industrializing economic growth that raised welfare ratios in several countries significantly above their eighteenth century levels (Sokoloff and Engerman, 1997). In Mexico although rates of economic growth rose after 1880s they did not translate into increasing welfare ratios in a similar way as it occurred in industrializing countries.

5. CONCLUSIONS

Mexico City's real wages were high in international perspective by the mid eighteenth century, only moderately below those of Northwestern European cities. Yet, real wages hit their a low point by the end of the colonial period and the decade of insurrection. The late colonial era of Bourbon reformism and mining expansion (1780s-1800s) was not a period of bonanza, but of significant decline in living standards, caused in part by the high extraction of resources by the Crown from the New Spain in order to fight wars against its European rivals (Marichal, 1999). Our real wage series using the barebones and respectable specifications, other welfare ratio series of the colonial period, and heights agree in this characterization.

After the late colonial decline, periods of growth were all brief and followed by periods of decline. The estimates from c. 1825 to c. 1850 indicate that welfare may have recovered their mid-eighteenth century levels, to experience a further collapse in the following civil conflicts. When peace was achieved in the late 1860s, real wages regained a higher average level punctuated by some pronounced falls and a dramatic plunge during the Mexican Revolution.

This paper provides a valuable perspective in which to place the long-held views about the Porfiriato (1877-1911) that often focus in its failure to improve general standards of living. Porfirian economic growth allowed a recovery of Mexico City's workers real wages. However, real wages grew slowly and with great volatility, a finding that contrasts with relative high rates of GDP growth, and of GDP per capita growth during this period.[17] This could be the result of increasing inequality during this period, and a failure to translate economic growth into better living standards for the working classes, a conjecture that goes in line with the historiography of

[17] Between 1877 and 1910 GDP increased by 200% and GDP per capita increased by 95.6%; see INEGI (2009).

the period, but that requires further research. It is also important to highlight that the upward movement in living standards did not begin during the Porfiriato but in the late 1860s, when the country finally reached an era of greater political stability, it was interrupted by the Revolutionary war (1913-1920), but it quickly rebound and continued in the 1920s.

On the long run, our results show that there was no long-term growth in real wages in Mexico City and, probably, in Mexico as a whole. The collapse of the Spanish empire, and the instability and constant warfare that followed were very costly for Mexico City workers in terms of their living standards. During the Porfiriato (1876-1910) and in the 1920s real wages recovered ground but it did not soar. The close correlation with soldier heights (an indicator of nutrition), the high relative price of food and charcoal throughout the period, and the impact of climatic crises suggest that a low level of agricultural productivity and constraints in the food supply remained a constraint in the capacity to attain higher levels of productivity.[18]

Finally, as real wages stagnated in the long run and other regions of the world grew, the Mexican economy fell behind. From having real wages moderately below high-wage northern European cities, by the turn of the twentieth century Mexico City found its place below the average middle-income group. The erosion of Mexico's position in the world economy started in the last two decades of the colonial period yet it became sustained and pronounced after the second half of the nineteenth century. This outlook agrees with John Coatworth's thesis that identifies the nineteenth century (before the Porfiriato) as period of stagnation of the economy in the context of fast growth in the industrialized nations (1978,1989). Although Mexico experienced some modernization, industrial growth, and global integration during the Porfiriato,

[18] FAO (1952, 51) estimated that food supply in Mexico in the 1930s averaged an appalling 1,800 kcalories per capita.

these results show that the degree of this process was modest in relation to those experienced by these countries. In the era of the great divergence, Mexico converged, not to early-industrialization countries, but to the rest of the world.

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TABLE 6

COST OF LIVING AND REAL WAGES 1730-1930.

