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## Abstract

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JEL Classification: J3, J4, J8, I3, N33

Keywords: Construction, Divergence, industrial revolution, living standards, prices, wages



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# Italy and the *Little Divergence* in Wages and Prices: New Data, New Results[1]

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**Abstract**

We present new and improved long-run wage indices for skilled and unskilled construction workers in Italy. Our data avoid multiple issues pestering earlier wage indices, including regional shifts and sub-contractor mark-ups, making our new indices the first consistent day-wage sequences for early-modern Italy. Our improved wages, obtained from the construction of the St Peter's Church in Rome, consolidate the traditional view that urban Italy began a prolonged economic downturn during the mid-17th century. The wages also offer sustenance to the idea that epidemics instigated the country's long decline. Comparison with newly downscaled construction wages for London show that Roman workers, despite Italy's downturn, out-earned their early-modern English counterparts. This suggests that high wages alone were not enough to trigger industrialisation.

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## 1. Introduction

This study presents two first-ever long-run wage indices for the former capital of the Roman Empire, one for skilled and one for unskilled construction workers. Our wages, which concern labour hired by the Papal State to build and maintain St Peter's Basilica in Rome, escape the complications inherent to earlier wage series for Italy, which are based on biased wage data and suffer from regional shifts. Our novel wage indices confirm the widespread (though disputed) view that urban Italy endured a prolonged early-modern recession starting in the mid-17th century. They also show, remarkably, that urban Italian workers out-earned their Northwest-European counterparts in the run-up to the Industrial Revolution once the issues pestering earlier wage indices for England and Italy are accounted for. This suggests that high wages alone were not enough to trigger industrialisation or, alternatively, that urban construction wages provide a poor testing ground for that idea.

Most historical wage indices are compilations of statistics drawn from secondary sources. This presents a wide range of problems. For example, the lack of access to the underlying primary sources has led to confusion about how much historical workers effectively earned. Certainly, the wages reported in account books from early-modern building sites in London and Milan habitually included a profit margin of foremen and subcontractors, obscuring how much construction workers were actually paid (Stephenson 2018; Mocarelli 2019). Earlier wage data for Italy are also plagued by the presence of harvest-inflated summer wages (Mocarelli 2019). Worse still, they include a major shift in the location where the wages were observed (Malanima 2013). The resulting jump in existing wage indices could distort the suggested timing of the onset of Italy's downturn, as well as its severity and underlying causes.

Our new Italian wages are drawn from the account books of the *Fabbrica of Saint Peter*, a primary source covering the same city (Rome) across several centuries leading up to the classical

years of the Industrial Revolution in England. The *Fabbrica* hired and paid its labourers directly, with no profit margins needing to be adjusted for and with summer wages easily removed. Our new wages thus offer a fresh assessment of the timing and nature of Italy's early-modern downturn based on more consistent wage data. The new data also enhance the quality of historical wages used for international comparison.

Our improved wages confirm that both unskilled and (especially) skilled urban workers in Italy experienced sustained depression in their real earnings during the 17th and 18th centuries. Comparison with pre-existing Italian wage indices (to the extent that we can trust these) indicates that the downturn began some two decades later in Rome than in the north of Italy. The regional variation in the onset of decline matches the timing of 17th-century plague outbreaks, thus supporting the hypothesis that epidemics were decisive in triggering Italy's prolonged recession (Alfani and Percoco 2019). We also provide a novel long-term skill premium for historical Italy, finding that this ranged around 50 per cent across the entire early-modern period consistent with the size of the skill premium observed early into the modern era (Federico et al 2019). Matching the size of the skill premium in early-modern London as well, our finding therefore contests the conventional view that pre-modern skill premiums were significantly higher in the south of Europe than in the northwest (van Zanden 2009).

Our novel wage indices also inform ongoing debates about the root causes of the Industrial Revolution. One of the leading theories – commonly known as the *high-wage* hypothesis – holds that expensive labour and cheap energy induced English producers to substitute workers for machines (Allen 2009). Earlier work has argued that Italian workers were relatively inexpensive, meaning that the incentive to introduce labour-saving technology in Italy was lacking at the time (Allen 2001). Our novel wage comparison between Rome and London shows, however, that Italian construction workers in the run-up to the Industrial Revolution were paid significantly more than

their English counterparts after sub-contractors' profit margins and other biases are removed. This suggests that high wages alone were not sufficient to induce labour-saving innovations, stressing the importance of focusing on other factors as well. Moreover, since the Industrial Revolution began in the English countryside and not in urban centres, the *high-wage* hypothesis is probably better tested using labour wages from provincial rather than metropolitan areas (e.g. Rota and Weisdorf 2019).

We proceed as follows. Section 2 summarises earlier works on the timing and causes of Italy's early-modern downturn as well as the country's position in the *little divergence* in European wages and prices. In this context, we highlight the key problems with earlier wage indices, motivating why new Italian wage data were called for. Section 3 describes the nominal wages and prices underlying our new Italian real-wage indices and draw comparisons with previous wage and price data for Italy as well as for England, the cradle of the Industrial Revolution and the main reference country in the *high-wage* debate. Section 3 also offers a first-ever consistent early-modern skill-premium index for Italian construction work. Section 4 compares our novel real-wage indices of skilled and unskilled workers with earlier indices in Italy and England. Section 5 concludes.

## 2. Background

This section revisits earlier long-run wage indices for Italy and look at their interpretation with respect to the timing and causes of Italy's early-modern economic downturn. We highlight a number of weaknesses with existing wages, explaining the advantages of using Roman wage data as a reference point instead. From an international perspective, we also emphasise the importance of placing our more consistent Italian wage indices in the context of the recently downscaled labour wages for London for ongoing debates about the root causes of the Industrial Revolution.

*The Decline of Italy and Issues with Earlier Wage and Price Data*

Much discussion surrounds Italy's early-modern downturn, an episode that appears to have followed a long epoch of economic prosperity in Italy between the Middle Ages and the end of 16th century. One aspect of the discussion concerns whether Italy's downturn applied to all sectors of the economy or only to some. Carlo Cipolla half a century ago dated the onset of the downturn to the 17th century, linking it to the combined effects of epidemics and falling competitiveness vis-à-vis foreign markets (Cipolla 1952). Cipolla's idea of an *absolute* decline of Italy paled, however, in the face of Domenico Sella's proposition that the downturn was mainly an urban phenomenon, as the countryside witnessed both rising agricultural productivity and growing proto-industry at the time (Sella 1997). Sella thus made Italy's decline a *relative* one in which the urban economy fell behind, with respect to both its rural counterpart and the emerging economies in Northwest Europe.

The onset of the downturn is also debated. Using revised estimates of real wages and per-capita output, Paolo Malanima pushed the starting point of Italy's decline forward in time to the 18th century (Malanima 2011, 2013). The adjusted timing consequently shifted focus towards new reasons for the decline. Malanima contended that the downturn was caused by an unparalleled growth of population, which he argued exhausted the available resources. Based on new mortality data, however, Guido Alfani subsequently reversed the onset of decline back to the earlier epoch, arguing with Cipolla that 17th-century epidemics set off the downturn (Alfani 2013). In Alfani's view, population tolls curbed total output, thus preventing plague-ridden areas from sustaining the fiscal capacity necessary to compete with Italy's Northwest European counterparts.

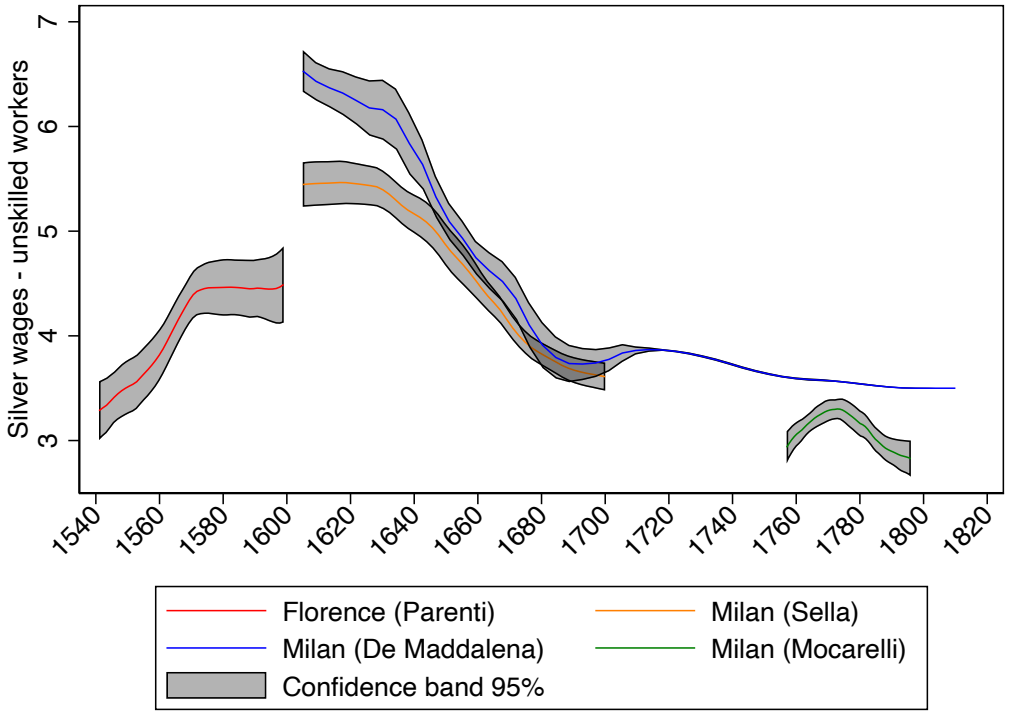
Alfani and Malanima's views thus conflict both on timing and nature: was Italy's decline driven by population *growth* (Malanima 2002; Capasso and Malanima 2007) or by population *decline* triggered by epidemics (Alfani 2013, Alfani and Percoco 2019). Mattia Fochesato spoke directly to this question in his recent analysis of the effect of demographic shocks on European real

wages, finding that the immediate response to population decrease was growing real wages (Fochesato 2018). Yet, for both Alfani and Malanima, what mattered for Italy's decline was not the short-term reaction to demographic change, but rather their longer-run effects. We return to this issue later on, when we discuss the timing of the onset of decline in the light of our new wages.

The discussions above about the timing and causes of Italy's downturn all built on wage indices. The wage statistics underlying those indices ultimately come from account books of large historical construction sites in central and northern Italy and are summarised in four key secondary sources: Parenti (1939), Sella (1968, 1979), and De Maddalena (1974). Parenti's data come from the construction sector in Tuscany (Florence) in the centre of Italy, whereas Sella and De Maddalena's wages come from the construction sector in Lombardy (Milan), some 300 km north of Tuscany. Displayed in Figure 1, these wage data show that the daily payments (measured in grams of silver) made to workers in Florence were significantly lower when Parenti's wage index for Florence (red line) ends in the early 17th century than those of Sella (orange line) and particularly De Maddalena (blue line) observed in Milan around the same time.

