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# LEM

## WORKING PAPER SERIES

**Six centuries of real wages in France from Louis IX to Napoleon III: 1250 - 1860**

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# **Six centuries of real wages in France**

## **from Louis IX to Napoleon III: 1250 - 1860<sup>1</sup>**

### **Abstract**

This article presents a new series of real wages for male agricultural laborers and construction workers in France from 1250 to 1860. I show that the overall picture is more complex than what a city-level early modern divergence thesis between northwestern Europe and the rest of the continent would suggest. Cross-national comparisons of real wages point to the coexistence of both divergence and convergence phases until the eighteenth century. One important implication is that the real wages of a significant share of the French male labor force were broadly on par with the levels prevailing in England before c.1750.

Key-words: Real wages, Living standards, France

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## INTRODUCTION

The “Little Divergence” in real wages between northwestern and southern Europe is one of the most prominent features in the evolution of living standards in the pre-industrial period. Two decades after Robert Allen’s (2001) seminal contribution, the notion of a divergence in real wages preceding the Industrial Revolution is indeed a well-established “stylized fact” among many economic historians.<sup>2</sup> However, some aspects of the empirical evidence underpinning this narrative have not received enough attention.

On the one hand, this view is based on the study of a sample of leading European cities (Amsterdam, Florence, London, Paris, Vienna, etc.), while with few notable exceptions (Clark 2005; 2007; Humphries and Weisdorf 2019, Pfister 2017), the evidence concerning smaller urban agglomerates and rural areas is still fragmented.<sup>3</sup> On the other hand, most of the literature has focused on construction workers, who represent only a fraction of urban occupations in a world that was still primarily rural. Accordingly, most of the claims about the dynamics of real wage divergence across countries rest on the assumptions that the real wages of leading cities are fully representative of the national experiences (Allen 2001), and that developments in the construction industry adequately capture general patterns of economic growth.<sup>4</sup>

Another important argument is related to the case of France, which has traditionally provided the most important point of comparison for assessing British economic performance between the seventeenth and nineteenth centuries.<sup>5</sup> In this regard, using a broad set of economic indicators, conventional wisdom has described France in terms of economic “retardation” relative to England.<sup>6</sup> While subsequent research has questioned this consensus, nuancing the contrasts between the French and English economies (Crouzet 1966; O’Brien and Keyder 1978), France’s backwardness has clearly re-emerged in recent literature on comparative levels of real wages. Based on evidence from Paris and Strasbourg, Allen (2009b) has characterized eighteenth century France as a low-wage economy relative to England. This view has become mainstream and has laid the foundation for Allen’s (2009a) influential argument on the origins of the

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<sup>2</sup> De Pleijt and Van Zanden (2016). It is worth noting, however, that Allen’s account did not lead to a universal consensus. For three critical perspectives, see Malanima (2013), Geloso (2018), and Stephenson (2017). The exact timing of the divergence in real wages is still a matter of debate among economic historians. Thus, while Allen (2001) found its origins in the early modern period, more recent contributions have identified the late seventeenth or early eighteenth century as the key turning point (Malanima 2013; Pfister 2017).

<sup>3</sup> Allen (2001) introduced the use of comparisons of leading cities. In contrast, Pfister (2017) compared his national series of German real wages with a set of city and regional level estimates from Allen (2001). Similarly, building on Clark (2004, 2005, 2007), Malanima (2013) compared real wages for north-central Italy (primarily based on Florence and Milan) with new country-level estimates of English real wages.

<sup>4</sup> For a critical perspective on the use of construction workers’ wages, see Rota and Weisdorf (2019).

<sup>5</sup> Crouzet (1966) may be regarded as the architect of this stream of literature.

<sup>6</sup> Crafts (1984) reviews the debate.

Industrial Revolution. In Allen's view, low wages and high cost of energy in France could not stimulate adoption of machine intense technology, despite the significant market opportunities offered by France's large population. Quite surprisingly and notwithstanding France's centrality in the debate on the origins of the Industrial Revolution, there is still very limited quantitative evidence on its economic performance before the nineteenth century. Indeed, despite the long research tradition emerging from the *Annales* group, existing contributions have an eminently localized character and mostly focus on the experience of specific regions or what might be called "local economies."<sup>7</sup> As a consequence, the study of the historical evolution of real wages (and GDP per capita) in France has remained at a more rudimentary stage compared to other countries.<sup>8</sup>

Georges d'Avenel (1898) was the first historian to venture a national reconstruction relying on a large body of quantitative evidence. While a landmark, the seven volumes of his *Histoire économique* were mostly based on evidence from Northern France and did not provide aggregate series of real wages.<sup>9</sup> Ernest Labrousse (1932) partially filled the gap by constructing new series of real wages for the eighteenth century, while subsequent research following the lead of François Simiand (1932) established national indices beginning with the early nineteenth century (Bayet 1997; Kuczynski 1944; Lévy-Leboyer and Bourguignon 1985; Sicsic 1995). Though fundamental in many respects, these contributions are too sparse and heterogeneous to permit formulating even tentative conclusions about long-term developments in real wages from a broader national perspective.

This study makes three main contributions. First, it presents five new series of real wages for male workers: French agricultural laborers, French building laborers, and French building craftsmen for the period 1250–1860, as well as Paris building craftsmen and Paris building laborers for the period 1300–1860. To accomplish this, I estimate new wage and price series using a regression approach, which allows me to combine a large number of observations drawn from a wide array of primary and secondary material, while properly controlling for the heterogeneity of the sources (Clark 2005). To provide an international perspective, I construct real wages using Allen's (2001) welfare ratio approach.

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<sup>7</sup> This definition is borrowed from Hoffman (1996).

<sup>8</sup> See Allen (2001) for Europe, Malinowski (2016) for eastern Europe, and Özmucur and Pamuk (2002) for southeastern Europe and the Middle East, among many others.

<sup>9</sup> Avenel (1898) also reports some less reliable tables of prices and wages obtained by averaging observations from various parts of France.

Second, this study reassesses the “Little Divergence” debate, focusing on the experiences of Paris-London and France-England. I find that London real wages had already begun to diverge from those in Paris by the fifteenth century. In contrast, estimates of real wages for England and France do not demonstrate systematic long-run behavior, but rather a sequence of divergence and convergence phases with no clear-cut trend until the second half of the eighteenth century. I suggest that this contrasting evidence can be accounted for by the different trajectories through which Paris and London emerged as the high wage regions of France and England, respectively. Overall, these findings challenge the notion of a late-medieval/early-modern Little Divergence in real wages between England and France and suggest that one should be cautious in inferring national trends from the experience of specific cities.

Third, this study contributes to the long-lasting debate on the comparative levels of development between France and England by extending the range of real wage comparison from the thirteenth to the second half of the nineteenth century. I also provide a reassessment of Allen’s (2015) notion of the British high wage economy as a key factor explaining the Industrial Revolution. Prior work in this area has disputed the high wage hypothesis (Humphries and Schneider 2018, Stephenson 2017). However, critiques mostly pertain to the internal consistency of the British series and focus on relative living standards of different occupations in Britain without taking a global perspective. In contrast, this study adopts an international comparative perspective by comparing English to French real wages. The results suggest that, in the century before the Industrial Revolution, the real wages of English construction workers were broadly similar to the levels prevailing in France. They slowly rose above the French standard in the second half of the eighteenth century, and definitely forged ahead in the second quarter of the nineteenth century. In contrast, the real wages of English agricultural laborers overtook French agricultural laborers only after the 1820s, in the “maturity phase” of the Industrial Revolution. These new findings indicate that for a significant share of the English male labor force, the high wage economy began to emerge during and not before the Industrial Revolution.

## WAGES: SOURCES AND METHODOLOGY

The empirical analysis is based on construction of a new dataset of nominal daily wages covering several occupations in the agricultural and construction sectors.<sup>10</sup> Data are retrieved from collections of printed primary material, a large body of secondary sources, and new archival evidence. This comprises manorial accounts, published records of several building projects, wage bills from the account books of hospitals, municipal organizations, and religious institutions, as well as a large set of local and national enquiries from the late eighteenth and early nineteenth centuries.<sup>11</sup> Overall, the dataset includes 26,332 wage observations for the period 1250–1860 derived from more than 150 sources. Despite efforts to ensure comprehensive time coverage, the distribution of data over time is uneven and periods of high data frequency alternate with phases of lower data coverage (Appendix S1, Figure S1.1). Notwithstanding this limitation, the sample contains enough observations to allow estimation of new series of real wages that are significantly more dependable than those previously available.

The dataset has wide spatial coverage, drawing information from approximately 300 locations in 20 regions. About 30 percent of the wage quotations come from Northern France, 10 percent from the Paris district, 23 percent from the Center, 21 percent from the East, and the remaining share from the South.<sup>12</sup> Despite the unequal distribution of data across space, the sample is characterized by consistent spatial coverage, as observations from the five regions are collected systematically in each time period.

### *Potential biases in estimating nominal wages*

A range of potentially relevant factors can affect the evolution of nominal wages. It is therefore important to identify these factors and check their effects on the estimates.

Pre-industrial labor markets were characterized by a remarkable degree of heterogeneity in terms of occupations and skill levels. To address this concern, I concentrate on construction workers because their wages are relatively homogeneous over time and space and allow me to make international comparisons

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<sup>10</sup> Only a handful of observations concern monthly wages and these are converted to daily rates assuming 20 days of work per month.

<sup>11</sup> Most of the daily wages in agriculture after 1789 come from Crebouv (1986). This study builds upon *les enquêtes du maximum* of 1793 (also called Garat's enquiry) and 1795, *les statistiques de préfets* and *les comptes annuels* between year IX of the French Revolutionary calendar (1800) and 1814, *la statistique agricole de 1814*, *les statistiques annuelles*, and the great *enquêtes décennales* of 1852 and 1862. In addition, some data are retrieved from the statistical yearbooks of various departments and from the *Statistique Générale de la France*, tome XII. See Appendix S1 for details.

<sup>12</sup> The north corresponds to the Paris Basin as defined by the first level of the current nomenclature of territorial units for statistics (NUTS 1) of France (except Burgundy and Center) plus Brittany, and Nord-Pas-de-Calais; the center corresponds to center-east (NUTS 1), West (NUTS 1 excluding Brittany), Burgundy, Center, and Limousin; the south includes the south-west (NUTS 1 except Limousin) and the Mediterranean (NUTS 1 excluding Corse). Île-de-France (i.e., the Paris district) and the east are the areas defined by NUTS 1 codes.

because of their frequent use in historical studies of other countries. In addition, I focus on agricultural laborers. Since day-laborers in agriculture accounted for the largest group in the French labor force, study of their wages provides the best vantage point for formulating general propositions about the historical evolution of real wages in France in the pre-industrial period.<sup>13</sup> Although wages of masons and carpenters were the most frequently recorded, I identified seventeen different professions among the building craftsmen. Wage differences were common in agriculture as well, but these were mostly related to the seasonal nature of the task accomplished. The archives provide rich source materials on the rates paid to day-laborers during harvest, haymaking, and vintage, which required a large quantity of manual labor for short periods. Conversely, it is more difficult to document employment activity of agricultural laborers during winter when the rhythm of work slackened.<sup>14</sup> In terms of skill levels, the wage structure nicely conforms with Emmanuel Le Roy Ladurie's (1976, p. 108) characterization of the building industry as having a three-tier structure, with lower rates paid to women, children, and apprentices; intermediate to unskilled laborers; and higher rates to skilled craftsmen.<sup>15</sup> In contrast, the remuneration by skill in agriculture had a dual structure because the top rank was almost nonexistent. Excluding seasonal peaks, the most qualified farm workers, like the winegrowers and reapers, were paid less than craftsmen in the building trades. These patterns are also evident in the database using 20-year averages, as shown in Figure 1. Overall, almost 44 percent of the wage observations are for male building craftsmen, almost 23 percent refer to male building laborers, and 33 percent are for male unskilled casual workers employed in agriculture.

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<sup>13</sup> Based on Morrisson and Snyder's (2000, p. 123) table of income distribution by social group, day laborers in agriculture (except servants) represent about 33 percent of the active population in 1788 if nobles, clergy, and bourgeois are excluded, and day laborers in agriculture are assumed to account for 75 percent of category 7 (Morrisson and Snyder (2000, p. 123, column 4), using the same proportions of active male workers per person proposed by the authors. If one additionally considers non-agricultural and mixed active male workers (agriculture and industry), the proportion approaches 45 percent. However, this share could be even larger since the second largest group includes small-scale farmers that possibly integrated their incomes with day labor in agriculture. Similar proportions can be found in 1765.

<sup>14</sup> See the section 'Seasonality' of Appendix S1 for details.

<sup>15</sup> Scattered evidence suggests that women employed in the construction industry were paid about half as much as male unskilled laborers in the Middle Ages (Michaud 2006, p. 7). See also Le Roy Ladurie (1987, pp. 107–110) for the wage gender gap in late sixteenth century Languedoc.

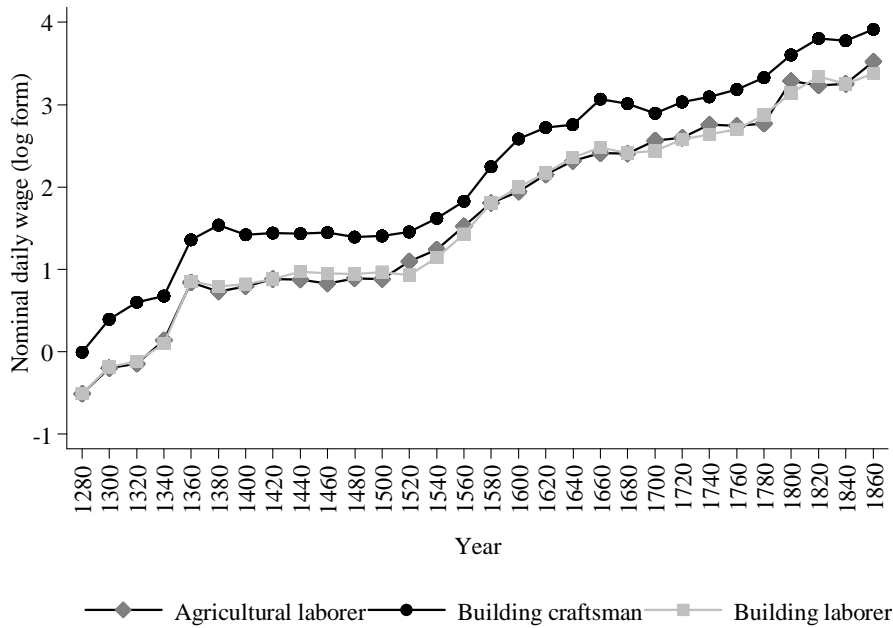


FIGURE 1  
 FRENCH NOMINAL WAGES BY CATEGORY: 20-YEAR AVERAGES  
*Sources:* See the text. Figures are expressed in sous tournois per day.

Another potential factor which can determine significant wage differences is seasonality. The writer of the *Compte of Guillaume d’Oncieu* illustrates this point clearly: when it came time to rebuild the mills and re-establish ordinary communications on the Ain’ river in the dry summer of 1312: “Seventy-two other laborers working at the same task [...] taking each twenty deniers per day, and they were more expensive because it was harvest time.”<sup>16</sup> From north to south, sources abound with references to the scarcity of labor in summer when the demand for farm labor peaked.<sup>17</sup> Furthermore, as manufacturing and agriculture became more specialized by the seventeenth century, competition across sectors grew in importance as a source of seasonality (Magnac and Postel-Vinay 1997, p. 98). Clearly, seasonal variations in daily wage were the result of several other interacting factors that could create large regional variations, such as the length of the

<sup>16</sup> “Septuaginta duobus aliis manuoperar laborantibus ad idem [...] capiente quolibet viginti den. per diem et erant quariores quia erat tempore messium” (Cattin 1991, p. 85; my translation).  
<sup>17</sup> The employees of Perigord’s convent had difficulty hiring workers in the summer because labor was scarce (Wolff 1954), while in the Cambrésis area, peasants dedicated special sections of their registers (“The expenses of August”) to detailing the higher labor costs incurred at harvest time (Neveux 1980, p. 300).



workday, skill level, or contracting system governing the recruitment process.<sup>18</sup> Until the early modern period, daily wages of construction workers in Avignon, Bayonne, and Dijon displayed astounding rigidity. Similarly, the amplitude of the seasonal movement was low in large urban agglomerates in the north, such as Paris or Troyes, as well as in Normandy, where the distinction between summer and winter wages had been progressively abandoned by the mid-fifteenth century (Beaurepaire 1865, p. 237). Conversely, seasonal pay differences were large (about 50 percent) and persistent in the grain-growing areas of nineteenth century France but were almost nonexistent in areas where livestock raising was predominant (Magnac and Postel-Vinay 1997, pp. 6–7).

Complicating the issue further, payment in cash coexisted with other forms of remuneration over the pre-industrial period. These included in-kind supplements of different types, which varied in relation to the nature of the work and length of employment. Wages in kind, mixed wages, or payment in the form of a proportion of produce spread to a fairly large section of rural society. Nevertheless, construction workers and agricultural laborers were paid primarily in money (Le Roy Ladurie 1987, p. 68; Rigaudière, 1982, p.725). Moreover, most of the workers employed on a monthly or yearly basis received food and lodging (Geremek 1968, p. 85; Rosenthal 1992, pp. 103–4), while construction workers employed on short-term contracts were mostly paid in cash. In practice, it is often difficult to distinguish how labor was compensated because the sources are often elusive about the nature of the wages. However, as the in-kind component was a significant share of total earnings, undue neglect of this feature can lead to significant underestimation of actual income (Geloso 2018). Based on the different forms of remuneration, wage observations are classified into four categories: (1) “not-nourished,” when the source clearly indicates that the worker is paid in cash, (2) “nourished,” if the worker additionally receives an in-kind component, (3) “not-nourished assumed,” when the source does not state if the payment is in cash or in kind, but it is possible to identify how the worker is paid, and (4) “unknown,” when the form of remuneration is not indicated. To distinguish between in-cash and in-kind payments, I check whether a specific source reports the cash rates paid to nourished and not-

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<sup>18</sup> When the price the contractor charged to his client was made at a fixed rate, the day bills were not a record of what the worker actually received, so that what seems a sort of wage rigidity may actually conceal systematic underestimation of seasonal fluctuations in workers’ earnings (Baulant 1971, p. 470; Malanima 2013, p. 58; Stephenson 2017). Seasonal pay patterns were also induced by changes in the terms of employment and variations in the local supply of labor. For example, during the late Middle Ages, starting from 11 November, winter wages were usually decreased by about 30 percent on the building sites of Normandy and to partially compensate this loss workers received a sum of money called “wine of Saint-Martin.” However, wage cuts were not taken during phases of labor scarcity (Lardin 2014, p.152). Seasonal pay patterns were related also to the level of specialization. For example, in the early sixteenth century, the construction workers employed on the building project of Troyes had their wage cut by 5 deniers *tournois* between November and March (Pigeotte 1870, pp. 85–87). Hence, in relative terms, unskilled laborers suffered greater pay cuts than building craftsmen (25 and 13 percent, respectively). Daily wages of unskilled laborers show more seasonal variation than skilled craftsmen also in Saint-Fleur (Rigaudière 1982, p.723).

nourished workers for the same task and period. Alternatively, I use a set of secondary sources that provide a long series of cash wages paid to nourished and not-nourished workers.<sup>19</sup> As payment in kind accounted for a large share of total remuneration, the cash component fell to implausibly low levels when the worker was nourished. Hence, wages in cash and in kind can be easily distinguished in these cases.<sup>20</sup> The final estimation sample includes wages of not-nourished workers and a limited number of observations of wages of nourished workers for which the value of in-kind payment could be imputed.

A final complicating factor in reconstructing annual incomes is the dearth of information on the days worked per year. For the sake of international comparability, I follow Allen (2001) and convert daily wages to annual incomes assuming 250 days per year. Still, one may wonder whether this assumption can be suitably applied in the French context.

Detailed information for agricultural workers is rare before the agricultural survey of 1852.<sup>21</sup> Nevertheless, it seems plausible to assume that agricultural laborers worked about 200 days per year between the seventeenth and eighteenth centuries, and that their working year increased only slightly to the middle of the nineteenth century (Postel-Vinay 1994, p. 65).<sup>22</sup> Despite that, it is difficult to interpret these numbers because employment was highly discontinuous for the overwhelming majority of workers, and households often integrated their earnings with other sources of income (Goubert 1986, pp. 101–04).<sup>23</sup> In contrast, the detailed pay records of a fairly large sample of building projects reveal that the work year of regular construction workers lasted about 250 days between the fourteenth and mid-sixteenth centuries, increasing slightly by the mid-sixteenth century with the reduction in number of festivities (Appendix S1, Table S1.6).<sup>24</sup> This evidence suggests the assumption of an average working year of 250 days is quite accurate for regular workers in the construction sector. In the absence of more precise information, and for the sake of international comparability, I assume the same “standard” duration for agricultural laborers.<sup>25</sup>

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<sup>19</sup> These included d’Avenel (1898, vol. 4, p. 580), Hanauer (1878, vol. 2, pp. 414–6, p. 423; pp. 529–34 pp. 537–40, pp. 545–54), and Le Roy Ladurie (1976, pp. 99–108), to name a few.

<sup>20</sup> For example, in eighteenth century Rouergue, the wages of unfed workers were twice as high as those of fed workers (Donat 1935, pp. 222–231).

<sup>21</sup> The results of the Agricultural Enquiry of 1852 suggest that agricultural laborers worked about 215 days (unweighted average) in 1852 (Marin and Marraud 2011).

<sup>22</sup> These numbers are consistent with the estimates of Vauban (1843) and Labrousse (1932) and with a set of direct observations concerning seventeenth century Southern France (AD Bayonne, H175–179).

<sup>23</sup> According to Grantham (1993, p. 490), at the beginning of the nineteenth century between 25 and 50 percent of the labor force was jointly employed in agriculture and other sectors.

