Artículo

The Evolution of Income and Inequality among Mexico City's Construction Workers during the "Independence Era": 1783-1853

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ABSTRACT

This paper explores inequality levels within the construction sector in Mexico City between the 1780s and the 1850s examining new microdata of daily wages that discriminate skill levels and individual variations. We study the evolution of skill premiums (foremen, masons, and laborers), and build a Theil inequality index of the entire distribution. We find a clear discontinuity in the trends taking place around 1814, when the wage level of unskilled laborers increased, and inequality decreased. An opposite change took place circa 1840 when inequality bounced back and approached its late colonial levels. We hypothesize that institutional change, namely the abolition of guilds (1814), shifts in the relative power of elites and manual laborers, and the cycle of urban growth in Mexico City are behind these trends.

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La evolución del ingreso y la desigualdad entre los trabajadores de la construcción en la Ciudad de México durante la "Era de la Independencia": 1783-1853

RESUMEN

El artículo explora los niveles de desigualdad dentro del sector de la construcción de la ciudad de México entre los años de 1780 y 1850, examinando nuevos microdatos de salarios diarios que distinguen entre niveles de calificación y variaciones individuales. Estudiamos la evolución de las primas de calificación entre maestros, oficiales y peones y construimos un índice de desigualdad de Theil de la distribución completa. Encontramos una clara discontinuidad en las tendencias en 1814, cuando el nivel salarial de los trabajadores no calificados aumentó y disminuyeron las primas de calificación junto con la desigualdad. Este cambio se revirtió cerca de 1840, cuando la desigualdad volvió a niveles similares a los de finales del periodo colonial. Desarrollamos la hipótesis de que esto se debió a cambios institucionales, en particular la abolición de los gremios (1814), cambios en el poder relativo entre las élites y los trabajadores manuales y los ciclos de crecimiento urbano de la ciudad de México.

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1. Introduction

In between the fall of New Spain and the emergence of modern Mexico, the political economy experienced significant changes in terms of the relative power, production, and institutional organization (Cárdenas, 1984; Chowning, 1991; Coatsworth, 1978; Dobado, Gómez-Galvarriato and Williamson, 2008; Salvucci, 1997; Sánchez-Santiró, 2001). With this backdrop of transformation, how did the distribution of income change? Economic historians are just beginning to build systematic reconstructions of the gaps in economic welfare and the distribution of income. Work has focused on broad social tables tracking income differentials, ratios between national income and wages, wealth inequality, and gaps in other measures of material welfare (Arroyo-Abad, 2013; Arroyo-Abad and Astorga, 2016; Bleynat, Challú and Segal, 2021; Williamson, 2010). In general, these measures focus on the variations that compare the gaps between rich and poor, privileged, and underprivileged. This study, by contrast, focuses on the construction sector, a small but pivotal sector, to gauge the disparities within the laboring classes.

The period under study starts in the early 1780s and ends in the early 1850s. It covers major institutional changes, as well as insurrections, rebellions, and civil wars, of which likely affected the distribution of income. In the late colonial period and even more after independence in 1821, Mexico went through considerable experimentation in its institutions. While this is often approached from a political perspective, colonial and independent authorities introduced significant innovations in economic institutions. Among the latter, one is particularly relevant for this work: the abolition of the trade guilds, which included the masons' guild, in 1814. Historians have only studied the abolition of guilds in the context of artisanal occupations of a higher standing and organized around workshops (Pérez Toledo, 1996, p. 217). Of the social unrest and mobilization of this period, John Tutino (1986, 1998) highlights the significance of the agrarian insurrection in the 1810s, which did not just erode the power of colonial authorities but also initiated an enduring social transformation. He found that in many regions, the popular classes challenged property rights and the organization of production forcing a change in social relations and a shift from large-scale commercial production to family-based subsistence agriculture, that produced real gains to large swaths of the rural population.

Mexico City, the focus of our study, was not yet to become the metropolis that we know today, but it was a city with a degree of complexity built on top of distinctions of income, status, and wealth. The city's footprint was only 20 squared kilometers; population counts range widely according to the sources, from as little as 100,000 to as much as 200,000 (INEGI, 2014, table 1.54; Miño Grijalva, 2006, pp. 36-37; Pérez Toledo and Klein, 1996, p. 253). Using the median of these population counts, we can glean an increase in population from 130,000 inhabitants (1776-1803) to 192,500 (1838-1860). As the country's capital, it captured revenues that sustained its civil and religious administrations. The wealthiest families of the country lived in the city as well as top bureaucrats and multitude of clerical workers (Arnold, 1988; Kicza, 1983, pp. 19-20). This accumulation of wealth and power is likely the reason why Mexico City workers earned a higher nominal wage than surrounding rural areas and other cities of the viceroyalty (Van Young, 1992).

Previous work showed that the real wages of male laborers declined from the 1780s to the 1810s; a partial recovery ensued in the succeeding decades; followed by another period of low real wages in the 1850s (Challú and Gómez-Galvarriato, 2015, p. 94). Laborers earned enough to barely sustain a nuclear family of four members on a modest lifestyle; in many years of our period, however, they had to revert to a minimum subsistence (barebones) lifestyle. These pressures were particularly stronger from 1795 to the late 1810s. This study shifts the attention from living standards to wage inequality among the different occupational categories in the construction payrolls; it extends the dataset to include skilled workers from the 1780s to the early 1850s. The accounting primarily tracked the building and repairing of rental units owned by hospitals, schools, and religious organizations. Our data capture the daily rates of masons and laborers of different ranks, as well as the number of man-days worked in the projects.

Our essay proceeds as follows. The next two sections discuss the organization of construction work, the distinctions among its ranks, and the overall position of construction work in the labor universe of Mexico City. Section 4 discusses the characteristics of our archival sources. We then proceed to present trends in nominal wages of the three main categories of workers. Section 6 analyzes an annual series of the Theil index of inequality of the construction wage distribution. Section 7 interprets our findings in the context of the social and economic historiography of Mexico. The conclusion contextualizes our contribution to the literature of Mexican inequality.

2. Construction labor and the masons' guild

In New Spain, construction labor, as other artisan work, was regulated by the guild system. Masonry was considered the craft used "to make buildings with bricks, stones or other materials such as plaster, rubblework or ceramic tiles" (Quiroz, 2020, p. 67; Terán Bonilla, 1998, p. 346). In Mexico City the ordinances of the mason's guild were written in 1599 and had several modifications through time. According to them, only Spaniards could join the guild, but they were not strictly implemented (Terán Bonilla, 1998, pp. 351-352). In 1749 the ordinances were changed to allow Indians, mestizos and people from other origins practice the trade. Thus, by the end of the eighteenth century and the beginning of the 19th century, many indigenous workers were in the construction sector. By 1800, for example a large share of the inhabitants of the Indian village of San Juan de México Tenochtitlán worked as masons (Quiroz, 2020, p. 67).