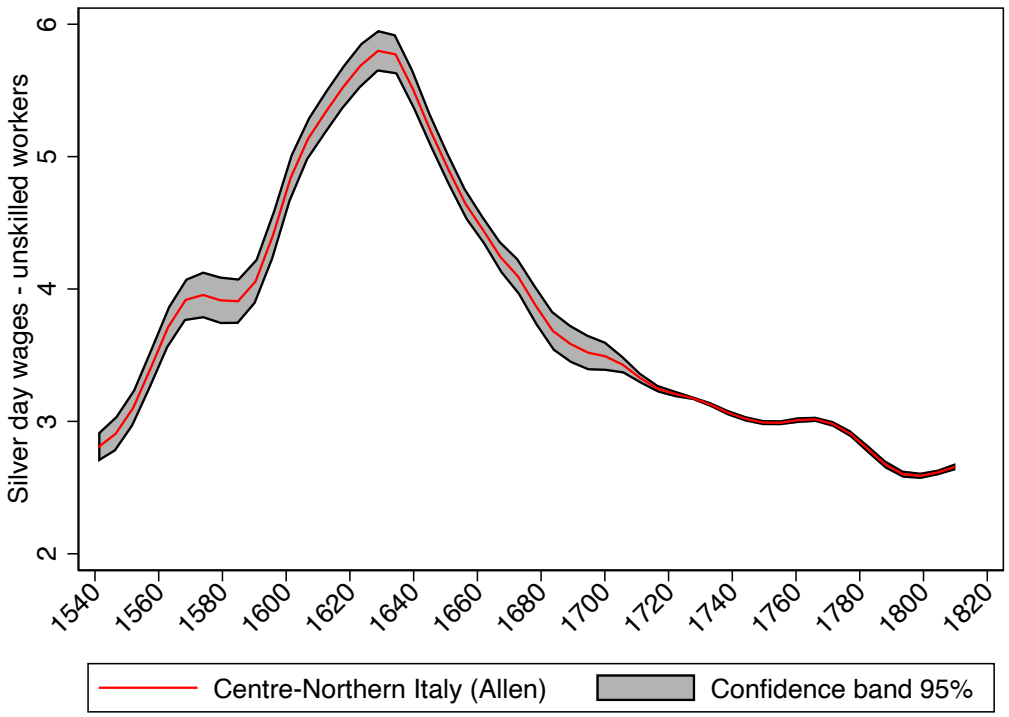
When the wage indices of Parenti, Sella, and De Maddalena are merged into a composite index for Central-Northern Italy following Allen (2001) and illustrated in Figure 2, the regional jump from Florence to Milan creates what appears to be a temporary boost to construction workers' daily pay rates. Equally, the subsequent downturn may have been exaggerated by the regional shift in the wage index around 1600. It should be noted that Malanima (2013) offered a revised wage index for Central-Northern Italy, which we return to further below. However, Malamina's revised wages build on the same sources as Allen's original one, and so with similar problems. Our Roman wage data presented below are free of any regional shifts, thus informing whether the shift affects the timing and severity of Italy's early-modern downturn.

Figure 1: Silver wages of unskilled workers in central and northern Italy, 1540-1810




*Note*: Lines fitted with *lpoly* in Stata. *Source*: Parenti (1939); De Maddalena (1974); Sella (1968); Mocarelli (2019).

Figure 2: Silver wage index of unskilled workers in central and northern Italy, 1540-1810




*Note*: Lines fitted with *lpoly* in Stata/IC16. *Source*: Allen (2001).

Luca Mocarelli's subsequent and meticulous investigation of the underlying sources of the wages and prices for the area of Milan makes it transparently clear that the indices for Central-Northern Italy are afflicted by more than just the regional shift (Mocarelli 2019). Indeed, both wages and prices turned out to be imprecise. For example, Mocarelli found that the consumer-price index for Milan, because its price information came from wholesale rather than retail statistics, tended to overestimate the costs of living. This emerged from the fact that retail merchants benefitted from public food subsidies while wholesale merchants normally did not. We return to his matter further below when we report our new consumer-price index.

Mocarelli also demonstrated that earlier wage indices were built upon secondary sources that lacked exact information about the wage payments made to masters and their assistants. Similar to the issues pestering the labour wages of London construction workers discussed below (Stephenson 2018), Mocarelli discovered that the wages reported by De Maddalena (1974) were actually paid to foremen and in most case therefore exceeded the wages paid to the labourers themselves. Figure 1 above shows that the adjusted wages reported by Mocarelli were in fact significantly lower than those reported in De Maddalena and thus in Allen and Malamina's indices. Our new Italian wages and prices presented below avoid the issues emphasised in Mocarelli (2019), thus providing a better setting for considering the timing and nature of Italy's early-modern downturn, as well as the country's position in the *little divergence* in European wages and prices (Allen 2001).

*Italy in the 'Little Divergence' and 'High-Wage' Hypothesis Debates*

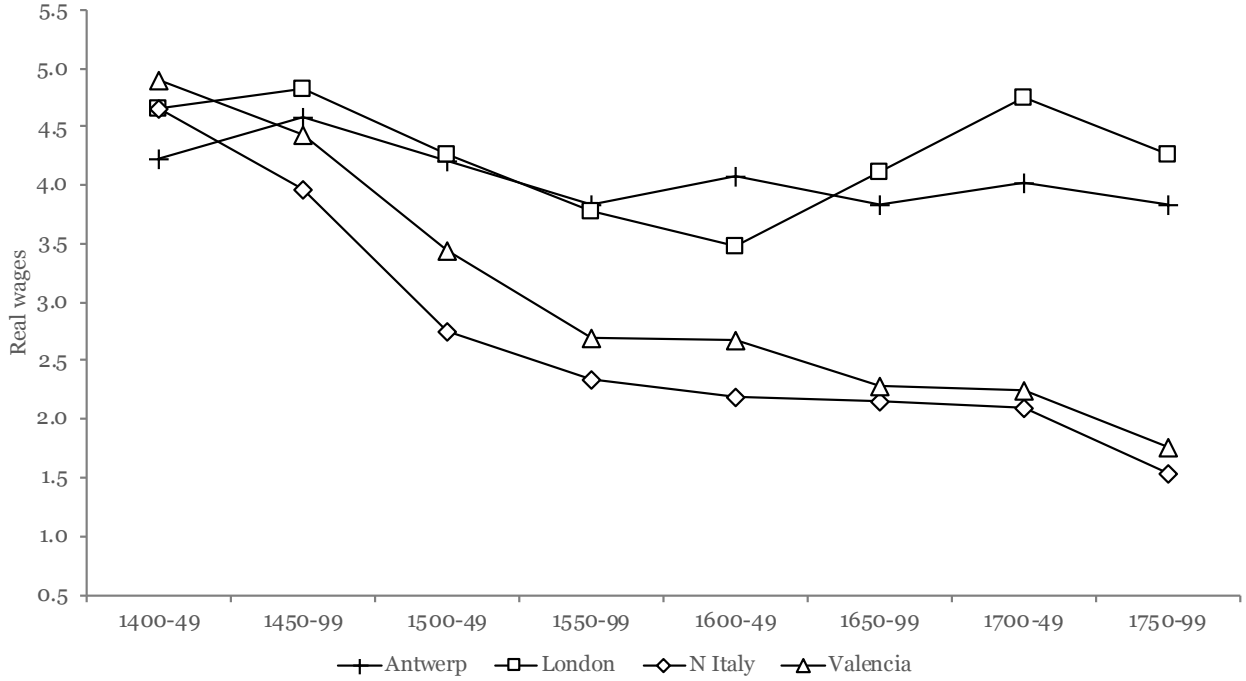
From an international perspective, early-modern Italy assumes a rather inferior position in the *little divergence* within Europe, especially compared to England, the cradle of the Industrial Revolution. However, as suggested above, Italy's position is determined on the basis of imperfect indices of wages and prices. Similar issues appear to apply to the wages of London workers originally

reported in Allen (2001). Below we explore the significance of accounting for these imperfections for how much English and Italian workers earned and cost during the early-modern period. To this end, this subsection reviews the so-called *high-wage* hypothesis for why the Industrial Revolution was English. It also emphasises the importance of taking a fresh look at the empirical evidence to see if it still sustains the *high-wage* argument.

It has long been recognised that the frontier of Europe's economic development moved from the south towards the northwest during the early-modern period (e.g. Braudel 1992; Pomeranz 2000). Consistent with these ideas, Robert Allen's empirical contribution and influential comparison of construction workers' wages across historical Europe showed that workers in late 17th- and early 18th-century London were paid considerably better, in real terms, than workers living elsewhere in Europe (Allen 2001). Indeed, Allen's original wage and price data indicated that some of Europe's richest cities, e.g. Florence, Madrid, Milan, Valencia, etc., were on par with London by the mid-15th century. However, whereas these European cities gradually witnessed falling real wages in the centuries leading up to the Industrial Revolution, the wages in London remained high.

These contrasting wage developments – commonly known as the *little divergence* in European wages and prices – are illustrated in Figure 3. Allen deftly used this pattern of the divergence to explain England's position as a frontrunner in the Industrial Revolution, arguing – with Habakkuk and others – that the high cost of English labour made it profitable for English producers to replace workers with machines (Allen 2001, 2009). Allen's *high-wage* explanation is commonly seen as one of the leading hypotheses for why the first Industrial Revolution was English.

Figure 3: Allen's cross-European real wages comparison, 1400-1800




*Source*: Allen (2001).

Follow-up work has pointed to a number of issues with Allen's original study. One complication concerned the consumption basket used by Allen to transform nominal wages into real wages. Jane Humphries argued that the caloric needs of women and children were not properly accounted for and suggested instead that the budget underlying Allen's cost-of-living deflator should contain more calories (Humphries 2013). Allen responded to Humphries' critique by adjusting the caloric consumption from 1,940 calories for an adult male (and less for women and children) to 2,100 calories per family adult (Allen 2015). This adjustment did not affect Allen's original conclusion.

Other complications concerned the nominal wages used in Allen's seminal article (Allen 2001). Subsequent studies argued that these were either too pessimistic, as in the cases of France, Italy, and Spain, or too optimistic, as in the case of London. For example, Vincent Geloso's re-examination of Allen's wage rates for Strasbourg showed that the French payments actually

concerned skilled workers with a significant in-kind component to their compensation. After shifting to the wages of unskilled workers, Geloso established that France was still poor, but not as poor as in Allen's original study (Geloso 2018). Similarly, after re-examining Allen's wages and prices for Central-Northern Italy, Paolo Malanima proposed that England diverged from Italy some two centuries later than Allen's study showed, i.e. after c. 1700 (Malanima 2013). A crucial part of Malanima's conclusion came from substituting Allen's London wages for Allen's wages for Southern England. Since the latter did not include an urban wage premium, Malanima was able to narrow the English-Italian wage gap considerably, achieved, however, by comparing urban Italy to rural England. Furthermore, after revisiting the historical wages and prices for Spain, Mario García-Zúñiga and Ernesto López-Losa found that England diverged from Spain later than Allen's original study had shown, part of which came from the substitution of oats for bread in the consumption basket (García-Zúñiga and López-Losa 2018a). Likewise, a re-examination of wages in Poland (Malinowski 2016) and Germany (Pfister 2016) led to adjustments of the positions of the relevant cities vis-à-vis the rest of Europe.

As with Humphries' critique, the amendments proposed in the follow-up studies mentioned above ultimately did not challenge Allen's conclusion of London's late 18th-century supremacy. But their studies emphasised a number of drawbacks connected to the wages used to substantiate Allen's work. Allen's study covered vast amounts of time and space, and hence was chiefly built upon wages and prices reported in secondary sources. A main problem with secondary sources, as was discussed above in the case of Italy, is that they do not allow a proper examination of the underlying data. Similar to the original Italian wages concerning Milan (Mocarelli 2019), Allen, for his London wage index, had relied on studies assuming that the major building institutions in London had paid their workers directly (e.g. Boulton 1996; Gilboy 1934; Schwarz 1986). Judy Stephenson's examination of the primary sources behind Allen's original study showed, however,

that this was not the case after all (Stephenson 2018). Instead, beginning in the 17th century or possibly even earlier, London construction workers were commonly appointed by sub-contractors. These contractors retained a mark-up for their services, paying workers only a portion of the pay rates reported in the building institutions' account books. Once the profit margins were deducted, it turned out that the sampled construction workers' actual earnings were significantly lower than suggested by the secondary sources underlying Allen's London wage index. While the same issue applies to the original payment observed in Milan (Mocarelli 2019), our Roman wages, along with the revised London wages reported in Stephenson (2018), were paid to workers directly. The comparative implication of using the unbiased wages instead is considered later on.

A further issue, pointed out by Stephenson for England, García-Zúñiga and López-Losa for Spain, and Mocarelli for Italy, concerns the fact that unskilled workers usually received a premium for seniority, possibly linked to aptitude achieved via learning-by-doing (Garcia-Zuniga and Lopez Losa 2019; Mocarelli 2019; Stephenson 2019). Because secondary sources are prone to simply report the average or median payment among *all* unskilled workers employed, they neglect the fact that wages might have varied over time depending on the composition of more and less senior, and hence apt, workers, or because some unskilled tasks were more dangerous than others and therefore paid a hazard premium. After inspecting the underlying primary sources of the English data mentioned above, Stephenson concluded that the London wages of *strictly* unskilled workers during the long 17th century were effectively 20-30 per cent lower than the London wages used in Allen's original study (Stephenson 2018, 2019).