<sup>24</sup> Geremek (1968) and Baulant (1971) found that the number of days worked per year varied between 251 and 274 for regular construction workers in Paris between the fourteenth and eighteenth centuries, while Marchand and Thélot’s (1991, p. 190) series implies that workers in industry and building could have approached 300 days per year between the 1830s and 1860s.

<sup>25</sup> As the working year was approximately stable over time, cross-country differences in days worked per year do not affect the international comparison of trends in real wages, while these become relevant in the comparison of incomes.

### *The regression model*

The construction of wage series from such a different array of sources requires particular attention to ensure the necessary degree of consistency in the aggregation process. For wide spatial coverage, I draw on several sources per time period, while I separately treat the observations from the Paris region to avoid oversampling from an area with a distinctively high wage labor market. The evolution of nominal wages in the rest of France was broadly similar over time and across space (Appendix S1, Figure S1.8). I estimate new series of nominal daily wages for male agricultural laborers and construction workers (both skilled and unskilled) in Paris and France using the following OLS regression model:<sup>26</sup>

$$\ln(w_{it}) = \sum_i \alpha_i LOC_i + \sum_t \beta_t D_t + \sum_j \gamma_j DSEAS_j + \sum_k \delta_k DOCC_k + \sum_l \vartheta_l DSOURCE_l + \varepsilon_{it} \quad (1)$$

where  $w_{it}$  is the nominal day wage in location  $i$  at time  $t$ ;  $D_t$  is an indicator for each of the years with a wage observation;  $LOC_i$  is a dummy equaling one if the wage comes from location  $i$  and zero, otherwise;<sup>28</sup>  $DSOURCE_l$  and  $DOCC_k$  are indicators for source and occupation, respectively. In particular, the occupational dummies ( $DOCC$ ) allow me to deal with occupational heterogeneity and to control for those occupations (master craftsmen, reapers, and wine growers) that consistently received high wages compared to the rest of the workers. In the baseline specification in equation (1), the standard unit of observation is the daily wage paid to a not-nourished worker for a particular task in a given season. However, while some observations are annual averages, seasonality is not observed for others (Appendix S1, Table S1.2). To limit the loss of information due to unobserved seasonality, I estimate equation (1) including a seasonal indicator  $DSEAS_j$  for each of the following categories: autumn, spring, summer, winter, mean, and unknown, where the category “mean” refers to cases where the wage observation is an annual average, while “unknown” denotes observations for which seasonality is not observed.<sup>29</sup>

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<sup>26</sup> I have not estimated agricultural wages for the Paris district. For the use of regression analysis in the treatment of price and wage data, see for example Clark (2005).

<sup>27</sup> The specification uses cluster-robust standard errors, clustered over cities.

<sup>28</sup> The wage observations come from approximately 300 urban and rural locations that occupy various levels in the urban hierarchy and cover different time periods. In descending order, the (top ten) cities providing most of the wage data are: Rouen, Troyes, Avignon, Amboise, Poitiers, Bourges, Orléans, Strasbourg, Chartres, and Amiens. I also include a location dummy for France equaling one for national average wages from the nineteenth century official statistics.

<sup>29</sup> Clark (2007, p. 101) uses a similar procedure. The set of seasonal indicators includes five categories for agricultural laborers: “winter” (October-March), “summer” (April-September), “mean,” “harvest,” and “unknown.” All predictions concern wages outside harvest obtained by setting “mean” as the base case.

To test the consistency of this procedure, I re-estimate equation (1) using two different sub-samples. The first is obtained by dropping the categories “mean” and “unknown” (Model S1), while the second excludes observations for which seasonality is not directly observed (Model S2). Figure 2 compares the predictions of Models S1 and S2 with the estimates obtained by fitting equation (1) on the full sample (baseline model). These series all refer to not-nourished workers, setting the national average wage of a French helper mason paid in autumn as the base case.<sup>30</sup> Although the predictions of Models S1 and S2 are relatively more volatile, the overall trends match the predictions of the larger sample.

Furthermore, I check the consistency of the procedure to distinguish between “nourished” and “not-nourished” workers by fitting the benchmark regression model on the reduced sample of “not-nourished” workers (Model F1). Results reassuringly confirm that there are no significant differences between the baseline specification and Model F1 (Appendix S1, Figure S1.5). Finally, I explore the sensitivity of results to the unequal spatial distribution of the data by fitting a weighted regression model that assigns greater weight to observations that have less spatial coverage (Model W1). These weights indeed correspond to the inverse of the probability of an observation being selected into the sample and are calculated by taking the inverse of the sampling fraction in a certain decade. In addition, to control for differences in regional wage movements, I add an interaction term between period-dummies (an indicator for each of the 50-year intervals between 1250 and 1860), and a set of regional (Paris Basin, Center, East, North, South) and seasonal indicators (Model W2) to the basic specification. Inspection of Figure S1.10 (Appendix S1) suggests that the predictions of models W1 and W2 are broadly consistent with the baseline specification.

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<sup>30</sup> The base case for source is “Levy-Leboyer (1971).” The section ‘Seasonality’ of Appendix S1 shows that results are similar for French building craftsmen and agricultural laborers.

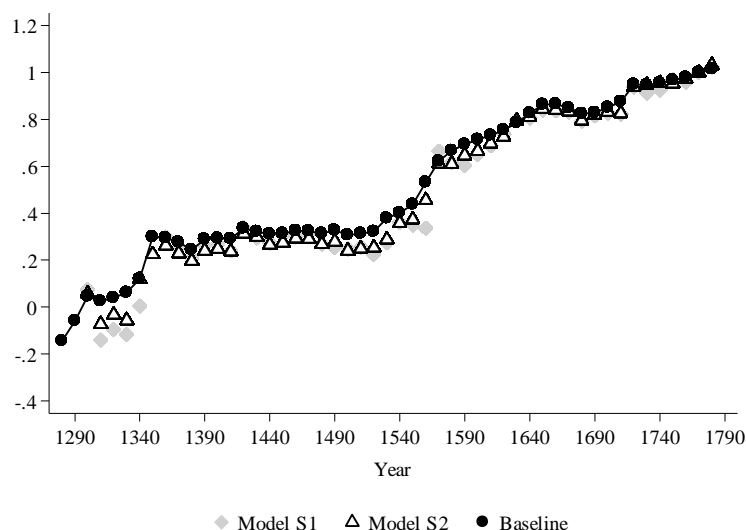


FIGURE 2  
SEASONALITY: NOMINAL WAGES OF FRENCH BUILDING LABORERS (1770–79=1)  
*Notes and Sources:* see text. The index is based on the series of nominal wages in sous tournois per day (log form).

## PRICES: SOURCES AND METHODOLOGY

The price dataset includes around 46,600 quotes of 12 commodities, retrieved from a large set of printed primary and secondary sources. These data have been supplemented with new archival evidence from the account books of religious institutions, hospitals, and the records of several construction sites, which provide information on the price of bread, wine, and textile products.<sup>31</sup> Even if the price observations are unevenly distributed over time, the sample has wide spatial coverage with the Center and the South together supplying about 42 percent of the price data, followed by the East (31 percent), North (17 percent), and Paris district (10 percent).<sup>32</sup>

I estimate the individual component price series of the consumer price indices for France and the Paris district using OLS regression models of the following form:<sup>33</sup>

$$\ln(p_{it}) = \sum_i \alpha_i LOC_i + \sum_t \beta_t D_t + \sum_k \gamma_k DTYPE_k + \varepsilon_{it} \quad (2)$$

<sup>31</sup> As part of the data reflect wholesale rather than retail prices, extensive use of such material may underestimate the cost of living of ordinary consumers. In the section ‘Price series’ of Appendix S2, I show this potential source of error should not bias the estimates or affect the comparison of real wages.

<sup>32</sup> See note 10 for a definition of the various regions. For a description of the distribution of price quotes over time, see Appendix S2, Figure S2.1.

<sup>33</sup> This aggregation of the data is suggested by the fact that prices had remarkably similar trends across France. The only exceptions were Artois, the Cambrésis region, and Flanders where grain prices remained relatively high even in the post-plague phase because the demand of Flemish cities sustained the cereal prices (Le Roy Ladurie 1969, p. 829). To account for this particular spatial pattern, I re-estimate the series of wheat excluding observations originating from these regions. The differences between the series are negligible.

where  $p_{it}$  is the price of a certain item in location  $i$  and time  $t$ ;  $D_t$  is a year dummy;  $DTYPE$  is a set of indicators that control for differences in the typology of source, quality, and the unit of measurement of individual commodities. I introduce these controls because *ceteris paribus*, both the quality of the product and the measuring unit can result in large price differences, even for the same good. Due to the dearth of direct evidence, I estimate the price of bread using Allen's (2001) bread equation and follow an analogous procedure to derive meat prices (Appendix S2, Table S2.2). Finally, I deflate nominal wages using a Laspeyres consumer price index whose weights reflect the quantities consumed per person per year as originally proposed by Allen (2001).

The consumption bundle provides 1,940 calories per day, sufficient proteins, and some expenditure on lighting, lodging, and clothing (Table 1). This weighting scheme represents a reasonable starting point to facilitate the international comparability of the series. However, in the Appendix S2, I depart from the benchmark index. Based on an examination of 116 French consumption baskets for the period 1343–1787 and a set of nineteenth century consumption bundles, I show the robustness of this specification to changes in the formula and weights used for construction (Appendix S2, Figure S2.3).

TABLE 1  
CONSUMER PRICE INDEX: BASKET OF GOODS

Good	Unit (metric)	Weight	Calories per unit	Calories per day	Proteins per unit	Proteins per day
Bread	kg	182	2450	1221.6	100	49.9
Beans/peas	liter	52	1125	160.3	71	10.1
Beef	kg	26	2500	178.1	200	14.2
Butter	kg	5.2	7286	103.8	7	0.1
Cheese	kg	5.2	3750	53.4	214	3
Eggs	each	52.0	79	11.3	6.3	0.9
Wine	liter	91.0	850	211.9	0	0
Soap	kg	2.6				
Linen	meter	5.0				
Candles	kg	2.6				
Oil light	kg	2.6				
Firewood	BTU (Millions)	5.0				
Total				1940.4		78.2

Source: Allen (2001).

Figure 3 displays the evolution of consumption prices in France and the Paris district and compares their evolution with Allen’s (2001) index for Paris. Overall, my series implies a slightly higher level of prices in Paris. This difference can be ascribed to the fact that several prices Allen relies on come from Strasbourg, while the data used in this study are drawn from the account books of Parisian religious institutions and hospitals.<sup>34</sup> Nevertheless, the series predict similar trend improvements. Overall, consumption price evolution in France is characterized by a typical U-shaped trend between the 1340s and 1420s and two successive waves of long-run inflation between c.1500–1650 and by the beginning of 1700.<sup>35</sup> However, prices in Paris grew faster than in the rest of the country by the 1550s. Consumption prices increased fourfold in France but almost sevenfold in Paris.

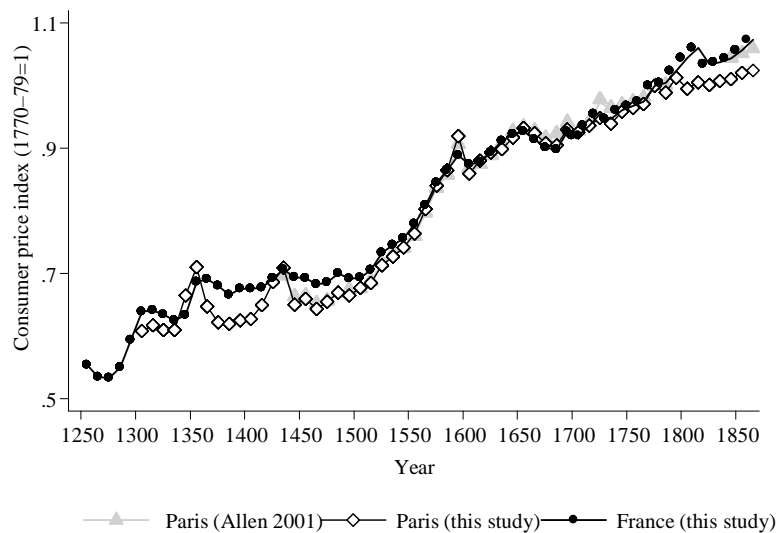


FIGURE 3  
CONSUMER PRICE INDICES: FRANCE AND THE PARIS DISTRICT

### THE LONG RUN EVOLUTION OF WELFARE RATIOS IN FRANCE

Following Allen (2001), nominal wages and prices are used to construct welfare ratios by dividing the annual income of a notional family of four components (woman, man, and two children) by the cost of maintaining it. Computations rest on the assumptions that the adult male worked 250 days per year and no other member of the family earned income. Total expenses are set equal to 3.15 times the price of the basket of goods to

<sup>34</sup> See Allen (2001, pp. 439–440) for a detailed description of the sources of prices and wages in Paris.

<sup>35</sup> The first peak after the Black Death was followed by a phase of falling prices and replaced by a new wave of inflation by the end of 1400 that culminated in the 1420s during the “Hiroshima phase” of the Hundred Years’ War. This expression is borrowed from Bois (1976) and denotes the period of greater political instability during the Hundred Years’ War in Normandy between c. the 1430s–1440s.

include a housing cost of 5 percent of total expenditure and support the entire family at the same standard of living as the male breadwinner.<sup>36</sup>

Figure 4 compares the welfare ratios of Paris building craftsmen and Paris building laborers with analogous series from Allen (2001). This comparison shows my series tracks Allen's (2001) Paris welfare ratios closely when they overlap, even if Allen's series implies slightly lower living standards, reflecting the differences in consumption prices mentioned above. In contrast, my series predicts higher welfare ratios for Parisian craftsmen. The source of this deviation lies in the evolution of the skill premium in Paris before 1726. According to Allen, mason's wages were 60 percent above Micheline Baulant's (1971) series of building laborers prior to 1726. In contrast, I found the wage differential between skilled and unskilled construction workers approached 100 percent during the fourteenth and sixteenth centuries (Baulant 1976, p. 980) but fell to 67 percent in the eighteenth century (Baulant 1971, pp. 480–481).<sup>37</sup> Baulant's (1971) series of building laborers is modified accordingly and these data have been used to integrate the direct evidence on building craftsmen's wages. In the case of France, there are no series spanning the entire period that is considered in this study. Accordingly, comparisons are only possible since the nineteenth century when the first estimates of industrial workers' real wages become available. Figure 5 shows that my series of building laborers' wages tracks closely with the indices of Bayet (1997), Lévy-Leboyer and Bourguignon (1985), and Kuczynski (1946) during the nineteenth century. However, my index is more volatile because it assigns greater importance to bread, which has relatively more erratic prices.

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<sup>36</sup> This procedure did not adjust for changes in the structure of consumption and employment behavior. In the absence of precise information, I favor Allen's (2001) assumptions over alternatives to set up proper international comparisons and facilitate interpretation of trends. See Appendices S1 and S3 for details.

<sup>37</sup> See Appendix S1 for a detailed description of the sources.



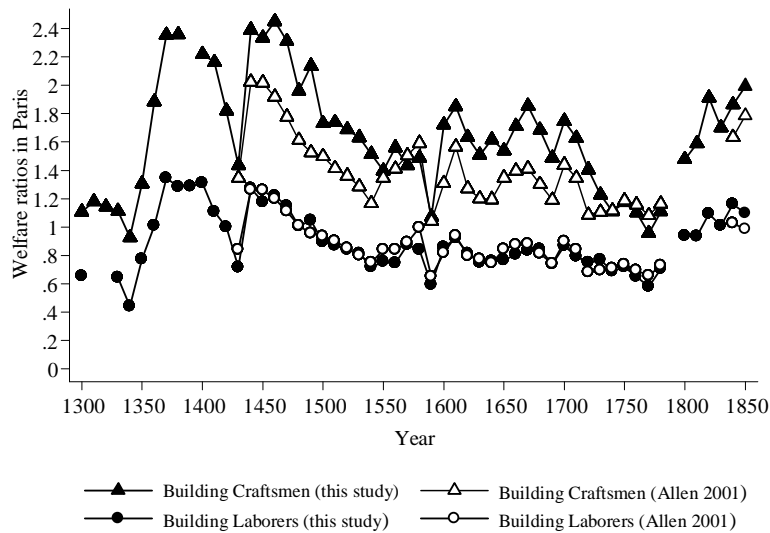


FIGURE 4  
WELFARE RATIO OF PARISIAN CONSTRUCTION WORKERS

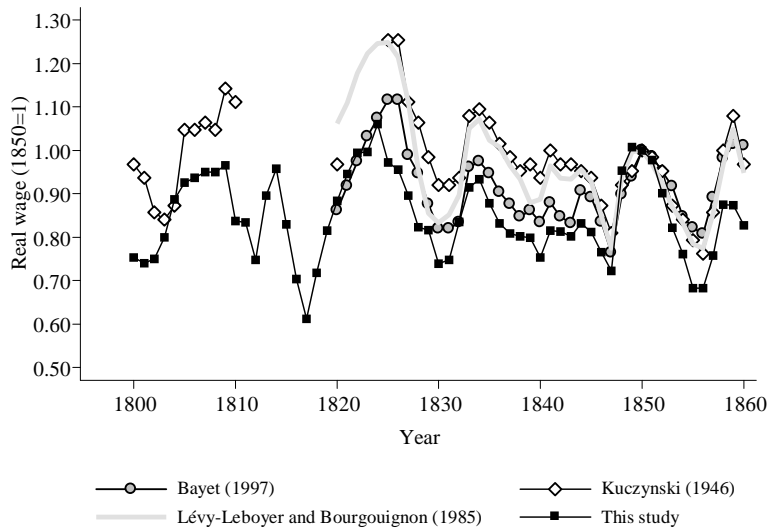


FIGURE 5  
FRENCH REAL WAGES: COMPARISON WITH PREVIOUS ESTIMATES  
*Sources:* Bayet (1997), Kuczynski (1946), Lévy-Leboyer and Bourguignon (1985).

### REAL WAGES IN PARIS AND LONDON, 1300–1860

So far, I have described the new series of real wages in the context of existing literature on French real wages without providing a characterization of the main trends. In this section, I compare the long-run evolution of real wages in Paris and London, while in the following section, I move on to consider England and France. Such comparisons are important for understanding to what extent the comparative real wage history of London and Paris matched analogous developments taking place at the country level.

Figure 6 shows the welfare ratios of building laborers in Paris and London over the period 1300–1860.

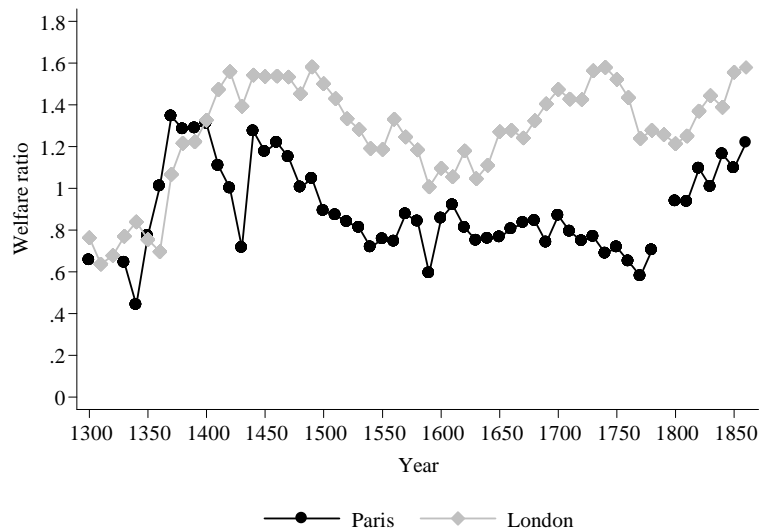


FIGURE 6  
WELFARE RATIOS OF BUILDING LABORERS IN PARIS AND LONDON  
Sources: Paris, this study. London, Allen (2001).

The substantive result emerging from this comparison is the almost steady trend of divergence between London and Paris welfare ratios dating back to the first decades of the fourteenth century when a large real wage gap first appeared. This trend anticipated by almost a half-century the well-known divergence in real wages between London and a wide set of southern European cities originally documented by Allen (2001). Internal conditions rather than factors peculiar to the international cycle of the construction industry were seemingly the source of the “precocious divergence” of real wages in Paris. The available evidence suggests that the declining trend in Paris welfare ratios was the result of the adverse combination of warfare and demographic factors. In Paris, unlike most European areas, the effects of the Black Death and its periodic visitations were compounded with the consequences of the Hundred Years’ War. Information from the account books of religious institutions indicates agricultural production saw a sharp decline during the three decades (*les trois horribles*) of greater political turmoil and military conflict (1410–1440), while prices increased dramatically after the monetary debasements of 1417, 1419, and 1420.<sup>38</sup> As daily wages adjusted only partially to prices, real wages in Paris fell rapidly between the 1410s and the 1440s. At the same time, London and the other leading European cities were experiencing the culmination of a process of real wage increases prompted by the Black Death. As a consequence, while the difference in real wages between Parisian and London building laborers was almost undetectable on the eve of the fourteenth century, by the

<sup>38</sup> The series of wheat prices are more fragmented in this period. However, the account books of the abbey of Saint-Germain-des-Prés allow us to trace the various phases of this process in some detail (Fourquin 1964, p. 314). Before 1415, the price of a Parisian setier of rye fluctuated between 6 and 9 sous parisais, jumped to a range between 64 and 80 sous parisais between May and October 1419, and peaked at 448 in May 1421.

1430s London building laborers were already earning twice as much as their Parisian counterparts. When the conflict came to an end, real wages in Paris recovered part of the lost ground but never reverted to their pre-crisis levels, averaging about one-half the levels prevailing in London between c.1450–1600.