The guild regulated the credentialling of its members, their rights and obligations. At the top of the hierarchy were the *maestros* (masters), followed by the *oficiales* (skilled masons), and the apprentices. The ordinances did not stipulate salaries or pay rates; instead they focused on how they were trained and examined, what types of work they were allowed to perform, and what kind of supervision they had. Becoming a *maestro* was expensive: the exam cost 112 pesos, or roughly equivalent to 150 days of work as a skilled mason. Some *maestros* were qualified to conduct more complex type of construction and to inspect buildings (Fernández, 1986;

Schuetz, 1987, p. 10). The *oficiales* were formally examined masons that worked under the supervision of *maestros;* yet, in practice, perceived experience (rather than examination) could be sufficient to be listed as an *oficial* in the guild rosters. *Oficiales* were also able to offer their work freely in public places, outside of the supervision of a *maestro* (Carrera Stampa, 1954, pp. 37-38; Ortiz Macedo, 2002, p. 81). Below this hierarchy were the *peones* or laborers. While this was the most frequent category in the payrolls, they were not regulated by the guild.

On January 7, 1814 Viceroy Félix María Calleja published a decree that abolished the guilds, in compliance with the law that the Cadiz Courts had passed on June 8, 1813 (Carrera Stampa, 1954, pp. 274-276). However, in June 29, 1815 the Crown reestablished guilds with the caveat that it exempted "anything that could cause a monopoly, be detrimental to the progress of the arts, or limit the just freedom of everyone to exercise their industry having proven that the knowledge required to perform it by the works that they present" (Tanck, 1979, p. 320). A few years later, by the end of 1820 a new decree was published that definitely extinguished guilds. After that year, they were never reestablished again. Thus, a new social subject appeared, the free artisan, that is the artisan free from a trade corporation (Illades, 1990, p. 75).

The mason's guild was never as structured and strong as those of other manufacturing artisans, partly because, due to the nature of this type of labor, masters did not own a shop. Moreover, *oficiales* were able to offer their services in public markets. In this way, construction masters lacked the control over the trade that was common in other guilds. Similarly, while construction workers had a common devotion in the Santa Cruz, a devotion that remains in practice in the present day, they did not have a *cofradía* that provided social security benefits to their members, as other guilds did (Pérez Toledo, 1996, pp. 67-68). Masons also lacked an identity shaped by shared struggles against competing imported goods. In the years following independence, manufacturing artisans organized to advocate for protectionist policies against foreign competition (Arrom, 1988, pp. 261-264). Since masonry is a non-tradable sector, masons did not have a vested interest to fight in this cause and did not join the emerging organizations of artisans. In short, masons were not part of formal organizations of artisans that reemerged in the 1840s, such as the Junta de Fomento de Artesanos in 1843 or the Juntas Menores (Pérez Toledo, 1996, pp. 193, 198-203, 217). As a further confirmation, the 1842 census for Mexico City records apprentices for different artisanal trades but has no mason apprentices.[1]

Thus, while guild practices of mutual assistance, training and credentialing persisted in the case of manufacturing artisans, the evidence indicates that the mason guild ceased to exist after the abolition of 1814. Abolition must have affected the hierarchical structure of the organization of this type of labor more than others, since no other institution replaced for a long period of time the formal training that guilds carried out formerly. There was no official evaluation system to distinguish a master from other masons for several decades. Only by 1855 a decree was passed to regulate the professionalization of certain trades, which included the *maestro de obras.* To obtain this title, which corresponded more to the colonial architect master, than to the mason master *(maestro albañil)*, it was necessary to be examined at the National Academy of San Carlos by three professors.[2]

Before and after the abolition of the guild, the organization of construction maintained the distinction between foremen, masons and laborers. However, before the elimination of the guilds, payroll sources rarely include the compensation of *maestros*, and instead list a related figure: the *sobrestante* or supervisor (Schuetz, 1987, p. 100).[3] Despite the changes in the ordinances that allowed Indians to form part of the guild, sources from the time period suggest that the highest ranks must have been kept by those identifying as Spanish (*ibid.*, p. 92). Underneath the foreman, there are almost always *oficiales* or masons. After the abolition of the guild, we see more payrolls listing *cucharas* ("trowelmen") and *media cucharas* ("semi-trowelmen"), with a pay at the bottom of the usual range for an *oficial*. Towards the mid nineteenth century, the terms *albañil* and *maestro albañil* became more frequently used in some projects; they are clearly skilled masons, but we considered the latter to be equivalent to the foreman category *(sobrestante)* because they received a higher pay rate. The payrolls typically referred to these higher ranks by family name (and occasionally with the "don" title, indicating a higher social standing). Underneath these skilled workers were the laborers. The *peón* was the most frequent category. Quite often they were referred by their given name only and were not given the "don" title. A few sources list *cabritos* and *muchachos* (boys) as the lowest-paid worker.

3. Construction work as a barometer of the working classes

Economic historians often use the construction sector as a barometer of the level of income of broad swaths of the population. Implicit in this use is that the labor sector, on the long run, behaves as a market and, because the construction sector employs many workers with moderate manual skills, the compensation in this sector is competitive with the compensation in other unskilled occupational groups. Even more, the characteristics of construction enable workers to move between self-sufficient agriculture to waged labor with relative ease (Lindert and Williamson, 1983). Because they are considered representative of broader dynamics in labor, Robert Allen's methodology of constructing international comparison of real wages relies primarily on construction wages as the indicator of choice of popular earnings (Allen, 2001), while Jan Luiten Van Zanden (2009) used the skill premium in the construction sector as an indicator of disparities in human capital in the broader economy.