	Bare bones CPI in silver grams		Respectable CPI in silver grams		Wage in silver gram	Welfare Ratio (bare bones)		Welfare Ratio (Respectable)		Obs.
Year	Low	High	Low	High	Daily	Low	High	Low	High	
1730	235	242	606	633	8.53	2.80	2.88	1.07	1.12	11
1731	241	261	610	682	8.91	2.71	2.93	1.04	1.16	6
1732	227	243	609	676	9.30	3.04	3.26	1.09	1.21	7
1733	235	249	619	685	9.30	2.97	3.14	1.08	1.19	7
1734	230	250	605	682	9.31	2.96	3.22	1.08	1.22	5
1735	206	226	585	662	9.31	3.27	3.59	1.12	1.26	5
1736	204	225	579	662	9.31	3.29	3.62	1.12	1.27	6
1737	255	280	633	717	9.31	2.63	2.90	1.03	1.17	6
1738	235	264	613	708	9.31	2.80	3.15	1.04	1.21	4
1739	291	317	656	746	9.31	2.33	2.53	0.99	1.13	5
1740	252	278	615	715	9.31	2.65	2.93	1.03	1.20	3
1741	290	315	653	731	9.31	2.34	2.55	1.01	1.13	7
1742	273	298	675	752	9.31	2.48	2.71	0.98	1.10	7
1743	204	233	601	684	9.31	3.17	3.62	1.08	1.23	6
1744	207	237	589	681	9.31	3.11	3.56	1.08	1.25	4
1745	208	232	602	683	9.31	3.18	3.56	1.08	1.23	5
1746	251	272	627	702	9.31	2.72	2.94	1.05	1.18	6
1747	242	259	626	693	9.31	2.86	3.05	1.07	1.18	6
1748	262	278	651	719	9.31	2.65	2.82	1.03	1.13	6
1749	315	333	695	767	9.31	2.22	2.34	0.96	1.06	5
1750	339	358	693	788	9.31	2.06	2.18	0.94	1.07	6
1751	220	273	636	726	9.31	2.71	3.35	1.02	1.16	6
1752	232	294	621	740	9.31	2.51	3.19	1.00	1.19	4
1753	229	245	597	683	9.31	3.02	3.22	1.08	1.24	6
1754	214	234	595	670	9.31	3.16	3.46	1.10	1.24	6
1755	208	227	553	651	9.31	3.25	3.54	1.13	1.33	6
1756	233	242	616	679	9.31	3.05	3.17	1.09	1.20	9
1757	207	226	555	597	9.31	3.27	3.56	1.24	1.33	7
1758	209	232	558	612	9.31	3.19	3.53	1.21	1.32	5
1759	233	238	593	619	9.31	3.10	3.17	1.19	1.25	11
1760	253	269	585	645	9.31	2.75	2.92	1.14	1.26	8
1761	186	231	531	612	9.31	3.19	3.97	1.21	1.39	6
1762	221	230	554	602	9.31	3.21	3.34	1.23	1.33	6
1763	197	209	555	596	9.31	3.54	3.75	1.24	1.33	8