Stephenson's sizable downscale of the London wages might implicate that London was no longer the most labour-expensive European city at the onset of the Industrial Revolution. Shedding light on this question requires an apple-to-apple comparison with an appropriate candidate. Clear of any profit-margins; stripped of any regional shifts; and with the possibility to account for harvest-

inflated wages or wage premiums paid to *semi-skilled* unskilled workers, our Roman wage data will form the basis of a new and more consistent historical wage index for Italian construction workers compared to previous indices.

## 3. Data

This section describes the Roman wages and prices underlying our comparison with earlier real-wage indices for Italy and London. We compute our new Italian real wages in the traditional way, i.e. by dividing workers' nominal wages by a standardised cost-of-living index based on appropriate commodity prices. In the following, we first present our nominal wages of skilled and unskilled workers: where they come from; how we treat them and identify skilled work; and how their levels compare with existing nominal skilled and unskilled wages for Italy and England. Next, we present the prices used to calculate the cost-of-living index: the sources used; the country-specific consumption baskets; and how our new cost-of-living index compares with earlier price indices for Italy and England. The resulting real wages are presented and discussed in Section 4 below.

*Nominal Wages*

Our nominal wages come from the archive of the *Fabbrica of Saint Peter*. The *Fabbrica* was an autonomous building institution initiated in 1506 by Pope Julius II with the aim of constructing a new cathedral in the capital city of the Papal States. The previous cathedral, today known as the *old* St Peter's Church and built in the 4th century, had long been neglected and by the 15th century had fallen into disrepair. The new St Peter's Church, designed by famous Italian artists including Michelangelo, is one of the world's largest churches and one of the finest works of Renaissance architecture. Suitably, the wages representing England and Central-Northern Italy come from

comparable building sites. In particular, Stephenson's English wages come from St Paul's Cathedral in London, the construction of which began shortly after the Great Fire of London in the late 17th century. Architecturally, St Paul's Cathedral was greatly inspired by its Roman equivalent (Summerson 1983), emphasising the direct comparability of the wages used in our comparison between London and Rome below. The wages representing Central-Northern Italy come from the construction and maintenance of the major cathedrals in Florence and Milan.

Rome during our period of interest was the heart of the Papal States, a large territory covering several regions of today's Italy. Rome's population triplicated between 1500 and 1800, from some 55,000 people to 153,000. While Rome by 1800 was half the size of Naples and a quarter of Milan, it was not significantly different in terms of how public administration or private commodity markets operated (Palermo 1997; Strangio 1998; Piola Caselli 2015; Mocarelli 2019). In particular, the Roman labour market functioned just like other European labour markets at the time (Sabene 2012). This is confirmed not least by the fact that the trends in our Roman wages were remarkably similar to those in Central-Northern Italy, as we show further below.

The *Fabbrica of St Peter* was responsible for organising and supervising the construction of the new Roman cathedral, as well as its subsequent maintenance. The wages used below come from the registers of the *Soprastante* and of the *Fattore*, the managing units of the *Fabbrica*'s employees. The records begin in 1541 and contain the daily wage rates of the workers employed, their occupational titles, their numbers of days worked per week, and the worker's names. Although registration continued beyond 1810, the books are not publically available between 1810 and 1858. Hence, our wage indices end in 1810, still leaving us sufficient time coverage to address the questions of the timing and severity of Italy's downturn and of why the Industrial Revolution first emerged in England.

Not all wages found in the *Fabbrica's* registers before 1810 were used in our analysis below. First, the Roman harvest season – notably the months of June and July – largely emptied the building site and moreover inflated the wage rates of the remaining employees. Indeed, the absence of competition from agriculture meant that winter wages were some 40 per cent lower than the wages paid during the summer period (Ait and Pineiro 2005). Similar to the English wage series, which is adjusted for high-season wages, our sampled wages were drawn from the months covering October to March. The wages of Milan reported by De Maddalena (1974) and shown in Figure 1 above did not systematically exclude summer wages – a problem that therefore extends to the existing wage indices for Central-Northern Italy (Mocarelli 2019).

Furthermore, Stephenson's downward-adjusted wages for London, which we compare to below, exclusively concern unskilled construction work. In order to make our wage series comparable to hers, payments made to skilled workers had to be separated from those of unskilled workers. We did this in two steps. First, the registers' occupational categories helped us to sort workers by skill. The most common occupations and those most relevant for our unskilled wage index below concern *manovali* and *lavoratori* (labourers), *scopatori* (sweepers), *pulitori* (cleaners), and *portiere* (doormen). Less frequent professions, i.e. *guardiania* (guards), *brunitore* (burnisher), and a long list of generic occupational titles, were also included in the pool of unskilled labour. Making up four out of five of the *Fabbrica*'s employees between 1541 and 1810, these occupational titles are traditionally considered to be unskilled work (but see the discussion about *strictly* unskilled work further below).

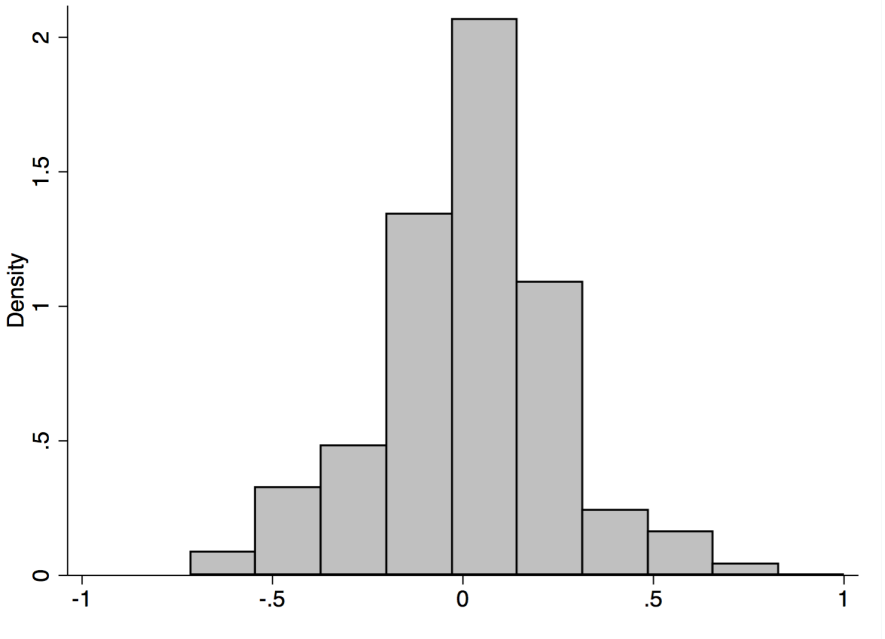
Table 1: Summary statistics

| Day wages and costs | Observations | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| All: | | | | | |
| ≦p(100) | 428,878 | 9.58 | 2.58 | 2.91 | 20.80 |
| Skilled work: | | | | | |
| ≦p(100) | 80,598 | 10.98 | 2.14 | 5.44 | 20.80 |
| Unskilled work: | | | | | |
| ≦p(100) | 348,280 | 6.83 | 1.78 | 1.88 | 13.71 |
| ≦p(75) | 294,418 | 6.43 | 1.54 | 1.88 | 9.65 |
| ≦p(50) | 213,961 | 5.90 | 1.39 | 1.88 | 8.93 |
| ≦p(25) | 126,565 | 5.38 | 1.35 | 1.88 | 7.86 |
| Daily cost-of-living | 249 | 1.33 | 0.14 | 0.96 | 1.72 |

*Notes*: All payments are expressed in grams of silver per day. The expression p(x) indicates the x-th percentile below which our wages are used in the analysis. *Sources*: The *Fabbrica of St Peter* (see Appendix 1).

Skilled workers mentioned in the registers included *falegnami* (carpenters), *maestri* (masons), *scalpellini* (highly-skilled stonecutters), *stuccatori* (plasterers and decorators), and *mosaicisti* (mosaic makers). These occupations all required specialist training leading to a skill premium, the size of which we estimate below. For our unskilled wage index, all wages paid to skilled workers were therefore dropped – and vice versa. We dropped entirely payments made to *aspiranti* (boys and very young men in training), *condannati* (criminals helping on the site), and *penitenti* (men in community service due to marital exemption). These workers were excluded on the presumption that they were employed under conditions that were out of tune with the regular labour market for construction workers. Indeed, their payments were usually some 50 per cent lower than the average day rate of a typical unskilled worker.

Figure 4: Deviations of unskilled labour wages from the yearly (low-season) median wage rate




*Sources*: The archive of the *Fabbrica of St Peter* (see Appendix 1).

Our truncations left us with a total of 348,280 low season day-wage observations of unskilled workers and 80,598 day-wage observations of skilled workers spread across 269 years. Summary statistics are given in Table 1. Of course, as is common in long-run wage series, these numbers include repeated entries for the same workers. Because not all workers were recorded by name, and since those that were frequently shared the same name, we are unable to observe to what extent repeated entry happened, which is perfectly common in historical wage indices. Our average of more than 1,500 daily wage observations per year (more than 10 observations per day on average) places our new historical wage indices among the most comprehensive to date worldwide.

There is still one more step to take before the unskilled wage index is complete. As emphasised in Stephenson (2018), unskilled workers did not all earn the same daily wage rate. Figure 4 shows the distribution of our sampled unskilled wage rates, expressed in terms of deviations from the yearly (low-season) median payment. The graph shows that the best-paid unskilled workers received roughly twice as much as the typical unskilled day rate. Conversely, the

poorest-paid unskilled workers received some 70 per cent less than the norm. Despite these variations, about 90 per cent of the unskilled wages fell within a 40 per cent deviation of the median unskilled wage.

Variation in unskilled workers' day rates have implications for how we identify and exclude what Stephenson refers to as *semi-skilled* unskilled workers (Stephenson 2018). Renata Sabene, who studied how work was organised in the *Fabbrica of Saint Peter* during the 18th century, was occasionally able to trace workers across time by using their names. This exercise informs that the wage profiles were usually upward sloping over time (Sabene 2012, p. 161). For example, Papi Giuseppe, a *manuale*, received 20 *baiocchi* per day in 1738, which was less than the median wage rate that year, i.e. 27.5 *baiocchi*. In 1766, 28 years later, he received 35 *baiocchi* per day, which was now more than the median wage rate of 25 *baiocchi*. Similar patterns have been observed among historical construction workers in Madrid (Garcia-Zuniga and Lopez Losa 2019) and Milan (Mocarelli 2019). Indeed, this phenomenon was probably common across Europe. We suspect seniority and aptitude could both have accounted for such wage promotions, even if the contribution of each component cannot be isolated, since wage promotions were not justified in the *Fabbrica's* registers. Irrespective of the underlying reasons, we must therefore proceed with care when estimating the typical wage rate of a *strictly* unskilled worker.