By the early seventeenth century, the ratio between London and Paris welfare ratios widened dramatically and peaked in the 1740s at around 2:1. The progressive consolidation of London as a high wage location in England (Allen 2015; Boulton 2000, p. 169) primarily reflected the dynamism and growing diversification of its economy. As the national government became more centralized, London established itself as the legal and financial center of the country, increasingly benefiting from its proximity to Westminster (Rappaport 2002, p. 119). Furthermore, by the sixteenth century, the expansion of manufacturing and new industries that produced for domestic rather than overseas markets offset the crisis of traditional sectors associated with the cloth export trade and the unemployment caused by the city's demographic boom (Dietz 1986). However, London's standing contrasted with Paris, whose economy grew more around the needs of the state than from the development of trade and manufacturing and never enjoyed anything comparable to the internal stability of London (Sheppard 1998, p. 145–6; Biraben and Blanchet 1998). This situation changed after the second half of the eighteenth century when the difference between the earnings of London and Parisian building laborers fell sharply due to the rise in Paris real wages between the French Revolution and the first Empire. Even so, in the first half of the nineteenth century, London building laborers still earned between 20 and 30 percent more than their Parisian counterparts, consistently with Allen's (2001) estimations. Overall, if used as the basis for nation-wide conclusions, this city-level evidence can only reinforce the argument that has dominated recent literature, positing that English preeminence was built gradually and dated back to the early modern period (Allen 2001, Broadberry 2015).

To understand the pattern of change in real wages in Paris, it is also convenient to examine some aspects of the demographic evolution that took place in this city and relate these changes to analogous developments occurring in London. The exact population of these cities is a matter of debate before the first nineteenth century censuses. In round figures, it appears that before 1500, population and real wages were characterized by a remarkably stable inverse relationship, which largely reflected the great demographic cycle fueled by the Black Death (Figures 7 and 8). Nevertheless, between 1500 and 1800, the experiences of Paris and London neatly diverged. Toward the end of the fifteenth century, the population of Paris returned to the level that prevailed before the demographic collapse of 1348, but witnessed rapid expansion thereafter. At the

beginning of 1500, Paris had around 220,000 inhabitants, soaring to 400,000 inhabitants before the great siege of 1590–92, reaching perhaps 500,000 inhabitants toward the end of the seventeenth century, and about 600,000 on the eve of the French Revolution. The rapid growth of the Parisian population (approximately 170 percent over the period 1500–1792) was paralleled by a prolonged phase of real wage decline (about 20 percent).<sup>39</sup> Overcrowding effects and excess labor supply are plausible candidates for explaining the decrease in real wages in Paris. The absence of homogeneous information on population density prevents any firm conclusion, but scattered evidence tentatively suggests that extremely low real wage values were reached during phases of rising population pressure, namely 1328, 1560–1570, and 1787–1788.<sup>40</sup>

This situation changed between 1792 and 1801, when the sharp rise in building workers' earnings, fostered by the positive construction industry cycle (Potofski 2009) and the increasing and widespread scarcity of labor during the Consulate and the Empire (Chabert 1944), led to a radical shift in the relationship between population and real incomes.<sup>41</sup> From that period onward, real wages kept pace with population growth. This evidence suggests the Parisian economy's growing diversification and the stimulus of public work in the construction industry could indeed assimilate the inflow of laborers to the capital without reducing workers' living standards (Potofski 2009). On the other hand, with only about 50,000 inhabitants in the early sixteenth century, London was still a relatively small center compared to Paris. Despite that, in 1600 its population amounted to about 200,000 inhabitants, reached about 575,000 in 1700, and more than 1 million in 1801. Unlike Paris, in London the inverse relationship between real wages and population started to change in the seventeenth century when the rapid demographic expansion fueled by the city's economic growth ran almost invariably parallel with rising real wages (Figure 8).

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<sup>39</sup> This temporarily broke down only in the first half of 1600 when population jumped, partially in response to the city's depopulation that occurred during the siege of 1590–92.

<sup>40</sup> The 1328 register of households indicates that population density could have approached around 63 inhabitants per square kilometer in an area of 3500 square kilometers surrounding the capital (Jacquart 1980, p. 88) more than twice as high as that in France. According to Jacquart, population attained a new peak density in 1560–1570, and despite several attempts to prevent population growth through successive construction bans and creation of new "satellite" towns (Biraben and Blanchet 1998), this level remained unsurpassed until the first decades of 1700. Between c.1700 and 1787–1788, population density again increased, passing from about 62 to 81.6 inhabitants per square kilometer (Dupâquier 1988, vol. 2, p. 76).

<sup>41</sup> In contrast, according to Potofski (2009), despite administrators' fears of labor shortages due to military conscription, war mobilization involved only 1 percent of the Parisian population.

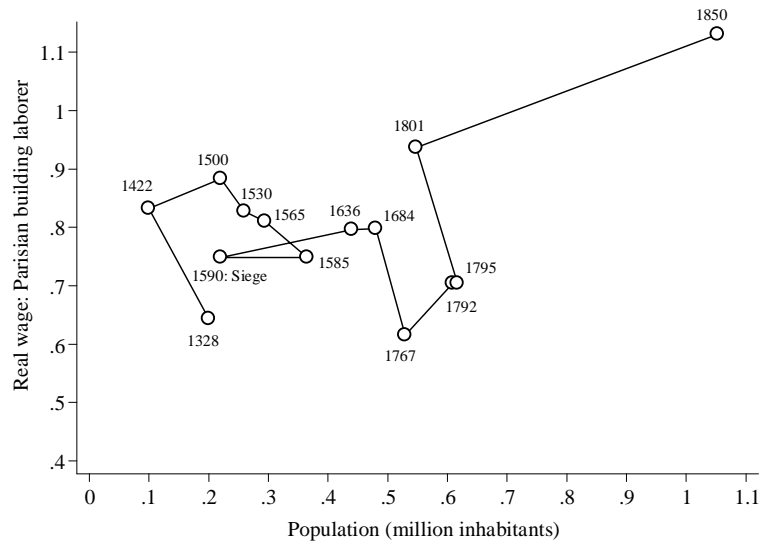


FIGURE 7

REAL WAGES AND POPULATION IN PARIS

Sources: Real wages, this study. Population of Paris: Jacquart (1980) for 1328 and 1422; Biraben and Blanchet (1998) between 1500 and 1801; Bairoch, Batou and Chèvre (1988) for 1850. Real wages are expressed as 20-year averages.

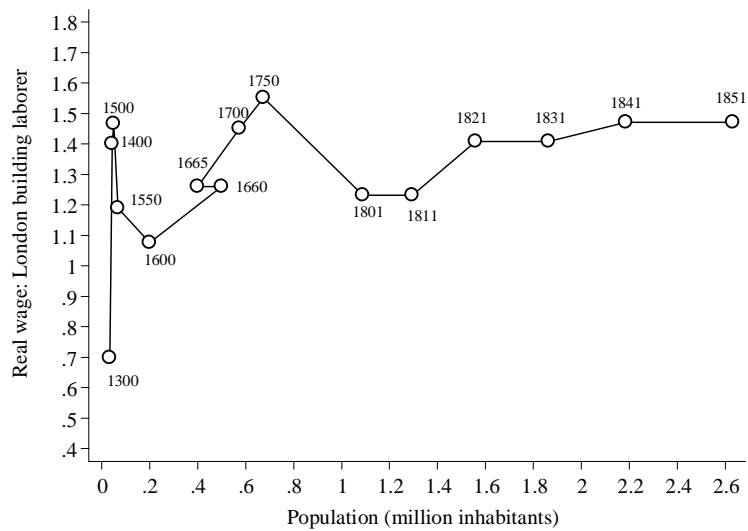


FIGURE 8

REAL WAGES AND POPULATION IN LONDON

Sources: Real wages, Allen (2001). London's population: Bairoch (1988) between 1300 and 1500; Sheppard (1998, p. 363) between 1550 and 1750. For the years before and after the Great Plague of 1665, Porter (2009, pp. 56-57). From 1801 to 1851, official population censuses.

## REAL WAGES IN FRANCE AND ENGLAND, 1250–1860

In this section, I shift the focus from comparing Paris-London to comparing France-England. Building primarily on the price and wage series estimated by Gregory Clark (2004, 2005, 2007), I construct new series of welfare ratios for building and agricultural laborers in England following the same procedure illustrated above for France.<sup>42</sup>

Figure 9 shows the ratios of English to French welfare ratios of building and agricultural laborers in the form of decadal averages.

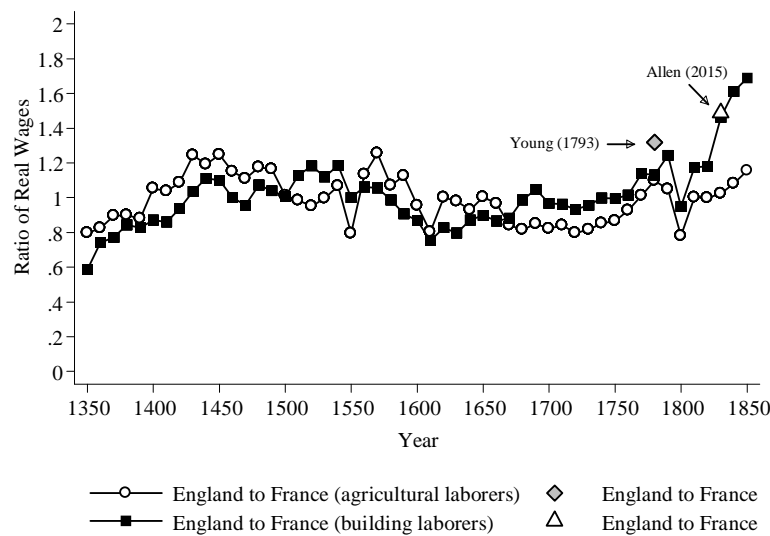


FIGURE 9

### RATIO OF REAL WAGES BETWEEN ENGLISH AND FRENCH AGRICULTURAL AND BUILDING LABORERS

*Sources:* France: this study. England: nominal wages come from Clark’s dataset available at: <http://www.iisg.nl/hpw/data.php> (English prices and wages, 1209–1914). Prices: (i) Bread: between 1259 and 1817 prices are extrapolated using Allen’s bread equation with wheat prices and craftsmen wages from Clark’s dataset. Thereafter, Clark’s bread prices. (ii) Beans, peas, beef, butter, cheese, eggs, linen cloth, candles, and oil light come from Clark’s database. Legumes are peas to 1499 and then they are an un-weighted average of the price of beans and peas. (iii) Beer, charcoal, and soap prices concern southern England (Allen 2001) since these prices are much lower than those by Clark. Data are available at: <http://www.nuff.ox.ac.uk/users/allen/studer/london.xls> (prices and wages of London and Southern England).

*Notes:* Clark’s (2005) wage series of construction workers are constructed without controlling for seasonality. To ease comparability and guarantee internal consistency of the series, predictions for France are obtained by setting “mean” as the base case, where “mean” indicates the annual average wage. The few gaps in the series are linearly interpolated. Welfare ratios for England are constructed following the same procedure illustrated in the text for France (Allen 2001).

The comparison of English to French real wages reveals a sequence of convergence and divergence phases rather than the steady and almost continuous process of divergence featured in the London-Paris comparison. In addition, it suggests that England emerged as a high wage economy relative to France by the second half of the eighteenth century. Broadly speaking, it is possible to distinguish three distinct stages over the period 1250–1860 (Figure 9).

<sup>42</sup> See notes to Figure 9 for a description of the sources.

The first phase was characterized by the tendency of English real wages to converge to the French levels between the late thirteenth and first half of the fifteenth century. This trend gained momentum after 1348 when the real wages of English laborers almost doubled while those of their French counterparts experienced a much lower increase. This evidence calls for a deeper investigation.

Classic Malthusian dynamics, working through variations in labor supply, as well as “horsemen-effect” type mechanisms that more directly relate real wage changes to war and diseases via urbanization, cannot account for the evolution of per capita incomes in this phase.<sup>43</sup> Indeed, contrary to the predictions of these models, real wages in France did not shift to a higher equilibrium level but remained stagnant or even declined in spite of demographic contraction.<sup>44</sup> The fact that this particular form of evolution of real wages was not shared by other countries suggests that factors specific to France dominated in this phase.

There is a deeply ingrained tradition among historians of the Hundred Years’ War to play down the economic effects of war and political turmoil, stressing the episodic and intermittent nature of the conflict, its low impact on population as well as its unequal spread in French territory.<sup>45</sup> However, the behavior of real wages suggests the effects of war did more to shape the course of real incomes than most literature has previously assumed. Recent contributions have revealed that armed conflict was much more frequent than previously thought (Firnhaber-Baker 2010) and that major land wars had a long-run negative effect on the French economy. Philip Hoffmann (1996) has shown that total factor productivity fell by approximately 25 percent in the areas of France where fighting was more intense during the Wars of Religion and the Thirty Years’ War. This occurred because armed conflict destroyed capital, especially that invested in clearing land, which represented a large share of total investment in the pre-modern economy. In addition, when peasants fled from troops, they took refuge in cities, and this movement was a potent driver of urbanization in the long run (Dincecco and Onorato 2016). Conflict could also provoke mortality crises (Weir 1989) and affect the distribution of population across space as well as the local dynamics of demand and supply of labor.<sup>46</sup> For instance, during the crisis of 1417–18, waves of refugees flocked to Paris (Forquin 1964, p. 359) to find protection behind the city walls and the progressive inflow of migrants from outlying rural parishes emptied the latter and swelled the city’s population. It can be argued that these dynamics played a role in shaping the

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<sup>43</sup> Voigtländer and Voth (2013) first characterized this self-enforcing mechanism leading to a higher equilibrium real wage as the “horsemen effect.” This process was sustained by the rise in mortality rates brought about by greater urbanization rates following the war-related real wage gains.

<sup>44</sup> Bove (2015) and Higounet-Nadal (1980).

<sup>45</sup> Contamine (1974) reviews the literature.

<sup>46</sup> See Higounet (1953) on the repopulation of the areas of Southwestern France that had been devastated by the Hundred Years’ War.

course of nominal wages and prices in this period. Furthermore, the exceptionally long duration of the conflict and its intermittent nature affected the timing and strength of real wage growth, which indeed was characterized by alternating peaks and troughs rather than by a steady trend of recovery.<sup>47</sup>

The second phase covers the period 1450–1750. Figure 9 suggests that in this phase, the real wages of English laborers did not exhibit any clear trend of diverging from their French counterparts. Conversely, although on a smaller scale for both duration and intensity, between the late sixteenth century and the eve of the French Revolution, the history of real wages in Europe is characterized by a second long cycle of growth and decline in which French real wages temporarily overtook the levels prevailing in England. The pattern of real wage growth and decline taking place between c.1550–1750 was the result of a series of mortality crises (famines and epidemics) and war-related shocks that unevenly affected the demography of various European countries.<sup>48</sup> In Germany, the effects on population of the Thirty Years' War replicated, just as in the modern era, the demographic collapse of the Black Death, transforming it into the high wage economy of the seventeenth century (Appendix S3, Figure S3.2). In France and Northern Central Italy, these shocks seem to also have had a positive impact on the growth of real wages (Malanima and Capasso 2007, p. 27) but on a much lower scale. In the most affected regions of Northern and Eastern France (Cambrésis, Alsace), production witnessed a major slump between the 1630s–1660s, and population probably fell by as much as 20 percent. In contrast, as one moves to the Center and the South the effects of war are reduced (Le Roy Ladurie 1987, p. 309).<sup>49</sup> Despite these regional differences, the series of nominal daily wages had remarkably similar trends across space, which suggests the evolution of real wages probably reflected a more general context of demographic decline.<sup>50</sup>

The third phase, covering the period after the 1750s, saw the progressive emergence of a real wage gap between English and French laborers. By the second half of the eighteenth century, population growth gained momentum, prices increased, and the real wages of French building laborers declined until the end of the eighteenth century. Unlike France, the real wages of English laborers remained remarkably stable, attesting to the higher resilience of the English economy in the face of population growth. Over the same period, England began to diverge from other areas of Europe, like Germany (Appendix S3, Figure S3.2) and

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<sup>47</sup> Boutruche (1947, p. 197 and ss) defined this alternation of phases of destruction and recovery as “eclipse reconstruction” (reconstruction à éclipses).

<sup>48</sup> See Alfani and Murphy (2017) on the major lethal epidemics in Europe in the modern period.

<sup>49</sup> This appears from the title series (Le Roy Ladurie 1987), and total factor productivity measures (Hoffman 1996).

<sup>50</sup> According to Le Roy Ladurie (1987), throughout the seventeenth century prices fluctuated without trend since the absence of meteorological adversities and demographic lethargy contributed to keeping grain prices low.



Northern Central Italy (Malanima 2013). The analysis of other economic indicators can help test the plausibility of these results.

For example, the evidence on urbanization rates, which are frequently used as a proxy for income per capita, supports the previous conclusion, suggesting England became more urbanized than France between the 1700s and the 1750s, approximately the same period that real wages of building laborers in England were overtaking those in France.<sup>51</sup> In addition, the cycles of physical stature in the eighteenth century seem to be quite consistent with the evolution of real wages illustrated above.<sup>52</sup> Even if the size of the height gap between England and France is hard to ascertain given the fragile data, the evidence on the stature of male convicts and army recruits suggests the British were taller than the French on the eve of the French Revolution and this fact has recently been associated with the higher quality of the British labor force in terms of human and physical capital (Kelly, Mokyr and Ó Gráda, 2014).<sup>53</sup>

So far, I have assumed that the timing of the Little Divergence in real wages between England and France was not affected by the various assumptions used to construct the welfare ratios. However, the results (based on a standard of 250 days of work) ought to be revised if these countries experienced a significant increase in the number of days worked per year. To address this concern, I compare the evolution of real wages in France and England obtained by assuming a fixed working year with alternative scenarios that imply “industrious revolutions” of varying intensity. I estimate trends in the actual working year in France and England by relying on a set of independent estimations and a large sample of French building projects that recorded the weekly number of days worked per person for the period 1320–1644.<sup>54</sup> I find the results are robust to changes in the days worked per year (Appendix S3, Figure S3.3). Indeed, consistent with the previous findings, real wages of English building laborers started to diverge from those of their French

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<sup>51</sup> In France, the urbanization rate was around 13 percent in 1600, 12 in 1650, 14 in 1700, and almost 15 in 1750, whereas in England it was approximately 12 percent in 1600, and 16, 15, and 24 percent in 1650, 1700, and 1750, respectively. These figures come from Fink-Jensen’s (2015) dataset available on the IISH’s website at: <http://hdl.handle.net/10622/LZ0Y36>.

<sup>52</sup> Trends in stature are not a perfect predictor of real wages since there is a large range of potentially relevant factors that influence this relationship (Steckel 1995).

<sup>53</sup> The evidence on human stature for the early eighteenth century indicates that the height gap was probably lower than in the late eighteenth century since the English were about as tall as the French, especially those living in Northern France (Komlos and Cinnirella 2007).

<sup>54</sup> See the section ‘Working days’ of Appendix S1 for a detailed description of methods and materials. The dearth of information prevents me from extending this check to other countries. However, the inflationary trend of the second half of 1700, and the expansion of calendar times (García-Zuñiga (2014)) suggest that at that time, work year increases of different intensity could have taken place in most parts of Europe.

counterparts after c.1750.<sup>55</sup> As shown in Figure S3.4 (Appendix S3), the timing of the Little Divergence in real wages is also robust to variations in the structure of consumption derived from estimating an oats-based basket (Allen et al. 2011, Tab.4, p. 21) instead of a bread-based one.

### *Malthusian dynamics in France and England*

The different character of economic and demographic development between France and England has spawned a long tradition of comparative analysis. Anthony Wrigley and Roger Schofield (1981) were among the first to emphasize these differences, distinguishing between a high-pressure Malthusian regime for France and the low pressure equilibrium prevailing in England. Thus, whereas French mortality rates were very sensitive to income movements (strong positive check) and fertility mechanisms were relatively ineffective (weak preventive check), in England, adjustments to equilibrium through fertility prevailed (strong preventive check) over mortality-driven mechanisms due to the lower elasticity of mortality to per capita incomes (weak positive check). These differences imply that, in equilibrium, population densities were higher in France than in England, while the reverse was true for wages. However, subsequent research has questioned this view. In particular, David Weir (1984) has shown that France did not conform to a high-pressure Malthusian regime because the preventive check in France was even more effective than in England, while the sensitivity of mortality to price changes was greater in France only prior to 1740.

A full analysis of these dynamics is beyond the scope of this study. However, using the newly constructed series of welfare ratios, in what follows, I highlight some of the differences between France and England in economic and demographic developments. I accomplish this in two ways.

First, I concentrate on a brief characterization of one of the basic tenets of the Malthusian model, namely the relationship between real wages and population. Figure 10a shows the evolution of the relationship from regressing the logarithm of the real wages on the log of population using a locally weighted scatter plot smoothing (LOWESS). I fit this regression starting with the period 1250–1550 and then sequentially expand the sample by adding 10-year windows until full coverage is reached (1250–1860).<sup>56</sup> Although this exercise admittedly provides only a partial guide to interpreting Malthusian dynamics, it allows me to introduce a

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<sup>55</sup> Notice this result is not significantly altered even in the extreme hypothesis that the actual working year experienced a significant increase in England (based on the trend outlined in the notes to Figure S3.3 of Appendix S3) but remained fixed in France. In this case, the real wages of English building laborers started to diverge from their French counterparts by the 1730s, and again the real wage gap between England and France was modest (c.10 percent) in the first half of the eighteenth century.

