THE LONG MARCH OF HISTORY: FARM LABORERS' WAGES IN ENGLAND 1208-1850

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Using manuscript and secondary sources, the paper calculates real day wages for male agricultural laborers in England from 1208 to 1850. Both nominal wages and the cost of living move differently than is suggested by the famous Phelps-Brown and Hopkins series on building craftsmen. In particular farm laborers real wages were only half as much in the pre-plague years as would be implied by the PBH index. The PBH series implied that the English economy broke from the stasis of the medieval period only in the late eighteenth century. The real wage calculated here suggest that the productivity of the economy began growing from the medieval level at least a century earlier in the mid seventeenth century.

INTRODUCTION

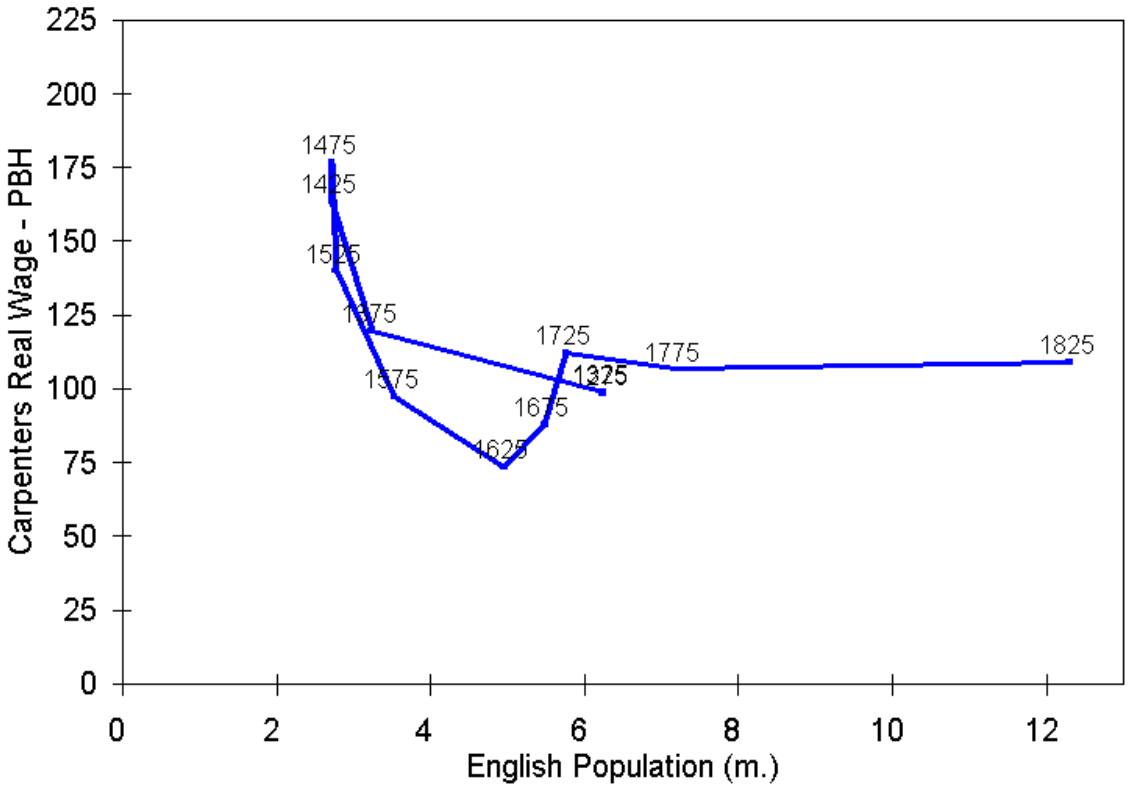
The wage history of pre-industrial England is unusually well documented for a pre-industrial economy. The relative stability of English institutions after 1066, and the early development of markets, allowed a large number of documents with wages and prices to survive in the records of churches, monasteries, colleges, charities, and government. These documents have been the basis of many studies of pre-industrial wages and prices: most notably those of James E. Thorold Rogers, William Beveridge, Elizabeth Gilboy, Henry Phelps-Brown and Sheila Hopkins, Peter Bowden, and David Farmer.[1] But only one of these studies, that of Phelps-Brown and Hopkins, attempted to measure real wages over the whole period. Using the wages of building craftsmen Phelps-Brown and Hopkins constructed a real wage series from 1264 to

1954 which is still widely quoted.[2] This series famously established two things. Both can be illustrated by figure 1 which displays by half century building craftsmens' real wages versus English population. First there is the extraordinarily high levels of wages in the late medieval period. Real wages after the onset of the Black Death in 1349 were not again equaled until the 1880s. Even in the densely populated period before the Black Death real wages were little below those of 1800-49, and were well above the level attained in the first half of the seventeenth century.