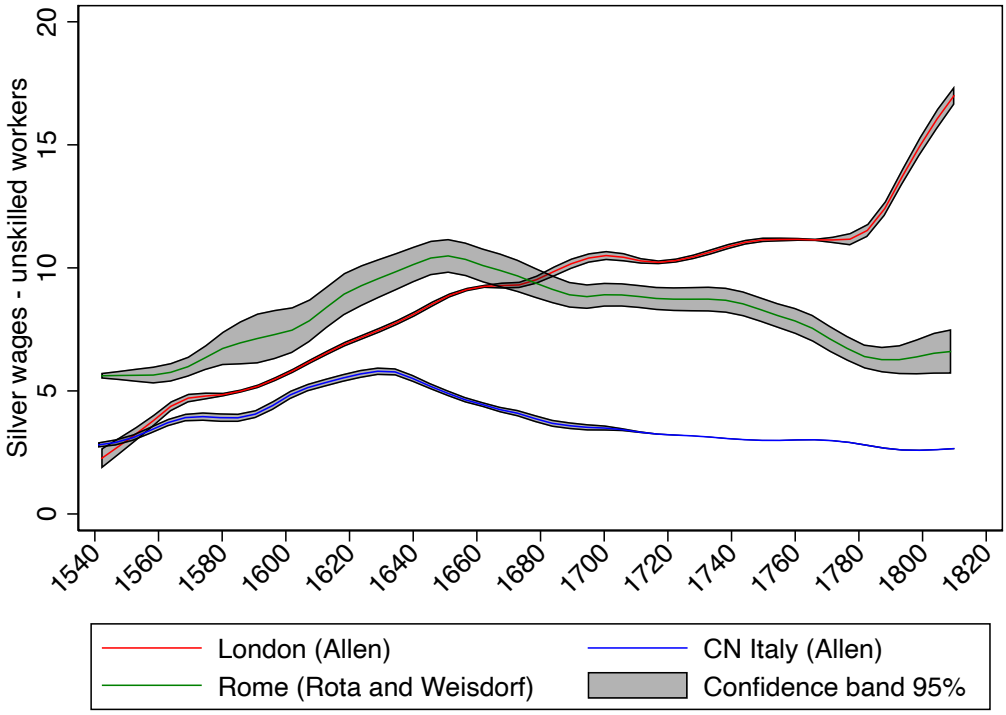
Our second step aimed to make our unskilled wage index comparable to Stephenson's for England thus involves a focus on the lower-end tail of our sampled (truncated) wage distribution. We have experimented with different cut-off points, covering the wages falling below the 75th percentile, the 50th percentile, and the 25th percentile of the sampled unskilled (low-season) wages. Figure A2 in Appendix 2 shows how the wage index evolves in the different cases. We ultimately settled for a compromised cut-off point, which involves taking the average payment of the wages below the 50th percentile in each year. A lower cut-off point (i.e. the 25th percentile) would mean

discarding two-thirds of the sampled unskilled wages (see the numbers in Table 1). On the other hand, a higher cut-off point (i.e. the 75th percentile) entails the risk of including labourers who earned a wage premium for aptitude. Note that the qualitative nature of our conclusions below is robust to using any cut-off point above the 50th percentile. Of course, this strategy does not entirely rule out the possibility of compositional effects caused by variation in the share of strictly unskilled workers to the total. But, by removing the payments of the most well paid unskilled workers in our sample, the strategy mitigates the portion of wage including premiums paid for occupational dexterities or hazards.

Figures 5 displays the resulting (post-truncation) nominal wages of unskilled Roman workers (green line) between 1543 and 1810, measured in grams of silver. Our transformation of the local Roman currency (*baiocchi*) into silver is based on the conversion rates reported in Martini (1883) and Piola Caselli (1999). Figure 5 also shows the pre-existing silver wages for unskilled workers in London (red line) and Central-Northern Italy (blue line), both of which are taken from Allen's original study (Allen 2001).

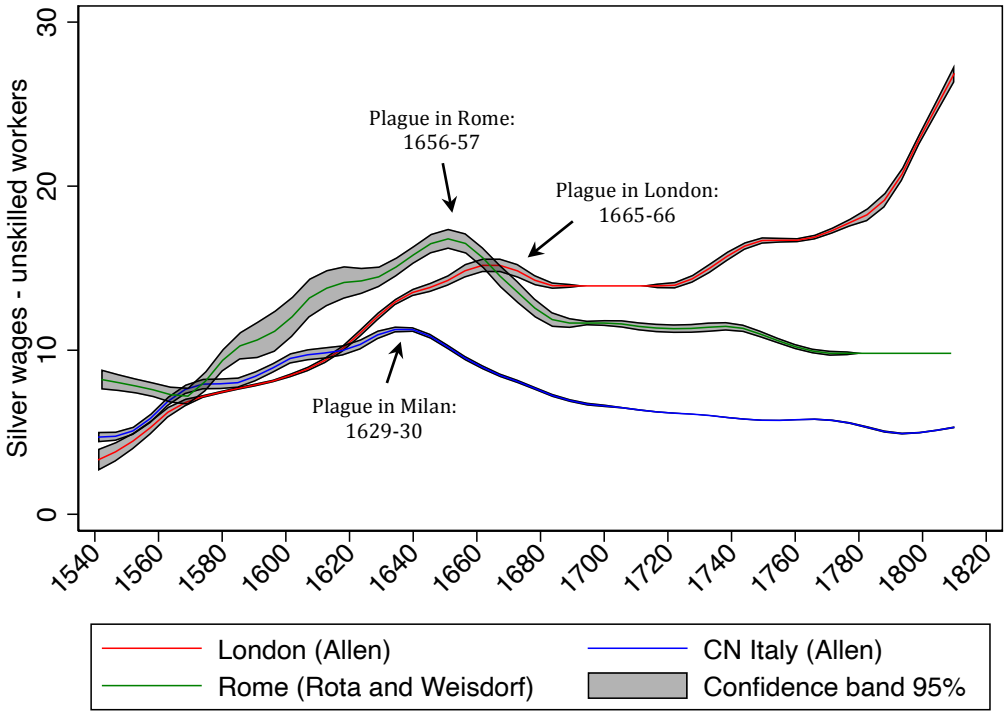
The nominal London wages were only mildly higher than those in Central-Northern Italy up until the 1630s. After that, workers in Central-Northern Italy received increasingly less per day – and the Londoners increasingly more – until our indices end. The Roman wages were higher, still, than those in London to begin with, rising in tandem with these until the 1650s before beginning a descending trend similar to that of Central-Northern Italy, but at a somewhat higher level. Regional variation in the onset of decline in the Italian indices is worth noting and something we return to further below.

Figure 5: Silver wages of unskilled workers: London, Rome, and Central-Northern Italy, 1543-1810




*Notes:* Nominal wages are measured in grams of sliver per day. Lines are fitted to the data using *lpoly* in Stata/IC16. *Sources*: Central-Northern (CN) Italy: Allen (2001). Rome: the *Fabbrica of St Peter* (see Appendix 1).

Figure 6: Silver wages of skilled workers in London, Rome and Central-Northern Italy, 1543-1810




*Notes:* Nominal wages are measured in daily grams of sliver. Lines are fitted using *lpoly* in Stata/IC16. *Sources*: Wages: Central-Northern Italy: Allen (2001). Rome: the *Fabbrica* (Appendix 1). Plague outbreaks: Alfani and Percoco (2019).

The trends in the nominal wages of skilled workers (Figure 6) are very similar to those of unskilled workers (Figure 5). Among the three regions, skilled Roman workers were paid most until the 1650s, after which decline set in. The onset of decline in Rome, however, came with a delay of some two decades compared to Central-Northern Italy (assuming we can trust the biased wages). Indeed, the timing of regional peaks is worth highlighting. The nominal wages in Central-Northern Italy peaked in the 1630s; the Roman wages in the 1650s; and the London wages in the 1660s (even if the English highpoint was a temporary one during the period of interest). Remarkably, the observed regional downturns clearly coincide with episodes of epidemic outbreaks, as hypothesised in Alfani and Percoco (2019). In particular, a plague hit Milan and Northern Italy in 1629-30 leaving Rome unaffected. A later plague hit Rome and Southern Italy in 1656-57 leaving Milan unaffected. Finally, London was hit by plague in 1665-66 leaving both Milan and Rome unaffected. Plague outbreaks thus appear to have turned wage *growth* into wage *decline* in all three regions.

This leads to two main observations concerning the long-term effect of epidemics. The first concerns the onset of Italy's early-modern downturn. Malanima (2013) argued that it was not until the 18th century that Italy began to fall behind – a clear disagreement with both Allen's original wage index and with our Roman wages, where decline began in the mid-17th century (Figures 2, 5 and 6). However, Malanima's idea that demographic growth pushed 18th-century Italy into recession is indeed supported by the new Roman data, showing a prolonged wage decline starting in the 1740s (Figures 5 and 6). The Roman wages thus suggests that the *onset* of Italy's downturn happened in the mid-16th century and was triggered by epidemics, whereas demographic growth during the mid-17th century made the recession still deeper. Of course, we need to check that the same patterns apply in the case of real wages. We return to this in the next section.

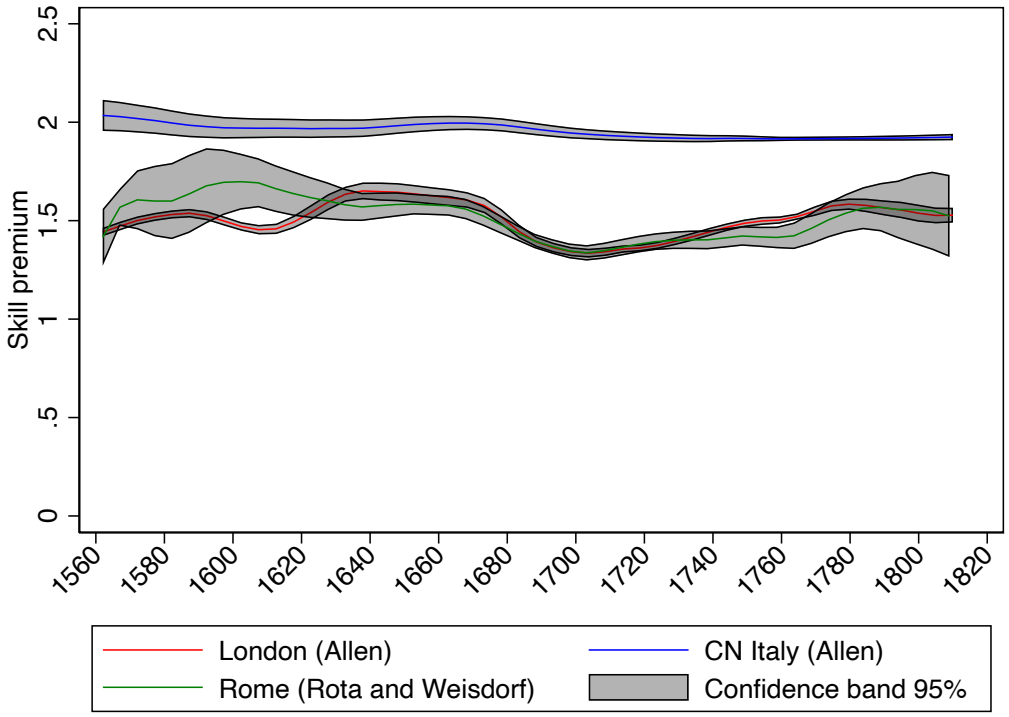
The second main observation concerns the short- and long-term effects of epidemics on the development of wages. Again, we have to check the development in real wages, too, to be sure; yet,

some initial comments seem appropriate at this stage. The argument forwarded in Malanima (2002) and Capasso and Malanima (2007) is that population growth depressed wages. Epidemics and their population toll should therefore have the opposite effect, causing wages to rise. Mattia Fochesato's recent study of the very short-run effect of epidemics in pre-modern Europe found support for that idea, observing that population decline let to rising wages (Fochesato 2018). However, although the initial reaction to plague on wages observed by Fochesato was positive, the longer-term response to a negative demographic shock on wages observed above (Figures 5 and 6) seems to be the opposite, consistent with the predictions in Alfani and Percoco (2019) discussed above. We reconsider these matters in the next section.

*The Skill Premium*

Our indices of skilled and unskilled workers' wages described above allow us to calculate a new skill-premium index for Italy. Figure 7 reports the skill premium in all three regions under investigation. The premiums in Rome and London were remarkably similar, with skilled construction workers earning some 50 per cent more than their unskilled counterparts throughout the early-modern period – a level that aligns with the skill premium reported for Italy after 1861 (Federico et al 2019). The pre-existing skill premium for Central-Northern Italy is bizarrely high in comparison, with skilled workers consistently receiving pay rates twice as large those of their unskilled colleagues. There is no apparent reason why the skill premium would have been that much higher in Central-Northern Italy than it was in Rome, except that the northern wages might be biased, as discussed above. At any rate, the size of the new and more consistent Roman skill premium contests the common belief that skill premiums in early-modern southern Europe were significantly higher than in northwest, as emphasised in van Zanden (2009).

Figure 7: The skill premium in London, Rome, and Central-Northern Italy, 1543-1810




*Notes:* The skill premium is computed as the average skilled daily wage rate divided by the average unskilled daily wage rate each year. Lines are fitted to the data using *lpoly* in Stata/IC16. *Sources*: London and Central-Northern Italy: Allen (2001). Rome: the *Fabbrica of St Peter* (see Appendix 1).