<sup>56</sup> For  $d = 0, 1, \dots, 61$ , I fit the following regression:  $\ln(wr) = \alpha + \beta \cdot \ln(pop)$  if year  $\geq 1250$  and year  $\leq 1550 + 10 \cdot d$  where  $d$  indexes the  $i$ -th decade between 1550–1850,  $wr$  is the welfare ratio, and  $pop$  is population.

simple characterization of the changing relationship between the new series of real wages and population over time. Now the scatter plot summarizing the trade-off between real wages and population for the period 1250–1550 points to an inverse relationship between the two variables, consistent with the Malthusian model’s prediction. Nevertheless, the scatter-plot is relatively flat for high values of real wages because real labor earnings stagnated in spite of the falling population during the 1370s–1450s. In addition, the scatter points for the periods 1250–1560, 1250–1570 up to 1250–1610 become more negatively sloped, suggesting that the structural features of the Malthusian relationship do not change in this phase. However, as the sample is progressively expanded to incorporate the decades after 1610, the scatters summarizing the trade-off tend to become flatter. This occurs because real wages show little sign of any trend while population almost doubles between the 1620s and the 1860s. However, this evolution was gradual and took place in two phases. The first, which occurred between the 1620s and 1790, was characterized by a slow “de-linking” of the relationship between real wages and population because per capita incomes remained roughly stable while population increased by around 37 percent. Nevertheless, population was still an important factor in determining real wage changes in this phase.<sup>57</sup>

A clear break in the relationship occurred only after the 1790s, when the flattening of the curve proceeded at a faster pace because real wage increases kept pace with population growth.<sup>58</sup> In contrast, in England, the trade-off between real wages and population was characterized by a remarkably stable inverse correlation until the mid-sixteenth century and by a steady “flattening” of the pre-1550 relationship in the subsequent period (Figure 10b). This pattern can be interpreted as evidence of an expansion of labor demand possibly related to the growth of the state, proto-industrial sectors, and international trade (Allen, 2009, chap. 5).<sup>59</sup>

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<sup>57</sup> The crisis of the second half of 1700 was characterized by rapid population growth and falling real wages.

<sup>58</sup> Between the 1790s and 1860s population increased by about 30 percent while real wages rose by around 22 percent.

<sup>59</sup> Real wages display an analogous evolution in other countries. This suggests that developments common to Europe may have prevailed over country-specific factors.

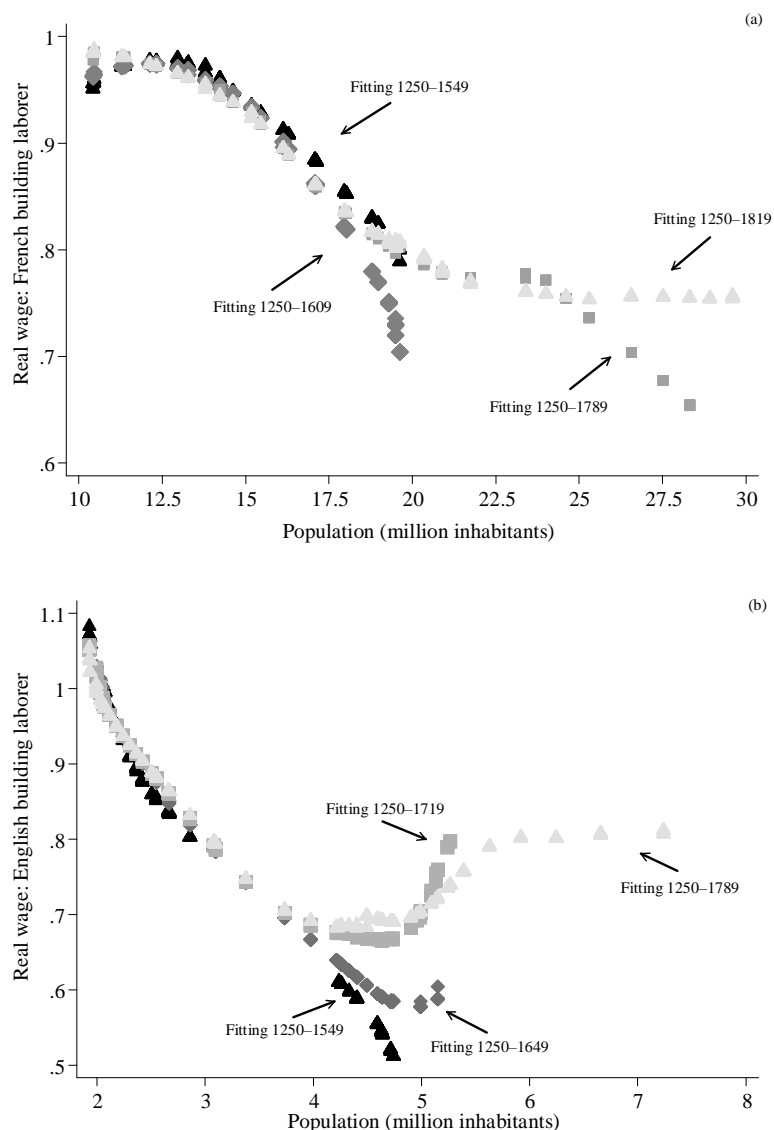


FIGURE 10

EVOLUTION OF THE TRADE-OFF BETWEEN REAL WAGES AND POPULATION: FRANCE (a) AND ENGLAND (b)

*Sources:* Population: France between 1330 and 1450 from Dupâquier (1988, vol. 2, pp. 515–516). From 1550 to 1729 the French population is the average of the minimum and maximum values reported in Dupâquier (1988, vol. 2, p. 68). From 1740 to 1790, Henry and Blayo's data corrected by Dupâquier (1988, vol. 2, p. 64) to account for under-registration of deaths (especially children aged less than 5 years). For the period 1801–1861, Dupâquier (1988, vol. 3, p. 123). Values are expressed at current day frontiers. England: Broadberry et al. (2015, p. 20) before 1541 and Wrigley and Schofield (1981, p. 528) thereafter. Intervening values have been linearly interpolated. Real wages: France: this study. England: *ibidem* Figure 9.

*Notes:* The scatter points summarizing the trade-off between real wages and population come from regressing recursively (locally weighted scatterplot smoothing) the logarithm of the real wage on the logarithm of population starting from the period 1250–1550 until 1250–1860.

Second, I examine the statistical properties of the time series of real wages using formal unit root and stationarity tests which can provide a summary indication of the effectiveness of Malthusian checks over a certain period.<sup>60</sup> In a Malthusian economy, one should observe a tendency of real wages to revert to their long-run equilibrium level after a shock. In other terms, real wages should be stationary because there are checks to population growth working through variations in fertility (positive check) and mortality

<sup>60</sup> Statistical tests of this type have been applied to a number of European countries. See for example Nicolini (2007) for England and Pfister (2017) for Germany.

(preventive check) rates, which counteract deviations of real wages from equilibrium. On the contrary, if the series are non-stationary, shocks have a permanent effect on real wages and these could move away from equilibrium for a long period. This suggests the adjustment mechanism based on purely demographic forces (Malthusian checks) is weak and other forces exist that tend to favor real wages deviations from equilibrium. These can include technological change, exogenous shocks to labor demand related to war and political instability, and the expansion of international trade. To analyze the statistical properties of the time series of real wages I use two tests: the augmented Dickey-Fueller (ADF) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The former tests the null hypothesis that the time series has a unit root, while the latter tests the null hypothesis of stationarity of the series. Based on the test statistics of the ADF test, the null hypothesis of a unit root in the series of real wages of French building laborers is rejected both in level and in level with trend for various sub-periods (Table 2).<sup>61</sup> The results of the KPSS test lead to similar conclusions. Consistent with Weir's (1984) argument, this evidence suggests the presence of strong preventive and positive checks, lending support to the Malthusian interpretation that shocks do not have permanent effects on French real wages. Conversely, the results of the ADF test reject the null hypothesis of a unit root in the series of English building laborers between the early modern period and the first half of the eighteenth century.<sup>62</sup> However, the test statistics of the ADF and KPSS tests clearly point to the non-stationarity of the series of real wages in levels and in levels with trend by c.1750 (Table 2).<sup>63</sup> This evidence suggests that the endogenous adjustment of population to real wages in England had been significantly weakened by the eighteenth century.<sup>64</sup>

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<sup>61</sup> The non-stationarity of the series in the period 1250–1550 is likely to depend on the long cycle of real wage growth and decline fueled by the Black Death.

<sup>62</sup> As in the case of France, the non-stationarity of the series of English real wages between 1250–1550 is again primarily related to the demographic collapse following the Black Death.

<sup>63</sup> This result is robust to various specifications of the sub-periods.

<sup>64</sup> This evidence is consistent with Nicolini's (2007) argument that positive and preventive checks in England disappeared before 1740.

TABLE 2  
UNIT ROOT AND STATIONARITY TESTS OF REAL WAGE

FRANCE	ADF		KPSS	
	Levels	Levels with trend	Levels	Levels with trend
Log of real wage				
1250–1550	-2.14	-2.05	1.19**	0.61**
1550–1650	-5.76**	-5.73**	0.109	0.09
1650–1750	-4.70**	-4.71**	0.133	0.09
1750–1860	-4.30**	-4.30**	0.193	0.15*
ENGLAND	ADF		KPSS	
Log of real wage	Levels	Levels with trend	Levels	Levels with trend
1250–1550	-1.21	-2.34	3.83**	0.55**
1550–1650	-4.00**	-4.81**	1.17**	0.16*
1650–1750	-5.04**	-5.06**	0.23	0.12
1750–1860	-0.21	-1.75	1.77**	0.44**

*Notes:* tests are performed on the real wages of building laborers. The optimal lag length of the ADF test is chosen on the basis of the Akaike information criterion, while for the KPSS the maximum lag Schwert criterion is used. \*\* p<0.01, \* p<0.05.

### REASSESSING REAL WAGE DIVERGENCE: LONDON-PARIS vs ENGLAND-FRANCE

The previous sections have provided contrasting accounts of the so-called “Little Divergence” in real wages, pointing to a late medieval real wage divergence between London and Paris and a late modern divergence between England and France. Fundamental differences in the real wage change patterns between Paris-France and London-England are behind this contrasting evidence. Table 3 explores these differences by considering a simple measure of real wage divergence, namely the difference in the growth rate of real wages between London-England and Paris-France over various sub-periods (figures in bold). In addition, I identify which variable, between wages and prices, was the main driver of divergence in the various sub-periods (figures in italics), and report the relative contribution of nominal wages and prices to the rate of divergence between London-Paris and England-France

TABLE 3  
THE COMPONENTS OF REAL WAGE DIVERGENCE

GROWTH RATE OF WAGES, PRICES, AND WELFARE RATIOS						
	LONDON			PARIS		
	Wages	CPI	WR	Wages	CPI	WR
1550–1750	0.81	0.64	0.17	0.20	0.30	-0.10
1750–1780	-0.02	0.37	-0.39	0.38	0.46	-0.08
1780–1820	0.89	0.77	0.12	1.09	0.11	0.99
	ENGLAND			FRANCE		
	Wages	CPI	WR	Wages	CPI	WR
1550–1750	0.38	0.32	0.06	0.15	0.10	0.05
1750–1780	0.42	0.47	-0.04	0.33	0.70	-0.36
1780–1840	1.03	0.43	0.60	0.48	0.36	0.11
DIFFERENCE IN THE GROWTH RATE OF WAGES, PRICES, AND WELFARE RATIOS						
	LONDON-PARIS			ENGLAND-FRANCE		
	Wages	CPI	WR	Wages	CPI	WR
1550–1750	<i>0.61</i>	0.34	<b>0.27</b>	<i>0.23</i>	0.22	<b>0.01</b>
1750–1780	<i>-0.40</i>	-0.09	<b>-0.31</b>	0.09	<i>-0.23</i>	<b>0.32</b>
1780–1820	-0.21	<i>0.66</i>	<b>-0.87</b>	<i>0.56</i>	0.07	<b>0.49</b>
	LONDON-ENGLAND			PARIS-FRANCE		
	Wages	CPI	WR	Wages	CPI	WR
1550–1750	<i>0.43</i>	0.32	<b>0.12</b>	0.06	<i>0.20</i>	<b>-0.14</b>
1750–1780	<i>-0.44</i>	-0.09	<b>-0.35</b>	0.05	<i>-0.23</i>	<b>0.28</b>
1780–1840	-0.15	<i>0.34</i>	<b>-0.49</b>	<i>0.61</i>	-0.26	<b>0.87</b>

Sources: see text.

Prior to the 1750s, the growth rate in Paris welfare ratios was lower than in the rest of the country, mostly as a result of the faster increase in consumption prices (Table 3). Conversely, between the late fifteenth century and the first half of the eighteenth centuries, London real wages diverged from the rest of the country at the average rate of 0,27 percentage points per year. In this phase, the main driver of real wage divergence was the greater dynamism of London nominal wages (Table 3). These trends reversed by the second half of the eighteenth century. The growth rate of Paris welfare ratios outperformed the progress realized in the rest of the country and Paris started to emerge as France's high wage area. The pace of real wage divergence between Paris and France proceeded at the rate of 0,28 percent per year over the period 1750–1789 and accelerated to 0,87 percent per year between the 1780s and 1840s due to the rapid increase in Paris nominal wages (Table 3). Clearly, Parisian construction workers benefited the most from the various urban plans of

public spending implemented during the Revolution and Empire. In contrast, by the second half of the eighteenth century, the real wages of English laborers converged upwards towards the London standard (Allen 2015). It is useful to distinguish two distinct stages in this process. In the first phase (1750–1789), the main source of convergence, explaining more than 80 percent of the overall variation, was the spectacular increase in English nominal wages relative to London. Underlying this tendency were key developments taking place at lower levels of aggregation by c.1750. In particular, England witnessed a reversal in the geography of English nominal wages between the 1760s and 1790s that resulted in the North and Midlands emerging as relatively high wage areas sustained by the growing dynamism of their expanding industrial regions (Hunt 1986). In contrast, real wages in London and the South declined compared to the earlier period because wages did not keep pace with rising inflation (Allen 2015; Clark 2001). Thus, it appears as if the rise of a new English growth pole centered on the north and midlands offset the downward pressure on real wages of rising population which characterized much of the rest of the country and ultimately prevented English real wages from falling (Rule 2014, p. 176).

Sustained by the rapid increase in English nominal wages, the process of real wage convergence between London and England proceeded at an even faster pace (0,49 percent per year) after the 1790s. However, in this phase, the main factor accounting for real wage convergence was faster growing prices in London than in the rest of the country (Table 3).

Hence, while past commentators have traditionally focused on the much greater dynamism of London compared to the rest of the country to question the use of London real wages as the basis for nation-wide conclusions (Humphries 2010, Malanima 2013), I offer a broader perspective that delves into the complex relationship between capital cities and countries.

One important implication of the comparison of wages relative to the cost of living is that city-level, national-level, and sectoral comparisons provide contrasting accounts of the notion of England as a high wage economy.<sup>65</sup> The real wages of London building laborers stood out from those in Paris prior to the Industrial Revolution. In 1600–1649, these were already around 30 percent higher than in Paris, peaking at almost 100 percent in 1700–1749, then sagging to about 30 percent again in 1800–1849. Moving outside London, the situation was different. The building laborers of Southern England, whose standards of living

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<sup>65</sup> Allen (2009) highlights other senses according to which English wages were high relative to France, such as with respect to the cost of capital and energy.



were the highest in the country next to London, did not earn more than their French counterparts before the early eighteenth century. However, in the ensuing decades, their real earnings jumped about 20 percent above the levels prevailing in France. Overall, English building laborers fared even worse in relative terms. Before 1750, their real wages were similar to French real wages, slowly advanced in the second half of the eighteenth century, and in the last decades of 1700 peaked at around 20 percent above the French standard. At the same time, the “political arithmetician,” Arthur Young (1793, vol. 2, pp. 316–7), concluded that English laborers’ standard of living was about 30 percent higher than that of French laborers. In the post-revolutionary phase, the real wage differential fluctuated widely but English real wages definitively forged ahead of France only in the second quarter of the nineteenth century, when the gap soared to more than 50 percent, consistent with Allen’s (2015, p. 10) benchmark estimation for 1833 (Figure 9).

Since pre-industrial economies were mostly rural, the evolution of real wages of construction workers was potentially not representative of national trends, and the experiences of other workers should also be considered. Agricultural laborers constitute a sensible comparator since they were the largest single occupational grouping in these countries (Humphries 2010). This exercise suggests the real wages of English agricultural laborers rose slightly above the levels prevailing in France only after the 1820s.

## CONCLUSION

Much of our current understanding of the evolution of living standards in the pre-industrial period has been informed by the notion of a divergence in real wages between northwestern Europe (England and Holland) and the rest of the continent that began around 1500. The empirical foundation of this argument lies in the study of a large sample of leading European cities, but the actual significance of this long-term trend beyond the experience of these leading urban economies is still largely unexplored. Using a novel dataset of prices and wages, and newly constructed series of real wages for male agricultural laborers and construction workers in France and the Paris district, I re-assess this argument by systematically comparing real wages in Paris-London and France-England over the period 1250–1860. The analysis highlights three main issues.

First, I show that at the country-level, the overall picture is evidently more complex than an early modern London-Paris divergence thesis would suggest. While real wages in London started to diverge from those in Paris after the first half of the fifteenth century, the comparative real wage history between England and France is characterized by the coexistence of both divergence and convergence phases with no unambiguous

tendency between the two prevailing before the second half of the eighteenth century. Thus, at least for England and France, one might put forward a three-stage account with a long phase of real wage convergence between the 1250s and the 1400s where English real wages converged upwards to the French level; a second period spanning from the mid-fifteenth to the first half of the eighteenth century, during which the real wage differential between England and France fluctuated without trend; and a last period beginning c.1750 where English laborers' real wages overtook those of their French counterparts. I show this contrasting evidence can be interpreted by looking at the different evolution of real wages in the capital city and the rest of the country in both France and England. Thus, London started to diverge from England by the late fifteenth century, while Paris emerged as a high wage area of France only after the French Revolution.

Compared to the national economy, urban economies were usually more sensitive to boom and growth reversals, especially in sectors characterized by high seasonality like the construction industry, where the demand for work varied widely over time and across space. The ties with international trade, finance, and government, provide London real wages with a dynamism quite different from the rest of the country while the effects (positive or negative) of major institutional shocks, like the Hundred Years War and the French Revolution were larger in the Paris district than in the rest of the economy, because their effects were unevenly distributed over the French territory. These differences suggest that the experiences of individual cities constitute a poor testing ground for assessing the timing and causes of the Little Divergence in real wages.

Second, the results of this study have relevance for the characterization of England as a high wage economy. One important argument of Allen's thesis is that before the Industrial Revolution, British wages were higher than French wages both at the exchange rates and relative to the cost of living, price of capital and cost of energy (Allen 2009b). Using the newly-constructed national series, I explore the first two dimensions along which English and French wages can be compared. I find that at the exchange rates, French wages were low relative to the English standard. However, since the lower wages earned by French workers in the eighteenth century were matched by low consumption prices, it appears that real wages of agricultural and building laborers in England were not higher than the levels prevailing in France before 1750. In this respect, while further research should be addressed to compare the relative living standards of other occupational groups (textile workers, workers employed on annual contracts) in France and England, these results provide

suggestive evidence that still on the eve of the Industrial Revolution, a significant share of English male labor force did not participate in the high wage economy.

Third, this article contributes to the debate on the sources of real wage divergence. While most research has stressed demographic factors to account for the long-run evolution of real wages in pre-industrial Europe, the pattern of change in French real wages indicates the combination of institutional factors (warfare, political turmoil, debasement) and broad demographic trends could have had a long-run effect on French living standards. Specifically, during the worst stages of the Hundred Years' War, real wages in Paris plunged. This fall initiated a long phase of decline relative to London and the Northern core, which anticipated by several decades the analogous divergence between northwestern and southern European cities. Similarly, during the most intense stages of the Hundred Years' War, there was rapid convergence of English real wages upward to the French standards. These results are consistent with Hoffman's (1996) argument, according to which warfare and political turmoil had a long-run negative impact on the French economy.

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### *Appendix S1: Wages: sources and methodology*

Figure S1.1 shows the distribution of wage observations over time and by source type. The dataset comprises 26,332 observations for the period 1250–1860. The inclusion of new data from archival sources and printed primary material allows me to considerably improve the spatial coverage of the dataset. Basing the wage sample solely on secondary literature tended to over-represent the north and the east of France compared to the center and the south. The distribution of data over time is uneven and periods of high data frequency alternate with phases of lower data coverage. However, while the low number of observations since the 1810s is directly related to the use of national averages from official enquiries, the relative dearth of information between roughly 1550 and 1750 reflects local changes in the summary accounting records, a result of the transition from direct to indirect farm management by large religious bodies (Neveux 1980, p. 307).<sup>66</sup> The summary accounts are highly detailed up to about 1550 but thereafter are consolidated for longer time periods, more often providing the amount paid for an unknown quantity of labor over a certain period. Table below also reveals significant heterogeneity in the occupational structure. Even so, about 70 percent of skilled workers’ wages regard masons and carpenters while more than 80 percent of unskilled workers’ wages are for building laborers. The rates paid to agricultural laborers during harvest, haymaking, and vintage are the most frequently recorded in the dataset (Table S1.1).

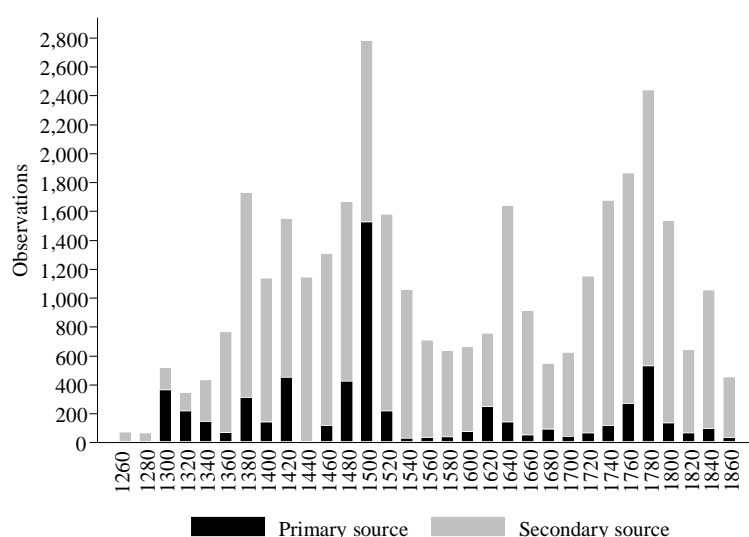


FIGURE S1.1  
NOMINAL DAILY WAGES BY SOURCE TYPE

*Notes:* Observations are computed on 20-year windows. For example, 1260 includes the observations from 1250 to 1269.

