The Condition of the Working Class in England, 1209–2004

Gregory Clark

University of California, Davis

I use building workers' wages for 1209–2004 and the skill premium to consider the causes and consequences of the Industrial Revolution. Real wages were trendless before 1800, as would be predicted for the Malthusian era. Comparing wages with population, however, suggests that the break from the technological stagnation of the Malthusian era came around 1640, long before the classic Industrial Revolution, and even before the arrival of modern democracy in 1689. Building wages also conflict with human capital interpretations of the Industrial Revolution, as modeled by Gary Becker, Kevin Murphy, and Robert Tamura; Oded Galor and David Weil; and Robert Lucas. Human capital accumulation began when the rewards for skills were unchanged and when fertility was increasing.

I. Introduction

The paper estimates the real wages per hour worked for building craftsmen and laborers in England annually from 1209 to 2004, as well as the wage premium received by skilled workers compared to that of laborers. These series are employed to interpret both the causes and the consequences of the Industrial Revolution. Because the derivation of these series involves a huge amount of data and sources—46,000

The data collection for this paper was funded by National Science Foundation grants SES 91-22191 and SES 02-41376. I owe an enormous debt to the many transcribers and compilers of English wage and price data, who are listed in the Appendix. This paper would have been impossible without these printed sources. Thus of the 46,000 wage observations used, only 5,000 were collected directly from manuscripts. A particular debt is owed John Munro for generously sharing his coded data from the Beveridge Archive on the Winchester Estates.

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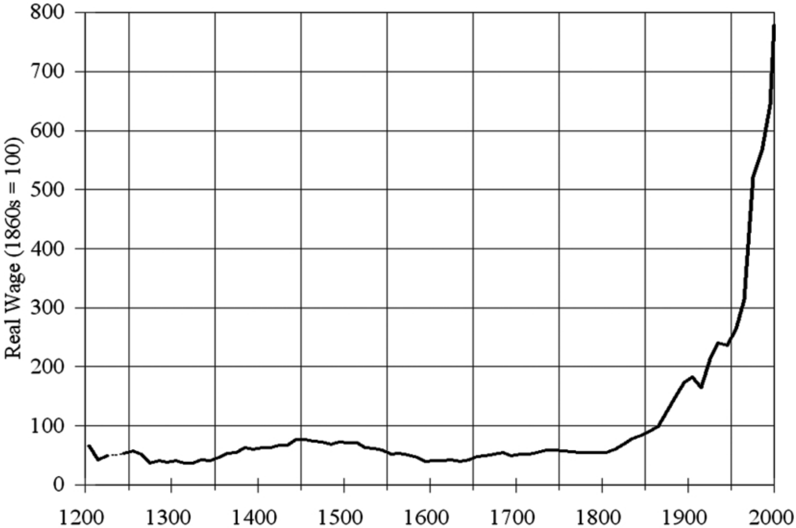

FIG. 1.—Builders' real day wages, 1209–2004 (source: table A2)

wage observations and 110,000 observations on prices and housing rents—the details are given in the Appendix. The body of the paper concentrates on the resultant series and their implications.

The most important implications are that the break from the Malthusian era of little advance in efficiency in England began circa 1640, long before the famous Industrial Revolution, and before even the emergence of the modern political regime in England in 1689. Further, while it is possible that the fundamental cause of this break was much greater investment in human capital, those gains in human capital investment cannot have their origin in the incentives provided by labor markets. Both real wages and the premium for skills in the seventeenth century did not change in such a way as to induce a switch to fewer children of higher quality. Finally, the new series suggest that the classic Industrial Revolution of the eighteenth century was much more favorable to workers' real earnings than other recent studies have implied.

Figure 1 shows the estimated real purchasing power of the hourly wage of building workers from 1209 to 2004 by decade. Before 1870, when wages are mainly quoted by the day, work hours are assumed to be 10 per day. The Appendix shows that, if anything, work hours before 1800 were possibly higher than 10 per day, so that the gain in real wages in the Industrial Revolution era is perhaps greater than the figure suggests.

Before 1800, though there were major fluctuations, real wages display no clear trend. Wages in 1200–1249, for example, averaged only 9 per-

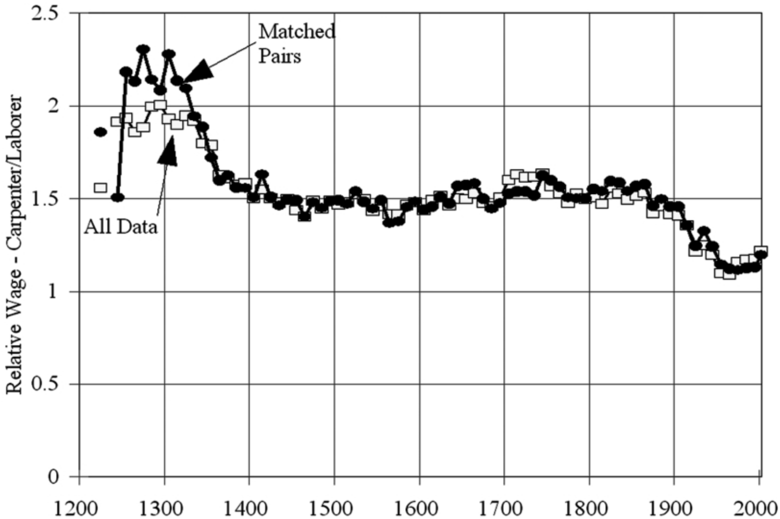

FIG. 2.—The wage of carpenters relative to laborers, 1220s–2000s (source: table A2 and Appendix).

cent less than those in 1750–99 at the eve of the Industrial Revolution. Given the large and persistent swings up and down in real wages before 1800, it is impossible to be confident that there was any trend. Thus a major implication of the Malthusian model of the preindustrial era, that there should be no secular gain in wages all the way from the hunter-gatherer era to the Industrial Revolution, is borne out as far back as 1200. From 1800 to 2004, in contrast, hourly real wages grew 13-fold, gaining 1.3 percent per year.

Figure 2 shows craftsmen's wages relative to those of unskilled workers by decade from the 1220s on, calculated in two ways: (1) by measuring by decade the relative wage of all craftsmen relative to all laborers and (2) by using only those observations in which there is a matched pair for the same place and year of wages for craftsmen and laborers. The broad trends are very similar and suggest that over time the skill premium declined markedly in England. The premium was 100 percent or more before 1350 but declined to only about 50 percent by 1400. It maintained this level for 500 years till about 1900. Then in the twentieth century there was another profound decline in the market reward for skills in the building industry, to a level of 10 percent or less by the 1960s. Since then, there has been a modest gain in the skill premium, but in 2004 it was still only 22 percent, less than half the preindustrial level.

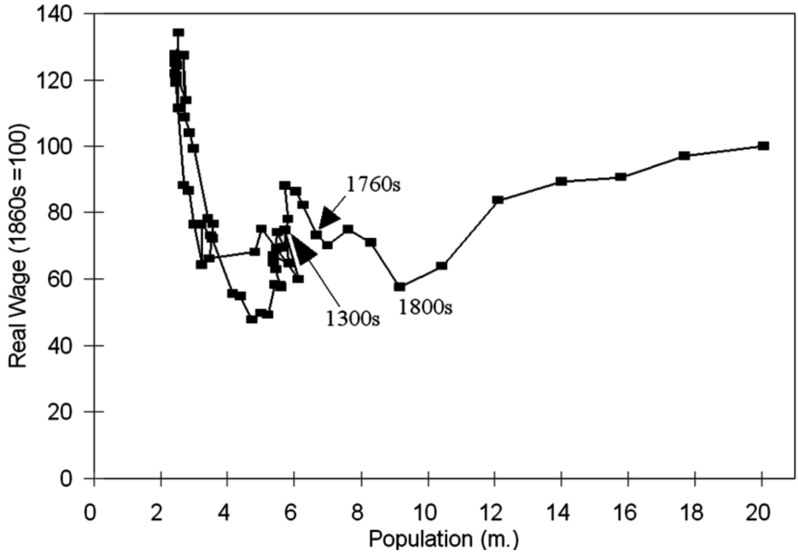

FIG. 3.—Real craftsmen's day wages from Phelps Brown and Hopkins vs. estimated population, 1280–1869. Sources: real wages, Phelps Brown and Hopkins (1981, 28–31); population, 1540–1850, Wrigley et al. (1997, 614–15); population, 1280s–1530s, Clark (2005*a*).

II. Wages and the Timing and Causes of the Industrial Revolution

There has been a tendency to regard the classic Industrial Revolution of the 1760s as representing a single sharp break between the Malthusian world of negligible advances in efficiency and the modern world of continual gains in efficiency. This view was supported by the famous earlier attempt to estimate real builders' wages in England from 1265 to 1956 by Sir Henry Phelps Brown and Sheila Hopkins (1981). Their results suggested that Malthusian stagnation continued in England almost up until 1800. In the Malthusian era we can roughly approximate the total factor productivity (TFP) of the economy by comparing real wages to the level of population, as is done for the Phelps Brown–Hopkins series for carpenters in figure 3.[1] If there was a constant level of TFP in preindustrial England, then there would be an inverse relationship between wages and population, other things being equal (including trade possibilities and taxation). At a given level of population, the higher the productivity of the economy, the higher the level of real wages would be. Figure 3 suggests almost complete stasis of aggregate productivity between the 1280s and the 1760s and even the 1800s, with

[1] Loose because the wage indicates only the marginal productivity of labor. So changes in the capital stock could also change wages.