Second the comparison of these real wages with population suggests that as late as 1700-49 there was no advance on the productivity of the economy of 1260-99. If we plot real wages, by half century, against the level of population as in figure 1, it provides a loose way of measuring overall productivity growth in the English economy.[3] If there is a constant level of productivity, then there will 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. Figure 1 suggests that between 1264 and 1749, a period of nearly 500 years, there was complete stasis in terms of productivity growth. The wage observations lie on an inverse line. The seventeenth century advances in intellectual understanding of the natural world apparently had little effect on the productivity of the economy before the late eighteenth century. Indeed the data suggests that in the years 1550-1699 the economy was less productive than in the years 1260-1399. Real wages in 1600-49 were estimated at only 75% of their level in the years 1260-1349, even though the population of England prior to the Black Death is believed to have been substantially above that

[1] Rogers (1866, 1888a, 1888b, 1902), Beveridge (1936, 1939), Gilboy (1934), Phelps Brown and Hopkins (1962a, 1962b), Bowden (1967, 1985), Farmer (1988, 1991).
[2] See, for example, Dyer (1989), Cipolla (1993), Wrigley and Schofield (1981).

Figure 1: Real Craftsmen's Day Wages from PBH Versus Population by Half Century, 1260-1849



Notes: The population estimates for the years before 1550 are 1250-1299 and 1300-49 6.2 m., 1350-99, 3.2 m., 1400-49 and 1450-99, 2.7 m., and 1500-49, 2.8 m.

Sources: Real wages. Phelps-Brown and Hopkins (1962). Population, 1540-1850. Wrigley, Davies, Oeppen, and Schofield (1997), pp. 614-5. Population, 1250-1530. Hatcher (1977), Poos (1991), Hallam (1988).

[3] Loose because the wage only indicates the marginal productivity of labor. So changes in the capital stock could also change wages. And a 10% increase in wages at a given level of population would only indicate a 10% increase

of 1600-49. In particular Phelps-Brown and Hopkins estimated real wages of carpenters in 1310-9 at 86% of their level in 1770-9, while in 1610-9 they were at only 68% and in 1630-9 only 70%. Yet there was no major famine in the 1610s or 1630s, while the 1310s saw the worst recorded famine in English history which resulted in a loss of up to 15% of the population. The source of this slump in the productivity of the economy between 1550 and 1700 is not readily apparent.

Since the publication of the Phelps-Brown and Hopkins series in 1956 significant new information on both wages and prices has become available. Phelps-Brown and Hopkins drew their wage material before 1700 from the work of James Thorold Rogers published between 1866 and 1902. Since then new material from the Beveridge and Farmer archives is available on both wages and prices. For the eighteenth century they used wages reported in Elizabeth Gilboy (Gilboy, 1934). For the nineteenth century their source is Arthur Bowley (Bowley, 1901).

Also Phelps Brown and Hopkins constructed their series in a somewhat opaque way. In the eighteenth century it appears that they used wages in Oxford for the first 30 years to link to their earlier Thorold Rogers material, then switched to wages in Maidstone in Kent from 1730 to 1796, then from 1796 to the 1890s used wages in London. The actual wages used in 1796 to 1895 were 80% of London wages to link these with the Maidstone wages in 1796. Theirs is obviously a rough and ready procedure with potential for mismatch at the linking points, and for idiosyncratic movements in London, Maidstone or Oxford.

Assembling the available evidence on farm wages, including both new material from manuscripts and unpublished material from the archives of Beveridge and Farmer, this paper constructs a series for day wages of farm laborers from 1200 to 1850. This farm wage series suggests a different story to that of PBH. The seventeenth century no longer appears as the great

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in the total factor productivity of the economy in special circumstances.

trough in the real wage series. Wages are low then, but still much higher than in the years before the Black Death. Signs of increasing productivity in the economy appear distinctly already in the seventeenth century, more than 100 years before the traditional date of the Industrial Revolution.

Winter Day Wages, 1280-1850

Table 1 shows the numbers of places used to construct the day wages series for the years 1200-1849. The second column shows the number of places supplying day wage quotes for farm work outside harvest each decade. Farm work included tasks such as hedging, ditching, making faggots, threshing, making faggots, spreading dung, plowing, and carting. An individual location often supplies many individual wage quotations within a decade, but since wages tend to change slowly from year to year it is the number of locations supplying data in each decade that matters to the precision of the estimate. The third column shows how many places supply day wage quotes where the place appears in more than one decade.

The average wage level varied widely across locations. In the medieval years, for example, day wages on the Westminster manors of Eybury, Hyde, and Knightsbridge near London were about 28% higher than average wages on a selection of the Winchester manors. Where we get few wage observations this makes it likely that we will have disproportionately sampled high wage and low wage locations. But if high and low wage locations show the same trends over time we can control for this using the trends on wages at given locations over time.

As can be seen, there are relatively rich sources for the years after 1670 from farm and estate accounts. With these in a related paper I construct an annual farm day wage series for England from 1670 to 1850 which is the average of four regional indices. This index comes within 4% of the level of wages measured from large cross sections of data in each of the years 1770, 1832, and 1850 (Clark, 1999).