According to censuses from this period, construction workers ranged from 3.4 to 8.3 percent of the population (Pérez Toledo

and Klein, 2004; Rodríguez Piña, 1976). However, their representativity of general patterns in the manual labor force rests on their relative position among working classes. The *Padrón* of Mexico City of 1842 provides individual information of the people counted, which includes their trade and age. This allows us to make a numeracy analysis, to locate masons among other workers. Numeracy (or age-heaping) has been shown to be closely correlated with other human capital indicators, such as literacy and schooling (Mokyr, 1983; A'Hearn, Baten and Crayen, 2009; Calderón-Fernández, Dobado-González and García Hiernaux, 2020). Following, Manzel, Baten and Stoz (2012), we calculate an ABCC rate that indicates the percentage of the population that reported their exact age. There were 1,010 masons *(albañiles)* in Mexico City according to this census, 63 *sobrestantes*, and only one *maestro de obras*. The ABCC index was 52.1 for masons, compared to 64.0 for the total population (71 for males, 59 for females). The numeracy of masons was above that of several low skill trades such as charcoal producers *(carboneros)* that was 36.62 or that of carriers *(cargadores)* 49.39. It was very similar to that of domestic servants (52.56) or cigar and cigarette makers (52.78). The ABCC index of *sobrestantes* was higher (55.56) but it was still lower than that of blacksmiths (62.50), carpenters (69.06), weavers (72.23) or shoemakers (72.51). Unfortunately, we cannot differentiate within the ranks of the construction trade, but it is reasonable to believe that *peones* ranked below masons and together with other laborers, and the latter might have an ABCC index similar to those of other manufacturing artisans.

Another measure of capabilities and living standards is the average adult height obtained from military records of central Mexico (from the 1760s to the 1850s). Holding other variables constant (such as genetic diversity and ecological characteristics), adult height is an indicator of nutritional status during the period of physical growth (typically up to 20 years of age). A higher stature is correlated to physical capabilities: healthier and better nourished individuals are likely to exert more physical force and work longer hours. Height aligned with occupational hierarchies in expected ways: those in the lower fringes of the social hierarchy were shorter, while those in the upper rungs (such as the merchants and white-collar workers) were taller. Table 1 reports the average height of major occupational groups from military records from the 1760s to the 1850s, and the ABCC rate. Both measures do not coincide for every occupation, but the results show a consistency regarding the social status of construction workers. Construction workers squarely fell in the lower end of this range. The *albañiles* (masons) recruited in the army were slightly taller than unskilled laborers *(peones)*, and shorter than skilled and semiskilled artisans.[4] Masons were shorter than rural workers and farmers, a gap likely tied to urban disamenities; but masons also scored lower in the numeracy index. In all, the construction categories that we include in this study are representative of a wide spectrum of the working population.

What the results on height and ABCC estimates suggest is that the masons were an underprivileged occupation, characterized by lower human capital and nutritional status, both highly correlated to their social standing. To be sure, masons stood closer to laborers than to artisans or even rural workers

in these metrics. Yet, as much as laborers and masons shared similar social origins, we will show in the next section that there were significant differences in income according to rank and skill, suggesting that experience and skill acquired in the construction trade were a vehicle of upward economic mobility.

Table 1.

Stature and numeracy of albañiles and other occupational groups

Group	Height in cm (SE)	ABCC
Laborers	159.77 (0.49)	51.95
Masons	160.13 (0.48)	52.10
Artisans	160.92 (0.94)	68.03
Rural workers	161.30 (0.32)	62.37
Merchants	162.06 (1.00)	67.12
White-collar	162.29 (1.47)	78.14
Service	162.41 (0.69)	59.04

Notes: The estimation of heights are based on the database and methods described in Challú, "The Great Decline". The sources are military records of the central states of the country from the 1760s to the 1850s. For the sources of the ABCC index, see text. It is calculated with the population 20 years old or more. Laborers include terms such as *carboneros, cargadores, obrajeros, operarios, peones* and *trabajadores*. Masons include *albañiles* and *sobrestantes*. Artisans include *arrieros, canteros, carpinteros, herreros, sastres*, and *zapateros*, among many others. Service workers is a broad category that includes *barberos, enfermeros, músicos, servidores domésticos*, and *sirvientes*. Rural workers include "*campo*", *chinampero, gañanes, hortelanos, milperos* and *vaqueros*, as well as independent producers such as *rancheros*. Merchants include *corredores, cajeros* and *viandantes*. White collar includes bureaucrats, priests, professionals, scribes, and students. The ABCC estimates include a marginal number of women in the average.

4. Sources

We built wages series of different masonry trades using 37 different collections and repositories of hospitals, churches, convents, street pavement and schools of the area historically considered Mexico City, totaling more than 231,000 man-days of work (the sources are listed in the Archives section). We complemented our data with information from newspapers that published annual reports of public works that included an accounting summary of pay rates and days worked. The largest number of observations comes from the Colegio de Vizcaínas, a school for girls established by the Basque community that owned an entire block in downtown Mexico City; all the street-facing rooms were rented out for housing and businesses (Calderón, 2009). This source is exceptional since it is one of the few institutions that survived the several upheavals of the 19th century and remains operating until the present day.

Most documents indicate weekly payments to each worker on the construction site as well as days they worked. The reports include not just those working in masonry, but also carpenters and ironsmiths (paid by the job and often including materials in the bill), and, very sporadically, night guards. The most detailed section is dedicated to those working in masonry. In most years, the categories among masonry workers are rather simple: a *sobrestante* leading and overseeing the group, *oficiales* (masons), and *peones* (laborers). As mentioned before, variations in the occupational labels became more common in the nineteenth century, especially since the 1830s. We simplified the categories in the three traditional categories: *maestros,*

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[4] The main outlier is the service worker category (e.g. doorkeepers) who tended to be relatively tall. In our experience with wage information, service workers often have a high degree of dispersion in salaries as well.

which includes both *maestros* and *sobrestantes*; *oficiales*, which also includes *albañiles*, *cucharas* and *media cucharas*; and *peones*, which also includes *cabritos*.

We vetted the wage observations for anomalies, and all units of accounting were transformed to pesos and cents. It is important to highlight that these accounting reports are not invoices charged to institutions, as it was the case in British sources (Stephenson, 2018). Instead, they account for the daily pay rate, number of days worked and total weekly pay of laborers, masons, and more specialized workers. They were prepared by *sobrestantes* and *maestros* at the end of the week to pay the workers (Schuetz, 1987, p. 100). While newspaper articles occasionally indicate the existence of corrupt practices, such as ordering more materials than needed, we rarely found significant discrepancies between the total amount paid to a worker and their pay rate, and errors were not systematically biased in favor of the foremen. As further corroboration, wages of other unskilled workers paid monthly, such as *hortelano* (gardener), were equivalent to 20 or 21 days of a construction laborer.[5]

Construction labor was anything but static. By analyzing the names in our data series between 1829 and 1853, we see that there was a constant turn-over in the labor force.[6] On average, we find that the same worker labored 37 days per year. Only 13 percent of workers labored over 90 days in a given year in the construction teams of which we have detailed records of names; the rest of the year they must have worked in other construction sites that do not form part of our data, or in other types of jobs. It is also the case that while the same worker was not full time in the same site, the same names tend to come back over the course of years. As expected, the turnover rate was higher for unskilled laborers than for skilled laborers or foreman, since the first was a more mobile type of labor. The average working days of the same person within a year were

27.4 for *peones*, 48.98 for *oficiales* and 54.53 for *maestros*.[7] Turnover of *peones* tends to be higher during harvest and planting seasons which suggests that they might have worked as agricultural laborers during part of the year. There was also some mobility within categories, and the richer occupational vocabulary of the 1830s and 1840s shows that some workers started as *peones,* to move later to *cuchara* and eventually to *albañiles* (or *oficiales*). In some cases, the promotion was temporal.