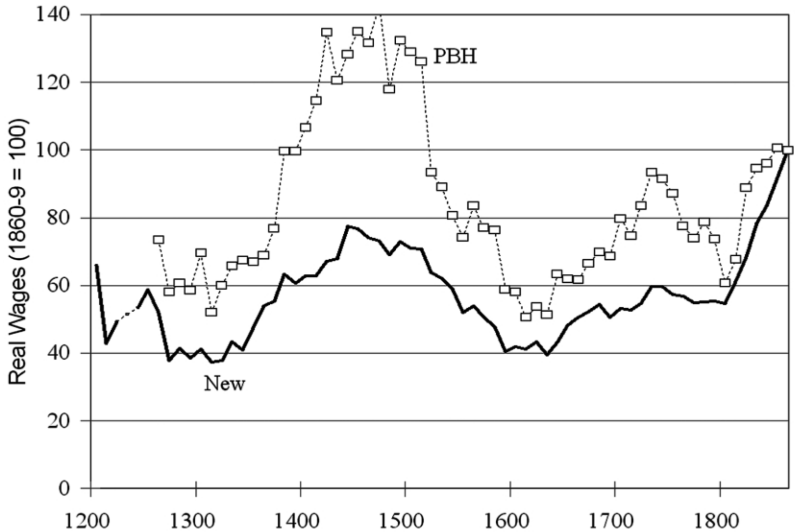

FIG. 4.—Real wages, 1200–1869, Phelps Brown and Hopkins vs. new series. In both series, 1860–69 has been set to 100. Sources: Phelps Brown and Hopkins (1981, 28–31), table A2.

some surprising declines in productivity in between. The seventeenth-century advances in intellectual understanding of the natural world—Francis Bacon, Isaac Newton, Robert Hooke, Robert Boyle, and their ilk—apparently had little effect on the efficiency of the economy before 1800.

The series developed here is very different from that of Phelps Brown and Hopkins, however. Figure 4 shows the two series for comparison for the decades before 1870. In particular, real wages before 1600 are much lower, in some decades being almost 50 percent less than Phelps Brown and Hopkins' estimate. The Appendix details why these series differ so much and why the current estimates are preferable.

The revised series also implies a very different image of economic growth in England before the Industrial Revolution. Figure 5 shows real wages by decade with these data from the 1280s to the 1860s versus estimated English population. Now in the decades prior to 1600 there is a remarkably stable inverse relationship between wages and population. The curve in figure 5 shows the fitted relationship from regressing the logarithm of the real wage on the log of population for the decades of the 1280s to the 1590s. Population alone explains wages very well in the years before 1640.

With the new data on wages, the efficiency of the economy shows the first signs of significantly exceeding medieval levels in the 1640s, when

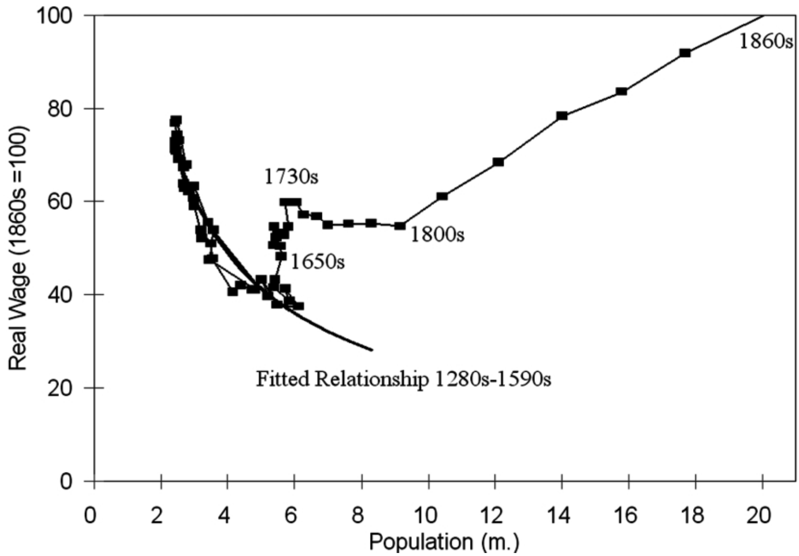

FIG. 5.—Real wages vs. population on the new series, 1280s–1860s. The line summarizing the trade-off between population and real wages for the preindustrial era is fitted using the data from 1260–69 to 1590–99. Sources: population, same as for fig. 3; real wage, table A2.

real wages are 11 percent higher than would be implied by the population given the observations before 1600. There was seemingly significant productivity growth in the economy between the 1630s and 1740s. By the 1740s, wages were 67 percent higher than would be predicted from the pre-1600 relationship. This growth was followed by an apparent pause in productivity growth at the eve of the classic Industrial Revolution, before its resumption in the 1790s. However, real wages in the decades of the 1770s to the 1810s were depressed by as much as 10 percent by the heavy indirect taxes imposed to finance the substantial military expenditures of the government in these years of the American Revolutionary War and the struggle with Napoleon, and by the disruptions of trade caused by the wars. The seeming pause in TFP growth in these years may thus reflect just the limitation of trying to infer TFP growth from wage and population information alone.

The beginning of the escape from the Malthusian stagnation in England in the 1640s is a surprise, considering the social and political history of seventeenth-century England. From the 1630s to the 1680s there was considerable political and religious conflict, resulting in an open civil war for most of the 1640s between the king and Parliament. After the execution of King Charles I in 1649, there were 11 years of unsuccessful rule first by Parliament and then by a military dictatorship

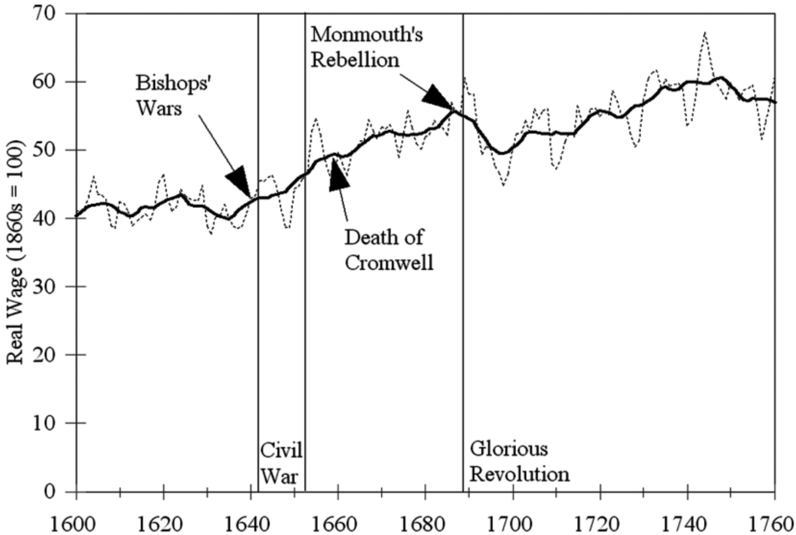

FIG. 6.—Economic growth in the seventeenth century. The dashed line shows the annual real day wage of building workers and the solid line the 11-year moving average of real day wages. Source: Appendix.

under Oliver Cromwell and his successor. The restoration of the monarchy in the form of Charles II in 1660 left the basic conflict between the king and Parliament unresolved, and the succession of his brother James II in 1685 added religious venom to the issues. Yet as figure 6 shows in detail, this was the first period in recorded English history in which substantial growth of real wages was not explained by declines in population. After six turbulent decades, real wages in the 1680s were 43 percent higher than would be expected from past experience.[2] This is thus the first sustained period of growth in estimated TFP in recorded English history. The arrival of the new stable regime of rule by Parliament with the replacement of James II by William III and Mary II in 1689 is associated with a decline of the implied TFP growth rates in the early eighteenth century and the stasis of the late eighteenth century.

For the many economists who see institutions as the explanation for the lack of growth in efficiency before 1800, the first appearance of modern growth in the years 1630–90, and its slowdown for 100 years thereafter, should be an uncomfortable revelation. The Glorious Revolution of 1688–89 established a highly stable democracy in England,

[2] This wage gain does not seem to be the result just of the redistribution of incomes. Real land rents rose in these years, and the tax burden was largely unchanged. While returns on capital fell, they fell so modestly that they could not explain these wage gains (Clark 1998, 2002*a*).

an institutional regime largely unchanged to the present day. Economists such as Douglass North and Barry Weingast have asserted that the reforms of 1688–89 were the precondition of modern growth. They allegedly gave security to investors and innovators in a way that previous rule by despotic monarchs, unable to control their predatory urges, could never ensure (North and Weingast 1989).[3] After 1689, increased security should have raised the value of private assets such as land or houses and reduced the rate of return on capital. Greater investment and capital accumulation should have driven up real wages. Instead, it is impossible to trace any effect of the Glorious Revolution on capital markets, land markets, housing markets, or now labor markets either (Clark 1996, 2002*a*, 2002*b*). The bad old regime fostered more economic growth than the new one did, at least initially.

Another class of recent theories of the Industrial Revolution has focused on the acquisition of human capital and the growth externalities this creates (Becker, Murphy, and Tamura 1990; Galor and Weil 1996, 2000; Lucas 2002). The vision has been of a preindustrial equilibrium in which both incomes and the private returns to skills were low. This induced parents to prefer to produce as many children as possible but invest little in the human capital of their offspring. Short-term gains in income in this preindustrial equilibrium resulted only in population growth, which pushed income back to the subsistence level. The Industrial Revolution represented a break from the Malthusian equilibrium associated with families switching their behavior toward fewer births but investing more in each child. The cause of this break differs with the specific theory, but there are really only two things that can signal families to change their childbearing and child rearing behavior toward modern norms: (1) a higher level of real incomes, for husbands, wives, or both, which determines the value of the opportunity cost of the parents' time; and (2) a higher implied private return to human capital, which determines the returns to investing in human capital.

England in the period before the Industrial Revolution certainly witnessed signs of a greatly increased stock of human capital. Figure 7 shows by decade estimates of the proportion of men and women in England who had at least basic literacy. This proportion rose substantially in the years before the Industrial Revolution. Literacy was also associated strongly with occupation and with wealth in the preindustrial period. Table 1 shows the fraction of will writers in the early seventeenth century seemingly illiterate (because they signed the will with an *X*) and the average value of the bequests by occupation. Those in skilled oc-

[3] Jones (2001) argues that the increased appropriability of knowledge was key to the Industrial Revolution.