Table 1: The Day Wages of Agricultural Workers, 1208-1849

Decade	Day Wage Quotes	Linked Day Wages	Raw Average Day Wages	"Corrected" Average Day Wages 1240-1739	National Wage Level
1240-49	1	1	1.45	1.28	1.09
1250-59	1	1	1.50	1.46	1.24
1260-69	1	1	1.50	1.32	1.13
1270-79	-	-	-	-	-
1280-89	8	7	1.44	1.22	1.04
1290-99	5	5	1.58	1.32	1.12
1300-09	8	8	1.41	1.27	1.08
1310-19	11	9	1.96	1.75	1.50
1320-29	13	8	1.83	1.76	1.50
1330-39	10	9	1.80	1.63	1.39
1340-49	12	10	1.91	1.72	1.47
1350-59	17	14	2.81	2.41	2.06
1360-69	14	11	3.35	2.85	2.43
1370-79	11	10	3.30	2.91	2.49
1380-89	10	8	3.47	3.17	2.71
1390-99	8	7	3.42	3.16	2.70
1400-09	16	14	3.67	3.38	2.89
1410-19	14	13	3.57	3.40	2.90
1420-29	24	17	3.56	3.48	2.97
1430-39	10	10	3.95	3.62	3.09
1440-49	15	12	4.00	3.70	3.16
1450-59	11	10	4.27	3.75	3.20
1460-69	6	5	4.12	3.44	2.94
1470-79	3	2	4.06	3.53	3.02
1480-89	5	3	3.73	3.29	2.81
1490-99	5	4	4.63	4.02	3.43
1500-09	5	5	3.58	3.28	2.80
1510-19	4	4	3.51	3.18	2.72
1520-29	7	4	4.55	4.19	3.58
1530-39	6	5	4.22	3.82	3.26
1540-49	8	4	5.10	4.34	3.70
1550-59	6	6	6.81	5.37	4.59
1560-69	4	4	7.37	6.42	5.48
1570-79	6	5	7.32	6.73	5.74
1580-89	11	8	7.39	7.75	6.62
1590-99	14	12	7.46	7.69	6.57
1600-09	12	11	7.58	7.88	6.73
1610-19	13	11	9.05	8.06	6.88
1620-29	12	11	8.76	9.04	7.72
1630-39	11	11	10.41	9.58	8.18
1640-49	13	11	10.20	10.66	9.10
1650-59	16	14	12.17	12.04	10.28
1660-69	19	18	10.46	11.84	10.11

1670-79	24	21	11.40	12.36	10.36
1680-89	19	19	11.25	12.04	10.79
1690-99	30	25	10.91	12.06	10.14
1700-09	35	30	11.27	12.24	10.05
1710-19	30	27	10.77	11.66	10.15
1720-29	34	30	11.02	11.81	10.30
1730-39	30	26	11.79	13.02	10.94
1740-49	33	29	11.40		10.82
1750-59	29	26	11.34		10.81
1760-69	41	38	11.94		11.17
1770-79	30	29	12.14		12.24
1780-89	21	21	13.15		13.27
1790-99	29	26	15.77		15.05
1800-09	45	43	21.26		19.21
1810-19	44	41	24.29		22.81
1820-29	38	37	20.65		19.96
1830-39	44	42	20.34		19.64
1840-49	28	27	20.34		19.96

Sources: 1208-1670, see text. 1670-1849, Clark (1999).

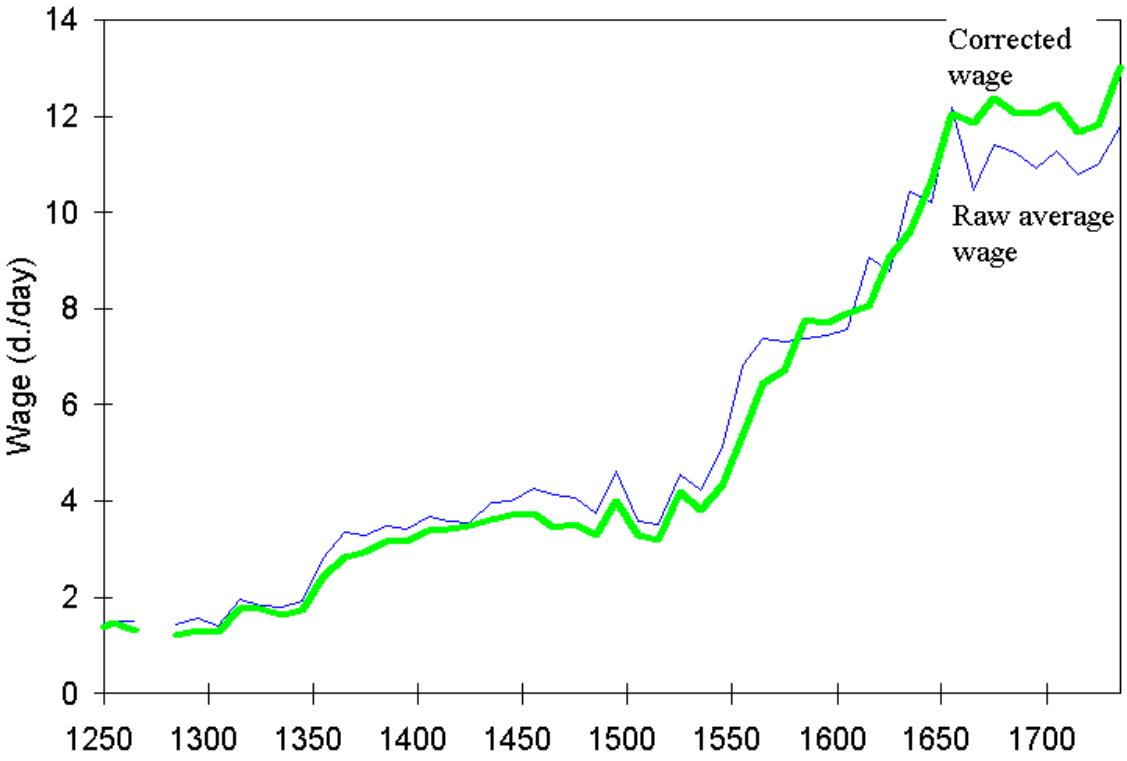
For earlier years the sources are generally much thinner, and most are from the south of England. The day wage data really only begins in 1280-9, and for each decade between 1470 and 1580 only a handful of places supply observations. Thus for the years 1280 to 1670 I calculate wages by decade only. The day wage observations from each source were combined into one decadal average wage from that source. To construct the overall average wage which is not influenced by the varying amount of data period by period from low and high wages locations the following expression was fitted to the data over the decades 1200 to 1739:

$$\ln(Wage_t) = \sum_k \alpha_k IND_k + \sum_t \beta_t DEC_t + \varepsilon$$

where k indexes the source, and IND_k is an indicator variable which is 1 when the observation is from source k, 0 otherwise and t indexes the year; DEC_t is 1 in decade t, 0 otherwise. The inclusion of the indicator for each wage source allows for variations from farm to farm in rates paid. The estimation procedure calculates the movement of wages by looking at what happens within each series from each source over time. The logarithmic form is chosen because the level of wages varies greatly over this period, and this allows these towns and regions to have proportionately higher or lower wages across the entire period. These are simple refinements but we shall see below that they can have a big effect on the estimated average wage.

Table 1 shows both the "raw" average wage across each location in each decade, and the corrected wage for the years 1240 to 1739. From 1240 to 1739 there are 116 locations which supply wages for more than one decade and are thus used in estimating the corrected series. Figure 2 shows the "raw" average wage, and the regression corrected wage for the years 1250 to 1739. As the figure shows the regression estimate suggests the sample drew from

Figure 2: "Raw" and "Corrected" Average Day Wages 1250-1739



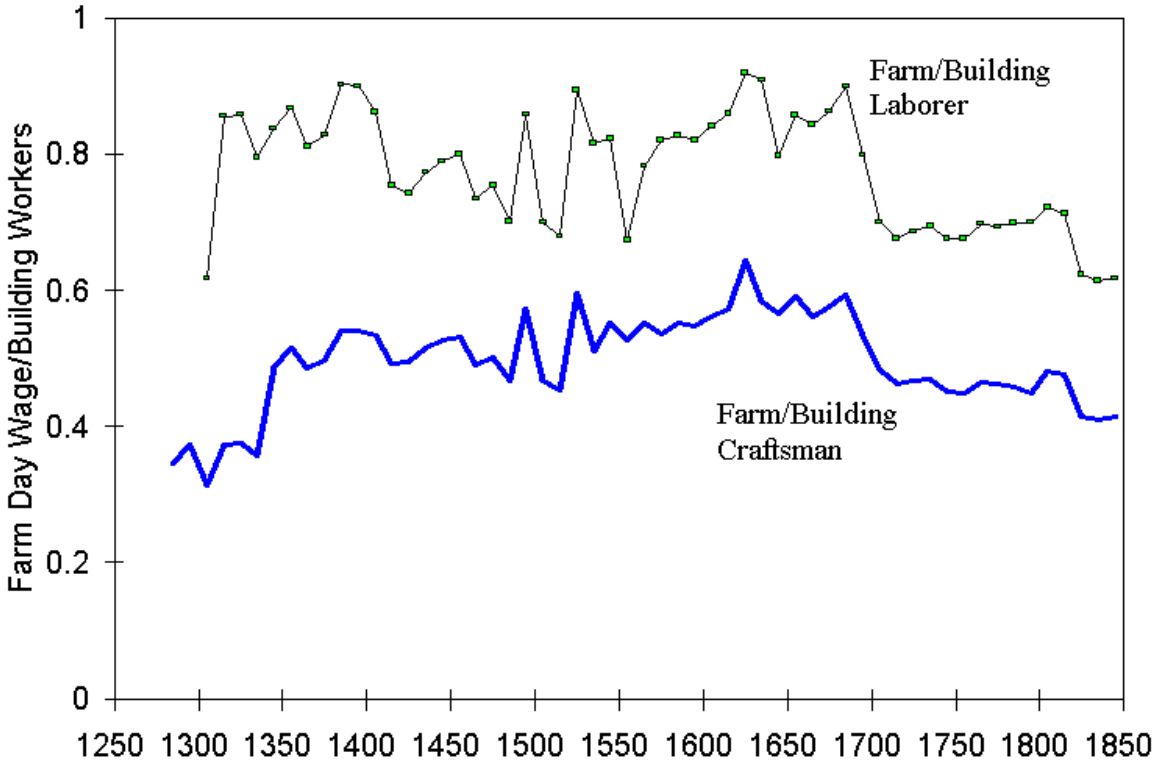
disproportionately many low wage locations in the years after 1660, and disproportionately high wage sources in the years 1460-1560. Wages in these lean years are drawn heavily from Oxford, Cambridge, Eton, Sandwich, and Winchester: all relatively urban locations with correspondingly higher wages. In contrast in the years after 1660 the wages come mainly from very rural locations.