<sup>66</sup> I wish to thank an anonymous referee of this journal for bringing this point to my attention.

TABLE S1.1  
NOMINAL DAILY WAGES BY OCCUPATION

SKILLED CONSTRUCTION WORKERS			AGRICULTURAL LABORERS		
Occupation	Freq.	Percent	Occupation	Freq.	Percent
Mason	5,903	45.48	Day-laborer	2,567	33.44
Carpenter	2,708	20.87	Vineyard worker	114	14.51
Stone cutter	953	7.34	Grape-picker	713	9.29
Tiler-slater	862	6.64	Carrier	502	6.54
Master mason	652	5.02	Unskilled worker	474	6.18
Plasterer	420	3.24	Thresher	424	5.52
Plumber	267	2.06	Agricultural worker	274	3.57
Construction joiner	235	1.81	Vine cutter	254	3.31
Master carpenter	192	1.48	Gardener	184	2.40
			Mower	168	2.19
			Reaper	158	2.06
			Digger	101	1.32
			Worker at the wine press	89	1.16
			Haymaker	88	1.15
UNSKILLED CONSTRUCTION WORKERS					
Occupation	Freq.	Percent			
Unskilled mason	5,627	84.57			
Unskilled worker	330	4.96			
Valet	186	2.80			
Unskilled carpenter	172	2.58			
Unskilled tiler	101	1.52			

*Notes and Sources:* see the text. The table reports the most prevalent occupations by skill and sector. Descriptive statistics regard the reduced sample used for regression analysis.

The pay differential between skilled and unskilled male construction workers was by no means constant. As shown in Figure S1.2, it averaged about 100 percent in the pre-plague phase, declined rapidly in the century after the 1340s, but remained remarkably stable in the following period, fluctuating between 60 and 80 percent. From an international comparative perspective, the skill premium in France was similar to the levels prevailing in Southern Europe (Van Zanden 2009) and was typically higher than in England after the 1350s (Figure S1.2).<sup>67</sup>

<sup>67</sup> The difference is statistically significant at 5 percent level based on the 50-year interval t-test differences in the skill premium of English and French workers.



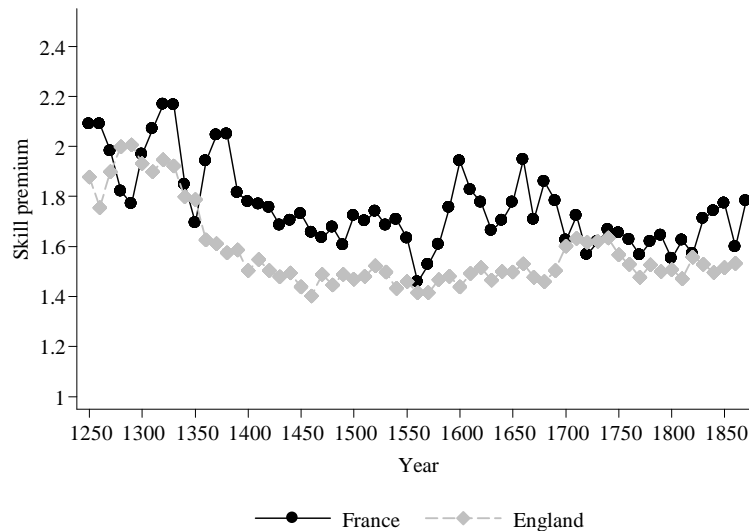


FIGURE S1.2  
SKILL PREMIUM: CONSTRUCTION WORKERS

Sources: France, this study; England, Clark (2005). The skill premium for English construction workers is the ratio between nominal wages of skilled and unskilled construction workers. Values are expressed as 10-year averages.

The skill premium displays large spatial differences within France. However, these did not follow a clear North-South divide but appeared to match quite closely the geography of urbanization. For example, the eighteenth century skill premium averaged 100 percent in rural areas of the Center and South like Marsan, the surroundings of Bayonne, and Rouergue but in the most urbanized areas of the Center and South of France like Avignon, Cavaillon, and Lyon, it had the same low values (c.60 percent) observed in Paris and the North Sea area.<sup>68</sup> It is beyond the scope of this paper to analyze the causes of these differences, but these are probably related to the degree of market integration. Where labor markets were less integrated and competition was lower, skill premiums tended to be large, while in the more urbanized areas pay differential likely decreased because the greater competition between skilled workers reduced their wage premium.

### Seasonality

Table S1.2 shows the distribution of wage observations by season. For each of the three categories of workers, between 43 and 45 percent of the data do not indicate if the wage was paid in a particular season. However, when seasonality is observed, this mostly concerns summer wages. As explained in the text, to

<sup>68</sup> Data for Marsan, Bayonne, and Rouergue come from the AD Landes (1 C151), the AD Pyrénées-Atlantiques (see the Appendix), and Donat (1935), respectively. In Avignon, the skill premium averaged about 160 percent from 1422 to 1585 and in the second half of 1700 (AD Vaucluse H Dépôt Avignon, Saint-Bénézet E28, E29, E35, E37, E40, E42, E44, and Couvent des Ursulines d'Avignon 95 H 32). It was remarkably low in Cavaillon (about 132 percent based on Rosenthal (1992)) and Lyon (157 percent between 1503 and 1570 based on the average ratio of master masons' wages relative to unskilled laborers using Gascon's (1971, vol. 2, pp. 930–32) figures; 154 percent from 1760 to 1780 using Gutton's (1971) series of master masons and unskilled laborers). In Paris, the skill premium fluctuated in the range c.250-167 percent between 1400–1726 while averaged 163 percent in the eighteenth century (Baulant 1971 pp. 480–81; Durand 1966, Ratio of masons to laborers wages, "mean of monthly modes").

limit the loss of information due to unobserved seasonality, I estimate the basic model of wages by including a set of seasonal indicators for each of the categories illustrated below (Table S1.2). To check the robustness of this procedure, I additionally re-estimate the baseline specification using various subsamples for which seasonality is observed directly using weighted and un-weighted regression models as illustrated in Table S1.3. Figures below show the baseline specification is consistent with these alternative specifications (Models S1 and S2).<sup>69</sup>

TABLE S1.2  
DISTRIBUTION OF WAGES BY SEASON

	CONSTRUCTION WORKERS				AGRICULTURAL LABORERS		
	SKILLED		UNSKILLED		Mean	Freq.	Percent
	Freq.	Percent	Freq.	Percent			
Mean	1,450	12.30	739	13.29	214	2.79	
Unknown	5,255	44.57	2,403	43.20	3,270	42.57	
Autumn	1,024	8.68	331	5.95	Harvest	437	5.69
Spring	567	4.81	332	5.97	Summer	2,413	31.41
Summer	2,349	19.92	1,158	20.82	Winter	1,348	17.55
Winter	1,146	9.72	599	10.77			
Total	11,791	100	5,562	100	Total	7,682	100

*Notes:* The descriptive statistics regard the reduced sample of wages used for regression analysis.

The table does not include wages paid to nourished workers (unless corrected to account for the share of in-kind payments) as well as observations for which the form of remuneration is unknown. It also excludes wages of Parisian workers. The overall sample originally included 15,208 observations for building craftsmen, 7,907 for building laborers, and 9,863 for agricultural laborers.

TABLE S1.3  
ROBUSTNESS TESTS: ADDITIONAL COVARIATES, DIFFERENT SAMPLES AND WEIGHTING

Model	URBAN LABORERS					CRAFTSMEN					AGRICULTURAL LABORERS			
	Baseline	S1	S2	W1	W2	Baseline	S1	S2	W1	W2	Baseline	S1	S2	W1
Sample	Full	Less unknown and mean	Less unknown	Full	Full	Full	Less unknown and mean	Less unknown	Full	Full	Full	Less unknown and mean	Less unknown	Full
Weighted				YES	YES				YES	YES				YES
Location	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Occupation	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Source	YES	YES	YES	YES	YES	YES			YES		YES	YES	YES	YES
Season	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES
Season X Period X Region					YES					YES				
R-squared	0.991	0.99	0.99	0.996	0.992	0.995	0.995	0.995	0.997	0.996	0.995	0.994	0.994	0.997
N	5,560	3,241	2,480	5,560	5,159	11,210	4,497	6,043	11,210	11,210	5,954	3,165	3,346	5,954

<sup>69</sup> For the results of models W1 and W2, see the subsection ‘Spatial coverage.’

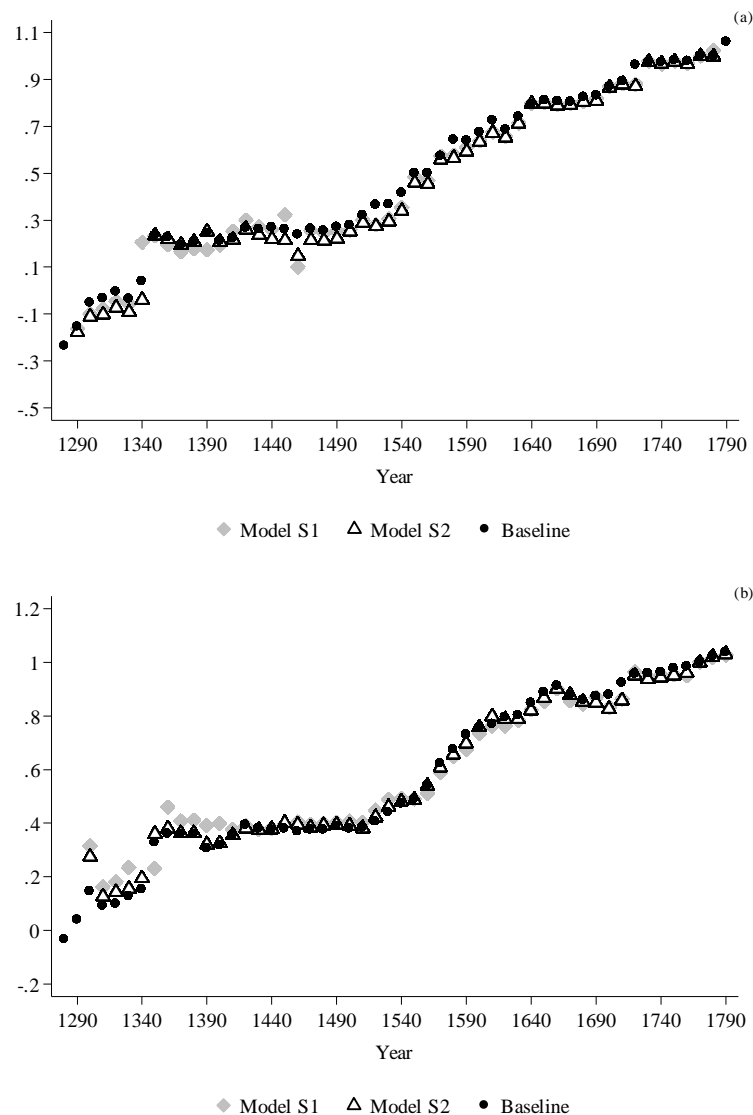


FIGURE S1.3

SEASONALITY: NOMINAL WAGES OF AGRICULTURAL LABORERS (a) AND BUILDING CRAFTSMEN (b) (1770–79=1)

Notes: See Table S1.3 for a description of the controls used in the various models. Nominal wages are expressed in local currency (sous tournois per day, log form). “Baseline” refers to the predictions of the benchmark specification illustrated in the text (equation 1).

*Payment in kind*

Table below shows the distribution of wages by form of remuneration for agricultural laborers and construction workers. In most of the cases some sort of correction procedure should be applied to the raw data to obtain cash wages. In particular, I assume that a large share of wage quotes (varying between 40 and 48 percent of the three estimating samples) regard not-nourished workers and I retain a limited share of wages of nourished workers after having imputed the value of payment in kind (Table S1.4, Nourished corrected). Complicating the issue further, changes to the structure of mixed wages were relatively frequent. These accommodations tended to compress the share of payment in cash and to lower the quality of in-kind supplements during phases of rapid population growth while extending the money part when labor was

scarcer. Figure S1.4 suggests that payment in kind was between 55 and 65 percent of total wage in the overpopulated France of the thirteenth and early fourteenth century. However, this share fell to about 40 percent in the post-plague phase. Low values were also observed in Normandy in this period. When population started to recover by the 1450s, the share of in-kind payment resumed and reached its apogee in the mid-seventeenth century (approximately 60 percent), remaining stable at around 50 percent afterwards. The connection between population growth and structure of wages can to some extent be explained in this way: *ceteris paribus*, during phases of population growth the aggregate demand increased and per capita stock of money decreased contributing to raise the price of basic foodstuffs. However, to the extent that some employers were also producers of some of these commodities or could afford to buy them at wholesale prices, these could have found more convenient to increase the component in kind instead of compensating workers with a greater amount of cash in periods of rising inflation.

TABLE S1.4  
DISTRIBUTION OF WAGES BY FORM OF REMUNERATION

	CONSTRUCTION WORKERS				AGRICULTURAL LABORERS	
	SKILLED		UNSKILLED		Freq.	Percent
	Freq.	Percent	Freq.	Percent		
Food						
Not-nourished	5,227	44.33	2,673	48.06	3,973	51.72
Not-nourished assumed	5,384	45.66	2,654	47.72	3,045	39.64
Nourished corrected	1,180	10.01	235	4.23	664	8.64
Total	11,791	100	5,562	100	7,682	100

*Notes:* The descriptive statistics regard the reduced sample used for regression analysis.

The table does not include wages paid to nourished workers (unless corrected to account for the share of in-kind payments) as well as observations for which the form of remuneration is unknown. It also excludes wages of Parisian workers. The overall sample originally comprised 15,208 observations for building craftsmen, 7,907 for building laborers, and 9,863 for agricultural laborers.

In what follows, I test the consistency of the procedure to distinguish between nourished and not-nourished workers by fitting the benchmark regression model on the reduced sample of not-nourished workers (Table S1.5). Figures below show there are no significant differences in drawing the sample from not-nourished workers or from the overall sample (not-nourished, not-nourished assumed, and nourished corrected).

TABLE S1.5  
ROBUSTNESS TESTS: ADDITIONAL COVARIATES, DIFFERENT SAMPLES

Model	URBAN LABORERS		CRAFTSMEN		AGRICULTURAL LABORERS	
	Base	F1	Base	F1	Base	F1
Sample	Overall	Excluding unknown	Overall	Excluding unknown	Overall	Excluding unknown
Location	YES	YES	YES	YES	YES	YES
Occupation	YES	YES	YES	YES	YES	YES
Source	YES	YES	YES	YES	YES	YES
Season	YES	YES	YES	YES	YES	YES
R-squared	0.991	0.993	0.995	0.996	0.995	0.997
Observations	5560	2761	11210	5214	5954	2538

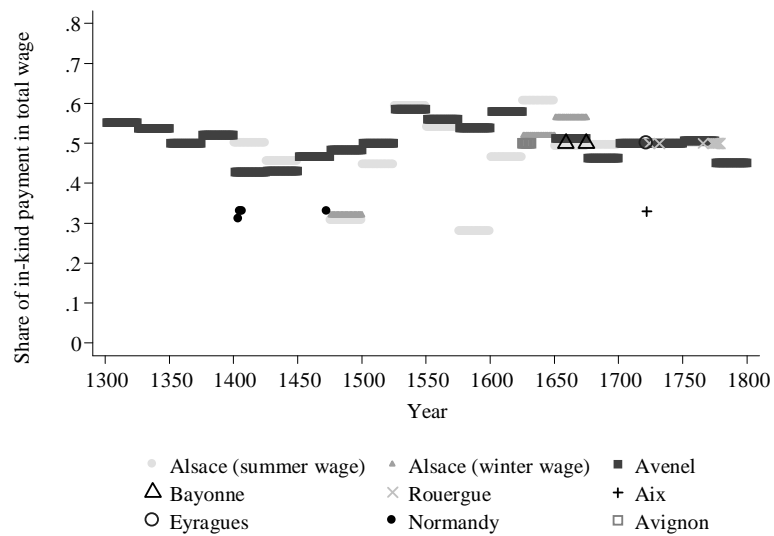


FIGURE S1.4  
SHARE OF IN-KIND PAYMENT IN TOTAL WAGE

Sources: France, d'Avenel (1898, vol. 4, p. 580); Alsace, Hanauer (1878, vol. 2, p. 555); Bayonne, AD Pyrénées-Atlantiques (Couvent des Jacobins de Bayonne H109 and Couvent Sainte-Claire de Bayonne H 101); Rouergue, Donat (1935, pp. 222–231); Aix and Eyragues (Baherel 1961, p. 613); Avignon, AD Vaucluse (Couvent des Ursulines d'Avignon 95 H 32); Normandy (Rivière 2006, pp. 27–56).

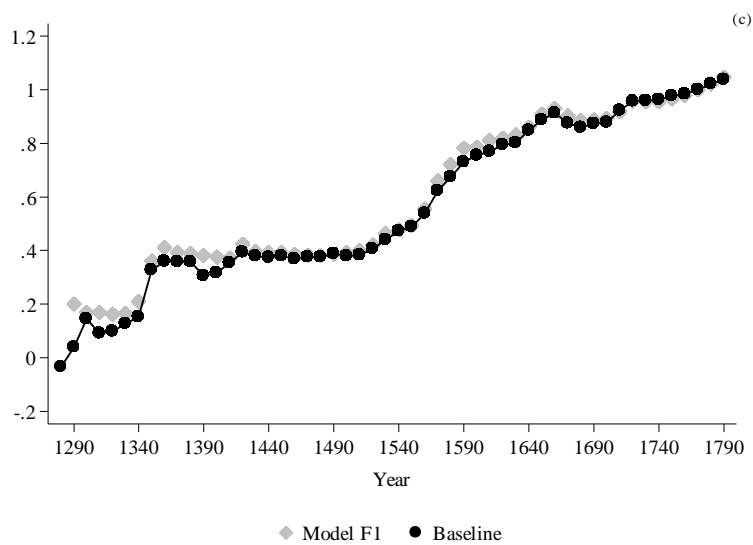
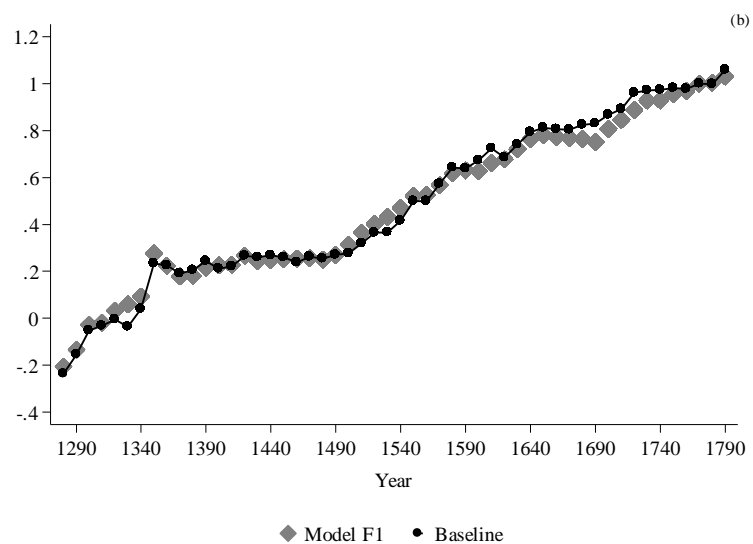
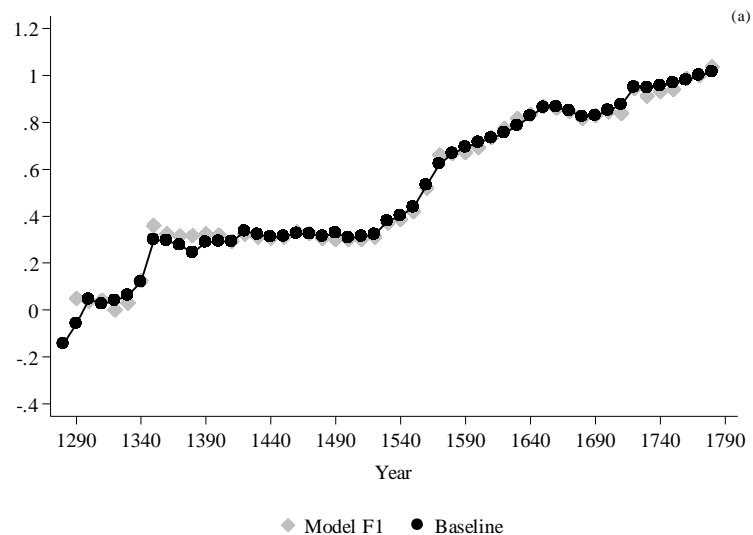


FIGURE S1.5  
 PAYMENT IN CASH: NOMINAL WAGES OF FRENCH BUILDING LABORERS (a) FRENCH AGRICULTURAL LABORERS (b),  
 AND FRENCH BUILDING CRAFTSMEN (c) (1770–79=1)

Notes: See Table S1.5 for a description of the controls used in the various specifications. Nominal wages are expressed in local currency (sous tournois per day, log form). “Baseline” refers to the predictions of the benchmark specification illustrated in the text (equation 1).

### *Working days*

In this section, I check the sensitivity of results to the assumption of a fixed working year. In particular, I present two sensitivity checks.