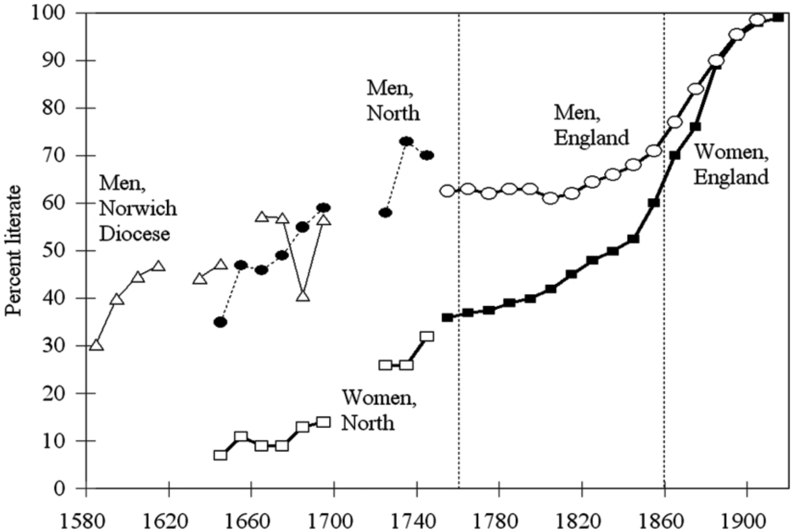

FIG. 7.—Average literacy in England, 1580–1920. Sources: 1750s–1920s, Schofield (1973), men and women who sign marriage registers; the North, 1630s–1740s, Houston (1982), witnesses who sign court depositions; Norwich Diocese, 1580s–1690s, Cressy (1977), witnesses who sign ecclesiastical court declarations.

cupations were more literate than those in unskilled occupations, and they had more assets at the time of death.

But why was literacy increasing in England in the years preceding the Industrial Revolution? The real-wage series in figure 4 shows that the gains in human capital evident in England in the seventeenth century were occurring in an environment in which real wages in the early part of that century were in fact low for the Malthusian era. Real wages in

TABLE 1
OCCUPATIONS, LITERACY, AND ASSETS: WILL WRITERS, 1620–36

Social Group	Wills in Sample	Fraction of All Wills Signed with an *X*	Fraction of Town Wills Signed with an *X*	Average Value of Assets Bequeathed (£)
Gentry	50	.11	.12	706
Merchants, professionals	60	.11	.13	284
Yeomen, farmers	439	.51	.36	271
Traders	60	.37	.40	87
Craftsmen	193	.56	.66	87
Husbandmen, shepherds	212	.65	.75	63
Laborers	34	.76	. . .	52
All	1,048	.53	.32	. . .

SOURCE.—Evans (1987), Allen (1989).

the fifteenth century were about 60 percent higher than those in the seventeenth century because of the very small population of the earlier years. Nor is there any sign in this era of a rise in women's wages relative to those of men, as would occur in the textile industries in the Industrial Revolution era.

The wage premium for skills shown in figure 2 similarly does not point to the seventeenth century as a period in which skill acquisition was being better rewarded in the marketplace.

Skilled building workers typically acquired those skills by apprenticing themselves to a craftsman, with the traditional apprenticeship lasting up to seven years. Parents in at least some cases had to pay to secure apprenticeships for their children. High skill premiums in the early years would not indicate strong incentives to invest in skills if the high premiums were caused by restriction of access to skilled crafts through guild limitations on apprenticeships. In major urban centers such as London from at least medieval times, crafts were organized through guilds, which required apprenticeships for access to the skilled trades. If the crafts could successfully limit this access, then they could drive up the relative wage of the skilled workers. This would result in an increase in the premium existing craftsmen were able to demand for apprenticeships, so that higher skill premiums in this case would indicate no greater incentive to pursue training for children.

But all the indications are that guild control of entry to skilled crafts in centers such as London was weaker in the years before 1350, when skill premiums were high, than in subsequent years, when premiums were low. One way to limit entry to the skilled crafts was to increase the required term of apprenticeships. In 1309–12 in London the modal term of registered guild apprenticeships was seven years: 82 percent served an apprenticeship of eight years or less (with the modal age at entry 14). By the early fifteenth century, when the premium for skills in the London building trades had fallen markedly, apprenticeships had lengthened: only 41 percent of registered apprenticeships lasted for eight years or less (Hanawalt 1993, 135).

Guild regulation of crafts was much stronger in cities than in the countryside. With the copious data I have, I can calculate separately the wage premium in the urban and rural areas throughout these years. Generally the skill premium was, if anything, higher in rural areas and small towns than in the largest cities. And the decline in the premium over time was just as profound in the countryside. Thus the secular decline in skill premiums must reflect underlying trends in the demand for and supply of skills in the building industry.

Another possible explanation for rising literacy in the years 1600–1900 would be the increasing urbanization of English society associated with industrialization. Estimates of the urban share of the population before 1800 are tentative, but most imply that it was very small before 1700. Between 1600 and 1800 the urban share of the population probably increased from about 15 percent to 35 percent.[4] Since there are different occupational demands for literacy and urban areas benefit from economies of scale in providing schooling, it is possible that the spread of education in preindustrial England was at least partially driven by urbanization and industrialization. However, evidence from the sample of male will writers presented in table 1 suggests that these effects at best explain little of the increase in male literacy between 1600 and 1800. Male testators in towns in 1620–36 had a 68 percent chance of being literate, compared to 45 percent for those dying in the countryside. But will makers were concentrated among the more literate. If we reweight the sample to conform to the likely occupational distribution of England as a whole, the difference was only about 15 percent. With one-fifth more people in urban areas in 1800 than in 1600, this would then explain a 3 percent greater male literacy rate. Figure 7 suggests that at least 20 percent more of the population of men was literate in 1800 than in 1600 (with an even greater increase for women). Rural literacy rates in 1800 must have been much higher in 1800 than in 1600.

Comparing figures 2 and 7, we see that the skill premium moved in an inverse relationship to the average stock of human capital. There was a fundamental shift in the amounts of education parents supplied children, even in rural areas, beginning long before the Industrial Revolution, without any significant improvement in the returns to skill. Further, as Clark (2005*a*) discusses, this increased investment in skills occurred long before there was any decline in fertility, and indeed in an era in which fertility was increasing from 1650 up until about 1820. It is thus probable that explaining rising human capital accumulation in preindustrial England will require models that posit changes in household preferences, as in Galor and Moav (2002).

III. The Consequences of the Industrial Revolution

There has been a long-standing controversy about whether and when labor gained from the Industrial Revolution in England.[5] Friedrich Engels, for example, claimed in 1844 that the preindustrial worker in England was far better off than his successors of the factories of the

[4] For example, of the sample of will makers in Suffolk in 1620–36 described in table 1, only about 10 percent lived in towns at the time of their death. If we added in London, the overall implied urban total for England would be more like 15 percent. By the time of the 1801 census, if we measure urban areas as parishes or townships with a population density of more than one person per acre, 34 percent of England was urban.

[5] This debate seems endless. Recent arguments for optimism are found in Lindert and Williamson (1985) and Clark (2001). Feinstein (1998) and Allen (2001) are much more pessimistic.

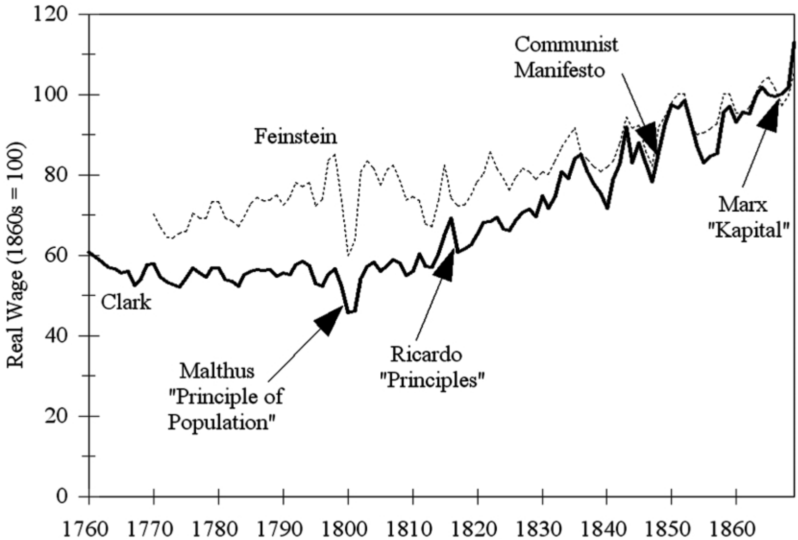

FIG. 8.—Real wages in the Industrial Revolution. Both series have been set to 100 in 1860–69. Sources: Feinstein (1998), Appendix.

1840s. "So the workers vegetated throughout a passably comfortable existence, leading a righteous and peaceful life in all piety and probity; and their material position was far better than that of their successors" (Engels 1892, 2).

Figure 8 shows building workers' real wages by year from 1760 to 1869 as calculated here, but also in contrast the recent pessimistic real wage series for British workers as a whole of Charles Feinstein (1998). The series here is much more optimistic for the Industrial Revolution era than that of either Feinstein or Phelps Brown and Hopkins (1981) (see fig. 3). Feinstein calculates that English workers gained 47 percent in real wages from the 1770s to the 1860s. The evidence here suggests that the gains for building workers were a much more substantial 82 percent. As before with Phelps Brown and Hopkins, the reason for my much greater optimism is almost entirely that my estimated cost of living rises much less than Feinstein's.