To link this 1240-1739 wage series with the national series calculated for 1670-1850 the level has to be reduced by 15%. This is because the data for the years 1240-1739 draws heavily from the high wage areas of the south of England. Wages in the North and the Midlands in the years before 1740 were about 33% less than southern wages (see Clark (1999)). The last column of table 1 shows the estimated national farm day wage as a consistent series from 1240 to 1849. For the years before 1670 where the series is mainly based on observations in the south of the country it will only portray national trends if wages in the north were at the same level relative to the south in the years before 1670. Evidence from the sources used for table 1 suggests this was certainly true as far back as 1580.

Farm Labor Wage Rates Compared to Building Workers

Figure 3 plots the ratio of my estimated farm laborer's wages to craftsmen and laborers wages in building as estimated by PBH by decades from 1260-9 to 1840-9. The ratios are far from constant. The ratio of farm workers to craftsmen starts at about .36 in the years 1260-1340. There is then an abrupt rise to about .5, followed by a slow increase over the years 1350-1690 to about .6. Then the ratio rapidly declines from .59 in 1680-89 to .48 by 1700-09. It stays at this new level till 1810-19, when there is a further decline to about .42 for the years 1820-49.

Figure 3: The Ratio of Farm Workers Wages to Building Wages



Notes: The figure shows by decade from 1260-9 the ratio of nominal "winter" farm day wages to nominal building craftsmens' and building laborers' daily wages.

Sources: Table 1. Phelps-Brown and Hopkins (1962a).

The large abrupt changes of the ratio of farm wages to craftmens' wages circa 1340 and 1700 both suggest that there are problems with the PBH index. The change circa 1700 occurs at the point where PBH switch sources from Rogers to Gilboy to Bowley. Their series shows a rise for craftsmen from 18 d. per day in 1687 to 24 d. by 1736, a rise of 33%, at a time when agricultural laborer's wages show no upward movement whatsoever. It seems plausible that PBH failed to link their various sources correctly. The earlier abrupt rise in farm labor wages relative to craftsmen circa 1340 is also problematic. In the years before 1340 there are very few quotes in Thorold Rogers of building laborers' wages. One possibility is that in earlier years the craftsmen hired their own laborers, and the wage paid to craftsmen incorporated an allowance for their assistants also.

The ratio of farm laborers' wages to building laborers' wages is between .8 and .9 from 1300 to 1690, but again shows an abrupt decline circa 1700. In 1700-09 the ratio is down to .70. It stays at this level between 1700 and 1820, when there is a further decline to about 0.62 in the years 1820-49. All in all, this suggests that this suggests that the Phelps-Brown and Hopkins series certainly is not a good proxy for nominal farm labor wages. It may not measure nominal urban wages correctly either.

Piece Rates and Day Wages (1200-1580)

While day wages are in short supply in the years before 1580, there are many records of piece wages in some of these decades. In particular the rates per quarter paid to workers for threshing wheat, barley and oats are frequently given in manorial accounts for the years 1200-1450. Thus David Farmer in constructing a wage series for farm workers for these years does not use day wages, but instead piece rate payments such as threshing payments per quarter, and

reaping and mowing payments. He gives annual averages of these wages for a group of manors, mainly the Winchester manors from 1208 to 1474. Farmer's assumption is that threshing, reaping and mowing was done at a constant rate independent of the relative price of labor and grain, so that the threshing, reaping and mowing payments tell us what happened to day wage movements for farm workers. The third column of table 2 shows Farmer's estimated cost of threshing and winnowing a quarter each of wheat, barley and oats.

An examination of the data underlying Farmer's series though, shows that the threshing costs from different manors in the same year differed considerably. In particular the Winchester manors which are the only ones in the series for the early years had much lower costs than most others, even when the were in the same area. Farmer did not control for this problem. Also Farmer did not use all the available data, since he only employed manors which had complete data on threshing costs in a given year. That is why his series ends in 1474. To correct these problems, and to extend the series, I have recalculated a threshing costs series using the available data from Farmer's archive, from the Beveridge archive, from Rogers, and from a few additional published sources.[4] Table 1 shows the amount of data available by decade on threshing costs. There is information from many different places for the years 1260 to 1450, much more than for day wage costs, but again like the day wage data the years 1450 to 1580 show thin coverage.

As with the day wages a measure of threshing costs which was not influenced by the varying amount of data period by period from low and high payment locations was constructed by fitting the following expression to the data over the decades 1200 to 1580:

$$\ln(Payment_{kt}) = \sum_k \alpha_k IND_k + \sum_t \beta_t DEC_t + \varepsilon$$

[4] Since most of the Winchester manors had very similar payments for threshing, I only used a two or three of these from each region of the country to avoid having them dominate the index completely in the earlier years.