1764	185	203	539	607	9.31	3.64	3.99	1.22	1.37	8
1765	193	206	559	616	9.31	3.58	3.82	1.20	1.32	9
1766	205	220	576	637	9.31	3.36	3.60	1.16	1.28	9
1767	211	228	564	636	9.31	3.24	3.49	1.16	1.31	7
1768	229	239	596	648	9.31	3.09	3.23	1.14	1.24	8
1769	233	245	624	683	9.31	3.02	3.17	1.08	1.18	5
1770	259	262	673	704	9.31	2.82	2.85	1.05	1.10	6
1771	257	260	646	668	9.31	2.85	2.88	1.11	1.14	9
1772	320	320	687	705	9.17	2.27	2.28	1.03	1.06	9
1773	260	268	637	667	9.17	2.71	2.80	1.09	1.14	7
1774	253	260	623	682	9.17	2.80	2.87	1.07	1.17	11
1775	223	229	595	642	9.17	3.18	3.26	1.13	1.22	10
1776	238	255	579	660	9.17	2.85	3.06	1.10	1.26	6
1777	195	210	548	627	9.17	3.47	3.73	1.16	1.33	6
1778	190	208	532	617	9.17	3.50	3.83	1.18	1.37	5
1779	212	218	692	717	9.17	3.33	3.43	1.01	1.05	12
1780	240	266	611	680	9.17	2.73	3.03	1.07	1.19	7
1781	293	310	667	738	9.17	2.35	2.49	0.99	1.09	9
1782	262	280	650	721	9.17	2.60	2.78	1.01	1.12	9
1783	223	255	622	713	9.17	2.85	3.26	1.02	1.17	7
1784	241	258	671	740	9.20	2.83	3.03	0.99	1.09	9
1785	409	418	798	840	8.89	1.69	1.73	0.84	0.88	10
1786	476	481	897	923	9.09	1.50	1.52	0.78	0.81	11
1787	342	354	744	797	8.95	2.01	2.08	0.89	0.96	9
1788	220	235	625	689	8.80	2.98	3.18	1.01	1.12	9
1789	313	328	719	779	9.13	2.21	2.31	0.93	1.01	9
1790	317	321	742	766	9.20	2.28	2.30	0.95	0.98	12
1791	262	266	707	732	9.09	2.71	2.76	0.99	1.02	12
1792	225	230	646	670	9.09	3.14	3.20	1.08	1.12	12
1793	228	240	606	647	9.09	3.01	3.17	1.12	1.19	10
1794	282	286	674	699	9.09	2.52	2.56	1.03	1.07	13
1795	282	292	671	702	9.09	2.47	2.56	1.03	1.08	11
1796	248	262	684	724	9.09	2.75	2.91	1.00	1.06	10
1797	297	299	667	695	8.88	2.36	2.37	1.01	1.06	11
1798	316	322	717	749	8.62	2.13	2.16	0.91	0.95	11
1799	317	319	744	763	9.04	2.25	2.26	0.94	0.96	12
1800	315	316	813	816	8.82	2.21	2.22	0.86	0.86	12
1801	323	325	824	828	9.09	2.22	2.23	0.87	0.88	12
1802	373	373	853	863	9.00	1.92	1.92	0.83	0.84	12
1803	304	308	800	810	9.41	2.42	2.46	0.92	0.93	11
1804	286	291	799	814	9.09	2.48	2.53	0.89	0.90	10

1805	298	298	779	779	9.09	2.43	2.43	0.93	0.93	13
1806	323	327	833	842	9.61	2.33	2.36	0.91	0.92	11
1807	283	289	757	771	9.11	2.50	2.56	0.94	0.96	12
1808	358	377	871	922	9.09	1.92	2.02	0.78	0.83	9
1809	362	370	871	880	9.09	1.95	1.99	0.82	0.83	12
1810	452	482	957	1026	9.09	1.50	1.60	0.70	0.75	8
1811	476	484	1146	1156	9.10	1.49	1.52	0.62	0.63	12
1812	454	474	1105	1136	9.17	1.53	1.60	0.64	0.66	11
1813	398	429	871	1085	9.73	1.80	1.94	0.71	0.89	7
1814	383	413	842	1045	10.29	1.98	2.13	0.78	0.97	8
1815	383	419	839	1069	10.41	1.97	2.15	0.77	0.98	4
1816	421	453	883	1126	10.52	1.84	1.99	0.74	0.95	5
1817	460	490	985	1183	12.22	1.98	2.11	0.82	0.98	6
1818	414	456	850	1083	12.08	2.10	2.32	0.89	1.13	2
1819	482	516	967	1055	11.37	1.75	1.87	0.86	0.93	8
1820	377	400	896	968	11.77	2.33	2.48	0.96	1.04	7
1821	354	419	731	960	12.16	2.30	2.72	1.00	1.32	3
1822	336	431	705	944	11.79	2.17	2.79	0.99	1.33	2
1823	379	520	771	1009	11.43	1.74	2.39	0.90	1.18	5
1824	292	301	760	793	11.06	2.92	3.01	1.11	1.16	11
1825	349	358	790	823	10.69	2.37	2.43	1.03	1.07	11
1826	320	434	755	935	10.69	1.96	2.65	0.91	1.12	6
1827	321	431	779	909	11.96	2.20	2.96	1.04	1.22	5
1828	487	499	855	972	11.68	1.86	1.90	0.95	1.08	5
1829	325	438	735	928	10.21	1.85	2.49	0.87	1.10	2
1830	401	411	756	872	11.46	2.21	2.27	1.04	1.20	5
1831	289	306	697	828	10.91	2.83	3.00	1.05	1.24	5
1832	425	438	869	909	10.61	1.92	1.98	0.93	0.97	11
1833	319	323	771	808	10.69	2.62	2.66	1.05	1.10	8
1834	332	350	718	836	10.77	2.45	2.58	1.02	1.19	7
1835	345	449	783	905	10.69	1.89	2.46	0.94	1.08	5
1836	321	449	701	962	10.69	1.89	2.64	0.88	1.21	1
1837	393	427	745	940	10.26	1.91	2.07	0.87	1.09	4
1838	406	447	773	953	10.02	1.78	1.96	0.83	1.03	2
1839	316	442	697	947	10.69	1.92	2.69	0.90	1.22	1
1840	308	446	693	956	10.69	1.90	2.75	0.89	1.23	3
1841	441	456	938	987	10.69	1.86	1.92	0.86	0.90	10
1842	297	400	665	867	11.07	2.20	2.96	1.01	1.32	3
1843	308	330	705	848	10.21	2.46	2.63	0.96	1.15	7
1844	285	295	729	776	10.69	2.88	2.98	1.09	1.16	11
1845	291	297	662	758	10.41	2.78	2.84	1.09	1.25	9