5. Trends in nominal wages by occupational categories

Our data shows that the nominal income of maestros and oficiales moderately grew during the colonial period, but the wage of *peones* stagnated at a flat 3 reales or 0.375 pesos per day. Although *peones* were on the margins of the regulations of the guild, their compensation was less variable than that of *oficiales* or *maestros*. As shown in Table 2, the pay of unskilled workers *(peones)* had a lower coefficient of variation than skilled workers (*maestros* and *oficiales*, pooled). Given the occurrence of subsistence crises and epidemics, this greater stability of the *peones* income is somewhat unexpected, but it could have resulted from the interaction between rural and urban labor.

The long-term stability and low variation of the unskilled wage began to change after 1813. The mean daily wages of *peones* experienced a remarkable increase after that year, while the top category (*maestros*) saw their wages drop on average, and the *oficiales* had a moderate growth (see Figure 1). Table 2 also indicates that the variation in wages decreased, with the variation in *oficial* wages now being closer to that of *peón* wages. These new levels of income remained stable for about two decades. Then, during the mid 1840s, an equally sudden and stable drop in the income of *peones* took place, when their daily wages dropped to the colonial rates, while skilled wages did not show much of a trend but became more variable.
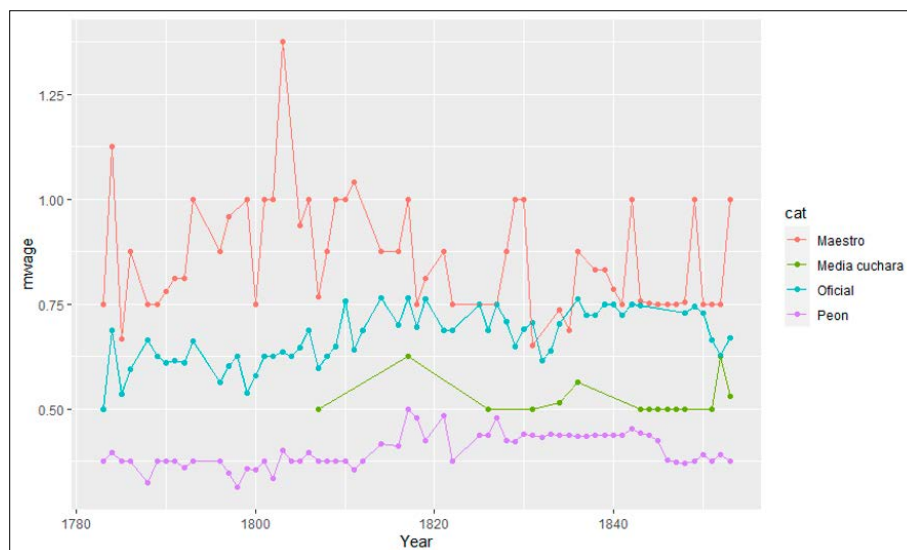

Figure 1.

Mean annual nominal wages by main occupational categories.

Table 2.

Variation within unskilled and skilled nominal wages, in pesos/day

	Mean	Std. Dev.	Coef. of Var.
1783-1812			
Peón	0.368	0.040	10.9%
Oficial	0.617	0.108	17.6%
1814-1839			
Peón	0.435	0.030	7.0%
Oficial	0.707	0.068	9.7%
1840-1853			
Peón	0.396	0.033	8.3%
Oficial	0.653	0.105	16.1%

To test if there was a clear distinction between the 1813-1847 and the rest of the years, we used the method of k-clustering to test the existence of two different means in the wages of *peones* in the period. The k-means method partitions the observations into k groups, while minimizing the Euclidean distance between points of d dimensions on the group and a mean, calculating k centroids. In other words, the k-clustering method classifies observations according to their closest mean, and the calculates the means that minimize the variance in the groups. The problem of minimization is to find the sets S_k which minimize the function:

$$\min_{s} \sum_{i=1}^{k} |S_i| Var S_i$$

Figure 2 explores the nature of the change by clustering the data into two sets of wages of *peones* during the period, using the k-means method. It clusters all the observations of *peones* wages (n=9131) into two means and plots all the observations that fall into those clusters, comparing them with the dummy variable of two different periods: 1) 1813-1847 and 2) the other years (1780-1812 and 1847-1855). Most observations of *peones* wages (77.5%) from 1813-1847 fall into the upper wage mean (0.439 pesos), while 94.1% of the observations from the second period (1780-1813) and (1847-1855) fall into the lower level mean (0.373 pesos). As Figure 1 shows, the mean wages of *maestros* and *oficiales* varied greatly but the mean wages of *peones* stayed around two values: 0.442 and 0.370. The upper mean corresponded almost exclusively to the period 1813 to 1847, while the lower mean corresponded to second period (1780-1812 and 1847-1855). In contrast, the mean daily income of *maestros* and *oficiales* was more unstable throughout the two periods 1780-1855 and did not necessarily move uniformly with the general wage of the construction sector. [8]
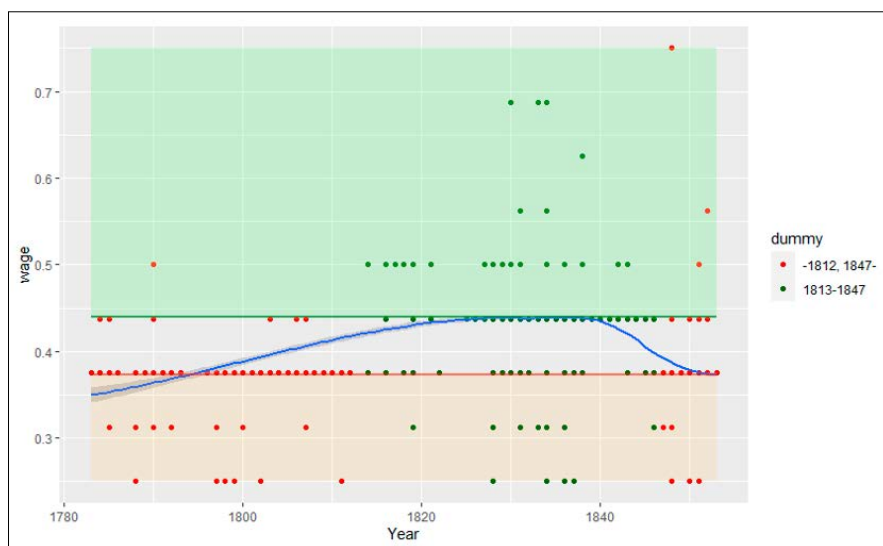
Figure 2.
Clusters of Nominal Wages of Peones.