Table 2: Estimated Day Wages, by decade, 1200-1599

Decade	Threshing rate quotes	Linked threshing rates	Average threshing payment	Farmer threshing costs (d.)	Corrected Threshing Cost (d.)	Day Wages Estimated From Threshing costs
1200-09	2	2	3.40	3.50	4.22	1.02
1210-19	3	3	3.57	3.03	4.58	1.32
1220-29	4	4	3.65	3.68	4.72	1.27
1230-39	5	5	3.62	3.52	4.61	1.29
1240-49	6	6	3.61	3.62	4.64	1.25
1250-59	13	10	4.18	3.71	4.48	1.13
1260-69	27	11	4.94	3.53	4.65	1.25
1270-79	16	15	4.78	3.72	4.91	1.17
1280-89	18	17	5.07	4.00	5.10	1.32
1290-99	37	30	5.16	4.55	4.83	1.13
1300-09	39	35	5.22	4.73	4.91	1.25
1310-19	40	33	6.32	4.82	5.59	1.25
1320-29	49	39	6.00	5.27	5.68	1.40
1330-39	37	32	5.85	5.32	5.57	1.46
1340-49	40	36	5.99	5.38	5.81	1.58
1350-59	41	36	8.32	6.00	8.05	2.19
1360-69	26	20	8.52	6.46	8.03	2.18
1370-79	26	24	8.80	7.56	8.72	2.51
1380-89	24	21	8.74	7.77	8.95	2.87
1390-99	27	24	8.45	7.69	8.39	2.54
1400-09	24	17	8.58	8.59	9.00	2.71
1410-19	18	15	8.70	8.37	9.31	2.83
1420-29	16	14	8.98	8.27	9.70	3.20
1430-39	8	7	9.99	9.16	9.45	2.80
1440-49	18	12	9.69	9.16	9.37	3.13
1450-59	10	8	10.33	9.95	9.16	2.96
1460-69	9	6	9.52	10.59	9.04	2.90
1470-79	5	2	9.80	10.92	8.67	2.73
1480-89	5	3	9.86		8.22	2.40
1490-99	3	2	11.18		8.91	2.83
1500-09	6	3	12.17		10.44	3.34
1510-19	5	2	12.21		9.93	3.15
1520-29	7	4	12.49		9.19	2.55
1530-39	7	4	16.48		14.17	4.55
1540-49	4	2	16.75		12.50	3.68
1550-59	3	3	19.21		14.24	3.44
1560-69	2	2	27.99		19.02	5.18
1570-79	2	2	26.71		18.13	4.70
1580-89	6	4	29.37		20.46	5.20
1590-99	5	4	33.96		22.51	5.32

Source: Farmer (1988, 1991).

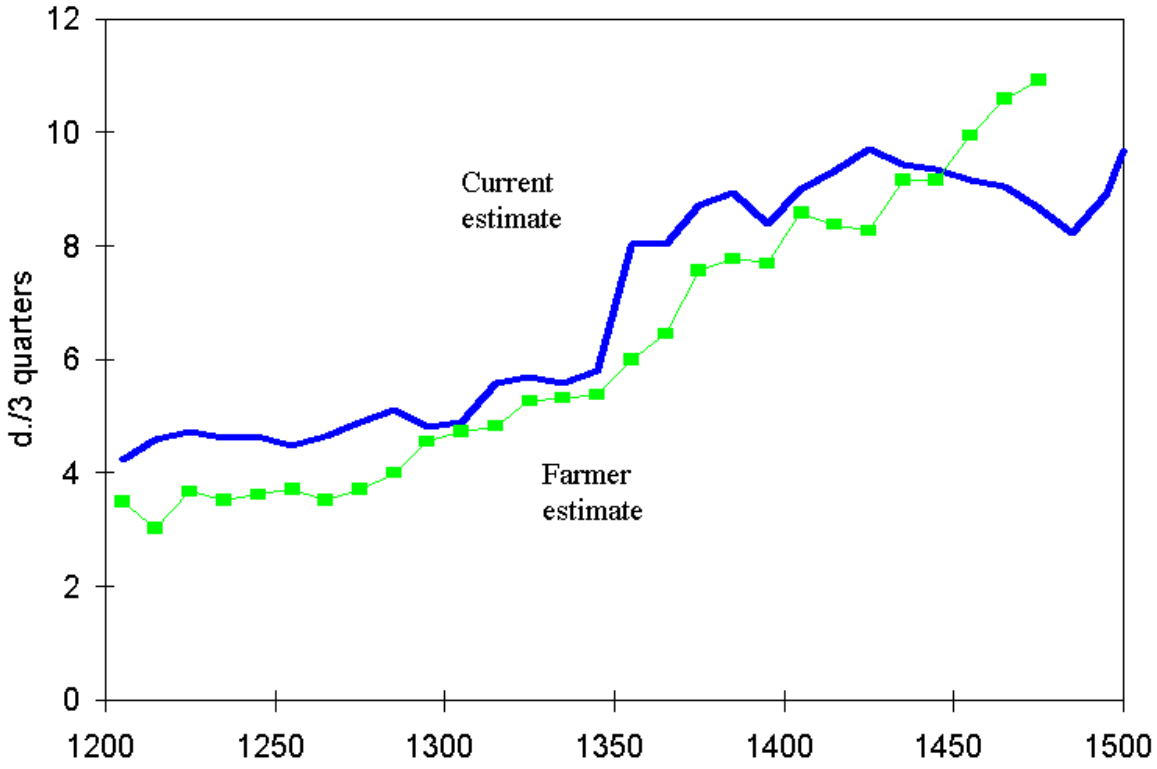
where k indexes the source, and IND_k is an indicator variable which is 1 when the observation is from source k, 0 otherwise and t indexes the year; DEC_t is 1 in decade t, 0 otherwise. Where data was missing in a given year on the cost of threshing one or more of the three grains, it was inferred based on the average ratio of threshing costs. To allow for winnowing costs where these were not given the threshing payments were adjusted upwards by the average ratio of winnowing to threshing costs for each of the three types of grain.[5]

Table 2 shows the resulting estimates of the costs of threshing from 1200-1599. Figure 4 shows these estimated costs compared to Farmer's. As can be seen there are quite significant differences between the series even though the based on much the same data. In particular the Farmer series rises much more between 1200 and 1479 than the one of this paper. Also the new series shows a much more rapid increase after the onset of the plague.