First, I estimate trends in the actual working year for French construction workers using a large sample of building projects that record the weekly number of days worked per person for the period 1320–1644. Conversely, for later years I use some scattered observations derived from a limited set of secondary sources. This exercise introduces several practical obstacles because building projects could differ in terms of size, duration, location, and nature of the labor contractor. These are all sources of heterogeneity that one should take into account in the estimating process. To make results comparable across sites of different duration, days of work are first normalized by the length of the building project expressed in calendar days (individual participation rates) and then multiplied by 365 days.<sup>70</sup> In addition, as most of the workers employed on site experience high rates of turnover, I set a threshold to distinguish between regular and casual workers. In particular, I assume that a male worker is “regular” if he works on site at least half of the workable time.<sup>71</sup> However, as the length of the calendar working year passed from about 260 to 300 days between 1300 and 1800, I define two alternative specifications.

First, based on a workable year of 300 days (365 days less 52 Sundays and a minimum of about two weeks of holiday), and an employment rate of at least 50 percent of workable time, I assume that a worker is “regular” if he works at least 150 days per year (participation rate of about 40 percent i.e. 150/365).

Second, assuming a workable year of 260 days, which is a more appropriate standard for the Middle Ages, and again an employment rate of at least 50 percent, I lower the threshold of “regularity” to 130 days or a participation rate of about 36 percent (130/365). I then regress the natural logarithm of the actual working year ( $d_{it}$ ) for a regular worker in location  $i$  at time  $t$ , on a set of period dummies ( $D_t$ ) and indicator variables ( $DTYPE$ ) that control for season, nature of the labor contractor, size, duration, geographic location of the

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<sup>70</sup> For example, in 1527 mason Pierre Bardet worked 8 days on the construction site of Chambord (Jarry, 1888). As this work schedule applied to the month, his participation rate was 27 percent (8/30), and his expected working year was 97 days. As a large share of observations come from building sites of short duration (less than or equal to a month) I also fit the model excluding them. Results are reassuringly consistent with the prediction of the larger sample.

<sup>71</sup> Overall, these assumptions have little bear on final results even assuming an implausibly low cutoff of 120 days.

working site, along with the occupation or degree of specialization of the worker.<sup>72</sup> I repeat this exercise for two classes of labor attendance, namely all regular workers and the top 50 percent more assiduous ones.

$$\ln(d_{it}) = \sum_t \beta_t D_t + \sum_k \gamma_k DTYPE_k + \varepsilon_{it}$$

I finally convert the predicted values in levels to get actual working days.<sup>73</sup> Table S1.6 shows the resulting estimates for all regular workers and for the top 50 percent more assiduous ones using the two definitions of “regular worker.”

TABLE S1.6  
ACTUAL WORKING YEAR IN THE FRENCH CONSTRUCTION INDUSTRY

Period	(1)	(2)	(3)	(4)
1310–1329	229	237	231	237
1330–1349	251	275	252	275
1350–1369	252	250	254	250
1370–1379	219	254	209	244
1390–1409	228	255	226	254
1410–1429	236	237	237	237
1450–1469	229	240	221	237
1470–1489	232	268	234	268
1490–1509	250	251	237	251
1510–1529	262	276	254	274
1530–1549	252	273	240	270
1550–1579	274	272	275	272
1590–1609		256	260	256
1630–1649	236	252	239	253
1750–1769	287	285	289	285
1770–1789	292	288	292	288
1790–1809		288	292	288
1830–1849	305	303	307	303
1850–1869	303	301	305	301

*Sources:* Amboise, Grandmaison (1912); Avignon, Bernardi (2014) and Piola Caselli (1981); Bordeaux, Brutails (1901); Bourges, Hamon (2003) and Rapin (2010); Bretagne, Hamon (2008); Chambord, Jarry (1888); Chartres, Merlet (1889); France, Marchand and Thélot (1991, p. 190); Gaillon and Lydieu, Deville (1850); Gisors, Hamon (2008); Granville, Villand (1986); Lyon, Gutton (1971); Orléans, Mesqui and Claude Ribéra-Pervillé (1980); Paris, Baulant (1971), Beutler (1971), Geremek (1968) and Potofsky (2014); Pierrefonds, Mesqui and Ribéra-Pervillé (1980); Poitiers, Rapin (2010); Riom, Rapin (2010); Rouen, Lardin (2014); Saint-Flour, Rigaudière (1982); Saint-Germain-le-Vieux, Bos (2003); Saint-Sauveur, Bernardi (1995); Toulon, Saint-Roman (2014); Toulouse, Meusnier (1951); Troyes, Galletti (2010).

*Notes:* For the definition of “regular worker,” see the text. The first column (Model 1) shows the estimates for all regular workers (cutoff of 150 days); the second column (Model 2) is for the top 50 percent more assiduous ones among those that were regular (cutoff at 150 days); the third (Model 3) regards all regular workers (cutoff at 130 days), and the fourth (Model 4) is for the top 50 percent more assiduous regular workers (cutoff at 130 days).

Regular construction workers are potentially unrepresentative of an average worker of the time. To address this concern I rely on the changing structure of wages and prices for estimating trends in the working year. In

<sup>72</sup> I considered the following covariates: “Size” namely the total number of workers employed on site for the length of the building project; “duration” that is the length of the building site in calendar days; “location”, “contractor,” and “profession” that are categorical variables denoting respectively the location, nature of the contractor (church, household, king, lord, state), and the occupation of the worker; “skill” that is a dummy taking value 1 if the worker is skilled and 0 otherwise. Predictions are robust to the presence of outliers.

<sup>73</sup> I used the procedure illustrated in Cameron and Trivedi (2009, p. 103) to pass from values in log to values in level.



particular, I devise a second test based on the evolution of the implied working year defined as the annual number of days required by a male breadwinner to buy the barebones basket specified in the text.<sup>74</sup> I find the implied working year of French building laborers increased by about 40 percent passing from 250 to about 350 days between 1400 and 1800.<sup>75</sup> To heighten any contrast, starting from an actual working year of about 300 days in the nineteenth century, I simulate the effect on real wages of a work-year increase of almost the same order of magnitude (from about 220 to more than 300 days) between 1400–1860. I then use these results to compare the evolution of real wages obtained by assuming a fixed working year with alternative scenarios that hypothesize industrious revolutions of various degree (Figure S1.6). Figure S1.7 shows that the level and trend predictions are broadly similar across different specifications even if real wage growth is higher because the numbers of days worked per year increase substantially by the eighteenth century.

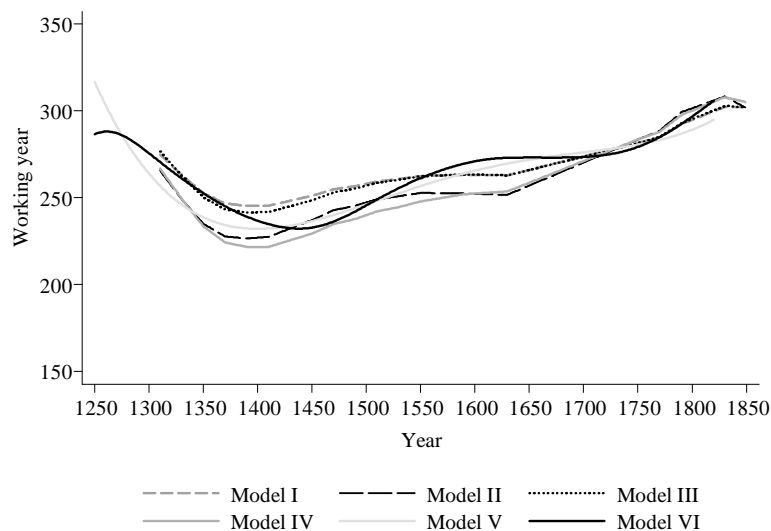


FIGURE S1.6  
SENSITIVITY ANALYSIS: TRENDS IN WORKING YEAR

*Notes:* The trends of Models I to IV are obtained by applying an eight-degree polynomial fitting to the values illustrated in Table S1.5. The trend of Model 5 is obtained by fourth-degree polynomial fitting of the implied working year of urban laborers, while the trend of Model VI is obtained by regressing the series of the implied working year on time using a LOWESS regression model with bandwidth at 0.6. To fix the trends of Models V and VI at an appropriate level, values are normalized multiplying them by the ratio between calendar year in 1750 (280 days based on García-Zuñiga (2014, p. 76)) and the mean value of the implied working year in 1740–49.

<sup>74</sup> This was obtained multiplying by 3.15 times the consumer price index and dividing by the nominal wage (Allen and Weisdorf 2011).

<sup>75</sup> Similar results are obtained by considering the series of building craftsmen and agricultural laborers.

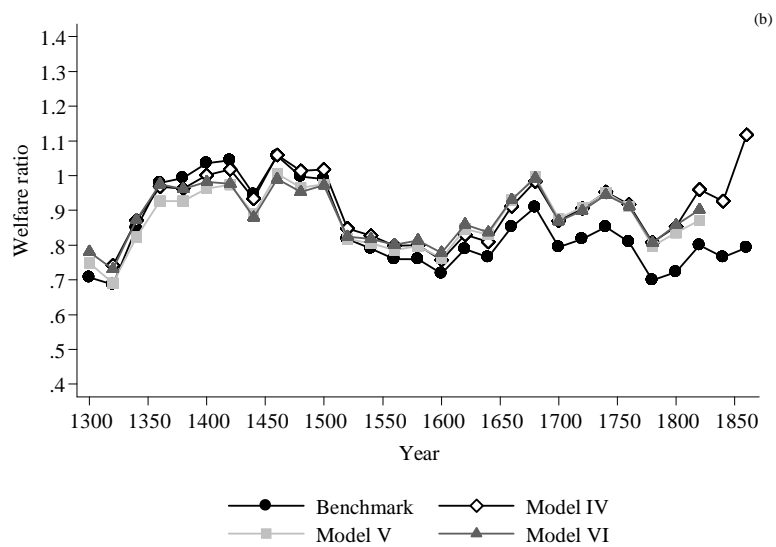
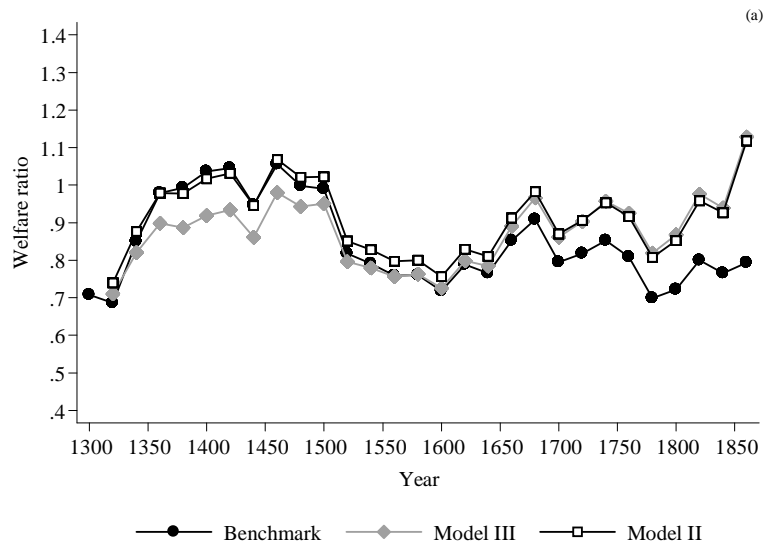


FIGURE S1.7  
 INDUSTRIOUS REVOLUTION AND REAL WAGES: SENSITIVITY TESTS  
*Sources and Notes:* The series refer to building laborers' real wages.

### *Spatial coverage*

Looking at the map of nominal wage dispersion in the nineteenth century rural France, Yvonne Crébow (1986, pp. 733–39) concluded that there existed two France: “one of low wages and payments in kind in the Northwest, North, and Southwest and another of middling or high wages in the North (dominated by Paris and the Normandy region), and even the Center. . . .”

In the first half of the nineteenth century, the nominal wages of skilled construction workers followed a similar spatial pattern (Désert 1971, pp. 91–93). This evidence suggests that geographically diverse evidence must be treated with care to avoid the introduction of misleading trends associated with compositional shifts. The basic specification illustrated in the text (equation 1) includes location-fixed effects.<sup>76</sup> Nevertheless, I perform several other tests to address concerns about possible differences in regional wage trends and check the sensitivity of results to the unequal spatial distribution of the data. Simple visual inspection of the raw averages by occupation reassuringly confirms that the aggregate and regional series of nominal day wages had remarkably similar trends and tracked closely the evolution of the basic model. The few differences in the level of wages can be ascribed to oversampling from rural areas (eighteenth century wages series for the North) and large urban centers (seventeenth century rural wages for the South due to oversampling from Provence) or to specific local contingencies (fourteenth century urban wages for the South due to the high rates paid in Haut-Dauphiné during the war period (Nicolas 2005)).

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<sup>76</sup> Notice, that due to the distinctively high rates paid in Paris, I fitted a separate regression model for the Paris district (see text). The series of Paris nominal wages are based on the following sources: Avenel (1898), Baulant (1971, 1976), Beutler (1971), Bordier and Brièle (1877), Bos (2003), Chabert (1949), Coyecque (1889), Dupré de Saint-Maur (1746), Durand (1966), Faignez (1877), Fourquin (1964), Geremek (1962), Husson (1875), Meuvret (1977), Potofsky (2014), Rougerie (1968).

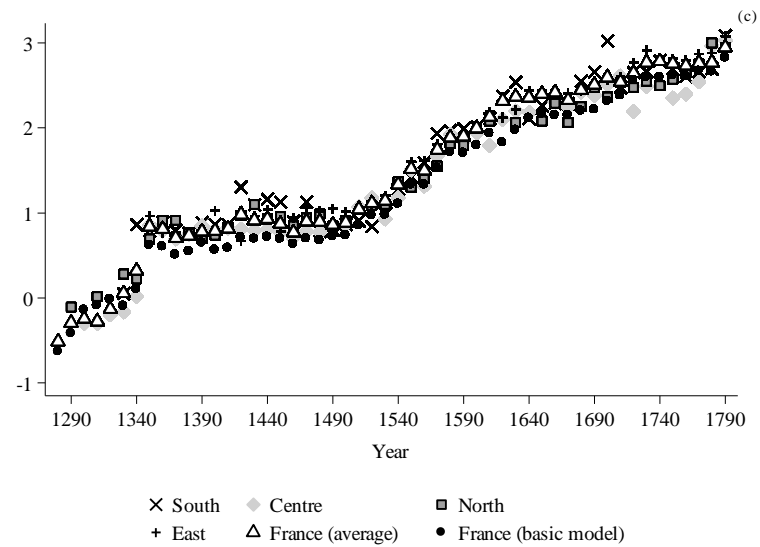
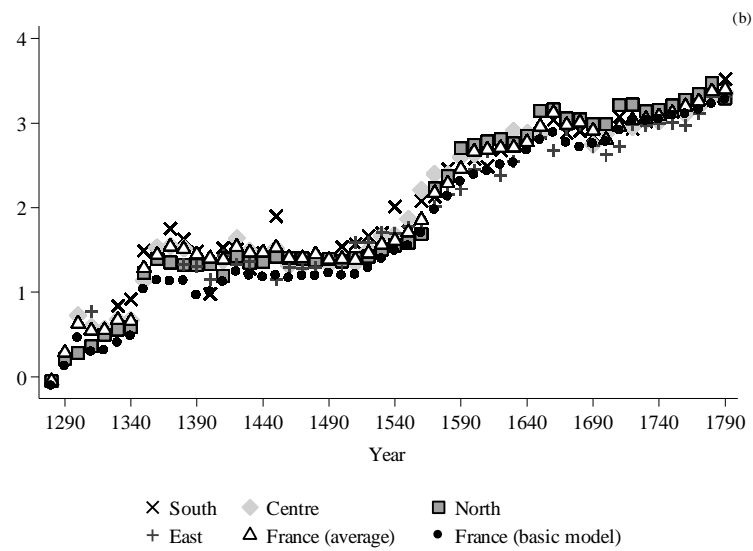
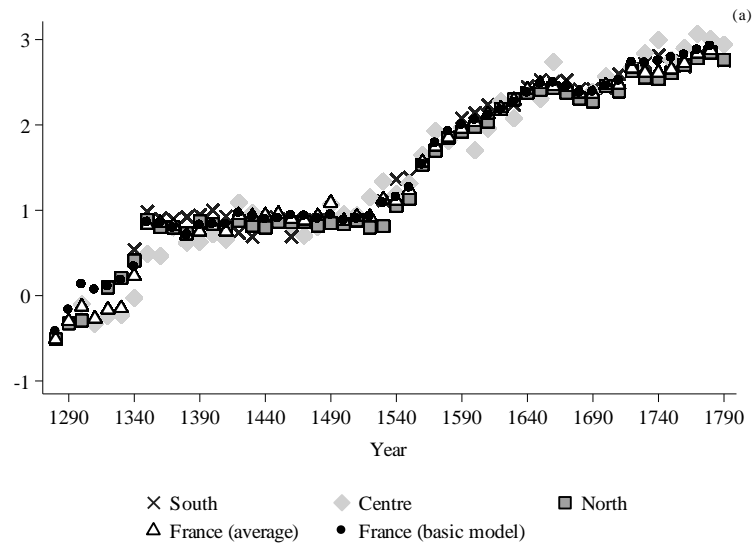
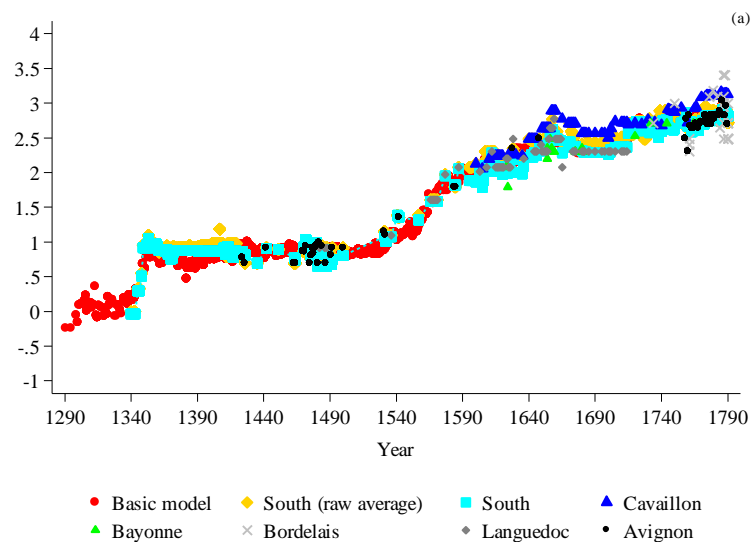


FIGURE S1.8  
 NOMINAL WAGES OF BUILDING LABORERS (a), BUILDING CRAFTSMEN (b), AND AGRICULTURAL LABORERS (c):  
 REGIONAL PATTERNS

*Sources and Notes:* see the text. Nominal wages are expressed in sous tournois per day (log form). France (basic model) refers to the predictions of the benchmark specification (equation 1) illustrated in the text.

Second, as the distribution of wages by region indicates that the South accounts for only about 16 percent of total observations, I construct new Southern wage series for urban and agricultural laborers to check their consistency with respect to the national averages. This exercise suggests that the Southern series (the raw averages and the estimates from the regression model) fit well the trend predictions of the national sample (Figure S1.9) but there are differences in the level of nominal wages. In particular, wages seem to be higher in Provence than in Languedoc and in the South-West, primarily as a result of the high rates paid in Cavaillon (Rosenthal 1992) and Aix-en-Provence (Baherel 1961) by the end of the sixteenth century. These spatial differences explain why the Southern wage series (raw average), oversampling from Provence, tend to predict higher wages than in France. Nevertheless, after controlling for the various sources of heterogeneity (location, season, source, and occupation), the level of wages in the South becomes very close to the predictions of the aggregate series (Figure S1.9).



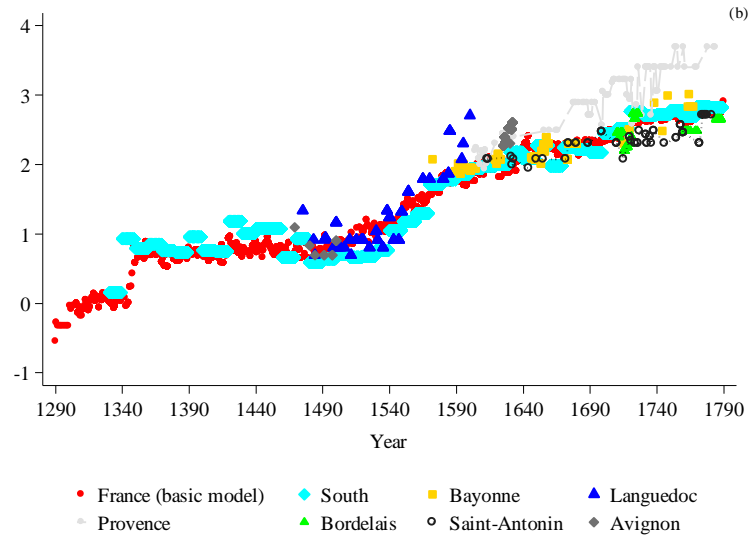


FIGURE S1.9

NOMINAL WAGES OF BUILDING (a) AND AGRICULTURAL (b) LABORERS IN FRANCE AND THE SOUTH

Sources: Avignon, France, and South, see the section ‘Sources of wages and prices’ of Appendix S1; Cavaillon, Rosenthal (1992); Bayonne, AD Pyrénées-Atlantiques (see the section ‘Sources of wages and prices’ of Appendix S1); Bordelais (Poussou 1983); Languedoc (Le Roy Ladurie 1976); Provence (Baehrel 1961); Saint-Antonin (Hauser 1936).

Notes: See Tables S1.3-S1.5 for a description of the controls used in the various specifications. Nominal wages are expressed in local currency (sous tournois per day, log form).