How did this inequality among Mexico City construction workers compare internationally? We estimate the skill premium as the percentage of the skilled pay (*maestros* and *oficiales*, pooled) over the unskilled pay *(peones)*, following Van Zanden (2009) to calculate comparable figures. The skill premium in Mexico City was 92 in 1780-1813 (the guild period), which was a high value by European standards of the time, although it was not as high as in some East-Asian countries discussed in Van Zanden (see Table 3). After the abolition of the guilds, the premium declined dramatically, to 62. This ratio was comparable to most European cities and was lower than Southern Europe, but this moment of convergence dissipated by the 1840s when the premium rebounded to 81. Taken as a whole, the skill premium was not exceptionally

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[8] The clusters of the relationship between mean wages of *maestros*, *oficiales* and peones illustrate this point. (see Appendix 2).

high as the East Asian cases shown in Van Zanden (2009) but was certainly in the upper fringes of the European range of skill inequality.[9]

Table 3.

Skill Premiums in Mexico City and other Regions

Place	Skill premium
Mexico City, 1780-1853	73
Mexico City, 1780-1813	94
Mexico City, 1814-1839	64
Mexico City, 1840-1853	76
Western Europe, 1750-99	53
Central Europe, 1750-99	58
Southern Europe, 1750-99	74
China, 1750-1820	100

Notes: Figures for Europe and China taken from Van Zanden (2009, pp. 127 and 145). Van Zanden's categories may be equivalent to our oficiales or maestros, hence we pooled these two categories for this calculation. The *oficial/peón* premium for the entire period is 64, and the maestro/peón is 84.

6. Trends in the inequality of construction wages

Changes in relative wages can be measured in terms of inequality. Our database of wages of individual workers allows us to calculate a Theil inequality index for each year and decompose how much of it originates in differences between occupational categories (*maestros*, *oficiales* and *peones*), and how much in the variation within these categories.[10] The first term of the Theil index equation 1 measures the participation of the *within* inequality of the group k on the total inequality in the population N. The second term measures the contribution of the inequality *between* groups into the Total inequality of wages y per day worked.

$$T = \frac{1}{N\,\overline{y}} \sum_{k=1}^{n} N_k\,\overline{y_k}\,T_k + \frac{1}{N\,\overline{y}} \sum_{k=1}^{n} N_k\,\overline{y_k}\ln\left(\frac{\overline{y_k}}{\overline{y}}\right) \quad (1)$$

Figure 3 shows annual Theil estimates and a smoothed trend line (see Appendix 1 for quinquennium averages). Let us first focus on the decomposition of the between and within inequality: inequality between groups composed 93 percent of the total inequality in the years surveyed. Only in a handful of years, the inequality within groups explained more than 10 percent of the total inequality. An important methodological derivation of this finding is that it validates the use of well-constructed social tables that retrieve significant skill and occupational differences as a means to estimate total inequality.
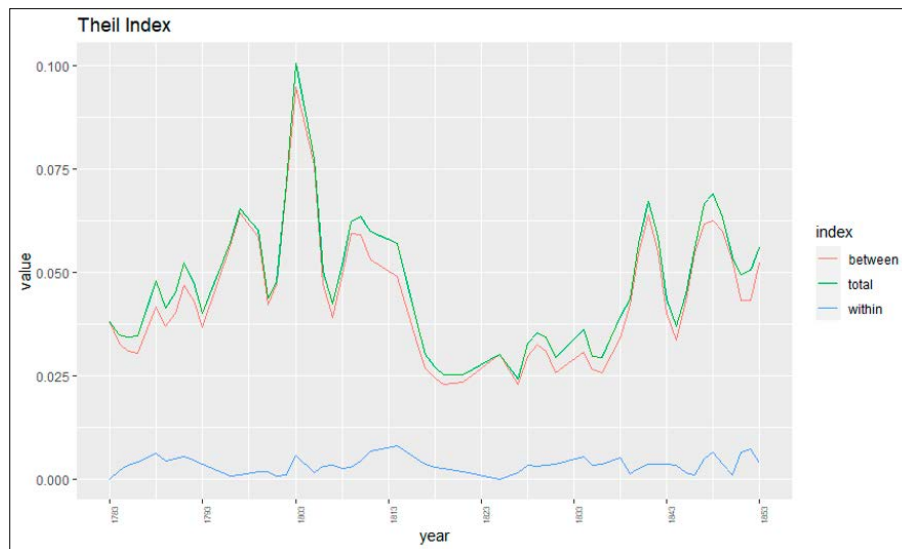

Figure 3.

Inequality in the construction sector: smoothed trendlines.

Notes: See text for sources and method of construction. The vertical axis represents the Theil index. The total equals the sum of the between and within subindexes. The fitted curves were built using the loess method.

The evolution of total inequality is the most interesting analysis from the annual Theil Index. Figure 4 plots structural breaks in the annual, unsmoothed estimates of the total Theil inequality index. We estimated structural breaks with the Bai-Perron method, with a selection of four breaks (five periods) using a Bayesian Information Criterion. The cutting points were 1795, 1805, 1816, and 1839. Inequality increased in the years around the turn of the nineteenth century: from a Theil of 0.042 in 1783-94, to 0.065 in 1795-1804. The turn of the century not only had a higher average but also the

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[9] Our average skilled wage is the weighted average of *oficiales* and *maestros.* Van Zanden (2009, p. 122) includes also carpenters' wages. Although insufficient to build a general series, our data shows that they had a similar wage to those of *maestros*. Thus, our results likely underestimate the Mexican skill premium relative to Van Zanden's calculations.