1846	342	347	748	774	9.25	2.12	2.15	0.95	0.98	12
1847	365	386	763	833	9.17	1.89	1.99	0.87	0.95	9
1848	313	388	724	862	10.68	2.18	2.71	0.98	1.17	5
1849	306	391	675	847	10.59	2.15	2.74	0.99	1.24	2
1850	509	532	911	971	10.50	1.57	1.64	0.86	0.91	9
1851	399	407	754	796	9.24	1.80	1.84	0.92	0.97	11
1852	316	316	694	719	9.58	2.41	2.41	1.06	1.10	12
1853	321	423	667	908	9.17	1.72	2.27	0.80	1.09	1
1854	333	344	690	834	9.17	2.11	2.18	0.87	1.05	11
1855	324	433	688	970	9.17	1.68	2.24	0.75	1.06	4
1856	363	364	846	891	9.17	2.00	2.00	0.82	0.86	11
1857	321	379	664	942	9.17	1.92	2.27	0.77	1.09	1
1858	347	400	712	952	9.93	1.97	2.27	0.83	1.11	5
1859	325	327	828	854	9.93	2.41	2.42	0.92	0.95	12
1860	466	469	1012	1040	9.93	1.68	1.69	0.76	0.78	12
1861	338	422	703	978	9.17	1.72	2.15	0.74	1.03	1
1862	336	461	696	1003	9.17	1.58	2.16	0.73	1.05	2
1863	346	455	711	1008	9.17	1.60	2.10	0.72	1.02	3
1864	348	445	725	990	9.17	1.64	2.09	0.73	1.00	2
1865	335	355	763	822	9.17	2.05	2.17	0.89	0.95	11
1866	406	417	885	923	9.20	1.75	1.80	0.79	0.83	11
1867	611	611	1076	1099	9.17	1.19	1.19	0.66	0.68	13
1868	357	373	740	874	10.68	2.28	2.38	0.97	1.15	11
1869	350	357	763	801	10.69	2.38	2.43	1.06	1.11	12
1870	247	260	617	734	10.50	3.21	3.37	1.14	1.35	10
1871	306	306	706	729	10.31	2.68	2.68	1.12	1.16	13
1872	282	288	647	738	10.12	2.79	2.85	1.09	1.24	10
1873	320	326	752	787	9.93	2.42	2.46	1.00	1.05	12
1874	338	338	727	749	9.74	2.28	2.28	1.03	1.06	13
1875	334	339	709	743	9.55	2.23	2.27	1.02	1.07	12
1876	297	355	693	819	9.36	2.09	2.50	0.91	1.07	5
1877	295	300	728	758	9.17	2.42	2.47	0.96	1.00	12
1878	306	350	698	807	9.17	2.08	2.38	0.90	1.04	5
1879	334	363	669	818	9.17	2.00	2.18	0.89	1.09	2
1880	379	392	749	823	9.17	1.85	1.92	0.88	0.97	8
1881	283	384	697	857	9.17	1.90	2.57	0.85	1.04	6
1882	273	376	681	850	9.55	2.02	2.78	0.89	1.11	3
1883	276	373	644	832	9.93	2.11	2.85	0.95	1.22	1
1884	348	367	731	797	10.31	2.23	2.36	1.03	1.12	7
1885	308	354	708	828	10.69	2.39	2.76	1.02	1.20	9
1886	288	291	652	743	10.69	2.92	2.95	1.14	1.30	12