Third, as indicated in the text, to control for differences in regional wage movements I add to the basic specification an interaction term labeled  $DPERDREGDSEAS$ , where  $DPER$  is an indicator for each of the 50-year intervals starting from 1250–1299, 1300–1349, ..., 1800–1849, and 1850–1860,  $DREG$  is an indicator variable for each of the five regions (Paris Basin, Centre, East, North, South), and  $DSEAS$  is a seasonal indicator (Model W2).

$$\ln(w_{it}) = \sum_i \alpha_i LOC_i + \sum_t \beta_t D_t + \sum_k \gamma_k DOCC_k + \sum_l \delta_l SOURCE_l + \sum_m \sum_n \sum_j \varphi_{mnj} DPER_m DREG_n DSEAS_j + \varepsilon_{it}$$

Finally, as explained in the text, I fit a weighted regression model that assigns greater weight to observations that have lower spatial coverage (Model W1). Figures below show that the predictions of the basic model are broadly consistent with the values estimated using these weighted approaches.

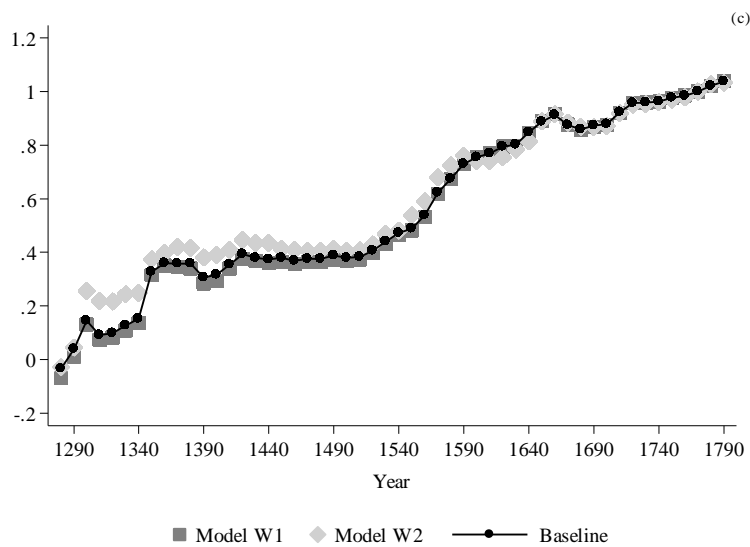
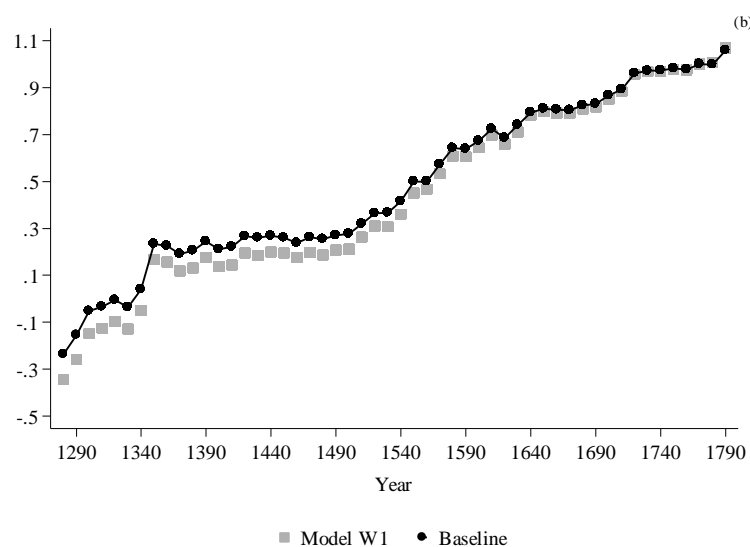
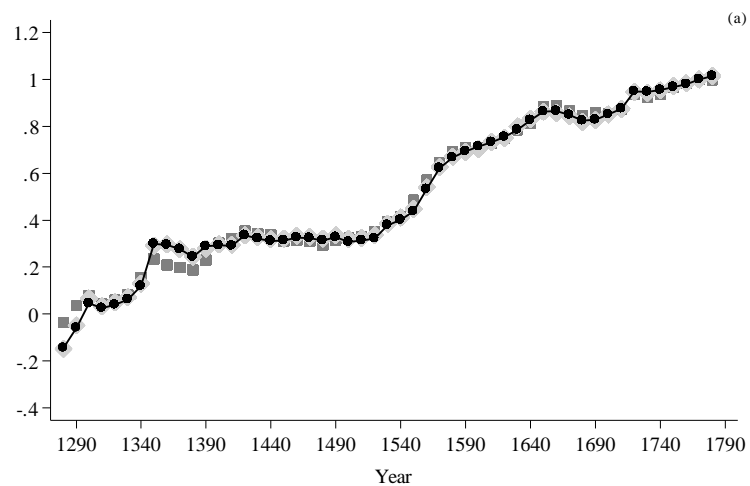


FIGURE S1.10  
 SPATIAL DISTRIBUTION OF THE DATA: NOMINAL WAGES OF FRENCH BUILDING LABORERS (a), FRENCH AGRICULTURAL LABORERS (b), AND FRENCH BUILDING CRAFTSMEN (c) (1770–79=1)

Notes: See Tables S1.3- S1.5 for a description of the controls used in the various specifications. “Baseline” refers to the predictions of the benchmark specification illustrated in the text (equation 1).

### *Comparison between raw and corrected averages*

Prior to 1790, the wage observations come from a variety of places across France while, after 1790, I mostly rely on national enquiries and a set of secondary sources detailing the evolution of nominal wages in the form of annual or quinquennial indices. In particular, I use the indices of construction wages devised by Kuczynski (1946) and Chabert (1949) as well as industrial workers' wage series estimated by Levy Leboyer (1971, p. 490, Tab.2 first column "Indices des salaries").<sup>77</sup> To fix these indices at an appropriate national level, I assume that the wage of a mason averaged 30 sous in 1790 and about 47 in 1855 while the building laborer's wage averaged 18 sous in 1790 and about 30 in 1860.<sup>78</sup>

Figure S1.11 checks the consistency of this procedure by comparing the raw average to the estimated national wage derived from the regression. Prior to 1700, on average, the raw means are between 2 and 8 percent higher than the values predicted by the model.<sup>79</sup> The source of this deviation is that in earlier decades, wages are drawn more heavily from high-wage areas near urbanized locations. In contrast, after 1700, the estimated nominal wages of construction workers average slightly above the raw averages, as the regression equation corrects for the relative under-representation of more urbanized regions. In addition, Table below suggests the estimated level of agricultural laborers and building craftsmen's wages is very close to the national averages derived from a set of broad cross sections available in the period 1789–1862. In particular, the estimates (building craftsmen) are 2 percent above the benchmarks reported in Table S1.7. The reason for this difference may be that the benchmarks concern masons' wages while the predictions come from a varied number of occupations that are usually paid more than masons. In addition, the wages of agricultural laborers average c.2 percent below the benchmarks between 1789 and 1862.

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<sup>77</sup> Levy Leboyer's (1971) index mostly relies on Simiand's (1932) data and is obtained by aggregating the wages of construction workers and those employed in other industrial sectors.

<sup>78</sup> The wage of a mason in 1855 comes from the *Statistique Générale de la France, tome XII* and this value is used to convert Kuczynski (1946) and Levy Leboyer's (1971, p. 490) indices. The 1790's benchmark corresponds to the wage of a mason in France in 1790 according to Young (1882, vol. 2, p. 363). I used the 1790's benchmark to convert Chabert's (1949) index. The wage of a building laborer in 1790 is the average (rounded by default) between Avenel (1898) and Young's (1882, vol. 2, p. 363) estimations. I used this benchmark to extrapolate Kuczynski (1946) and Chabert's (1949) indices. The 1860's value (obtained by extrapolating forward Kuczynski's (1946) series) is used to convert Levy Leboyer's (1971) index.

<sup>79</sup> Between 1250 and 1700, the raw average daily wages of agricultural laborers, building laborers, and building craftsmen are about 8 percent, 8 percent, and 2 percent above the estimates, respectively.



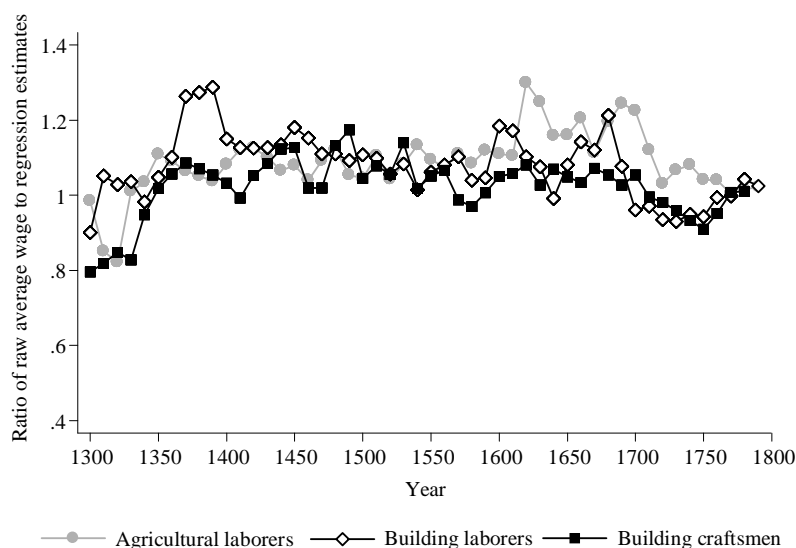


FIGURE S1.11  
ESTIMATED NOMINAL DAILY WAGES OF FRENCH WORKERS COMPARED TO THE RAW AVERAGES  
Sources: See text.

TABLE S1.7  
COMPARISON OF NOMINAL WAGES WITH BENCHMARK ESTIMATES

Period	Source	Coverage	Occupation	Benchmark	Regression	Difference (%)
1824–1833	SGF (1863)	all departments	Building craftsmen	40.0	41.5	3.8
1834–1843	SGF (1863)	all departments	Building craftsmen	41.4	41.3	-0.2
1844–1853	SGF (1863)	all departments	Building craftsmen	43.0	43.0	0.0
1854	SGF (1863)	all departments	Building craftsmen	45.2	46.2	2.1
1855	SGF (1863)	all departments	Building craftsmen	46.8	47.0	0.3
Overall period						<b>1.2</b>
1789	Postel-Vinay (1989)	17 departments	Day-laborer	17.9	17.6	-1.8
1790	Postel-Vinay (1989)	17 departments	Day-laborer	19.0	18.6	-2.2
1801	Simiand (1932)	16 departments	Day-laborer	26.6	25.9	-2.5
1801	Postel-Vinay (1989)	17 departments	Day-laborer	26.4	25.9	-1.6
1802	Simiand (1932)	16 departments	Day-laborer	26.6	26.1	-2.0
1839–1845	Chanut et al. (1995)	21 regions	Agricultural worker	28.2	27.8	-1.4
1860–1865	Chanut et al. (1995)	21 regions	Agricultural worker	37.0	36.0	-2.8
1852	Chanut et al. (1995)	21 regions	Agricultural worker	28.2	27.6	-2.1
1852	Simiand (1932)	all departments	Day-laborer	28.2	27.6	-2.1
1862	Chanut et al. (1995)	21 regions	Agricultural worker	37.0	35.9	-3.1
Overall period						<b>-2.1</b>

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- Arch. dép. Pyrénées-Atlantiques Couvent des Jacobins de Bayonne Comptes des recettes et dépenses, H 109
- Arch. dép. Pyrénées-Atlantiques Couvent des Jacobins de Bayonne Comptes des recettes et dépenses, H 112
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## *Appendix S2: Prices: sources and methodology*

### *Price series*

The price data used in this study come from two main source-types: the account books of hospitals and religious institutions and market-price lists (*Mercuriales des prix*). The former primarily report wholesale prices while the information found in the latter more closely reflects the rates paid by ordinary consumers. The market price lists are official tables showing current prices of commodities (mainly cereals) sold on the markets. While the combination of diverse source material can potentially underestimate the consumption basket cost, there are several elements that provide confidence in the figures offered here.

First, by far and large, the prices of wheat, legumes, and wine come from the official market price lists and together these items account for a large share of total expenditure.<sup>80</sup> For instance, about 72 percent of wheat prices derive from the market price lists while only 16 percent come from the account books of religious or public institutions. In addition, almost 60 percent of the prices of legumes are taken from the market price lists while only 30 percent are drawn from the account books of large institutions. The percentages are similar for wine: about 50 percent originate from the market price lists while about 30 percent are institutional.<sup>81</sup>

Second, the comparison between market and institutional prices suggests that the gap was relatively small. For example, between 1801 and 1860, beef prices from the market price list of Strasburg average about 15 percent above those recorded in the account books of Strasburg's hospital. The gap is similar for olive oil (15 percent between 1820 and 1860) but lower for eggs (2 percent between 1838 and 1860), and butter (9 percent in the period 1821–1860).<sup>82</sup> Furthermore, Baulant (1968, pp. 529–30) found almost no difference between the fifteenth century prices of wheat registered in the account books of the college of Beauvais and those reported in the market price list of Paris. I also test the significance of this gap for wheat and wine prices by adding to the basic model a dummy variable equaling one if the price comes from a market price list and

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<sup>80</sup> Almost 70 percent in the geometric index of type I and 56 percent in the geometric index, type II (Table S2.3).

<sup>81</sup> The remaining share comes from a set of secondary sources that combine institutional and market prices.

<sup>82</sup> Computations are based on Hanauer's (1878) data.

zero otherwise.<sup>83</sup> I find that in both cases the gap is close to the numbers illustrated above and not statistically significant.<sup>84</sup>

Third, since other authors rely on analogous source-types, the use of such material should not affect the comparison of real wages (Allen 2001; Pfister 2017).

Figure S2.1 shows the distribution of price quotes over time. The number of observations increases over time, especially after the early sixteenth century with the beginning of the first market price-lists and the rise of the first official state statistics (1690–1789).<sup>85</sup>

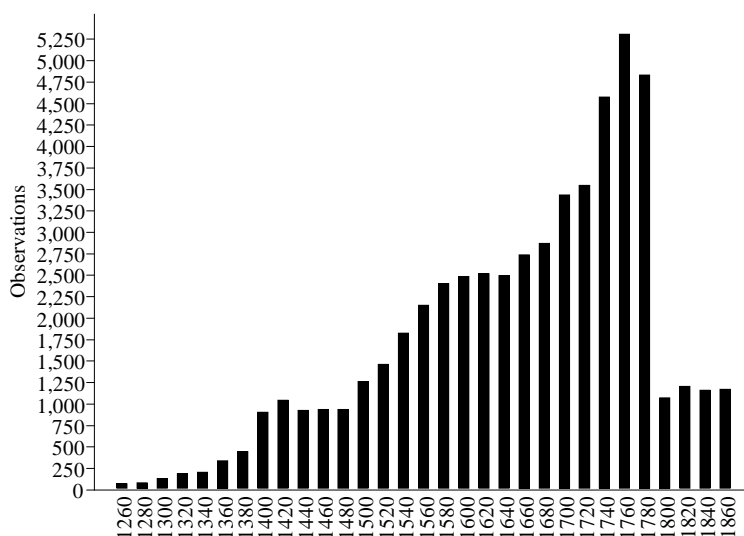


FIGURE S2.1  
NUMBER OF PRICE OBSERVATIONS OVER TIME

Notes: Observations are computed on 20-year windows. For example, 1260 includes the observations from 1250 to 1269.

Due to the dearth of direct information, I estimate the price of bread following the procedure originally proposed by Allen (2001). In this section, I check whether the coefficients of Allen’s (2001) bread equation can be suitably applied to the French context. First, I assemble a dataset including 1,968 observations (matched triples) on the prices of bread, wheat, and craftsmen’s wages (assumed as representative of baker’s income) for the period 1250–1820. I estimate the coefficients of the bread equation regressing bread prices in kilogram on wheat prices in liters, craftsmen’s day wages expressed in local currency, and a set of regional-dummies to capture differences in tax and regulatory regimes across space (Table S2.1).

<sup>83</sup> Lack of sufficient information prevents me from extending this check to the overall set of items included in the basket. For instance, some secondary sources used a mixed of institutional and market prices while others did not specify the type of price (wholesale or retail). See Grenier (1985). In addition, institutional and market prices are unevenly distributed over time. The first *mercuriales* start in the late fifteenth century, while most of the fourteenth to sixteenth centuries prices come from religious or public institutions.

<sup>84</sup> The coefficient of the price of wheat coming from the market price lists is 0.11 and the p-value is 0.904. The coefficient of the price of wine is negative (-0.02) with a p-value of 0.901.

<sup>85</sup> For a more extended analysis of the market price-lists, see for example Frêche (1979).

TABLE S2.1  
BREAD EQUATION

	Bread price
Wheat price	1.257*** (49.90)
Wage	0.017*** (7.98)
Paris Basin's dummy	0.384*** (7.74)
Center's dummy	0.529*** (9.47)
Île-de-France's dummy	0.266*** (5.22)
South's dummy	0.195*** (3.87)
Constant	0.043 (1.09)
Observations	1968

\* = Significant at the 5 percent level.  
\*\* = Significant at the 1 percent level.  
\*\*\* = Significant at the .05 percent level.

Notes: *t* statistics in parentheses. Sources: See the text.

The coefficients of the wage rate and the price of wheat are broadly consistent with Allen's (2001) predictions and the regional dummies are positive and strongly significant, with the coefficients measuring deviations from the East. I use the coefficients of the bread equation to compute bread prices for France. Figure S2.2 shows my estimates match almost exactly the bread series obtained using Allen's (2001) coefficients. Similarly, my bread price series for Paris is broadly consistent with Allen's figures (Figure S2.2).<sup>86</sup>

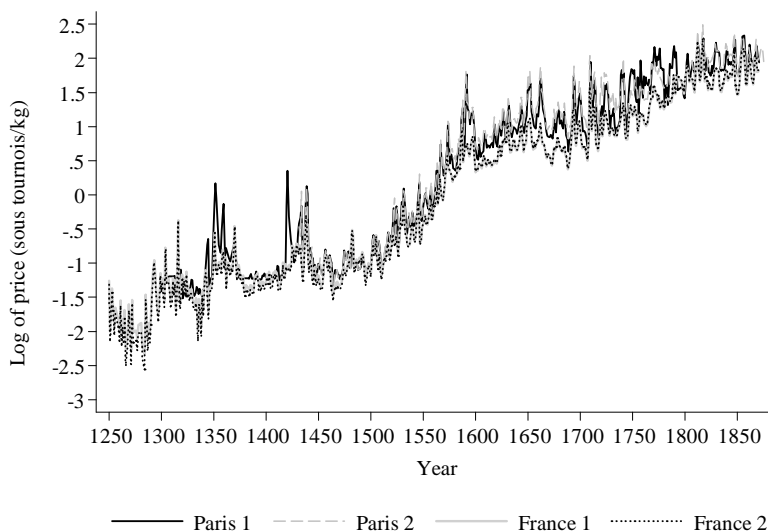


FIGURE S2.2  
BREAD SERIES

Notes and Sources: France 1, France 2, and Paris 1, this study. Paris 2, Allen (2001). The series France 1 and Paris 1 use the coefficients (constant, coefficient on wheat price and craftsmen wage) of Allen's (2001) bread equation while France 2 the coefficients illustrated in Table S2.1.

<sup>86</sup> Both of them are obtained using Allen (2001)' coefficients and the differences are related to variations in the series of wheat prices and craftsmen wages.



To derive the price of meat, I follow an analogous procedure because few of the price quotes before 1500 regard meat by the kilogram. However, instead of assuming a constant or variable weight for cattle over time, I use animal prices to fit a meat equation and obtain meat prices by the kilogram.<sup>87</sup> As animal quotes regard both cow and calf whose weights vary by about 2:1 over the years 1250–1789, I first reduce variability by extrapolating calf prices using cow prices. I then regress the meat price by the kilogram on the animal price and the craftsmen’s wage that captures the income of the butcher (Table S2.2). I also include a Paris dummy as well as time dummies to control for time, city effects, and variations in tax regimes across space. The resulting estimates are broadly consistent with the price of beef by the kilogram. I finally compute the price of beef as an arithmetic average of the two series.

TABLE S2.2  
MEAT EQUATION

	Beef price (kg)
Beast price	0.007*** (8.38)
Wage	0.156*** (7.39)
Paris dummy	7.161*** (8.28)
Modern era’ dummy	0.581 (1.15)
Post-Revolution’s dummy	0.140 (0.20)
Constant	-0.016 (-0.04)
Observations	170

\* = Significant at the 5 percent level.  
 \*\* = Significant at the 1 percent level.  
 \*\*\* = Significant at the .05 percent level.

Notes: *t* statistics in parentheses.

Sources: See the text. The time dummies correspond to the following spells of time: 1250s–1540s; 1550s–1780s; 1790s–onwards.

Furthermore, several gaps in the series of cheese are extrapolated using butter. The lighting component of the basket includes firewood, candles, and oil light whose prices are drawn from lower quality oils as olive oil was used for consumption. Firewood was sold in various forms including price in sous tournois per stere and per hundred bundles of faggots. Whereas all data are expressed as price by the cubic foot (stere), to increase the sample dimension, I extrapolate some prices per stere from the price by the unit (hundreds, thousands etc) and finally convert firewood prices in local unit of account per millions of BTUs (Allen 2001). Furthermore, I fill the several gaps in soap prices using candles and linearly interpolate the intervening gaps

<sup>87</sup> The beef price series in Paris starts in 1649 and regards meat by the kilogram.

in the various prices series. As one goes back in time, the evidence becomes scarcer and prior to 1300 there are no prices of dairy and textiles products. To address this concern, I construct a partial cost of living index using the prices of available goods. The spending shares of missing items during the Middle Ages are rather stable, so I assume that the resulting partial cost represents, in percentage terms, the total minus the average expenditure share of missing items computed in the first overlapping decade. I finally divide the partial expenditure by the estimated share it represents in total cost.<sup>88</sup> Even though this procedure is prone to errors, it has little impact on final results because I am able to estimate at least 90 percent of total expenditure by the 1290s. For earlier decades this percentage never falls below 63 percent.