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[10] A total of 59 years, representing almost 28,000 worker-days were discarded because they lacked information on one of the three main skill groups. These years, however, were retained to calculate mean wages.

highest variability in annual estimates. Inequality declined to 0.058 in the next period (1805-1815) but it was still higher than in the first decade of our series 0.058 in. The decline that followed after 1815 was pronounced: to 0.032 in 1816-1838 —half of the level of inequality detected *circa* 1800. In the last period, 1839-1853 inequality bounced back to 0.053.[11] The period dummy variables capture 22 percent of the variance of the Theil.[12]
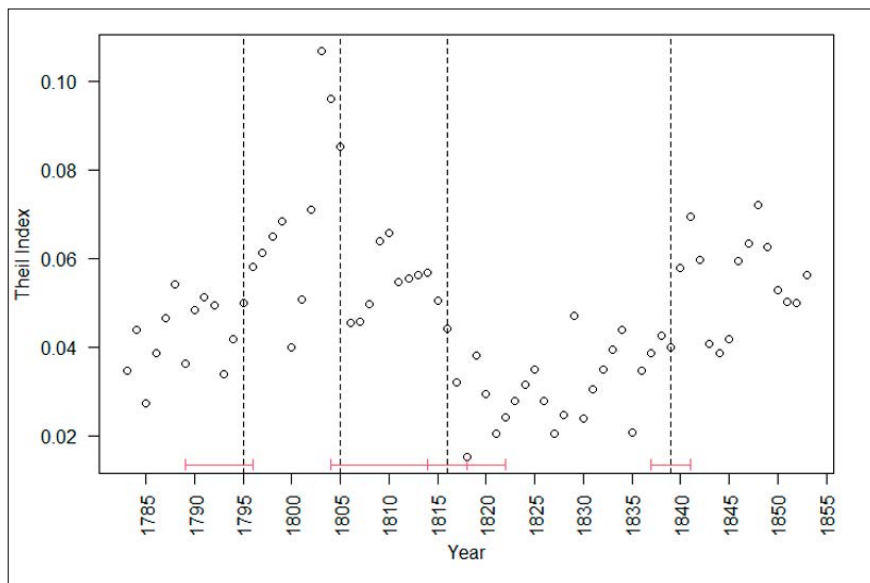
In other words, Figure 4 highlights the clear fall in levels around the mid-1810s that interrupted an otherwise rising trend before. When seen in conjunction with Figure 3 another feature stands out: the within-inequality component explained more of the total Theil (11 percent) in 1816-1838 than in the other periods (6 percent); in other words, the differences between ranks became less of a driver of inequality in this period and the wages of one rank (*peón, oficial, maestro*) more frequently overlapped with those of another rank. The figure also shows that the inequality drop lasted more than two decades.

Figure 4.

Structural breaks in the annual Theil inequality estimates (1783-1853).

7. Explaining the changes in inequality

We find an increase in inequality from the 1780s to the 1800s followed by a substantial drop, and a rebound in the late 1830s to the end of the period. We propose that three forces shaped the overall U-shaped trajectory of inequality: a) the abolition of the guilds shifted the supply of skilled labor; b) the changing political economy of the countryside changed the opportunity cost of a rather elastic supply curve of unskilled labor; c) the cycles of construction in Mexico City affected the demand for labor.

The coincidence of the changes in the inequality patterns with the abolition of the guilds (1814-1820) are hard to miss. From 1811 to 1814 *peón* wages increased and they did so more than the increase in *oficial* wages, while the *maestro* wages had a maximum in 1805 and remained at similar level during the first decade of the 19th century. The Theil index went down to a historical low in 1815-19 and remained at low levels through the 1830s as wages gaps between ranks narrowed. This sug-

gests that by restricting the access to the *oficial* and *maestro* ranks, the guild system created a greater distance in wages. Our findings suggests that the masons' guild increased the pay rate of skilled workers. After the elimination of the guild, and in a context of rising prices, all wages increased, but those of unskilled workers outpaced the wages of skilled workers. In the short term, our findings run against Van Zanden (2009)'s argument that the guild system helped regulate contracts between masters and apprentices, which increased investment in human capital and, therefore, reduced the skill premium in the long run. However, Van Zanden's argument may apply to Mexico in the long run given that the skill premium increased towards the end of our period, and it continued to increase later in the nineteenth century.

The suppression of the guilds would explain why the relative wage of skilled workers diminished relative to that of unskilled workers, but a second driver of the decline in inequality may be related to changes in the rural economy in Central Mexico. For this, Tutino's thesis of compression and decompression of rural tensions is quite relevant. The late

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[11] There is a good argument to consider 1795-1815 one period, given the wide confidence interval around the break in 1805. For the estimation of the Bai-Perron structural breaks, we interpolated the values of the missing years of the Theil index.

[12] The total R2 is 0.55. The Theil annual series rejects the unit-root hypothesis at the 5 percent significance in ADF and DFGLS tests.

colonial was a period of "compression" of social tensions in the countryside due to demographic growth and growing marginalization of peasant communities. A decline in traditional entitlements to food may have increased the reliance on wage labor to secure the access to food. In other words, the supply of labor likely increased. While our work is not concerned with rural income, studies that used both urban and rural sources in Latin America in this period have shown that the trajectories tend to be correlated. [13]

After compression, the insurrection in the 1810s ushered an era of "agrarian decompression —a shift of production away from large commercial estates and towards peasant villagers and ranchero families" (Tutino, 1998, p. 410). Tutino found that the rural population of a fertile agricultural region in central Mexico (el Bajío) increased their control over production despite the efforts of the politically divided elites. On top of changes in the countryside, the decline of silver mining and the weakness of commercial elites combined to threaten the power of the dominant class in central Mexico. At the same time, increased migration toward the north and other peripheral regions relieved population pressures in the central highlands so "villagers could drive hard bargains with estates seeking their services as laborers" (Tutino, 1986, p. 235). This process improved the economic welfare of villagers and shifted power in their favor. During those years "economic developments and social decompression began to favor peasants and rancheros and weaken elites" (*ibid.*, p. 243). The decompression hypothesis has clear implications in terms of inequality but has not been assessed in terms of wages. Tutino offered evidence of rental agreements, production levels and income by households in haciendas, but the hypothesis has not been corroborated in rural wages (to a large extent due to the use of non-monetary compensation in addition to wages).