*The Consumption Basket*

We now turn to the regional cost-of-living indices used to convert the nominal wages into real ones. Here, we follow Allen's original work (Allen 2001), but with a couple of important adaptations. In particular, Allen's original basket included 1,940 daily calories for an adult male (Allen 2001). This number of calories is less than the estimated caloric ingestion suggested in Gross (1990) for Roman individuals during the middle of the 18th century. Gross proposed that a middle-class adult consumed 2,315 calories per day on average, whereas a lower-class adult consumed somewhat less, i.e. 2,124 calories per day. Inspired by Gross estimations, as well as Humphries' critique discussed above suggesting that Allen's original basket was too meagre, we proceed to use the common standard of 2,500 calories per person per day in Rome, London, and Central-Northern Italy.

Table 2: Allen's *respectability* consumption basket for England and Italy

| | England | | | Italy | | |
|---|---|---|---|---|---|---|
| *Food:* | Amount | Unit | Calories/day | Amount | Unit | Calories/day |
| Bread | 234 | kg | 1,571 | 234 | kg | 1,571 |
| Meat | 26 | kg | 178 | 26 | kg | 178 |
| Butter | 5.2 | kg | 104 | - | - | - |
| Oil | - | - | - | 6.2 | litres | 139 |
| Beer | 182 | litres | 212 | - | - | - |
| Wine | - | - | - | 76 | litres | 177 |
| Cheese | 5.2 | kg | 54 | 5,2 | kg | 54 |
| Eggs | 52 | pieces | 11 | 52 | pieces | 11 |
| Beans | 52 | litres | 369 | 52 | litres | 369 |
| Total calories | | | 2,500 | | | 2,500 |
| *Non-food:* | Amount | Unit | Mill. BTU/year | Amount | Unit | Mill. BTU/year |
| Firewood | - | kg | - | 168 | kg | 2 |
| Charcoal | 210 | kg | 5 | - | kg | - |

*Notes*: Rent allowance is five per cent of the total cost of the remaining items in the basket. *Sources*: Allen (2009).

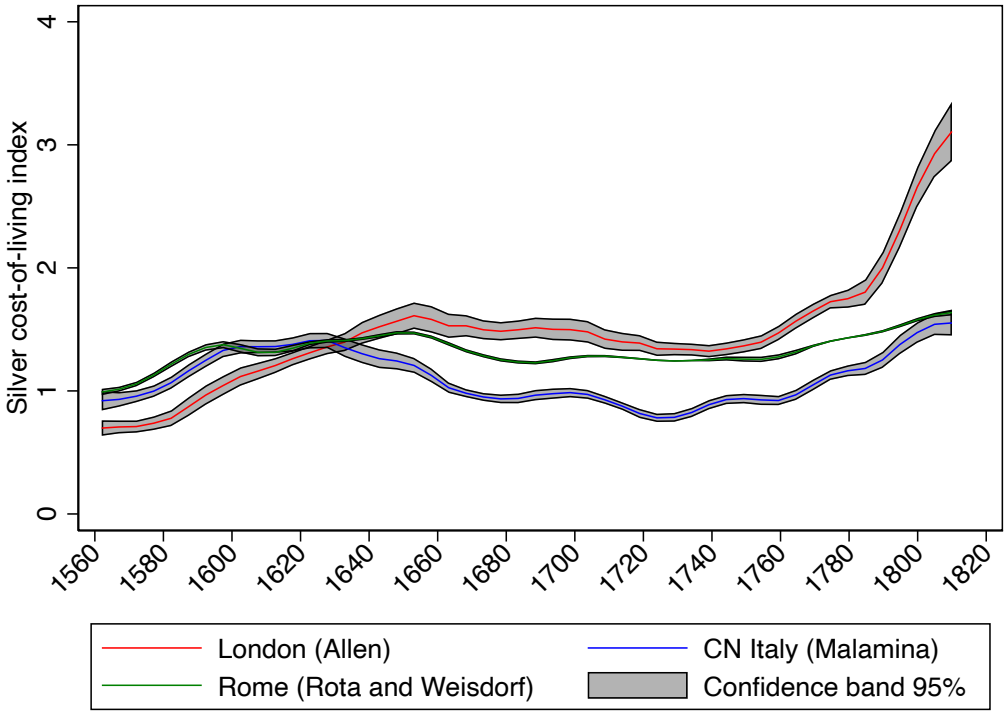
Different from Allen's original baskets, and because we were unable to construct a Roman price series for linen, this item was excluded from our cost-of-living indices for Rome, London, and Central-Northern Italy. The five meters of linen contained in Allen's original basket for London make up some four per cent of the annual consumption expenditures in London during our period of interest. We know from Friz (1980) and Gross (1990) that clothing for lower-class people in Rome accounted for some two per cent of their annual budget. Moreover, it seems reasonable to assume that more linen was needed in London than in Rome due to temperature differences (Allen 2017). Hence, we do not suspect that including linen in the index will alter our conclusions below. The items contained in each of the two baskets used below – one for England and one for Italy – are reported in Table 2.

*Prices and Daily Costs of Living*

Our Roman prices come from a variety of sources, which are detailed in Appendix 1. The bulk of our prices were reported in the Monography on the City of Rome (1878) and in Jean Delumeau's detailed historical Roman economic indicators (Delumeau 1959). The prices for London and Central-Northern Italian were taken from Allen (2001). Similar to earlier price indices, sporadic gaps in our price series were closed using interpolation (see Appendix 1 for details).

It should be noted that Allen (and also Malanima) predicted the prices of bread from the prices of wheat and labour using Allen's so-called *bread equation* (Allen 2001). Different to that approach, we use the retail market prices of bread published in Reinhardt (1990) instead. This is relevant because public food-price control in Italy – known as the *Annona* – meant that retailers sometimes received price subsidies (e.g. Mocarelli 2019). For examples, unlike wholesale wheat-merchants, whose prices were unregulated, retailers, such as bakers, were able to keep their prices stable thanks to these subsidies – except during extreme episodes of famine (Alfani et al 2017). Because our bread prices are retail rather than wholesale values, our new Italian cost-of-living index provides a more precise measure of the costs of bread – a main stable in the consumption basket – than the existing index for Central-Northern Italy, which is not fully accounting for the influence of the *Annona*. This is clearly visible the cost-of-living indices below.

Figure 8: Silver cost-of-living indices in London, Rome, and Central-Northern Italy, 1560-1810




*Notes*: The cost-of-living indices are calculated using the baskets reported in Table 1 and report the daily cost in silver of obtaining the basket specified in Table 2. Lines are fitted to the data using *lpoly* in Stata/IC16. *Sources*: Prices for London and Central-Northern Italy: Allen (2001). Prices for Rome: see Appendix 1.

Figure 8 shows the daily cost-of-living indices between 1560 and 1810, measured in grams of silver, for Rome (green), London (red), and Central-Northern Italy (blue). Although our wages begin in 1543, our prices for Rome were only available from 1560 on, explaining why we start in 1560 rather than in 1543. The indices for Rome and Central-Northern Italy were rather similar, both in size and trend, though with Central-Northern Italy being systematically less expensive than Rome after the 1630s. While the English basket was cheaper during the early part of the period, costing some 60-70 per cent of the Italian baskets over the course of the late 16th century, it was more than twice as expensive than the Italian ones after 1800. Yet, for most of the period under observation, the cost of living in all three regions differed much less from each other than wages did (see Figures 5 and 6 above).

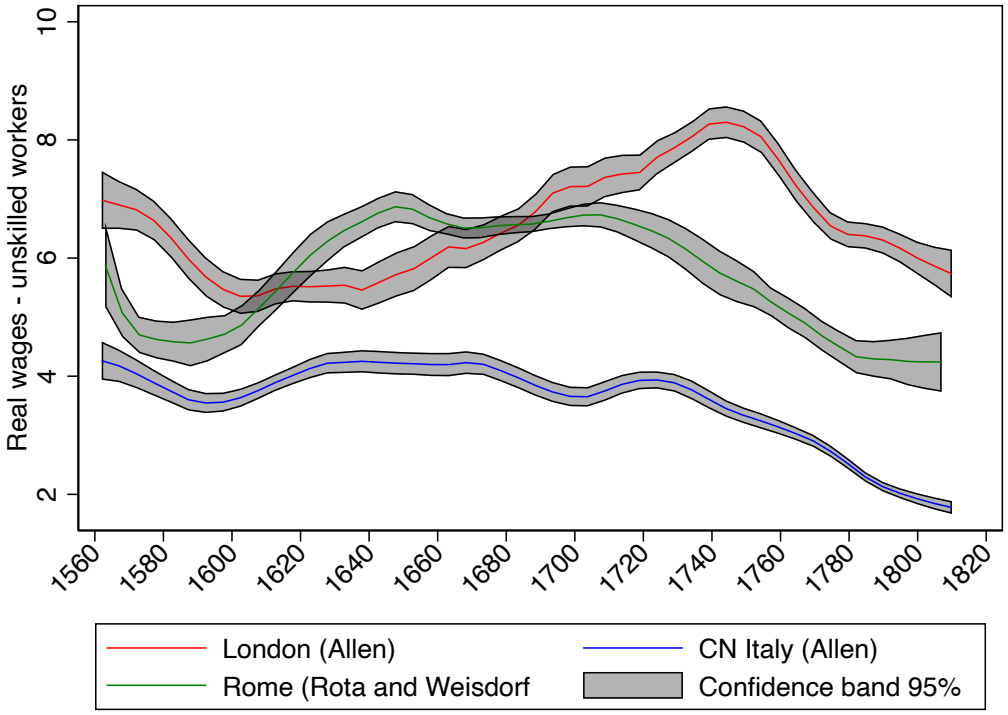
The cost-of-living index also varied much less in Rome than in London and Central-Northern Italy. Regarding the two Italian indices, we suspect their different variability is due to differences in how well the influence of the system of the *Annona* is captured, as explained above. It is also well known that the *Annona* effectively regulated food prices in Rome, whereas public price intervention in Florence and Milan normally only took effect during food shortage (Maffi and Mocarelli 2018; Mocarelli 2019; Strangio 1999). Finally, it is worth nothing how the peaks in living expenses roughly coincided with the timing of regional plague outbreaks (Central-Northern Italy: 1629-30; Rome: 1656-57; London: 1665-66).

## 4. Real Wage Comparison

This section places our new Italian real-wage indices for skilled and unskilled workers in the context of earlier indices for Italy and England. This serves a dual purpose: to take a fresh look at the timing of Italy's early-modern downturn in an international perspective and to consider our new Italian real wages against Allen's original real wages for London (Allen 2001) before ultimately replacing Allen's London wages with the downscaled London wages provided in Stephenson (2019). The dual goals are thus to re-examine Italy's position in the *little divergence* in European wages and price in light of Mocarelli and Stephenson's critiques, as well as to reconsider the *high-wage* hypothesis after accounting for the imperfections of earlier real-wage indices.

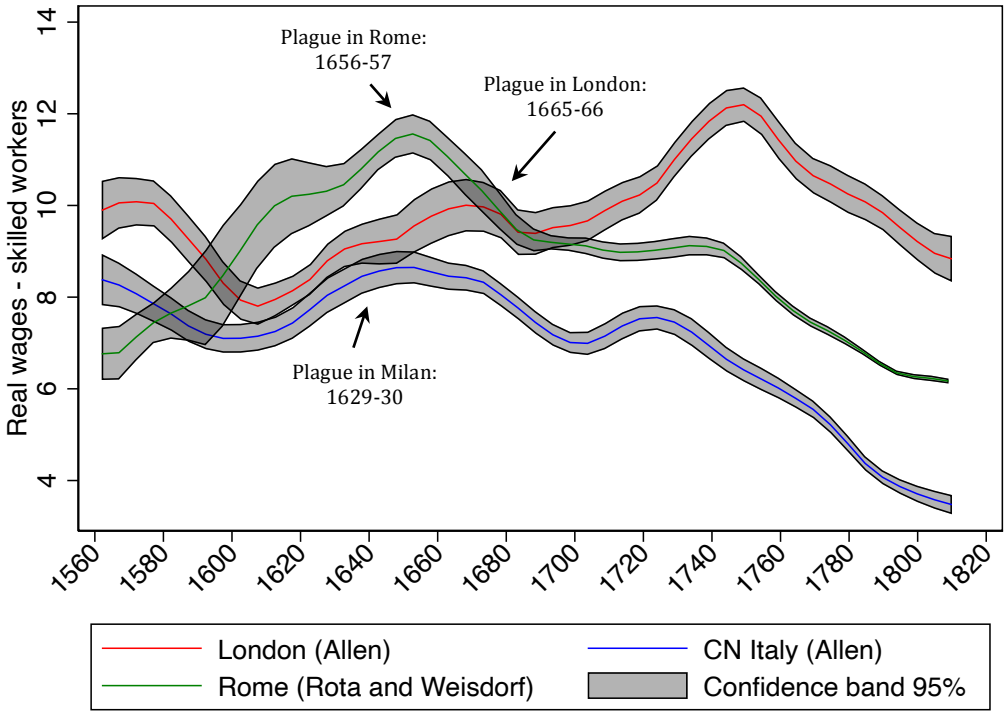
The real-wage indices for each of the three locations – Rome, Central-Northern Italy, and London – were computed by dividing the nominal daily wage rates by the daily costs of living described above. Similar to the real wages reported in Malanima (2013), this calculation makes no assumptions about the number of days worked per year or the size of families potentially needing support. Hence, the real wages reported in the following inform simply how many consumption baskets a skilled or unskilled construction worker was able to buy on days when he was working.