The real wage series in figure 8 does suggest, however, that Feinstein is, if anything, too optimistic about the *early* Industrial Revolution. It was not till the 1820s that real wages advanced beyond their level in the middle of the eighteenth century at the beginning of the Industrial Revolution era. Before then, real wages actually declined somewhat from their level of the 1760s. When Thomas Malthus published his famous *Essay on the Principle of Population* in 1798, real wages had been flat or declining for several generations, ever since the first half of the eigh-

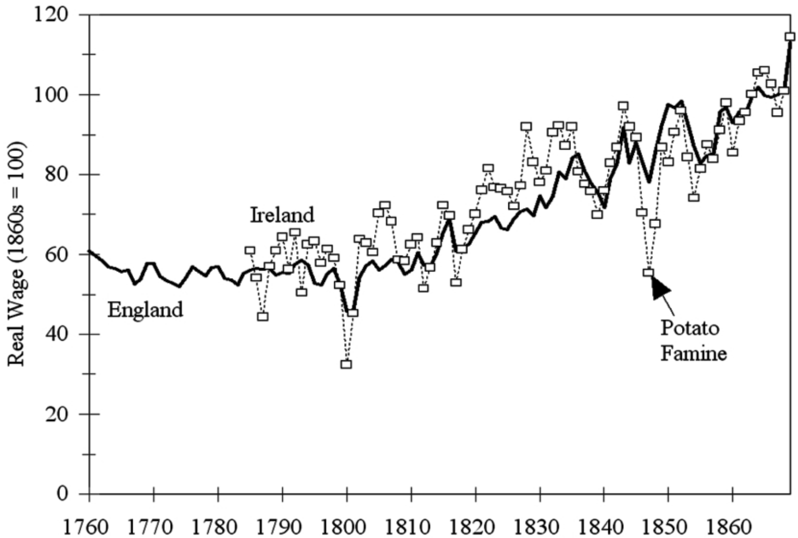

FIG. 9.—Real wages in England and Ireland. Both series have been set to 100 in 1860–69. Sources: England, Appendix; Ireland, Geary and Stark (2004).

teenth century. At the time Malthus was writing, the dramatic technical innovations that transformed cotton spinning—the spinning jenny and water frame in 1769 and the mule in 1776—were almost a generation old. But these gains were expended mainly in allowing significant population growth rather than in raising real wages. David Ricardo's adoption and elaboration of the subsistence wage doctrine in the *Principles of Political Economy and Taxation* published in 1817 were also entirely reasonable at the time of its formulation, given the path of real wages to that point. There was as yet no sign that the economy could consistently generate enough productivity growth to allow permanent real-wage increases. Only in the 1820s did real wages begin showing robust growth. Between then and the 1860s, real-wage growth averaged 0.9 percent per year.

The *Communist Manifesto*, published in London in 1848 (Marx and Engel 1976), asserted that the wages of the new industrial proletarian were determined by "the means of subsistence that he requires for maintenance, and for the propagation of his race." But building wages in the 1840s exceeded the highest level they attained in any earlier decade in recorded history in England. By 1867, when Karl Marx published the first volume of *Kapital*, his subsistence doctrine of wages was increasingly remote from English reality.

This optimistic view of wage growth in Industrial Revolution England is supported by figure 9, which shows the movement of the real wages of Irish building workers in the Industrial Revolution era in comparison with those in England. Both series were set to 100 in the 1860s. Irish real wages were always considerably below those in England, but they rose nearly as much as those in England between the 1780s and the 1860s, and with very similar timing. In the Industrial Revolution era, Ireland deindustrialized in response to the industrialization of Britain, losing much of its domestic textile industry and specializing increasingly in the production of foodstuffs for a rapidly urbanizing England. Ireland also suffered in the years 1846–50 from the devastating potato famine, which resulted in the deaths of perhaps as many as 12 percent of the population. But, nevertheless, Irish real wages rose because of the declining prices of cloth, candles, fuel, sugar, and tea. It would be bizarre indeed had English workers at the heart of the Industrial Revolution witnessed less improvement in real wages than their Irish colleagues.

Since Irish workers gained as much as English from the Industrial Revolution, it is unwise to assume in general that England gained any more from the Industrial Revolution than other countries did. The competitive nature of Industrial Revolution industries and the rapid transition of England toward exporting manufactures in return for foodstuffs and raw materials meant that perhaps half of all the TFP gains of the Industrial Revolution were directly exported as falling prices to consumers in England's trading partners, such as Ireland.

IV. Conclusion

The real wage series developed above provide insights into the English economy in both the Malthusian and Industrial Revolution eras. The Malthusian prediction that real wages should be trendless before the Industrial Revolution is confirmed for the years after 1200. I also find extremely long periods in which there was apparently no productivity growth in the preindustrial economy. If we compare real wages with population, we see from the 1200s to the 1600s a period of 400 years without any signs of TFP growth. But the Industrial Revolution of the 1760s and later is preceded by a period of more modest economic growth starting in the 1640s. Thus the Industrial Revolution is not clearly an abrupt break around 1800 from a stagnant economy. It may just be the acceleration of a process of modern growth that began about 150 years earlier.

We also see in the premium paid for skills that while increased investment in human capital may lie at the heart of the Industrial Revolution, the causes of this increased investment, evident in England as early as 1600, are mysterious. The market signal to parents, in the form of the level of real wages, the relative wages of men and women, or the market premium for skills, does not explain the increased investment in human skills evident after 1600.

Appendix

Calculating Nominal Wages, the Cost of Living, and Real Wages

Preindustrial England has a uniquely well-documented wage and price history. The stability of English institutions after 1066 and the early development of monetary exchange allowed a large number of documents with wages and prices to survive. This paper fashions a large collection of these records of wages and prices—more than 46,000 quotes of day wages, 90,000 quotes of the prices of 49 commodities, and 20,000 quotes of housing rents—into an estimate of English building workers' real day wages from 1209 to 2004.[6] The new national wage series is calculated as an average of five regional series in the years before 1915: London, the Southeast, the Southwest, the Midlands, and the North.[7]

There was a change in how wages were quoted around 1860. Before then, most wages were quoted for "a day" or "half a day," with the length of a day unspecified. Thereafter, increasingly hourly wages were quoted. What was the length of the workday before the 1860s? In a transitional period between 1720 and 1869, wages were sometimes quoted both by the day and by the hour. I calculate the implied hours per day in these decades by dividing the day wage by the hourly wage. Table A1 gives the implied hours per workday by decade using this method. If one either takes just the raw averages or controls for craft and location, the results are the same. After the 1810s, the implied workday is about 10 hours. But from the 1750s to the 1810s the day seemingly declined from 11 to 10 hours. However, the evidence for the years before 1800 is limited to a few observations from three towns: London, Exeter, and Bristol. Thus I assume a standard 10-hour day for all day wage quotes for the years before 1869, without making any adjustment for potentially longer days before 1810. Hourly wages after 1869 were converted into a wage for a notional 10-hour day.

Another discontinuity enters the series around 1860. Later wage quotes were mainly the amounts actually received by workers in wages. Earlier, most quotes were the amounts paid by institutions to craftsmen or building firms for labor costs. The amounts actually received by the workers would be less than these payments in many cases, judging at least from the evidence in the years in which we know of both types of payments. The difference was the payment to the firm or the master craftsman for his role in organizing the work. For the years 1843–69, for the same place and work type, I have a set of observations on both types of wage reported. In this sample the average direct wage payment is 0.905 of the payment for labor costs by the customers. Thus the overhead charge averaged a little less than 10 percent of the charge for labor costs. I apply this number to all wage observations that were not clearly direct payments to workers.

[6] These documents have been the basis of many studies of preindustrial wages and prices. Most notable are those of James E. Thorold Rogers (1866–1902, vols. 2, 3, 6, 7 [pt. 1]), Elizabeth Gilboy (1934), William Beveridge (1936, 1939), Peter Bowden (1967, 1985), Bernard Eccleston (1976), Henry Phelps Brown and Sheila Hopkins (1981), David Farmer (1988, 1991), Steve Rappaport (1989), Donald Woodward (1995), Jeremy Boulton (1996, 2000), and Charles Feinstein (1998).

[7] London is defined as any location within 10 miles of the City of London.

TABLE A1
ESTIMATED HOURS OF WORK, 1720–1869

Decade	Towns	Observations	Simple Average Length of Day	Towns with Multiple Observations	Average Length of Day*
1720	1	1	10.0	1	10.4
1730	...	...	...	...	...
1740	1	1	8.0	1	8.3
1750	1	2	12.0	...	...
1760	1	3	12.0	1	11.9
1770	1	2	9.8	1	10.1
1780	2	6	11.2	2	11.3
1790	2	14	11.2	2	10.9
1800	4	22	10.6	4	10.5
1810	5	41	10.0	5	10.3
1820	7	51	10.1	6	10.3
1830	9	44	9.8	8	9.9
1840	10	48	9.8	9	9.9
1850	9	75	10.0	8	10.0
1860	8	67	9.9	5	10.0

NOTE.—Observations for this table are taken from Ampthill, Barking, Billericay, Bristol, Canewdon, Chelmsford, Colchester, Croydon, Exeter, Guildford, Halstead, Hull, Leicester, London, Penrith, Sherborne, Sutton Valence, Wigton, and York.
* Controlling for craft and town.

To get from the mass of observations of individual wages to a consistent wage series, the annual day wages for craftsmen in the new series before 1915 were calculated by estimating the coefficients of a regression of the following form:

$$\ln(W_{it}) = \alpha_i + \sum_{j=1}^{29} \gamma_j \text{CRAFT}_j + \sum_{k=1}^{12} \eta_k \text{JOINT}_k + \sum_{l=1}^{4}\sum_{m=1}^{13} \theta_{lm} \text{REGION}_l \text{PERIOD}_m + \sum_t \phi_t D_t + \epsilon_{ijt}, \tag{A1}$$

where W_{it} is the average wage in location i of a craftsman in year t; α_i is a fixed wage premium for each location i, such as Chelmsford; CRAFT_i is a set of 29 indicator variables for different crafts such as bricklayer and mason (the omitted category is carpenter); JOINT_j is an indicator variable for a joint wage of a craftsman and a servant or assistant for the 13 periods 1200–1299, 1300–1349, 1350–99, …, 1800–1849, and 1850–69 (there are no joint wage quotes after 1869); REGION is an indicator variable for each of the four "regions" (London is the omitted category); PERIOD is an indicator variable for each of the periods 1200–1299, 1300–1349, …, 1800–1849, and 1900–1914 (the relative levels of day wages changed across the other regions over time, but by modest amounts); and D_t is an indicator for each of 672 years with a wage observation. From 1209 to 1914 there are 23,524 observations of craftsmen's wages, with the average wage of each craft at each location in each time period treated as one observation. Of these observations, 2,164 pertained to the joint wage of a craftsman and a helper.