Some of the effects of this decompression appear on the construction sector in urban areas. Historically, construction workers have been a sector strongly connected to rural labor, and there is evidence that links the wages of unskilled construction workers and rural laborers. Decompression could have reduced the supply of unskilled labor that flowed to Mexico City during the first decades of the nineteenth century. Rural decompression did not last more than two or three decades. Since the 1830s, elites and the liberal politicians pushed for a restriction of peasant power. These actions unchained a series of rural revolts from the 1840s to the 1870s, but they did not succeed in changing the balance of power as was the case of the 1810s insurrection. In our data, the wages of unskilled workers began to decline in the 1840s reaching a level comparable to pre-insurrection times; skilled wages declined but at a lower pace, resulting in an increase in the Theil index around 1840, reaching levels similar to those of the late eighteenth century. While this upswing in the inequality of the construction sector tracks with Tutino's hypothesis, it still remains unclear why this trend manifested itself specifically in the 1840s.

The effects of massive military mobilization, attained through the forced recruitment of vulnerable sectors of the population, is a factor that deserves greater attention. In other regions of Latin America in this period, nominal wages responded well to mobilization —increasing when military demands went up and declining afterward.[14] Certainly, the impact of military recruitment on labor markets needs to be assessed in more detail, but if this were a major driver, we would expect that nominal wages returned to more normal patterns in the 1820s and 1830s; we would expect some resemblance to the 1810s during the Mexican American War (1846-48) as well. Moreover, we do not observe any change in the wage of construction workers in the era of large-scale military conflicts that began in the 1840s.

A third factor in this story is the evolution of construction and overall urban growth in Mexico City. The city experienced moderate growth during our period although it is not comparable with the late nineteenth century or the explosive growth of the twentieth century. The construction boom of churches and luxury residences in the late eighteenth century is well known, but how generalized was this boom? And did it keep its pace after insurrection? A report of rental buildings in 1813 shows that the stock of properties grew from 1796 to 1813: 68 new blocks were added to the initial 173 blocks of the city. From 1813 to 1848, however, the housing stock fell by 10 percent. It recovered by 1863, but it did not reach the number seen earlier in the century (Morales, 1976, pp. 86-87; 1995, p. 185). Trends in building roughly (but not precisely) track the developments in inequality in the construction payrolls: inequality increased during the boom of construction at the turn of the nineteenth century, receded when construction abated after insurrection, and restarted as more housing was added to the city. It can well be that skilled wages are more reactive to construction cycles. In particular, the construction of high-end building likely requires a greater degree of expertise that cannot be substituted with more unskilled labor. Yet, construction laborers earned the amount usually paid to other unskilled workers in gardening and other occupations, suggesting that the factors affecting the construction sector broadly applied to other sectors of the urban economy. As decompression limited the unskilled workforce, a decline in construction may well be a response to a tighter labor market.

We can summarize how we visualize the changes in the inequality and differences in the wage ratio between *maestros* and *peones* in Table 4, using the inequality breakpoints from Figure 4. As we can see, *maestro*'s wages, both nominally and in real terms, were more reactive to changes in the demand of construction in Mexico City, while *peones*' wages were more stable even in real terms (in nominal terms they moved very little during the period). This indicates that the supply of labor of *maestros* was more inelastic than that of *peones*. This could be explained by low wages (close to the subsistence level), low productivity, and abundance of labor in the agricultural sector where *peones* came from, and higher wages and productivity and less abundance of skilled labor such as *maestros*. There-

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[13] We can draw from other Latin American experiences in this regard. For instance, Carina Frid (2015) found an almost perfect correspondence between the wages of unskilled construction workers *(peones de albañil)*, and the wages of rural workers *(jornaleros rurales)* in Santa Fe, Argentina, in the same period.

[14] War mobilizations had an impact in other Latin American regions in this time period. Parolo (2019) finds an increase in both nominal and real wages in Tucumán, Argentina, in 1818. She attributes this increase to the scarcity of workers provoked by the military enrollment. In the case documented by Parolo, and logically, this increase is short term and nominal wages dropped in the following years. This is certainly not the case in Mexico City.

fore, changes in the demand of labor had a larger impact on *maestros* real wages than on those of *peones*.

Differences in inequality between these two groups were caused by the different ways the demand and supply of labor of each interacted through the period. In Figure 5 we present a plausible explanation of the wage variations shown in Table 4, using the main variables we have identified: agrarian decompression, the abolition of guilds, and construction trends in Mexico City. We start in 1795 at the equilibrium between S_0 and D_0 (point A) that results in wages W_0. From 1795 to 1805 the demand of labor increased to D_1 because of the growth in construction during the last years of the colonial period, while the supply of *peones* shifted downwards due to increasing "compression" in the countryside, to S_1.[15] This generates a new equilibrium (point B) that raised *maestros* wages to W_1, but *peones* wages decreased slightly to W_1, due to a lower opportunity cost. From 1805 to 1816, the demand of labor decreased to D_2 because the rate of construction growth slowed down as a result of the war of independence. At the same time, the labor supply of *maestros* increased to S_1 and the labor supply of *peones* increased to S_2 because the turmoil and destruction in the mines and rural areas increased migration to Mexico City and, in the case of *maestros*, the abolition of guilds allowed *oficiales* to work as *maestros*. At the new equilibrium (point C) the wages of *maestros* and *peones* (W_2) decreased. From 1816 to 1839, the resumption of construction increased the demand of labor to D_4, still below its colonial levels. However, the supply of labor of *peones* in Mexico City decreased to S_3, as a result of the agrarian decompression, reaching a new equilibrium at point D, and a raise

in their wages (W_3). In contrast, the *maestros*' supply of labor did not decrease, or could have even continued increasing because of the abolition of guilds, generating a lower raise of their wages (W_3). From 1839 to 1853 the demand of labor continued growing, returning to levels similar to those that prevailed before Independence (D_0). At the same time, as the agrarian decompression subsided, the supply of labor of *peones* in Mexico City raised to S_0, also returning to its colonial levels. The new equilibrium (point E) produced a decrease in their wage level (W_0), similar to that of the colonial period. In the case of *maestros* their labor supply decreased to S_2 as a result of the lack of training of new *maestros* that resulted from the abolition of guilds, increasing wages to W_3 but still below its colonial level.

Table 4.