Figure 9: Real wages of unskilled workers: London, Rome, and Central-Northern Italy, 1560-1810




*Note*: Lines are fitted to the data using *lpoly* in Stata/IC16. *Sources*: Nominal wages and prices for Central-Northern Italy and London: Allen (2001). For Rome: see Appendix 1.

Figure 10: Real wages of skilled workers: London, Rome, and Central-Northern Italy, 1560-1810




*Note*: Lines are fitted to the data using *lpoly* in Stata/IC16. *Sources*: Nominal wages and prices for Central-Northern Italy and London: Allen (2001). For Rome: see Appendix 1.

Figure 9 shows, consistent with Allen's original findings, that the unskilled real-wage gap between London (red line) and Central-Northern Italy (blue line) was already significant by the mid-16th century. The gap tightened slightly in the early 17th century, but then grew wider again after the 1630s. By the mid-18th century, at the onset of the classical years of the Industrial Revolution, the real wages in London were some three times higher than in Central-Northern Italy. These developments were roughly similar in the case of skilled workers, as shown in Figure 10, and confirm Allen's *little divergence* evidence, except that Italian workers according to the Roman index (green line) cost more during large parts of the 17th century than their London counterparts. A Table containing the Roman wages presented in Figures 9 and 10 is found in Appendix 4.

Coming back to Italy's early-modern downturn, it is clear that this was not just a nominal phenomenon or indeed an artefact of biased Central-Northern Italian wages. Both skilled and unskilled Roman workers' real wages displayed long-run depression. Whether decline began in the mid-17th century, as both earlier and more recent works has suggested (Cipolla 1952; Sella 1997; Alfani 2013), or during the mid-18th century, as Malanima (2013) has advocated, depends to some degree on whether the wages considered are those of skilled or unskilled workers. For unskilled workers, severe descent is detectable mainly after 1700 consistent with Malanima's hypothesis that demographic growth was a key impetus to Italy's downturn. For skilled workers, decline – especially in Rome but also in the more northern parts of Italy (assuming the imperfect wages and prices can be trusted) – started much earlier and clearly coincided with the timing of regional epidemics in the mid-17th century (Alfani and Percoco 2019). Malanima's hypothesis is valid also for skilled workers, however, in that demographic growth after the 1740s appears to elongate the downturn. But recession in the real wages of skilled workers commenced long before.

Keeping in mind that the Central-Northern Italian wage data were probably biased, the respective trends of the two regional Italian indices were remarkably similar, even if Romans

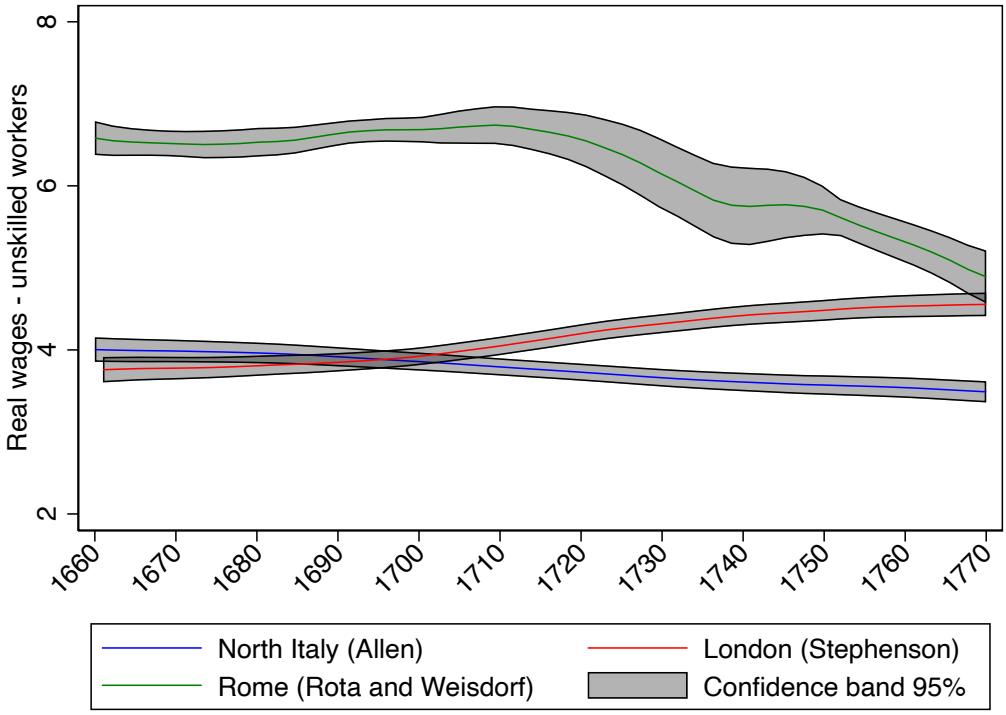
workers usually cost more than their more northern counterparts. Also clear from the graphs, perhaps most notably for the evolution of unskilled wages (Figure 9), the Italy's downturn was not enhanced by the regional shift from Florence to Milan, as one might have expected on the basis of Figure 1 above. If anything, our new and improved wage indices suggest Italy's downturn was even more severe than hitherto thought, as the real-wage peak was more impressive in Rome than further to the north (Figures 9 and 10). London construction workers also saw their purchasing power decline, but this was mainly after 1750 and was seemingly unrelated to the London plague of 1665-66, which brought a brief halt in the growth of real wages for skilled London workers (Figure 10).

*Unbiased real wages*

Our novel Italian wage indices, different as they are from the previous and arguably imperfect ones for Central-Northern Italy, enables us to reconsider Italy's economic position in a *little-divergence* context. As discussed above, recent studies have showed that the earlier wage indices habitually included a profit margin of foremen and subcontractors in London and Milan alike (Stephenson 2018; Mocarelli 2019). These margins need to be eliminated before we can see what workers actually earned and cost to hire.

In particular, Judy Stephenson argued that London construction workers effectively received 30-35 per cent less than the wages used in Allen's original study (Stephenson 2019). Mocarelli's adjusted wages for Milan also showed that previous wage indices in Italy overstate how much workers actually earned (Mocarelli 2019). Figure 11 repeats the unskilled real-wage comparison displayed in Figure 9 – this time with Stephenson's downscaled wages for London covering the period 1660 to 1770 (*ibid*., Appendix). Mocarelli's adjusted wages for Milan are not included in the graph, since they begin only at the very end of Stephenson's period, in 1757.

Figure 11: Profit-adjusted unskilled wages: Rome, London, and Central-Northern Italy, 1660-1770




*Note*: Lines are fitted to the data using *lpoly* in Stata/IC16. The real wages for Central-Northern Italy are not adjusted for profits. *Sources*: Wages for London: Stephenson (2019). Prices for London: Allen (2001). Wages and prices for Central-Northern Italy: Allen (2001). Wages and prices for Rome: the *Fabbrica of St Peter* (see Appendix 1).

A number of important messages emerge from Figure 11. The first is that Stephenson's corrected wages (orange line) still confirm Allen's hypothesis, as long as the comparison is made (as originally) between London and Central-Northern Italy (blue line). The pay gap is obviously smaller this time due to Stephenson's downscaled London wages, but the gap still widens after the 1730s, coinciding with the spread of steam engines in England, one of the major labour-saving technological efforts (e.g. Nuvolari et al 2012). Hence, this is still consistent with the *high-wage* hypothesis, according to which expensive English labour was replaced with machines.

The downscaled London wages are, however, significantly lower than those reported in our new Italian wage index (green line) at least up until the two lines finally meet, in the 1770s. Stephenson does not report adjustments for skilled workers' wages, which means that we can only

draw comparison in the case of unskilled labour. But the conclusion is clear. Allen's original *little divergence* between England and Italy – with more consistent and unbiased data – has transformed into a '*little convergence*' between the south and northwest of Europe during the 18th century.

## 6. Conclusion

In this paper, we presented two new and improved wage indices for skilled and unskilled workers in historical Italy based on payments related to the construction and maintenance of the St Peter's Church in Rome. The new indices, which escape complication inherent to earlier wage indices for early-modern Italy, confirm the widespread view that Italy experienced a prolonged economic downturn – one that saw its onset in the middle of the 17th century and that persisted at least until the early 19th century.

We observed in comparison with earlier wage indices that the onset of downturns coincided with regional incidents of plague outbreaks. This was true for Italy as well as for England. However, the growth in real wages, which England and Italy both experienced before the first half of the 17th century, quickly re-emerged in England after the plague had ended. In Italy, by contrary, the economic decline persevered. These remarkably differences between England and Italy observed on the doorstep into modern economic growth might be worth a deeper investigation, as they could hold the key to why England industrialised before Italy. Equally relevant, we also found that, despite Italy's prolonged downturn, labour was costlier in early-modern Italy than in England once the issues pestering earlier wages indices are eliminated. The latter finding suggests that high wages alone are not enough to trigger industrialisation.

There are, however, good reasons to believe that the daily wage rates of construction workers were out of tune with those of workers employed in other more regular sectors of the economy. One

reason is that construction work was very often seasonal or intermitted (e.g. Gary 2019) and hence paid workers a premium for the risk of underemployment (e.g. Smith 1776; Swenson 1991; Hatton and Williamson 1991; Fishback 1998; Atack et al 2002; Averett et al 2007). The size of this premium supposedly varied with construction workers' outside options, which differed from city to city. It is plausible, therefore, that the resulting wage premiums provide misleading estimates of the costs of hiring an average industrial worker across Europe, making construction wages an unsuitable testing ground for the *high-wage* hypothesis. A more appropriate setting for considering the *high-wage* argument for why the Industrial Revolution was English would then be to use wages in the relevant countries more widely, geographically, and not just in cities. An improved cost-of-labour comparison would also focus on the wages paid for work that was not seasonal or intermitted, but represented more encompassing sectors of the economy than construction work.

## References


Alfani, G. (2013), "Plague in seventeenth-century Europe and the decline of Italy: an epidemiological hypothesis", *European Review of Economic History* 17, 408–430.

Alfani, G; L. Mocarelli; and D. Strangio D. (2017), "Italy", in G. Alfani, G., and C. Ó. Gráda (ed.) *Famine in European History*, Cambridge: Cambridge University Press, pp. 25-47.

Alfani, G., and M. Percoco (2019), "Plague and long-term development: the lasting effects of the 1629–30 epidemic on the Italian cities", *Economic History Review* 72, pp. 1175-1201.

Allen, R.C. (2001), "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War," *Explorations in Economic History*, 38, pp. 411–447.

Allen, R.C. (2009), *The British Industrial Revolution in a Global Perspective*, Cambridge: Cambridge University Press.

Allen, R.C. (2015), "The high wage economy and the industrial revolution: a restatement," *Economic History Review* 68, pp. 1-22.

Ait I. (1996), "Salariato e gerarchie del lavoro nell'edilizia pubblica romana del XV secolo," *Rivista Storica del Lazio*, 5, pp. 101-129.

Ait I. and M. Vaquero Piñeiro (2005), "Costruire a Roma fra XV e XVII secolo," in Cavaciocchi S. (ed.), *L'edilizia prima della rivoluzione industriale (secc. XIII-XVIII)*. Atti della Trentaseiesima Settimana di Studi, Istituto internazionale di storia economica «F. Datini», 26-30 aprile 2004, pp. 229-284.