Wages for laborers and assistants for 1914 and before were calculated in a similar way by fitting the parameters of a regression of the form

$$\ln(W_{il}) = \alpha_i + \beta \text{JOINT}_{<1350} + \sum_{l=1}^{4}\sum_{m=1}^{13} \theta_{lm}\text{REGION}_l\text{PERIOD}_m + \sum_t \phi_t D_t + \epsilon_{ijt}. \quad \text{(A2)}$$

The variable definitions are the same as for equation (A1). I have assumed that laborers' wages did not vary across crafts. I also use the joint wages of craftsmen and laborers only for the years before 1350 ($\text{JOINT}_{<1350}$), where wage observations on helpers alone are scarcer. There are 11,988 observations available for this estimation, of which 572 were joint observations of the wage of a craftsman and a helper before 1350.

These series for nominal day wages were extended from 1914 to 2004 using a variety of sources. For 1970–2004 on, I employed the New Earnings Survey followed by the Annual Survey of Hours and Earnings. This reports hourly earnings in April of each year from a national sample of workers including those in construction. For 1914–74, various sources report hourly earnings of building workers fixed by collective bargaining agreements in some of the larger towns in England: Bowley (1921, 1937), U.K. Department of Employment and Productivity (1971), and the *Department of Employment Gazette.*

The earnings of a craftsman relative to an unskilled worker was calculated in two ways. The first was to calculate by decade the relative wage of craftsmen relative to laborers. This is the result shown in column 3 of table A2. The second was to use only those observations for which there exists a matched pair of wage observations for the same place and year for craftsmen and laborers, and to estimate the coefficients of a regression of the form

$$\ln\left(\frac{W_{\text{craft}}}{W_{\text{lab}}}\right)_{it} = \alpha_i + \sum_k \beta_k \text{CRAFT}_k + \sum_t \phi_t \text{DEC}_t + \epsilon_{ijt}, \quad \text{(A3)}$$

where i indexes places and t the year. As before, CRAFT is an indicator for the craft of the skilled worker, and DEC is an indicator for the decade. The results of this estimation are broadly similar to the simple average, as figure 2 shows.

Figure A1 shows the nominal wage estimated by Phelps Brown and Hopkins (1981) relative to this paper for craftsmen and for their helpers. Though in individual decades the wage estimates deviate by as much as 23 percent, there is little pattern to these deviations. They do not explain the much higher real wages systematically found by Phelps Brown and Hopkins in the years before 1600.

The cost-of-living index for 1209–1869 was formed as a geometric index of the prices of each component, with expenditure shares used as weights. It thus assumes constant shares of expenditure on each item as relative prices change. That is, if p_{it} is the price index for each commodity i in year t and a_i is the expenditure share of commodity i, then the overall price level in each year, p_t, is calculated as

$$p_t = \prod_i p_{it}^{a_i}.$$

TABLE A2

Building Wages, Living Costs, and Real Wages by Decade, 1209–2004

Decade	Craftsmen's Day Wage (Pence) (1)	Helpers' Day Wage (Pence) (2)	Relative Wage (3)	Cost of Living (1860s =100) (4)	Craftsmen's Real Wage (1860s=100) (5)	Helper's Real Wage (1860s=100) (6)
1200–1209	2.78	. . .	. . .	7.40	71.3	. . .
1210–19	2.08	. . .	. . .	8.44	46.5	. . .
1220–29	2.60	1.63	1.56	10.0	50.7	45.6
1230–39	. . .	. . .	. . .	9.15	. . .	. . .
1240–49	2.89	1.88	1.92	9.10	58.0	56.7
1250–59	3.17	1.71	1.93	9.85	60.2	48.2
1260–69	3.10	1.77	1.86	10.8	54.9	46.9
1270–79	2.70	1.45	1.89	12.7	40.8	32.4
1280–89	2.84	1.43	2.00	11.8	45.7	35.3
1290–99	2.83	1.42	2.01	12.6	42.6	32.7
1300–1309	3.01	1.57	1.93	12.8	44.9	35.8
1310–19	3.27	1.73	1.90	15.5	40.5	32.7
1320–29	3.23	1.67	1.95	15.0	41.3	32.5
1330–39	3.26	1.70	1.92	13.2	47.1	37.6
1340–49	2.89	1.61	1.80	12.6	43.6	37.2
1350–59	4.06	2.28	1.79	15.3	50.4	43.1
1360–69	4.45	2.75	1.63	15.4	55.1	52.0
1370–79	4.72	2.94	1.61	16.0	56.6	53.9
1380–89	4.62	2.95	1.57	13.8	63.9	62.4
1390–99	4.56	2.88	1.59	14.1	61.6	59.5
1400–1409	4.72	3.15	1.50	14.4	62.3	63.6
1410–19	4.89	3.17	1.55	14.7	63.2	62.6
1420–29	4.96	3.31	1.50	14.1	66.7	68.2
1430–39	5.06	3.43	1.48	14.4	67.0	69.4
1440–49	5.29	3.54	1.50	13.1	76.7	78.6
1450–59	5.19	3.62	1.44	13.1	74.9	79.9
1460–69	5.03	3.59	1.40	13.3	71.7	78.3
1470–79	5.13	3.45	1.49	13.5	72.4	74.4
1480–89	4.99	3.45	1.45	14.0	67.5	71.5
1490–99	5.09	3.43	1.49	13.4	72.1	74.1
1500–1509	4.93	3.36	1.47	13.4	70.0	72.9
1510–19	5.12	3.47	1.48	13.9	70.0	72.5
1520–29	5.29	3.48	1.52	15.8	63.7	64.1
1530–39	5.45	3.64	1.50	16.8	61.6	63.0
1540–49	5.78	4.04	1.43	19.2	57.5	61.4
1550–59	7.62	5.23	1.46	28.4	51.2	53.7
1560–69	8.63	6.10	1.42	31.4	52.2	56.4
1570–79	9.06	6.42	1.42	35.0	49.3	53.5
1580–89	9.76	6.67	1.47	39.6	46.9	49.0
1590–99	10.0	6.76	1.48	47.8	40.1	41.4
1600–1609	10.9	7.6	1.44	50.7	41.0	43.6
1610–19	12.0	8.0	1.49	55.7	40.7	41.8
1620–29	12.5	8.2	1.51	55.0	43.1	43.5
1630–39	13.3	9.1	1.47	64.7	39.0	40.7
1640–49	15.0	10.0	1.50	66.4	43.0	43.8
1650–59	16.6	11.1	1.50	66.2	47.8	48.8
1660–69	17.6	11.5	1.53	66.4	50.5	50.5
1670–79	17.7	12.0	1.48	65.0	51.6	53.4
1680–89	17.8	12.2	1.46	63.2	53.6	56.1
1690–99	18.5	12.3	1.50	70.4	50.2	51.1
1700–1709	19.0	11.9	1.60	66.7	54.2	51.8

TABLE A2
(*Continued*)

Decade	Craftsmen's Day Wage (Pence) (1)	Helpers' Day Wage (Pence) (2)	Relative Wage (3)	Cost of Living (1860s = 100) (4)	Craftsmen's Real Wage (1860s = 100) (5)	Helper's Real Wage (1860s = 100) (6)
1710–19	19.7	12.1	1.63	69.2	54.1	50.8
1720–29	20.0	12.4	1.62	68.0	55.8	52.8
1730–39	20.3	12.6	1.62	63.1	61.1	57.7
1740–49	20.6	12.6	1.63	63.9	61.4	57.4
1750–59	20.5	13.1	1.57	67.5	57.8	56.4
1760–69	21.3	13.9	1.53	71.1	56.8	56.8
1770–79	22.3	15.1	1.48	78.0	54.1	56.1
1780–89	23.4	15.3	1.53	80.5	55.2	55.2
1790–99	26.8	17.9	1.50	92.7	55.0	56.0
1800–1809	35.9	23.9	1.51	126	54.3	55.2
1810–19	43.8	29.8	1.47	139	60.1	62.5
1820–29	42.1	27.0	1.56	116	68.9	67.7
1830–39	42.7	28.0	1.53	104	78.4	78.5
1840–49	43.3	29.0	1.50	99.6	82.7	84.9
1850–59	45.6	30.1	1.52	95.0	91.4	92.4
1860–69	52.7	34.5	1.53	100	100	100
1870–79	65.2	45.8	1.42	99.3	119	131
1880–89	67.8	46.4	1.46	88.5	145	152
1890–99	73.2	51.7	1.42	83.2	167	180
1900–1909	80.8	57.3	1.41	87.2	176	190
1910–19	103	79	1.36	128	152	178
1920–29	172	142	1.22	173	189	238
1930–39	160	128	1.25	139	217	265
1940–49	238	200	1.20	218	207	265
1950–59	406	371	1.10	349	221	308
1960–69	660	603	1.09	478	262	365
1970–79	2,612	2,249	1.16	1,099	451	592
1980–89	7,734	6,594	1.17	2,974	493	642
1990–99	14,127	12,022	1.18	4,787	559	727
2000–2004	20,756	17,089	1.22	5,705	690	867

NOTE.—Wages throughout are measured in old English pence. £1 = 240d.

The individual price series were derived as the estimated parameters on year indicators of regressions of the form

$$\ln (P_{it}) = \sum_k \beta_k \mathrm{DTYPE}_k + \sum_t \phi_t D_t + \epsilon_{ikt},$$

where DTYPE is a dummy variable for each type of a product, with a type defined by location, purchaser, characteristics, and measuring unit. In this regression, I try to control for variations in the size of units across sources and in the quality of the product. This is important because both the quality of the product and the size of the measures varied across sources, even for very homogeneous commodities in the same place at the same time. In London in 1827, for example, the Clothworkers Guild paid 20d. per gallon for milk, Bethlem insane asylum 13d., and the king's household 24d., a range in price for a seemingly standard product of nearly 2 : 1.