Real wages of *peones* and *maestros* (in pesos of 1792)

Year	*Maestro*	*Peón*	Skill premium
1795	0.827	0.342	2.42
1805	0.982	0.334	2.94
1816	0.622	0.274	2.27
1839	0.662	0.355	1.87
1853	0.728	0.325	2.24

Notes: Wage average in the previous 5 years to the structural breaks used in Figure 8. Real wages based on the respectable price index in Challú and Gómez-Galvarriato (2015).
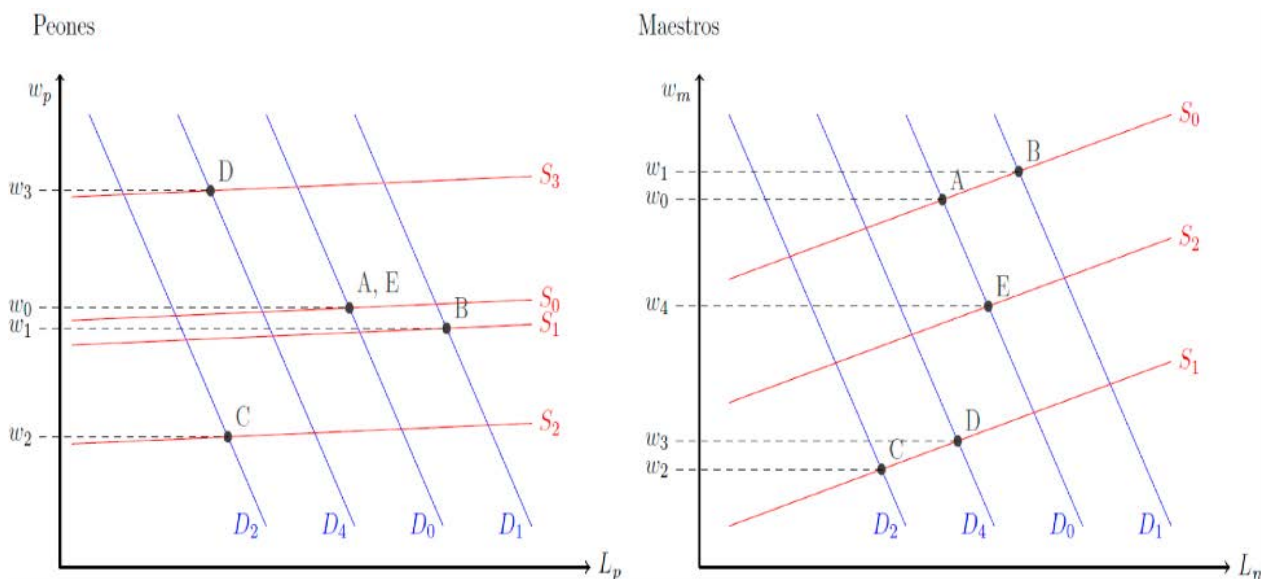

Figure 5.

The Supply and Demand of Labor of Peones (Plot A) and Maestros (Plot B).

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[15] According to Comisión Monetaria, "Datos sobre fincas", many new houses appeared in the western neighborhoods of Mexico City from 1796 to 1812, while in other areas of the city there was also a marginal increase in the number of constructions.

8. Conclusions

The systematic measurement of income inequality in the late colonial period and early independence era is evolving at a fast pace. While the construction sector in Mexico City is a limited scope, it is a significant case in this growing body of literature given that our reference population stood at the crossroads of significant axes of differentiation in Mexican society —between rural and urban and skilled and unskilled, for instance. At the same time, Mexico City was the heart of the central region, which concentrated the majority of the population.

In a field that has mostly emphasized distinctions between extreme sides of the income distribution (owners vs workers, top-income vs bottom-income earners), this study focused on the relative wages of different types of workers in the construction sector, which had strong linkages to the agrarian economy and had a high degree of labor mobility. There is limited scholarship on the mason's guild and the application of their regulations. However, our study suggests that the guild was influential in the salary structure and its inequality. While our estimates are limited to a small percentage of the working population, the construction sector is a bellwether of broader cleavages in society, as well as conditions in Mexico City relative to other places. Our finding that inequality among construction workers tracked well the timing of both the abolition of the guilds and the strengthening of the bargaining power of the peasantry in central Mexico, both speak of the deep impact that the independence era had on the economic welfare of larger sectors of the population.

A first contribution of this study is that it helps place wage inequality against a broader international backdrop. On average between 1780 and 1853, the skill premium was slightly above the levels in Southern Europe during 1750-99 and significantly higher than the skill premium in Western and Central Europe; the only region with a higher premium was China. Following Van Zanden's analysis that considers the skill-premiun as a measure of the relative abundance of human capital, Mexico's relative high levels must have constrained its economic growth.

At its minimum, our article contributes to the international measurement of inequality by highlighting that variations within a rather homogeneous occupational category (construction) need to be considered in order to estimate inequality. At its maximum, if our reference population is considered representative of the wider Mexican society, it suggests that the skill premium and wage inequality was higher than that which prevailed in Europe but lower than that of East Asia.

Our findings contrast with other comparative studies. Dobado and García (2010, pp. 266-267) conclude, using a GDP-to-wage ratio (using miners' wages) that inequality in New Spain should not be considered high by Western standards at the end of the Bourbon period. Williamson (2010, p. 239) reaches a similar conclusion. The problem in comparing these metrics is that we still know very little about what the overall distribution of income looked like. GDP calculations for that period are inaccurate, errors of measurement can play a significant role, and social tables can not identify the variations within occupational categories. However, their results may be compatible with ours if Mexican inequality (in comparative terms) was more pronounced in the lower and middle sectors of the income distribution than between the top and middle or lower groups.

A second contribution is measuring inequality over time, particularly in the critical transitions of the late colonial period and the early postindependence. Our findings corroborate those of most systematic calculations of income and wealth inequality in Mexico and Mexico City during this period: a drop in inequality levels from the late colonial period to the early post-independence. Williamson (2010) found a decline in the Gini from 63.5 to 51.0 from 1790 and 1844, which he attributes to the end of colonial exactions.[16] Bleynat, Challú and Segal (2021) found a 20 to 25 percent decrease in the ratio of GDP-per-worker to unskilled wages and median income in this period. Morales (1976, 1995) showed that private real estate ownership in Mexico City became less concentrated between 1813 to 1863. In contrast, Arroyo-Abad and Astorga (2016) reconstructed measures of inequality since 1830 without finding a trend through 1850, while afterwards inequality tends to track terms of trade.

While roughly validating a decline from high levels in the late colonial period, we show a strong recovery of inequality levels since the late 1830s that indicates that the uptick in inequality predated the *belle epoque.* We believe that major changes in labor institutions, the relative power of manual labor vis-à-vis elites, and the economic cycle of Mexico City shaped the U-shaped trajectory of inequality in this period.

Acknowledgments

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[16] In Williamson's model, population density, GDP per capita and the urbanization rate are other predictive factors; but in his accounting, these variables did not change in Mexico from *circa* 1790 to 1844.

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