### *The consumer price index*

As pointed out in the text, I follow Allen's (2001) barebones basket methodology to construct the consumer price index. To check the consistency of this benchmark, in what follows I present two alternative specifications that differ in terms of weights and methods used for construction. First, as different formulae may suggest opposite conclusions I estimate a geometric price index by setting the spending share on bread at 0.5 and proportionately reducing expenditure share on other items according to their daily caloric intake (first column of Table S2.3). Second, I construct a geometric price index looking at the patterns of change of consumption in the French economy. Weights are suggested by examining the expenditure shares of 116 family budgets for the period 1343–1787 and a set of nineteenth century consumption bundles (Chabert 1949, vol. 2, p. 226; Lévy-Leboyer and Bourguignon 1985, pp. 23–42). Most of the budgets detail food expenditure but do not provide information about lighting and clothing, especially for earlier periods. However, nineteenth century records indicate that energy and clothing accounted for about 20 percent of total expenditure excluding rents and this share was relatively higher for city dwellers than rural workers. The remaining 80 percent was spent on food, although this proportion decreased in the course of the nineteenth century (Lévy-Leboyer and Bourguignon 1985, p. 32 and p. 40). Overall, the preferred weighting scheme is very close to Allen's (2001) spending shares and reflects a low standard of living (second column

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<sup>88</sup> I tried different computational schemes varying the number of decades on which computing the averages and taking into account the economic trend. These changes have little bear on final results.

of Table S2.3). Figure S2.3 suggests differences in the price series are negligible while inspection of Figure S2.4 indicates that my French consumer price index is broadly consistent with Lévy-Leboyer and Bourguignon (1985) and Bayet's (1997) series.<sup>89</sup>

TABLE S2.3  
CONSUMER PRICE INDEX: DIFFERENT WEIGHTING SCHEMES

Good	Scheme I	Scheme II
Bread	50.0	30.0
Beans/peas	3.6	6.0
Beef	8.4	14.0
Butter	3.0	5.0
Cheese	2.4	4.0
Eggs	0.6	1.0
Wine	12.0	20.0
Soap	2.0	2.0
Linen	6.0	6.0
Candles	3.0	3.0
Oil light	4.0	4.0
Firewood	5.0	5.0
Total	100.0	100.0

Sources: Scheme I: Allen (2001).

Scheme II: Between 1343–1787: Bernard (1969), Boehler (1995), Charbonnier (1975), Chevalier (1968), Couperie (1963), Endres (1968), Frijhoff and Julia (1975), Le Roy Ladurie (1966), Morineau (1985), Piponnier (1974), Stoff (1970), Vedel (1975), and Villemon (1971). Thereafter, Chabert (1949, vol. 2, p. 226) and Lévy-Leboyer and Bourguignon (1985, pp. 23–42).

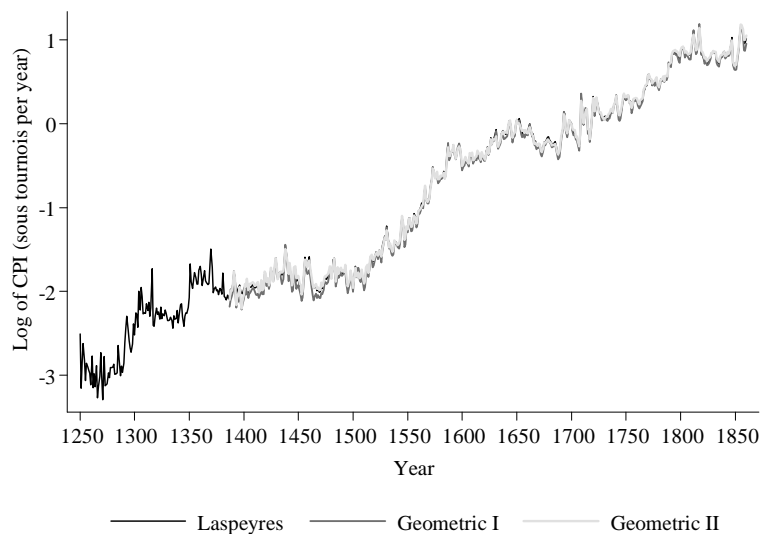


FIGURE S2.3  
COMPARISON BETWEEN DIFFERENT CONSUMER PRICE INDICES FOR FRANCE  
Sources: See text.

<sup>89</sup> My index is relatively more erratic because it tracks closely the evolution of the price of bread.

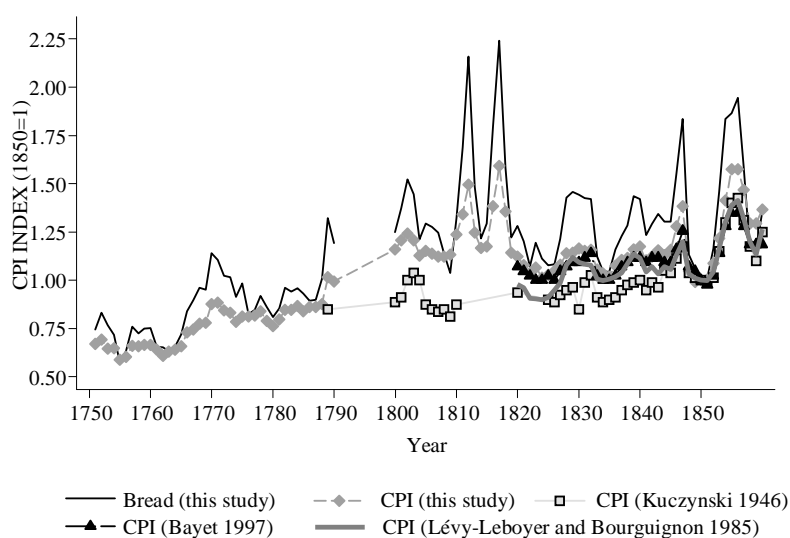


FIGURE S2.4  
DIFFERENT NATIONAL PRICE INDICES FOR THE 18<sup>th</sup> – 19<sup>th</sup> CENTURIES

Sources: Bayet (1997); Kuczynski (1946); Lévy-Leboyer and Bourguignon (1985); This study: benchmark index constructed with the weights presented in the main body of the article (Tab 1).

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### Appendix S3: Real wages

#### Paris welfare ratios

To check the consistency of building laborers' welfare ratios for Paris I construct an alternative series of Paris welfare ratios using Philip Hoffman's database of prices and wages.<sup>90</sup> Figure below suggests that my welfare ratios track closely the evolution of this new series and both are consistent with Allen's (2001) estimates.

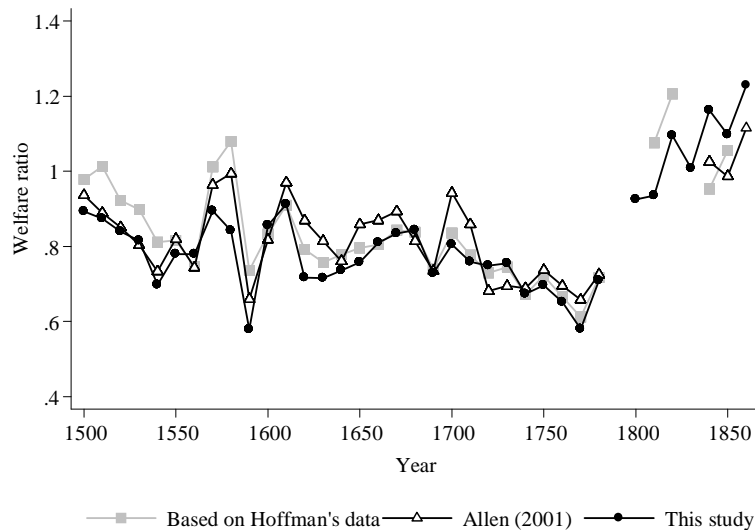


FIGURE S3.1  
PARIS WELFARE RATIOS

*Notes and Sources:* series labeled "Allen" and "This study," see text. The series "Based on Hoffman's data" refers to the welfare ratios of Parisian building laborers obtained by using Hoffman's database of prices and wages (available at: <http://gpih.ucdavis.edu/Datafilelist.htm#Europe>) and applying Allen's (2001) barebones basket methodology. The prices of cheese and oil lamp are the same as my index, while the price of bread before 1738 is estimated with Allen's (2001) bread equation using Hoffman's (1996) wheat prices and the wages of building craftsmen presented in this study. Missing prices are linearly interpolated. The comparison covers the period 1500–1860 but the information for some items is fragmented before c.1650.

#### The timing of the Little Divergence in real wages

Was the timing of the Little Divergence in real wages between England and France a distinctive feature of the English-French comparison or reflected a more general pattern of change? Figure below provides answer to this question, comparing the ratio of English to French and English to German welfare ratios of building laborers in the form of decadal averages. This comparison suggests that England began to emerge as a high wage economy relative to Germany and France after the second half of the eighteenth century.

<sup>90</sup> These data are available at: <http://gpih.ucdavis.edu/Datafilelist.htm#Europe>



FIGURE S3.2  
RATIO OF ENGLISH TO FRENCH AND ENGLISH TO GERMAN WELFARE RATIOS

Sources: France and England: see the main body of the article. Germany: Pfister (2017, Appendix S3. Series shown in figures 2-5, sheet “Annual values”, columns b and c)’s data available at: <https://onlinelibrary.wiley.com/doi/abs/10.1111/ehr.12419>

Notes: Welfare ratios for England and Germany are obtained following the same procedure as illustrated for France (Allen 2001).

In what follows, I also test the sensitivity of results to changes in the days worked per year. To make this, I test two hypotheses. First, I posit that the actual working year in France and England experienced “industrious revolutions” of varying intensity based on the trend outlined in the notes of Figure S3.3. These trends mostly reflect changes in actual workloads experienced by regular workers employed in the construction industry and are consistent with the evolution of the implied working year (Appendix S1). Second, to heighten any contrast, I assume the actual working year remained fixed in France but experienced a significant increase in England based on trends outlined in notes to Figure S3.3. The results suggest that in both cases, the real wages of English building laborers started to diverge from their French counterparts by the second half of the eighteenth century (Figure S3.3).

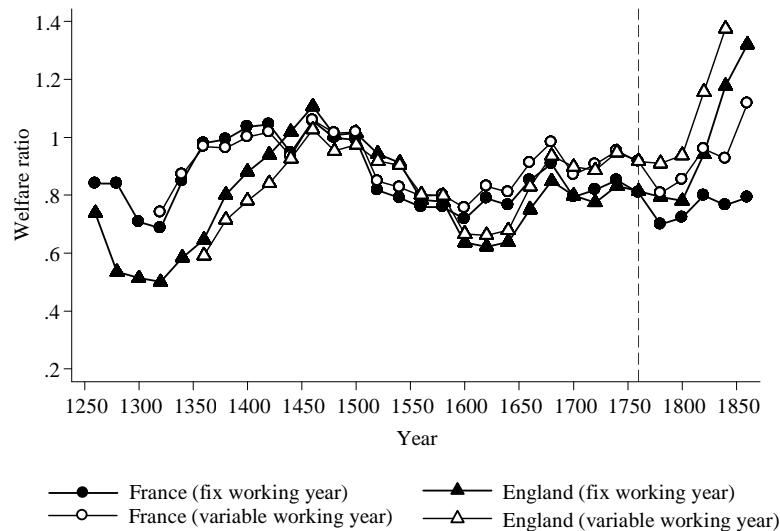


FIGURE S3.3  
INDUSTRIOUS REVOLUTION AND REAL WAGES: FRANCE AND ENGLAND

*Sources:* The series with a fixed working year assume 250 days of work per year. The other series assume the following working years: for France, see Appendix S1 (Model IV, notes to Figure S1.6), while for England, I use the same values as France until 1559; between 1560 and 1771, Clark and van der Werf (1998); in 1750, 1800, and 1830 Voth's (2001) data as presented in Allen and Weisdorf (2011, p. 721, lower bound of non-farmers).

Finally, I test the sensitivity of results to the so-called “oat-meals effect”, namely the increase in the level of welfare ratios deriving from the estimation of an oats-based basket instead of a bread-based one.<sup>91</sup> To test this argument, I estimate a new consumer price index using the weighting scheme proposed by Allen et al. (2011, Tab.4, p. 21). Basically, this basket provides the same amount of calories as the benchmark specification but these now come mainly from the cheapest carbohydrates (oats instead of wheat or white bread). Furthermore, the consumption bundle contains a lower amount of meat and legumes and implies a reduction in the quantity of most non-food produces by about half (candles, soap, and linen). As expected, this change in the structure of consumption raises substantially the welfare ratios of building laborers. However, the main trends are not substantively altered and again the real wages of English building laborers overtake those of their French counterparts by the second half of the eighteenth century.

<sup>91</sup> See Losa and Zarauz (2016).



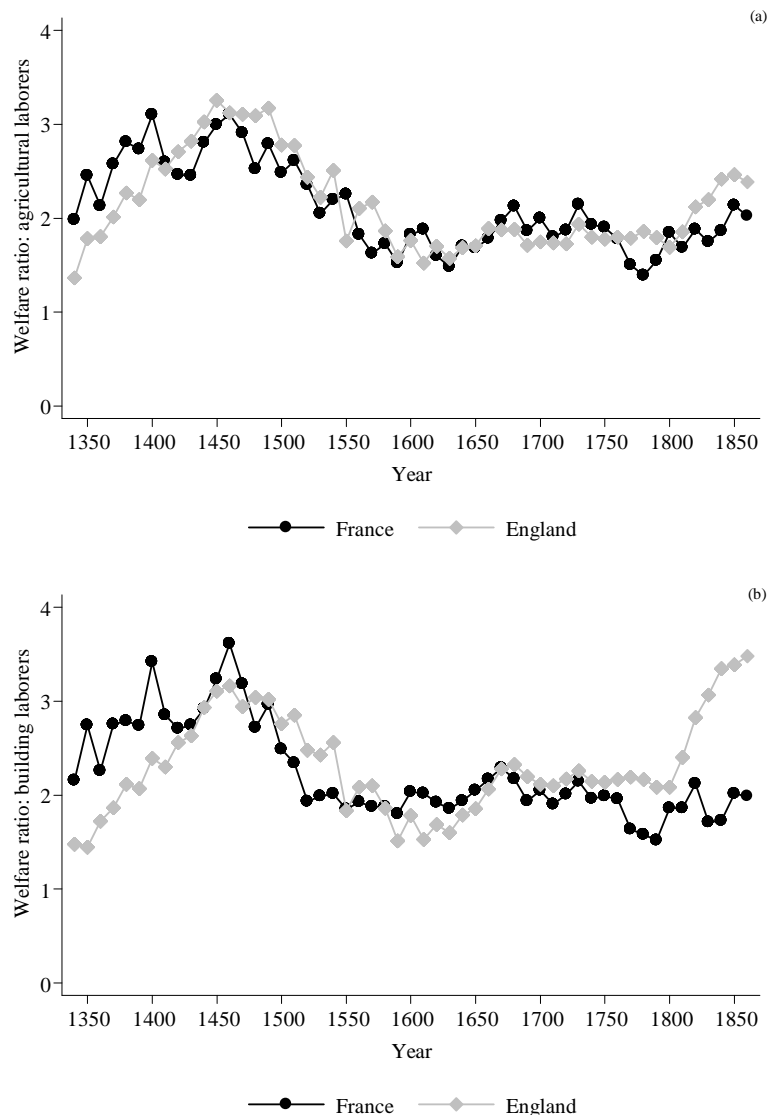


FIGURE S3.4  
OATMEAL EFFECT: REAL WAGES OF AGRICULTURAL AND BUILDING LABORERS IN FRANCE AND ENGLAND  
Sources: France: this study. England: see text. Oats prices come from Clark's dataset (Clark DB) available at <http://www.iisg.nl/hpw/data.php> (English prices and wages, 1209–1914).

### *Real wages in the capital city and the rest of the country*

In this section, I analyze the difference in living standards between the capital city and the rest of the country by plotting the ratio of real wages between Paris-France and London-England. Furthermore, I explore the sensitivity of results to various changes in the structure of consumption and employment behavior.

First, I assume that the expenditure share on rent was twice as high in Paris than in France. However, nineteenth century evidence suggests that the extent of the gap could be even lower than this (Lévy-Leboyer and Bourguignon (1985, p. 32); Hoffman et al. (2005, p. 141)).<sup>92</sup>

<sup>92</sup> French rural workers could have experienced lower prices, compared to city dwellers, because of auto-consumption, and the low per capita meat consumption (Weir 1997, pp. 170–74). For instance, according to Expilly (quoted in Toutain 1961, p. 162), per capita meat consumption was five times lower in the countryside than in the cities.

Second, to the extent that the more diversified economic structure of the capital city could offer greater job opportunities and less discontinuous employment, I posit that the working year lasted 25 percent more in Paris than in the rest of the country.<sup>93</sup> Taken separately, these assumptions pull the results in opposite directions, increasing or reducing the scope of the gap illustrated in the text. Thus, to obtain a plausible range of variation I test either separately and jointly the effects of these assumptions. In the absence of more precise information, I compute the ratio of London to England's building laborers real wages, using the same set of assumptions. Figure S3.4a shows the inclusion of a greater expenditure share on rent reduces very slightly the gap between Paris and France compared to the "Basic" model. In contrast, differences in the days worked per year determine an upward shift of the curve. However, in both cases, Paris welfare ratios are almost on par or only slightly higher than in the rest of the country, ranging between about 0.95 and 1.1 before 1790. The evidence of heights paints a similar picture, suggesting that soldiers in Paris were shorter than average between the 1690s and 1730s while those in Île-de-France (Champagne and Normandy) were very close to the French average between the 1670s and 1750s (Komlos 2003). In addition, the widening of the gap by the 1790s suggests that the economic effects of the French Revolution and the Napoleonic interlude tended to raise real wages in Paris relative to the rest of the country. In the absence of precise information on differences in working time between Parisian and French workers, I retain the same standard duration of 250 days per year to ease international comparisons. A different picture emerges when looking at the London-England comparison. Irrespective of the assumptions about rents and days worked per year, the real wage gap between London and England was indeed large, and clearly widened between the fifteenth and first half of the eighteenth century (Figure S3.4b).

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<sup>93</sup> Eighteenth century agricultural laborers worked about 200 days per year (excluding employment outside agriculture) while industrial workers averaged about 250 days (Postel-Vinay 1994). These figures are appropriate for the purpose of defining the upper and lower bounds of the gap in rural-urban labor industriousness, but do not consider temporary and seasonal migrations of rural workers to the cities. However, mixed forms of sectoral employment can be interpreted as combinations of the upper and lower bounds defined above.

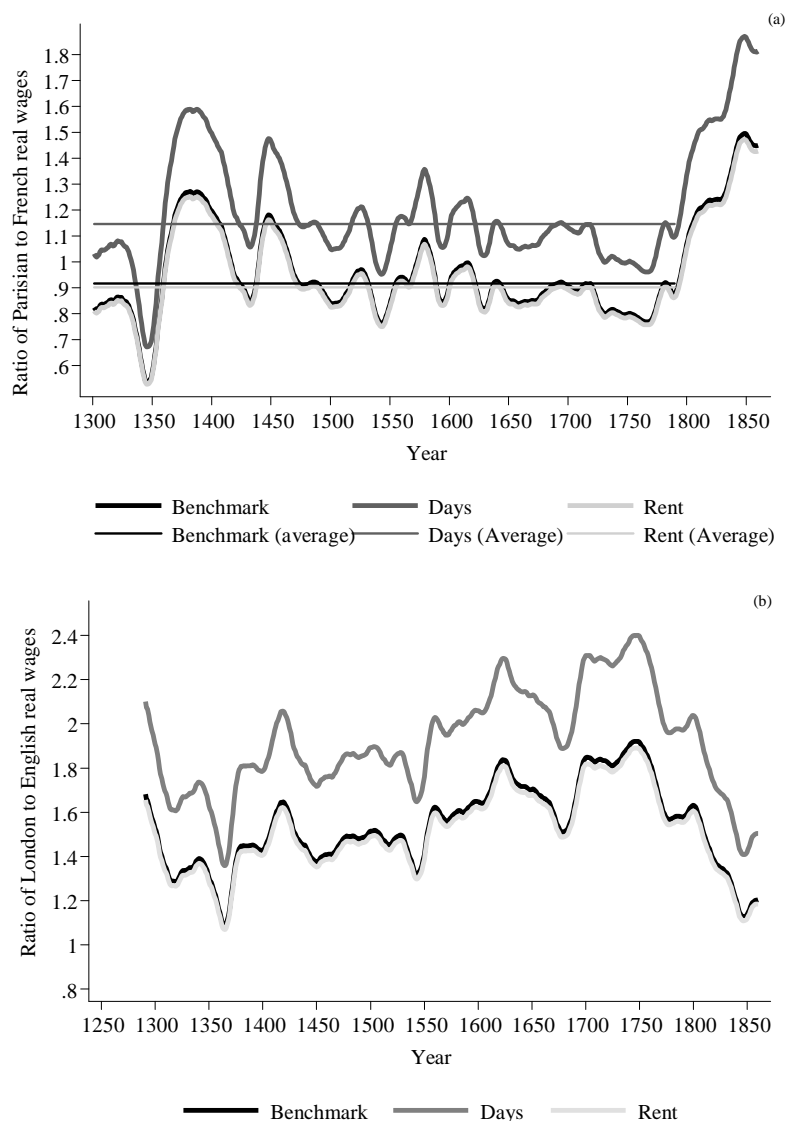


FIGURE S3.5  
REAL WAGES IN THE CAPITAL CITY AND THE REST OF THE COUNTRY  
Sources: Paris and France, this study. London and England, see the text.

Notes: "Basic" refers to the ratio of Paris to French welfare ratios (same procedure as Allen (2001)). "Days" refers to the ratio of Paris to French welfare ratios obtained by assuming that the working year lasted 25 percent more in Paris than in the rest of the country. "Rent" assumes the expenditure share on rent was twice as high in Paris than in France. Similar considerations hold for the ratio of real wages between London and England.

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