The weights for expenditures are derived mainly from budget studies of man-

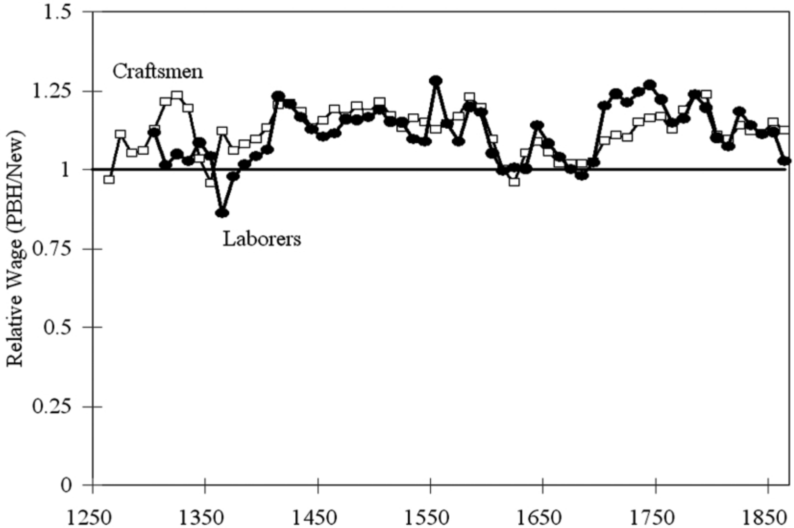

FIG. A1.—Nominal wages in Phelps Brown and Hopkins relative to this paper. Sources: table A2, Phelps Brown and Hopkins (1981, 11–12).

ual workers' expenditures collected in the years 1786–1854, as summarized by Horrell (1996). The Horrell average budget shares, together with earlier evidence for London manual workers from Vanderlint (1734), are given in table A3. For the share of housing costs in expenditure, I can supplement this evidence from even earlier for cases in which I know that the renter of a house is a building worker. In 22 cases before 1740 the average rental payment as a share of estimated annual income (with a 300-day work year assumed) was 5.9 percent.

Since, as we shall see, real living standards vary by only about 2.5 : 1 over the years 1200–1869, I use the same set of weights for the major categories of expenditure throughout these years. Also, in the interests of economy of space, I use the same cost-of-living index for craftsmen and laborers. Craftsmen spent more for meat, dairy products, beer, and tea than laborers, but the different movements in their costs of living are not big enough to justify the extra space that would be required to treat them separately. There are at maximum 49 items included in the cost-of-living index, including such exotica as stockings and pewter plates.

Up until 1869, bread was the single most important item of consumption for workers. The available prices of bread before 1816 mainly pertain to London, but they were regulated by statute before 1815. Over time the ratio of the assize price of bread in London to the cost of wheat changed markedly. A breakdown of the costs of bread baked for the navy in 1767 suggests that the price of bread should be nearly proportional to that of wheat, since wheat constituted 92 percent of the costs of making bread (Beveridge 1939, 542). Yet the ratio of the price of 48 pounds of bread in London to the price of a bushel of wheat in England falls from an average of 1.36 in 1670–1769 to 1.14 in the years 1770–99, but then bounces back up to 1.32 in the years 1820–69 after the assize was abolished (Webb and Webb 1904). This would not be possible if the bread were

TABLE A3
PERCENTAGE OF EXPENDITURES BY CATEGORY, MANUAL WORKERS, 1734–1854

Category	1734 (Vanderlint)	1787–96 (Horrell)	1840–54 (Horrell)	Assumed Here
Food and drink	**54.4**	**75.4**	**61.7**	**67.0**
Bread and flour	12.5	17.5	23.5	18.5
Barley	0	3.6	.0	1.0
Oats and oatmeal	0	9.9	1.5	2.0
Peas	0	. . .	. . .	1.0
Potato	0	6.3	4.0	4.0
Rice	0	.0	.2	.5
Farinaceous	**12.5**	**37.8**	**29.7**	**27.0**
Meat (beef, mutton, pork)	16.7	11.8	9.8	10.0
Fish	0	.1	.2	.5
Bacon	0	.2	1.8	1.0
Eggs	0	.0	.3	.5
Meat	**16.7**	**12.1**	**12.1**	**12.0**
Milk	2.1	5.9	2.7	4.0
Cheese	2.1	2.7	1.9	2.5
Butter	4.2	6.2	4.1	5.0
Dairy	**8.4**	**14.8**	**8.7**	**11.5**
Sugars	. . .	**4.2**	**4.5**	**4.5**
Beer/cider	12.5	2.8	1.7	6.5
Tea	0	3.4	2.2	2.5
Coffee	0	.0	1.0	1.0
Drink	**12.5**	**6.2**	**4.9**	**10.0**
Salt	. . .	. . .	. . .	1.0
Spices (pepper/vinegar)	. . .	. . .	. . .	1.0
Other food	**4.2**	**.6**	**2.1**	**.0**
Housing/housewares	**7.2**	**5.3**	**10.9**	**8.0**
Fuel	**5.6**	**4.4**	**4.8**	**5.0**
Light	2.1	. . .	. . .	4.0
Soap	2.1	. . .	. . .	.5
Light and soap	**4.2**	**3.8**	**5.2**	**4.5**
Services	**8.2**	**.1**	**2.5**	**2.5**
Tobacco	**0**	**.0**	**.7**	**1.0**
Other (clothing, bed linen)	**20.5**	**11.0**	**14.2**	**12.0**

SOURCE.—Vanderlint (1734, 76–77), Horrell (1996, 568–69, 577).
NOTE.—The boldface entries are the sums for each major category of food, such as farinaceous or meat. These groupings of items are the ones whose price levels are reported in table A4.

of constant quality. So for bread and flour before 1816, I infer bread prices from wheat prices. I do this using the estimated coefficients of the regression

$$\ln\left(\frac{p_b}{p_{\bar{w}}}\right) = a + b\ln\left(\frac{p_w}{p_{\bar{w}}}\right)$$

for the years 1816–69, when bread prices were free of regulation. The term p_b is the bread price (in pence per pound), p_w is the wheat price (in pence per pound), and $p_{\bar{w}}$ is the average wheat price over a 21-year period centered on the year in question. The estimated coefficients were

$$\ln\left(\frac{p_b}{p_w}\right) = 0.174 - 0.221\ln\left(\frac{p_w}{p_{\bar{w}}}\right).$$

The standard error on the estimate of b is 0.051. Thus the coefficient on wheat prices relative to trend is highly significant statistically (the R^2 of the fit is 0.26). This implies that bread prices were smoother than wheat prices.

For beer, a very significant consumption item before 1800, a major improvement of this index over previous indices is that I have been able to compile from churchwarden and other accounts a series of beer prices by the gallon back to the thirteenth century, as well as cider prices by the gallon from 1209 to 1485. The earlier cost-of-living index of Phelps Brown and Hopkins' (1981) had beer prices only back to 1660 and proxied beer by barley and malt prices before that.

Meat prices by the pound can be found only after 1540. Before this, meat was typically quoted by the live animal, the carcass, the quarter carcass, or such cuts as the leg, not by weight. By the nineteenth century, farm animals seem to have been much larger than those of the medieval period (Clark 1991). So it seems unwise to proxy meat prices using prices of whole animals before 1540. For the years before 1540, I approximate meat prices using an average of the one animal product that was sold by the pound, suet, egg prices, and also the price of fish (which being caught in the wild can be assumed to be of uniform size over time).

"Sugar" is calculated on the basis of the price of sugar and currants and raisins in later years, but earlier mainly on the prices of honey. Raisins and currants were included here because they seem to have been valued mainly for their sugar content. As can be seen in table A3, sugar is extremely expensive in the early years relative to other goods.

For fuel I use the price of faggots (bundles of sticks), turf, charcoal, and coal, increasing the relative weight of coal over time.[8] Light prices are proxied by a mixture of prices for gaslight, oil, and candles for the years after 1815 and for oil and tallow candles alone before then. Gaslight prices are measured by the average cost of a cubic foot of gas. The inclusion of gaslight, which fell rapidly in price from the 1810s to the 1860s, makes light prices relatively much higher in earlier years than in the Phelps Brown–Hopkins or Feinstein cost-of-living series.

A major innovation in the cost-of-living series in this paper is the inclusion of housing rental costs, which I estimate constituted 8 percent of the expenditure of workers. Rents controlling for housing quality are estimated for 1290–1840 using the methods discussed in Clark (2002*b*). For the years before 1540, there are only two major sources of housing rents: detailed studies of medieval Winchester by Derek Keene (1985) and of Cheapside in London by Keene and Vanessa Harding (1987). After this the range of sources is greater, including properties leased by the Armorers and Braziers, Carpenters, Clothworkers, and Grocers in London; rents on a substantial set of leases for houses owned by the almshouse in Saffron Waldon, Essex, before 1700; and properties owned by local churches in such towns and villages as Ashburton, Betresden, Cambridge, Tewkesbury, and York. To calculate the whole cost of lodging, I include as 20 percent of dwelling costs the cost of pewter plates and vessels and of wooden plates (1540–1650).

The cost-of-living series used in this paper also has much improved estimates of clothing and bedding costs. These are estimated to constitute about 12 percent of total expenditure. Much new data for the years 1560–1869 were collected

[8] Coal is given 90 percent of the weight for 1820–69, 80 percent for 1750–1819, 50 percent for 1690–1749, 25 percent for 1590–89, and 20 percent for all years before 1590.

from the records of clothing charities administered by London guilds or parishes: in particular, the Brewers, Carpenters, Clothworkers, and Goldsmiths. Services, such as schooling, doctors, and barbers, were assumed to constitute 2.5 percent of expenditures. Their cost is approximated by the average wage of building workers.

The decadal price levels for the major commodity groups used to form the cost-of-living index are given in table A4. For the years 1870–1995, I used the cost-of-living index of Feinstein (1995). Thereafter I employed the retail price index of British National Statistics.