1887	279	282	654	745	11.38	3.20	3.24	1.21	1.38	10
1888	323	325	737	765	11.51	2.81	2.83	1.19	1.24	12
1889	327	328	797	822	11.06	2.67	2.68	1.07	1.10	13
1890	326	331	790	821	11.15	2.67	2.72	1.08	1.12	12
1891	434	436	826	836	11.13	2.02	2.03	1.06	1.07	13
1892	480	507	842	904	11.18	1.75	1.85	0.98	1.05	13
1893	420	420	838	843	11.00	2.08	2.08	1.04	1.04	14
1894	357	357	774	778	9.65	2.14	2.14	0.98	0.99	14
1895	345	364	766	806	12.34	2.69	2.84	1.21	1.28	12
1896	415	428	784	817	9.17	1.70	1.75	0.89	0.93	13
1897	365	365	691	695	9.17	1.99	1.99	1.05	1.05	14
1898	354	354	759	763	9.16	2.05	2.05	0.95	0.96	14
1899	365	373	799	818	9.73	2.07	2.12	0.94	0.97	12
1900	384	410	829	884	10.21	1.98	2.11	0.92	0.98	12
1901	441	451	908	932	10.97	1.93	1.97	0.93	0.96	13
1902	506	506	1060	1064	10.63	1.67	1.67	0.79	0.80	14
1903	401	410	942	966	11.71	2.27	2.32	0.96	0.99	13
1904	382	383	928	935	14.25	2.95	2.96	1.21	1.22	13
1905	413	432	959	1003	15.12	2.77	2.90	1.20	1.25	13
1906	461	464	1009	1017	15.43	2.64	2.66	1.20	1.21	13
1907	445	464	1014	1059	17.55	3.00	3.13	1.32	1.37	13
1908	491	495	1085	1095	18.32	2.93	2.96	1.33	1.34	13
1909	552	571	1167	1212	18.33	2.55	2.64	1.20	1.25	13
1910	626	626	1350	1354	18.33	2.32	2.32	1.07	1.08	13
1911	598	621	1300	1408	18.33	2.34	2.43	1.03	1.12	11
1912	582	611	1299	1419	18.33	2.38	2.50	1.03	1.12	11
1913	560	611	1296	1450	18.33	2.38	2.60	1.00	1.12	12
1914	687	733	1687	1814	18.33	1.98	2.12	0.80	0.86	11
1915	409	434	795	956	4.16	0.76	0.81	0.34	0.41	8
1916	181	216	458	561	3.92	1.44	1.72	0.56	0.68	6
1917	704	1033	1457	2480	17.28	1.33	1.95	0.55	0.94	6
1918	1009	1009	2119	2163	15.34	1.21	1.21	0.56	0.57	13
1919	632	632	1591	1626	13.89	1.75	1.75	0.68	0.69	13
1920	713	713	1879	1917	15.14	1.68	1.68	0.63	0.64	13
1921	1167	1167	2715	2843	27.61	1.88	1.88	0.77	0.81	12
1922	857	857	2112	2219	30.18	2.80	2.80	1.41	1.46	12
1923	791	791	2007	2065	34.45	3.46	3.46	1.61	1.61	13
1924	784	784	1989	2045	33.30	3.37	3.37	1.55	1.55	13
1925	921	921	2276	2331	32.83	2.83	2.83	1.31	1.31	13
1926	922	922	2447	2506	35.82	3.08	3.08	1.35	1.36	13
1927	891	903	2423	2513	38.53	3.39	3.43	1.47	1.47	13

1928	878	878	2297	2360	38.04	3.44	3.44	1.56	1.56	13
1929	969	969	2363	2430	40.43	3.31	3.31	1.62	1.63	13
1930	1644	1647	3604	3705	53.35	2.57	2.58	1.36	1.37	12

Sources: See online Appendix A
Notes: All CPI and wages in silver grams. The last column reports number of prices available.