Atack, J.; F. Bateman; and R. A. Margo (2002), 'Part-year operation in nineteenth-century American manufacturing: Evidence from the 1870 and 1880 censuses,' Journal of Economic History Volume 62:3, pp. 792-809.

Averett, S.; H. Bodenhorn; and J. Staisiunas (2007), "Unemployment Risk and Compensating Differential in Late-Nineteenth Century New Jersey Manufacturing," *Economic Inquiry* 43:4, pp. 734-749.

Baccelli, G.; A. Betocchi; A. Castellani; P. Castiglioni; G.S. Ferrari; A. Gabelli; and C. Masotti (1878), *Monografia della città di Roma e della Campagna romana* (Vol. 2). Tip. Elzeviriana.

Boulton, J. (1996), "Wage Labour in Seventeenth Century London," *Economic History Review* 49, pp. 268-290.

Braudel, F. (1992), *Civilization and Capitalism, 15th-18th Century*, California: University of California Press.

Capasso, S., and P. Malanima (2007), "Economy and population in Italy. 1300-1913," *Popolazione e Storia* 2, pp. 15-40.

Delumeau, J. (1959), *Vie économique e sociale de Rome, dans la second moitié du XVI siecle*, Paris, De Boccard

De Maddalena, A. (1974), *Prezzi e mercedi a Milano dal 1701 al 1860,* Milan: Banca Commerciale Italiana.

Fishback, P. V. (1998), "Operations of 'Unfettered' Labor Markets: Exit and Voice in American Labor Markets at the Turn of the Century," *Journal of Economic Literature* 36:2, pp. 722-765.

Fochesato, M. (2018), "Origins of Europe's north-south divide: Population changes, real wages and the 'little divergence' in early modern Europe", *Explorations in Economic History* 70, pp. 91-131.

Friz G. (1980), *Consumi, tenore di vita e prezzi a Roma dal 1770 al 1900*, Roma, Edindustria.

García-Zúñiga, M., and E. López-Losa (2018a), "Building Workers in 18th-century Madrid Skills and Wages," *unpublished manuscript*.

García-Zúñiga, M., and E. López-Losa (2019), "Building Workers in Madrid (1737-1805). New Wage Series and Some Methodological Issues," EHES Working Paper No. 152.

Gary, K.E. (2019), "The distinct seasonality of early modern casual labor and the short durations of individual working years: Sweden 1500-1800", Lund Papers in Economic History No 2019:189.

Geloso, V. (2018), "Were Wages That Low? Real Wages in the Strasbourg Region Before 1775," *Journal of Interdisciplinary History* 48, pp. 511-522.

Gilboy, E. (1934), *Wages in eighteenth century England*, Harvard: Harvard University Press.

Gross, H. (1990), *Roma nel Settecento*, Rom-Bari, Laterza.

Hatton, T., and J. Williamson (1991), "Unemployment, employment contracts, and compensating wage differentials: Michigan in the 1890s," *Journal of Economic History* 51:3, pp. 605-632.

Humphries, J. (2013), "The lure of aggregates and the pitfalls of the patriarchal perspective: a critique of the high wage economy interpretation of the British industrial revolution," *Economic History Review* 66, pp. 693-714.

Maffi, L., and L. Mocarelli (2018), "Approvvigionare Milano. Le complesse dinamiche di annona e mercato in antico regime," *unpublished manuscript*.

Malanima, P. (2002), *L'economia italiana. Dalla crescita medievale alla crescita contemporanea*, Bologna: Il Mulino.

Malanima, P. (2011), "The long decline of a leading economy: GDP in central and northern Italy, 1300–1913", *European Review of Economic History*, 15(2), 169-219.

Malanima, P. (2013), "When did England overtake Italy? Medieval and Early Modern Divergence in Wages and Prices," *European Economic History Review* 17, pp. 45-70.

Malinowski, M. (2016), "Little Divergence revisited: Polish weighted real wages in a European perspective, 1500–1800," *European Review of Economic History* 20, pp. 345-367.

Martini, A. (1883), *Manuale di metrologia, ossia misure, pesi e monete in uso attualmente e anticamente presso tutti i popoli*, Torino, Loescher

Mocarelli, L. (2019), "What is Wrong with the History of Wages: Or the Divide in Economic History—A Reappraisal Suggested by Eighteenth-Century Milan," in J. Hatcher and J. Stephenson (eds.), *Seven Centuries of Unreal Wages*, Palgrave Studies in Economic History, pp. 95-117.

Federico, G.; A. Nuvolari; L. Ridolfi; and M. Vasta (2019), "The race between the snail and the tortoise: skill premium and early industrialization in Italy (1861–1913)," *Cliometrica* (forthcoming).

Nuvolari, A.; B. Verspagen; and N. von Tunzelmann (2011). "The Early Diffusion of the Steam Engine in Britain, 1700-1800. A Reappraisal," *Cliometrica* 5, pp. 291-321.

Palermo L. (1997), *Sviluppo economico e società preindustriali: cicli, strutture e congiunture in Europa dal Medioevo alla prima età moderna*, Napoli: Viella.

Parenti, G. (1939), *Prime ricerche sulla rivoluzione dei prezzi in Firenze,* Florence: Casa Editrice del Dott. Carlo Cya.

Pfister, U. (2017), "The timing and pattern of real wage divergence in pre-industrial Europe: evidence from Germany, c. 1500-1850," *Economic History Review* 70, pp. 701-729.

Piola Caselli, F. (1999), "Merci per dogana e consumi alimentari a Roma nel Seicento," in Società Italiana di Demografia Storica (eds.), *La popolazione italiana nel Seicento*, Bologna, Clueb, pp. 387-409.

Piola Caselli, F. (2015), "Public debt in the Papal States: financial market and government strategies in the long-run (17th-19th centuries)", in Piola Caselli ed., *Government debts and Financial markets in Europe*, Routledge.

Pomeranz, K. (2000), *The Great Divergence: China, Europe, and the Making of the Modern World Economy*, Princeton: Princeton University Press.

Reinhardt V. (1990), "Prezzo del pane e finanza pontificia dal 1563 al 1762," in *Dimesioni e Problemi della ricerca storica* 2, pp. 109-134.

Reinhardt, V. (1991), *Überleben in der frühneuzeitlichen Stadt: Annona und Getreideversorgung in Rom 1563-1797*, Tübingen: Max Niemeyer Verlag.

Rota, M., and J. Weisdorf (2019), "Expensive Labour and the Industrial Revolution: Evidence from Stable Employment in Rural Areas," Centre for Competitive Advantage in the Global Economy (CAGE) Working Paper No 442.

Sabene, R. (2012), *La fabbrica di San Pietro in Vaticano: dinamiche internazionali e dimensione locale*. Gangemi Editore spa.

Schwarz, L. D. (1985), "The standard of living in the long run: London, 1700–1860," *Economic History Review* 38, pp. 24-41.

Sella, D. (1968), *Salari e lavoro nell'edilizia lombarda durante il secolo XVII*. Annales Cisalpines d'histoire sociale, Pavia.

Sella, D. (1979), *Crisis and Continuity. The Economy of Spanish Lombardy in the Seventeenth Century*, Cambridge: Harvard University Press.

Sella, D. (1997). Italy in the Seventeenth Century. Longman: *London/New York*.

Stephenson, J. (2018), "'Real' wages? Contractors, workers, and pay in London building trades, 1650–1800," *Economic History Review* 71, pp. 106–132.

Stephenson, J. (2019), "The pay of labourers and unskilled men on London building sites, 1650-1770," in J. Hatcher and J. Stephenson (eds.), *Seven Centuries of Unreal Wages*, Palgrave Studies in Economic History, pp. 143-164.

Strangio, D. (1999), *Crisi alimentari e politica annonaria a Roma nel settecento*, Istituto nazionale di Studi romani.

Summerson, J. (1983), *Architecture of Britain 1530–1830, The Pelican History of Art*, Penguin Books.

Swenson, P. (1991), "Bringing Capital Back in, or Social Democracy Reconsidered: Employer Power, Cross-Class Alliances, and Centralization of Industrial Relations in Denmark and Sweden", *World Politics* 43, p. 513-544.

van Zanden, J.L. (2009), "The skill premium and the 'Great Divergence", *European Review of Economic History* 13:1, pp. 121-153.

Vaquero Piñeiro M. (2005), "Ricerche sui salari nell'edilizia romana (1500-1560)," in *Rivista Storica del Lazio* 5, pp. 131-158.

Vaquero Piñeiro M. (2009), "Patrimoni agricoli e redditi familiari della chiesa nel XVI secolo in Istituto datini", in S. Cavaciocchi: *Economic role of the family in the European economy from the 13th to the 18th centuries* (Vol. 40). Firenze: Firenze University Press.

## Appendix 1: Sources of Data

*Wages*

Wages were collected from the following archival sources at the archive of the St Peter's Church:

1558-1562: Giornale, A terzo, ASFP, Arm. 25, B, 61

1562-1569: Giornale, B, ASFP, Arm. 25, B, 65

1570-1579: Giornale, ASFP, Arm. 25, C, 70

1579-1582: Giornale, ASFP, Arm. 25, C, 86

1582-1587: Giornale, ASFP, Arm. 25, D, 99

1585-1586: Giornale, ASFP, Arm. 25, D, 104

1587-1589: Libro delle giornate di muratori e manovali, ASFP, Arm, 25, D, 112

1589-1590: Libro delle giornate de muratori e manovali della Fabbrica, ASFP, Arm. 25, E, 126

1589-1590: Giornate di muratori e manovali de la Cupola di Santo Pietro, ASFP, Arm. 25 E, 127

1591-1593: Giornate de muratori e manovali, ASFP, Arm. 25, E, 134

1597-1602: Giornale de muratori e manovali della Cupula, ASFP, Arm. 26, A, 158

1617-1622: Stracciafogli, ASFP, Arm. 26, B, 218

1623-1633: Giornate del soprastante, ASFP, Arm. 26, C, 244

1629-1637: Giornate. Soprastante, ASFP, Arm. 26, C, 256

1648-1650: Rassegna di manuali della Fabrica di San Pietro, ASFP, Arm. 96, D, 296

1648-1653: Libro mastro del Fattore. Giornate di homini, AFSP, Arm. 96, D, 298

1653-1667: Libro mastro del Soprastante, AFSP, Arm. 26, E, 309

1653-1667: Libro mastro del Fattore, AFSP, Arm. 26, E, 310

1667-1684: Libro mastro del Fattore, AFSP, Arm. 27, A, 358

1667-1684: Libro mastro del Soprastante delle giornate, ASFP, Arm. 27, A, 359

1691-1716: Libro mastro del Soprastante delle giornate, ASFP, Arm. 27, B, 393

1712-1726: Rassegna dei manovali, ASFP, Arm. 27, C, 408

1716-1736: Libro mastro del Soprastante, spese, ASFP, Arm. 27, C, 415

1720-1725: Libro del Soprastante per il riscontro delle spese dei manovali, ASFP, Arm. 27, C, 418