One thing that makes the price index before 1869 much more reliable than previous indices is the greater range of commodities included and the consequently much smaller weight of any individual commodity. Any one series may contain errors, but with 49 different prices at its maximum, the law of large numbers begins to operate in reducing the effects of these errors. Thus in the new price index, after bread (18.5 percent) the single commodities with the next largest weights are housing (6.5 percent) and beer (6 percent). In contrast, Phelps Brown and Hopkins use at their maximum only 20 goods and give a weight of 25 percent to sheep alone and 22.5 percent to malt alone in some earlier years. Errors in individual series can then have a huge effect on the cost-of-living index as a whole.

Table A2 shows the cost-of-living index and implied real wage of skilled and unskilled workers by decade from 1200–1209 to 2000–2004. For real wages and the cost of living, 1860–69 is set to 100. One feature lending plausibility to the new real-wage series compared to that of Phelps Brown and Hopkins is that the lowest level of real wages in the new series occurs in the 1310s, the decade that witnessed the last major famine in England in the years 1316–17. In Phelps Brown and Hopkins' series, real wages from 1590–99 to 1660–69 and in 1800–1809 fell below the decade of the 1310s, yet without any sign in either of these periods of any hunger-related deaths.

The lowest curve in figure A2 shows by decade the Phelps Brown–Hopkins cost-of-living index relative to the index employed here. Before the 1520s, they estimated the cost of living as typically only 60–70 percent of my index, a remarkable deviation. Surprisingly little of this divergence stems from the more extensive set of prices employed here. Instead it has two main sources. The first is that Phelps Brown and Hopkins employ a Laspeyres index, with the fixed quantity weights derived from their base period of 1451–75. The Laspeyres index overestimates costs of living compared to the base period when relative prices change because people do not consume goods in fixed proportions. With fixed quantity weights, goods whose price increases relative to the index become a larger implied share of expenditures. Between 1451–75 and the 1860s, Phelps Brown and Hopkins do indeed find dramatic differences in relative prices, as table A5 shows. Drink prices, for example, increased more than 17 times, whereas textile prices increased less than two times. While in the base period Phelps Brown and Hopkins gave an already robust 22.5 percent weight to drink, by the 1860s they implicitly assume that drink is 32 percent of the cost of living for workers! And while in the base period textiles are given a very reasonable 12.5 percent weight in expenditures, by the 1860s they are a mere 3 percent of expenditures. As table A3 shows, the actual expenditure weights in these years were closer to 8 percent for drink and 12 percent for textiles.

Figure A2 also shows the level of the Phelps Brown–Hopkins index relative to the index in this paper if instead of the Laspeyres assumption we employ fixed expenditure shares for the subseries in their book over time, by employing

TABLE A4

LIVING COSTS, 1200s–1860s, BY COMMODITY GROUPS

Decade	Grain and Potato	Meat	Dairy	Sugar and Honey	Drink	Salt	Spices	Shelter	Fuel	Light	Soap	Clothing
1200–1209	4.5	6.3	4.2		7.0					19.0		17.7
1210–19	6.0	6.4	5.2		7.3	12.8	15.4			16.8		18.0
1220–29	6.8	6.7	8.6		8.1	12.7	23.6			35.5		17.5
1230–39	6.5	8.0	7.0		6.2	11.8				28.9		15.7
1240–49	6.9	7.8	6.1		7.8	14.9	37.2			25.2		18.0
1250–59	7.7	7.7	6.6		9.2	16.1	17.3		12.5	25.2		16.3
1260–69	7.6	8.5	5.8	43.7	9.8	16.5	23.6	8.8	19.5	24.7		20.2
1270–79	10.7	9.5	6.5	58.3	12.5	18.4	25.2	11.5	24.8	27.5	12.0	18.4
1280–89	9.3	9.2	6.9	46.1	11.5	16.7	25.1	11.8	17.4	24.1	16.5	18.9
1290–99	11.4	9.6	6.6	55.1	11.5	21.5	33.3	12.4	20.5	28.0	22.6	16.6
1300–1309	9.6	9.9	7.7	48.8	13.5	17.8	30.6	11.3	21.1	32.4	25.7	19.3
1310–19	13.8	12.3	9.8	61.0	14.5	41.0	30.1	10.6	24.1	35.5	16.9	22.4
1320–29	11.9	12.5	9.3	55.4	23.0	27.9	32.0	8.6	21.6	36.1	19.8	20.6
1330–39	9.4	11.0	8.3	48.2	20.7	23.4	30.4	8.3	21.7	32.1	21.4	20.3
1340–49	9.1	10.8	8.1	62.4	17.0	21.2	34.9	7.5	19.7	31.2	21.8	18.2
1350–59	12.1	10.7	10.0	83.5	18.4	50.3	58.3	4.8	32.7	38.2	22.2	27.7
1360–69	12.4	11.3	9.8	83.1	18.9	43.5	37.5	4.5	27.6	39.0	22.4	28.2
1370–79	12.7	11.7	10.4	89.6	22.1	49.5	43.7	4.6	28.6	38.8	26.2	29.4
1380–89	9.1	11.4	9.3	75.1	17.4	41.7	28.6	4.4	26.1	36.8	26.5	27.8
1390–99	9.6	10.7	9.5	69.6	20.3	36.1	36.0	5.5	30.8	33.4	26.5	24.8
1400–1409	10.2	10.0	9.9	93.1	15.0	48.9	28.1	6.3	31.0	34.1	26.5	25.9
1410–19	10.5	11.1	11.1	73.9	14.6	37.5	57.3	6.2	31.2	32.3	26.5	25.9
1420–29	9.0	12.0	10.7	76.6	15.2	37.2	43.2	6.0	33.7	30.5	26.7	24.8
1430–39	11.2	10.9	10.0	79.6	17.8	41.3	34.0	5.0	31.5	30.1	27.3	23.3
1440–49	8.8	10.6	8.9	72.9	16.9	37.2	22.9	4.9	29.9	30.2	37.3	21.8
1450–59	9.3	10.9	9.2	63.4	14.5	36.0	26.6	4.8	29.2	25.8	36.9	23.1
1460–69	9.6	11.3	9.1	68.4	14.9	30.9	33.3	5.1	29.9	26.2	35.4	21.8

1470–79	10.0	11.5	8.7	77.7	13.5	30.5	34.6	5.2	27.8	26.0	26.6	23.1
1480–89	11.2	11.9	9.2	70.9	14.9	40.7	38.9	5.4	21.8	25.4	29.2	23.4
1490–99	9.8	12.7	8.7	60.3	14.9	36.8	34.6	5.3	22.5	24.0	29.8	23.4
1500–1509	10.8	10.9	7.9	68.0	13.9	36.0	42.0	5.4	25.4	23.6	26.9	23.1
1510–19	10.9	12.0	8.4	66.6	14.6	41.5	34.9	5.9	25.8	25.3	31.0	23.1
1520–29	14.6	13.1	9.4	80.9	15.0	48.1	51.5	5.9	27.1	25.7	35.0	24.7
1530–39	15.9	12.9	10.8	86.7	14.0	48.8	54.3	6.5	27.3	27.5	44.7	26.0
1540–49	17.9	17.8	13.4	113.3	14.9	56.7	57.4	7.2	29.7	31.0	41.7	27.6
1550–59	29.0	31.2	19.8	158.5	19.9	75.3	76.5	9.2	41.8	49.2	72.1	34.4
1560–69	27.2	32.6	23.6	146.9	21.7	77.1	98.5	13.1	46.7	72.2	88.6	42.6
1570–79	29.9	31.6	26.6	181.9	28.8	109.9	81.9	14.2	52.9	70.5	76.3	49.5
1580–89	35.8	34.1	28.1	178.8	36.4	101.0	117.6	17.7	58.3	78.6	73.7	52.6
1590–99	52.1	38.2	35.2	185.0	40.9	126.6	119.9	20.8	64.7	91.5	81.8	54.8
1600–1609	52	41	42	214	36	110	122	23	77	100	85	60
1610–19	61	44	45	205	38	106	110	27	85	105	88	65
1620–29	60	43	43	179	36	128	112	26	89	103	88	70
1630–39	73	47	41	212	60	173	132	31	97	107	109	81
1640–49	72	53	43	213	58	193	163	25	118	117	108	90
1650–59	71	50	43	239	63	181	121	26	109	124	97	88
1660–69	68	53	46	153	68	165	72	30	116	121	93	88
1670–79	64	53	44	142	66	174	98	34	121	111	82	81
1680–89	58	49	47	133	68	169	103	36	121	106	84	79
1690–99	70	51	57	146	76	247	122	33	130	125	116	83
1700–1709	57	45	57	143	80	455	106	39	132	115	95	82
1710–19	65	43	54	130	85	433	128	35	129	137	130	85
1720–29	62	45	51	123	87	414	106	38	124	124	132	85
1730–39	52	44	47	115	83	349	94	37	124	118	125	84
1740–49	53	47	50	122	85	377	92	34	135	140	140	86
1750–59	62	48	52	120	82	374	93	36	134	136	133	91
1760–69	68	49	56	118	83	376	91	39	137	142	144	94
1770–79	77	57	64	121	91	374	97	43	150	144	144	92
1780–89	80	57	66	131	94	462	106	42	146	156	159	92
1790–99	96	67	80	166	95	599	111	53	167	172	180	94
1800–1809	137	98	113	197	129	1,310	145	74	203	226	224	107

TABLE A4
(*Continued*)

Decade	Grain and Potato	Meat	Dairy	Sugar and Honey	Drink	Salt	Spices	Shelter	Fuel	Light	Soap	Clothing
1810–19	144	117	124	198	138	1,589	170	89	223	247	250	118
1820–29	107	102	98	156	139	668	165	88	192	162	179	112
1830–39	104	97	86	149	101	144	140	86	134	141	161	107
1840–49	103	97	85	144	95	124	126	78	113	127	118	104
1850–59	98	88	89	111	101	82	118	87	98	105	101	93
1860–69	100	100	100	100	100	100	100	100	100	100	100	100

NOTE.—The index for each commodity is set to 100 for 1860–69.