If threshing rates per day were constant these payments suggest that the day wages recorded for the years 1430-1500 are too high. Thus from 1300-49 to 1450-99 day wages rose by 122%, but threshing payments increased by only 60% on my estimate. Another possibility, however, is that the threshing was done more quickly in years where grain was abundant relative to wages. When labor was expensive relative to grain there might be less worry about losing some of the grain by rapid threshing. In this case, assuming piece workers and day workers received the same relative wage over time the piece rate would rise less when labor got more expensive relative to grain since the number of bushels threshed per day would be greater. There is clear evidence in the years 1280-1460 when we have decent numbers of observations for each decade for both day wages and threshing rates that such a process was occurring. Figure 5 shows the estimated wage measured in terms of bushels of grain in each decade on the horizontal axis, versus the estimated threshing payment again measured in bushels of grain. Also

[5] For wheat winnowing payments were estimated at 13% of threshing payments, for barley 19% and for oats 26%.

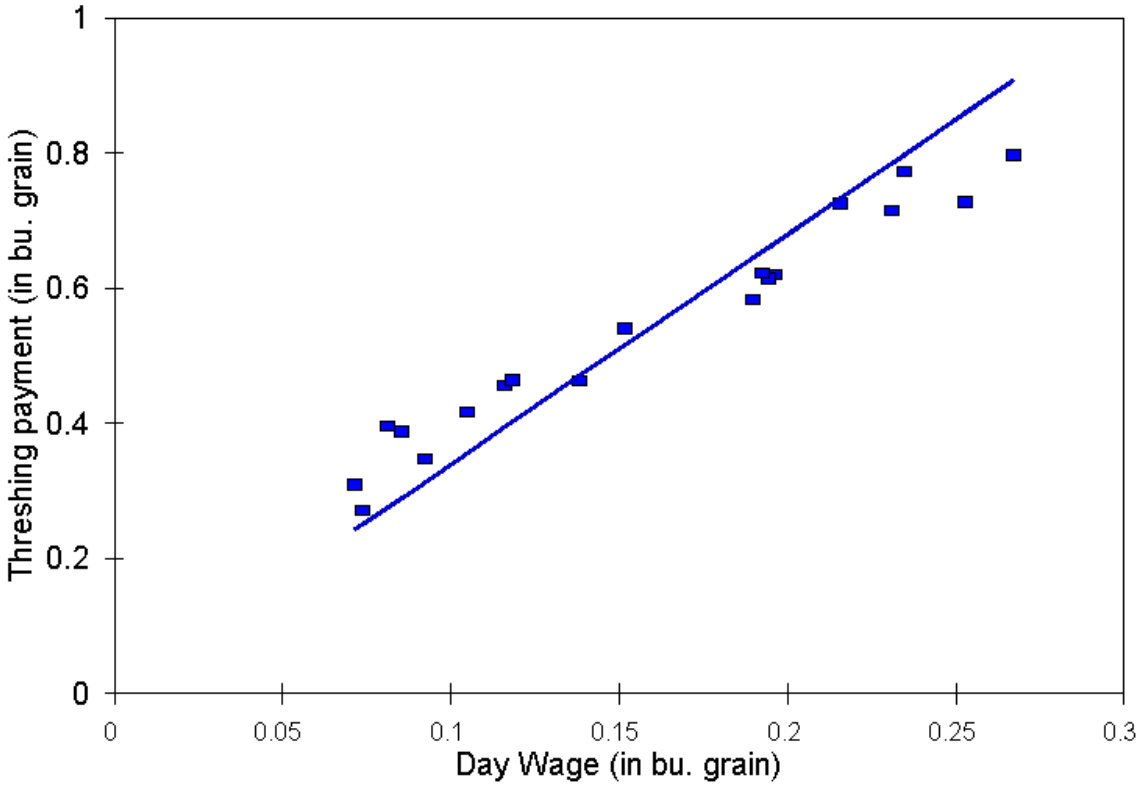
Figure 4: Payments to Workers to Thresh and Winnow a Quarter Each of Wheat, Barley and Oats, 1200-1500



Note: The figure shows the average by decade of threshing and winnowing payments.

Source: Table 2.

Figure 5: Threshing Costs versus Day Wages Measured in Grain Units, 1280-1460.



Source: Tables 2 and 3.

shown as a straight line is the predicted threshing cost if threshing costs were a constant proportion of day wage costs. As can be seen there is a very close relationship in these years between day wages and threshing costs. But the threshing cost is higher than would be predicted from a constant threshing rate when grain wages are low, and lower than would be predicted when grain wages are high. When wages rose workers threshed grain somewhat more quickly.