1738-1755: Registro delle opere dei manuali, ASFP, Arm. 27, D, 431

1755-1769: Registro delle opere dei manovali, ASFP, Arm. 27, D, 433

1769-1777: Registro delle opere dei manovali, ASFP, Arm. 27, D, 436

1786: Liste bimestrali e giustificazioni dell'anno 1786, ASFP, Arm. 44, C, 1-2

1791-1794: Registro delle opere manovali, ASFP, Arm. 28, A, 446

1796-1798: Liste bimestrali e giustificazioni, ASFP, Arm. 44, F, 34/40

1800-1802: Liste bimestrali e giustificazioni, ASFP, Arm. 44, G, 44/50

1803-1805: Liste bimestrali e giustificazioni, ASFP, Arm. 45, A, 53/57

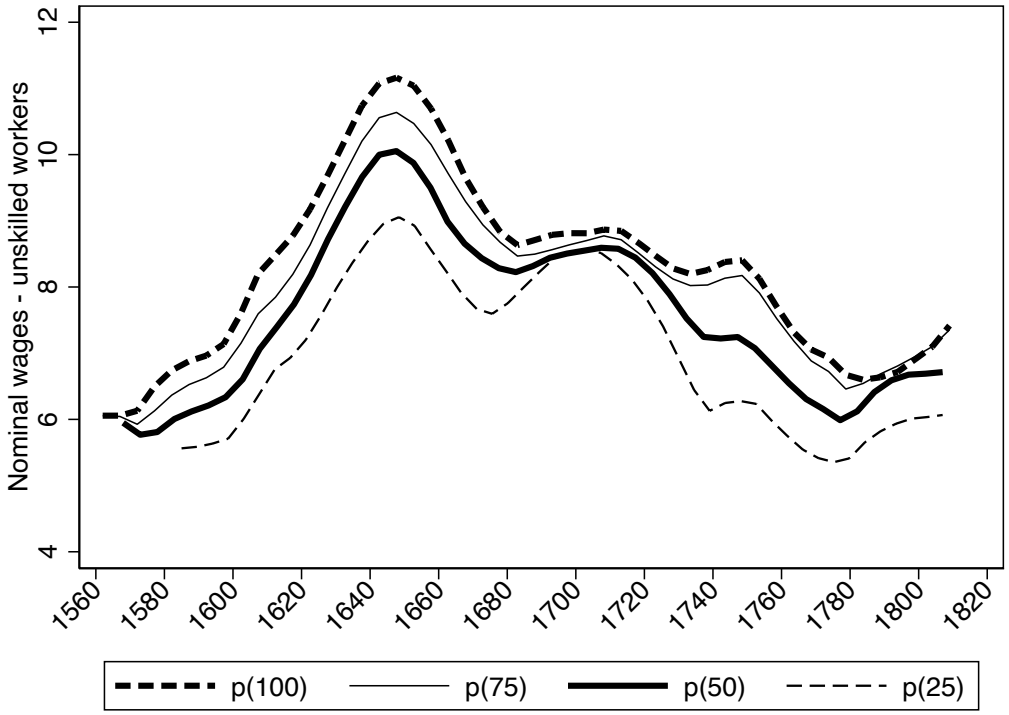
1809-1810: Liste bimestrali e giustificazioni, ASFP, Arm. 45, C, 66/69

*Prices*

*Bread*: 1563-1762: Reinhardt (1990). 1770-1810: Friz (1980). 1763-1769: interpolation. *Olive oil*: 1532-1648: Deluemau (1959). 1674-1810: Baccelli et al (1878). 1649-1673: interpolation. *Wine*: 1533-1630: Deluemau (1959). 1631-1810: extended using wine prices for Central-Northern Italy from Allen (2001) and for Rome from Friz (1980). *Meat*: 1538-1629: Delumeau (1959); 1630-1810: Baccelli et al (1878). *Eggs*: 1538-1630: Deluemau (1959). 1770-1810: Friz (1980). *Beans*: Prices assumed to be equal to the prices of wheat. Wheat prices: 1563-1797: Reinhardt (1991). 1798-1810: Baccelli et al (1878). *Cheese*: 1560-1810: average prices of *ricotta fresca* from Baccelli et al (1878) and Vaquero Pinerio (2009). *Firewood*: 1552-1650: Delumeau (1959). 1651-1810: prices of firewood in North Italy from Allen (2001).

## Appendix 2: Wage series robustness

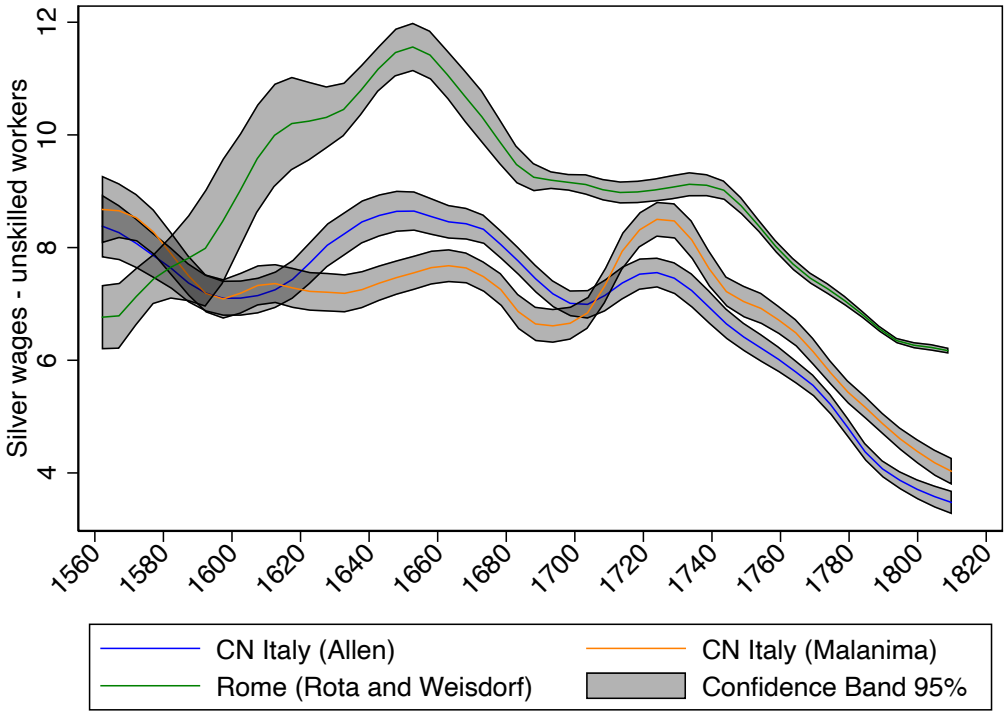
Figure A2: The wages of unskilled workers when using different cut-off points, 1560-1810




*Notes:* Lines are fitted to the data using *lpoly* in Stata/IC16. *Source*: the *Fabbrica of St Peter* (see Appendix 1).

## Appendix 3: The wages of skilled workers in Italy

Figure A3: The wages of skilled workers in Rome and Central-Northern Italy, 1560-1810




*Notes:* Lines are fitted to the data using *lpoly* in Stata/IC16. *Source*: Central-Northern Italy: Allen (2001) and Malanima (2013). Rome: the *Fabbrica of St Peter* (see Appendix 1).

## Appendix 4: Wage and price data by demi-decade

Table A4: Wages and prices in Rome, by demi-decade, 1560-1810

| Demi | Nominal wages | | Real wages | | Cost | Skill |
|---|---|---|---|---|---|---|
| decade | unskilled | skilled | unskilled | skilled | of living | premium |
| 1560-64 | 5.62 | 7.32 | 5.67 | 7.39 | 0.99 | 1.42 |
| 1565-69 | 5.63 | 7.28 | 5.55 | 7.18 | 1.01 | 1.57 |
| 1570-74 | 5.77 | 8.12 | 5.46 | 7.68 | 1.06 | 1.61 |
| 1575-79 | 6.00 | 9.33 | 5.31 | 8.26 | 1.13 | 1.60 |
| 1580-84 | 6.12 | 9.75 | 5.03 | 8.01 | 1.22 | 1.60 |
| 1585-89 | 6.16 | *10.17* | 4.75 | 7.84 | 1.30 | 1.64 |
| 1590-94 | *6.20* | 10.47 | 4.58 | 7.73 | 1.35 | 1.68 |
| 1595-99 | 6.30 | 10.98 | 4.58 | 7.98 | 1.38 | 1.69 |
| 1600-04 | 6.55 | 11.94 | 4.87 | 8.87 | 1.35 | 1.70 |
| 1605-09 | 6.98 | 13.25 | 5.31 | 10.09 | 1.31 | 1.69 |
| 1610-14 | 7.53 | 13.85 | 5.73 | 10.54 | 1.31 | 1.66 |
| 1615-19 | 8.06 | 14.16 | 5.99 | 10.51 | 1.35 | 1.64 |
| 1620-24 | 8.58 | 14.23 | 6.18 | 10.25 | 1.39 | 1.62 |
| 1625-29 | 8.96 | 14.49 | 6.37 | 10.30 | 1.41 | 1.60 |
| 1630-34 | 9.27 | 15.14 | 6.58 | 10.74 | 1.41 | 1.58 |
| 1635-39 | 9.52 | 15.90 | 6.68 | 11.15 | 1.43 | 1.57 |
| 1640-44 | 9.77 | 16.23 | 6.75 | 11.21 | 1.45 | 1.58 |
| 1645-49 | 9.83 | *16.57* | 6.68 | 11.26 | 1.47 | 1.58 |
| 1650-54 | 9.69 | 16.89 | 6.59 | 11.48 | 1.47 | 1.58 |
| 1655-59 | *9.55* | 16.62 | 6.64 | 11.56 | 1.44 | 1.58 |
| 1660-64 | 9.15 | 15.72 | 6.62 | 11.37 | 1.38 | 1.58 |
| 1665-69 | 8.82 | 14.55 | 6.65 | 10.98 | 1.33 | 1.56 |
| 1670-74 | 8.58 | 13.58 | 6.68 | 10.56 | 1.29 | 1.52 |
| 1675-79 | 8.44 | 12.58 | 6.74 | 10.05 | 1.25 | 1.48 |
| 1680-84 | 8.35 | 11.85 | 6.76 | 9.60 | 1.23 | 1.44 |
| 1685-89 | 8.32 | 11.66 | 6.78 | 9.49 | 1.23 | 1.40 |
| 1690-94 | 8.40 | 11.66 | 6.74 | 9.35 | 1.25 | 1.37 |
| 1695-99 | 8.52 | 11.66 | 6.71 | 9.18 | 1.27 | 1.35 |
| 1700-04 | 8.59 | 11.60 | 6.69 | 9.05 | 1.28 | 1.34 |
| 1705-09 | 8.53 | 11.55 | 6.64 | 9.00 | 1.28 | 1.35 |
| 1710-14 | 8.41 | *11.50* | 6.60 | 9.03 | 1.27 | 1.36 |
| 1715-19 | 8.25 | 11.43 | 6.54 | 9.06 | 1.26 | 1.38 |
| 1720-24 | 8.16 | 11.40 | 6.53 | 9.13 | 1.25 | 1.39 |
| 1725-29 | *8.07* | 11.42 | 6.49 | 9.19 | 1.24 | 1.40 |
| 1730-34 | 7.84 | 11.48 | 6.29 | 9.21 | 1.25 | 1.40 |
| 1735-39 | 7.53 | 11.52 | 6.01 | 9.20 | 1.25 | 1.40 |
| 1740-44 | 7.21 | 11.34 | 5.71 | 8.98 | 1.26 | 1.41 |
| 1745-49 | 7.00 | 10.99 | 5.56 | 8.73 | 1.26 | 1.42 |
| 1750-54 | 6.87 | 10.59 | 5.47 | 8.43 | 1.26 | 1.42 |
| 1755-59 | 6.71 | 10.21 | 5.26 | 8.00 | 1.28 | 1.41 |
| 1760-64 | 6.55 | 9.94 | 4.98 | 7.56 | 1.32 | 1.42 |
| 1765-69 | 6.38 | 9.88 | 4.67 | 7.23 | 1.37 | 1.46 |
| 1770-74 | 6.21 | *9.81* | 4.42 | 6.99 | 1.40 | 1.50 |
| 1775-79 | 6.22 | 9.81 | 4.35 | 6.85 | 1.43 | 1.54 |
| 1780-84 | 6.30 | 9.81 | 4.33 | 6.74 | 1.45 | 1.56 |
| 1785-89 | 6.38 | 9.81 | 4.30 | 6.61 | 1.48 | 1.57 |
| 1790-94 | *6.47* | 9.81 | 4.23 | 6.41 | 1.53 | 1.56 |
| 1795-99 | 6.59 | 9.81 | 4.17 | 6.22 | 1.58 | 1.56 |
| 1800-04 | 6.67 | 9.81 | 4.13 | 6.07 | 1.62 | 1.55 |
| 1805-10 | 6.69 | 9.81 | 4.08 | 5.99 | 1.64 | 1.52 |

*Notes*: Nominal wages and costs of living are reported in grams of sliver per day. The numbers were extracted from the fitted lines reported in Figures 5 to 10 using the function *serset* in Stata/IC16. Six demi decades (three for each skill group) were closed using interpolation (numbers reported in *italic* above). *Source*: the *Fabbrica of St Peter* (see Appendix 1).