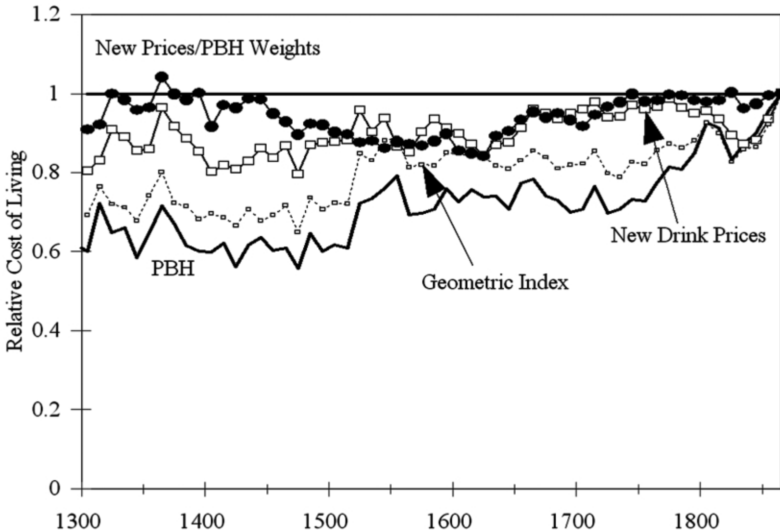

FIG. A2.—The cost of living in Phelps Brown and Hopkins relative to this paper. The ratios are the relative cost of living by 10-year periods, compared to 1860–69. Sources: tables A3 and A4; Phelps Brown and Hopkins (1981, 44–58).

the geometric index used in this paper. This one change increases the cost of living on their index for the years before 1500, relative to the 1860s, by 11 percent on average. But this is only a partial correction of the problems created by the Laspeyres nature of their index, for the six subseries that Phelps Brown and Hopkins combine into their overall index were themselves each created as Laspeyres indices of the individual items. And even within categories such as "drink," relative prices changed significantly over time.

The second source of the divergence is the price series Phelps Brown and Hopkins employ for their index. The top curve in figure A2 illustrates the relative level of the cost-of-living indices if I replace all their price series with the ones used in this paper, using their expenditure shares but with constant expenditure weights throughout. Now there is little difference between the level of the series through most of the decades. The most important difference in the price series occurs in the drink series. As noted, even when constant expenditure weights are used, drink is 22.5 percent of expenditure in Phelps Brown and Hopkins' study. Drink represents beer exclusively before 1689 and, after 1801, beer and tea and sugar. However, Phelps Brown and Hopkins do not observe beer prices directly, but infer them through the prices of malt and hops. Despite the rise of large-scale brewing in the late eighteenth century and the introduction of tea and sugar as an alternative to beer, they find that these inferred drink prices rise more rapidly than their index as a whole. I calculate an alternative drink index using actual prices of beer and using tea prices earlier than Phelps Brown and Hopkins introduce them in 1801, since tea is already important in working-class budgets before 1800, as shown in table A4. Instead of increasing 17-fold between 1451–75 and the 1860s, this drink price index increases by 7.4 times. Figure A2 also shows the relative level of the Phelps Brown–Hopkins index to

TABLE A5
PRICE MOVEMENTS, 1451–75 TO 1860S

Category	Weight PBH 1450s	Price PBH 1860s/1451–75	Weight PBH 1860s	Weight Clark	Price Clark 1860s/1451–75
Grains	.200	11.7	.180	.275	10.9
Meat	.250	14.9	.305	.120	10.7
Dairy	.125	13.2	.130	.120	8.9
Drink	.225	18.2	.319	.100	7.4
Honey/sugar/raisins	. . .	. . .	. . .	.045	1.5
Salt	. . .	. . .	. . .	.010	3.1
Pepper	. . .	. . .	. . .	.010	2.9
Fuel and light	.075	5.9	.035	.090	3.4
Soap	. . .	. . .	. . .	.005	2.9
Clothing	.125	2.9	.030	.120	4.4
Housing/housewares	. . .	. . .	. . .	.080	20.0
Services	. . .	. . .	. . .	.025	9.5
All	1.00	12.6	1.00	1.00	7.6

SOURCE.—Table A4 and Phelps Brown and Hopkins (1981, 44–58).

the Clark index if we both employ fixed weights and use these improved drink prices. This alone removes most of the difference between the series.

The new cost-of-living series also differs from the more recent one of Feinstein for the years 1770–1869. The reasons for this are explored in detail in Clark (2001). The single most important one is that Feinstein, as Phelps Brown and Hopkins do, uses a Laspeyres index with a base period in the 1770s. Others include Feinstein's use of official London bread prices for the years 1770–1815 when these seem to have understated true bread costs, so again inflating apparent price increases. Further, Feinstein does not include some products such as salt, pepper, currants and raisins, tobacco, and gaslighting, which were falling rapidly in price from 1815 on.

Sources

The wage and price quotes were drawn from a wide variety of sources, either directly from the original manuscripts or, when possible, from transcripts of manuscripts or summaries of their contents. Sources included manorial account rolls; accounts of monasteries and cathedrals; records of Oxford and Cambridge colleges; charitable foundation records; churchwardens' accounts; town government records; London guild corporation records; payments by county governments for the maintenance of gaols, courts, and bridges; and private household accounts.

Major Secondary Sources

Three major printed sources that give quotes of prices from the 1260s to the 1860s were Rogers (1866–1902, vols. 2, 3, 6, 7 [pt. 1]), the U.K. Board of Trade (1903), and Beveridge (1939). Rogers also gives extensive wage material. Information for the years 1750–1869 is also drawn from Gayer, Rostow, and Schwartz (1953), John (1989), and Afton and Turner (2000). For earlier years, I got some

London food prices from Marsh (1913–16), Ainsworth (1937–39), Rappaport (1989), and Boulton (1996, 2000).

Gilboy (1934) gives wages approved by quarter sessions for repairs to county facilities in the years 1700–1800 in a variety of counties. Eccleston (1976) gives wages paid on estates for building workers for five Midland counties for the years 1750–1835. Rappaport (1989) and Boulton (1996, 2000) summarize building wages paid by the London Livery Companies from 1490 to 1700, as well as prices of food. Woodward (1995) reports annual wage rates for major northern towns for building workers from 1450 to 1750 derived from town chamberlains' accounts and vouchers supplemented by churchwardens' records. Wages in the early nineteenth century for a variety of years and towns are given in Bowley (1900, 1901). I have supplemented these sources with a set of 26 printed transcriptions of churchwardens' and chamberlains' accounts from around the country, detailed below, mainly for the sixteenth century.

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Bedford Record Office: Ampthill, churchwardens' vouchers, 1824–52, P30/5/4; Billington, Town Lands Charity Account Book, P111/25/4.

Beveridge Papers, Robbins Library, London School of Economics: The Beveridge Wage and Price History project, which was never completed, extracted copious wage and price materials from archival sources beyond those published in Beveridge (1939). They include prices and wages in the medieval period from eight Winchester manors, from Hinderclay and Redgrave in Suffolk, and from selected Westminster Abbey and Battle Abbey manors. There were also the records of religious and charitable institutions: Battle Abbey, Canterbury Cathedral Priory, Croyland Abbey, Durham Priory, Eton College, Norwich Cathedral Priory, St. Bartholomew's Hospital in Sandwich, Kent, Westminster Abbey, and Winchester College. Finally, there were records of the town corporations such as Bath, Canterbury, Dover, Exeter, and Nottingham.

Borthwick Institute, York: Churchwardens' vouchers, St. Michael Spurriergate, 1838–69, PR Y/MS 58–60.

Bristol Record Office: Bristol town chamberlain's vouchers, 1750–1855.

Cheshire Record Office: Town chamberlain's vouchers, 1766–1836, TAV/3/51–83.

Clothworkers' Hall, London: Warden's accounts, 1580–1869; vouchers, 1798–1869; court minutes, 1580–1690; lease books, 1770–1800.

Cumbria Record Office: Carlisle town chamberlain's vouchers, 1748–1834, CA/4/11; Cumberland quarter session vouchers, 1851–54, CQF/5/117; Penrith magistrates' vouchers, 1861–69, QPL/20–21; Penrith churchwardens' vouchers, 1816–49, PR/110/1/85.

Devon Record Office: Exeter chamberlain's vouchers, 1760–1855.

Dorset Record Office: Lardner MSS, 1702–49, PE/WCH/MI/7; Sherborne Almshouse vouchers, 1850–69, D/SHA/A981–1139.

Essex Record Office: Quarter session vouchers, 1759–1869, Q/FAc/5/1, Q/FAc/6/2/1–59. Saffron Walden Almshouse leases; Bassom MSS, 1805–60, D/DU 84/14.

Guildhall Library, London: Brewers' Company; Pratt's Almshouse, Aldenham, Hertfordshire; Dame Alice Owen's Almshouse, Islington, 1600–1869, 5491–92, 5473/1–5, 5478/1–3; Carpenters' Company, warden's accounts, 1680–1869.

Hull City Record Office: Chamberlain's vouchers, 1750–98, 1828, 1833, BFR/6/–; Charterhouse Charity, 1850–51, 1860–61, WT/6/–.

Leicester Record Office: Quarter session vouchers, 1778–1869, QS/112/1–426.

London Metropolitan Archive: Foundling Hospital vouchers, 1830–56, A/FH/B3/31/42–68.

Staffordshire Record Office: Shrewsbury MSS, 1808–67, D 240/E/F/4/1–27.

Surrey Record Office: Quarter session vouchers, 1750–1851, QS2/6; Guildford Borough vouchers, BR/OC/6/9/1–60.

U.K. Data Archive: H. R. Southall and D. R. Gilbert, *Great Britain Historical Database: Economic Distress and Labour Markets Data: Wages Statistics, 1845–13* [computer file]. Colchester, Essex: U.K. Data Archive [distributor], August 2004. SN: 4564.

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