We can still use threshing costs to predict day wages as long as we control for the variation in threshing costs caused by the changing level of real wages. To do this I estimate for the data from 1280 to 1469 the constants in the expression

$$ln(w/p) = \alpha + \beta ln(tc/p) + \varepsilon$$

where *w* is the day wage, *p* the grain price, and *tc* the threshing payment per three quarters. This produces the estimate:

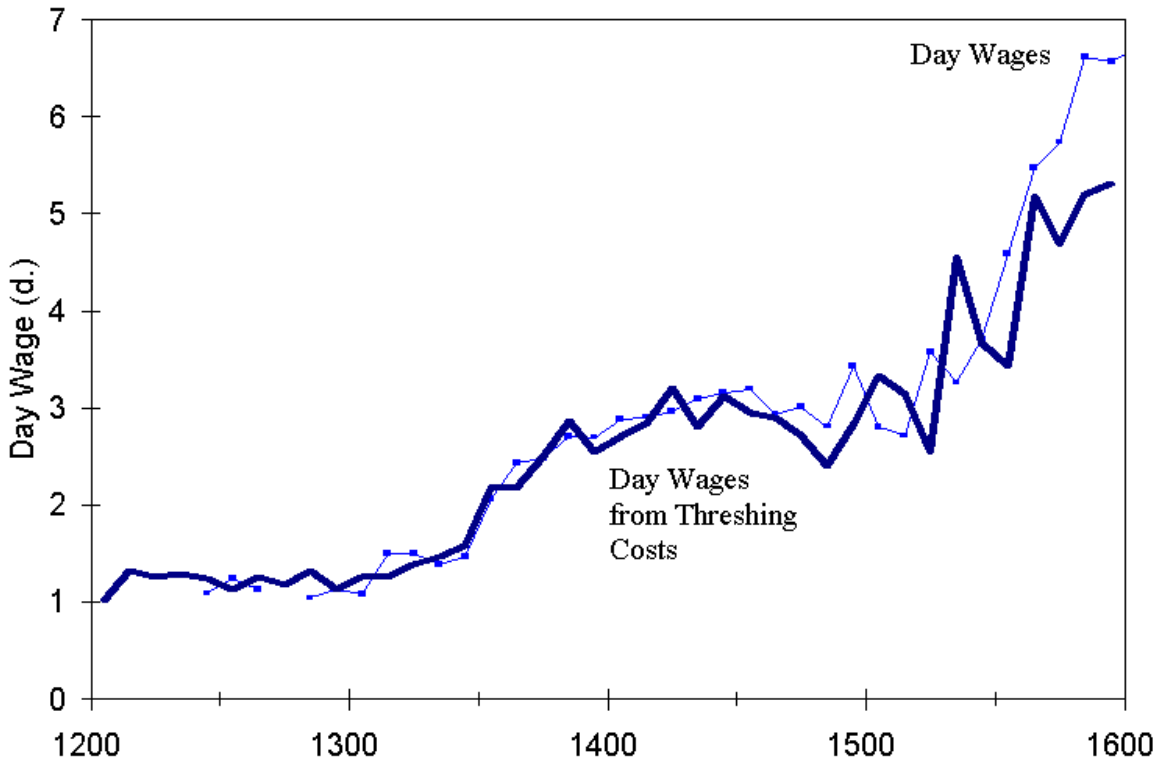
$$ln(w/p) = \underset{(.055)}{-1.010} + \underset{(0.075)}{1.376}ln(tc/p)$$

with the standard error of the estimate in parentheses. This implies that for every 1% that threshing costs rise measured in terms of grain, day wages rise by 1.38%. To predict day wages from threshing costs in the years 1200-1580 I thus use the formula

$$w = 0.364(tc)\left(\frac{tc}{p}\right)^{0.376}$$

These predicted wages are shown in column 7 of table 2. The wages predicted from threshing costs versus the directly estimated day wages are also shown in figure 6. As can be seen in the figure the day wages estimated from threshing costs are stable in the years 1200-1300

Figure 6: Day Wages Predicted from Threshing Costs, 1200-1599



when there is little direct day wage data. In the years 1460-1600, however, because of the small numbers of observations this series is very noisy.

For the years 1200 to 1600 I calculate the day wage of farm workers as a weighted average of the wage calculated directly and the wage calculated from threshing costs, taking as weights the standard errors in the estimates of day wages and threshing costs.[6] These day wages are shown in table – below.

The Cost of Living

To measure the cost of living I use the weights for expenditures by rural families given in the Clark (1999), and the cost of living index developed there for the years 1670 to 1850. That cost of living index improves upon PBH by using later price series from the various volumes of the Agrarian History of England and Wales. The cost of living index for this period also includes measures of cottage rents.

For the years 1200-1670 I use many of the same sources of prices as PBH, but with new series on grain and cheese prices for 1200-1500 from Farmer. The decadal price levels for the major commodity groups used to form the cost of living index are shown in table 3. For bread and beer, the staple articles which formed nearly half of farm laborers expenditures I use the prices of wheat, barley and oats. Even though these were only the inputs into making bread and beer, their price would be closely related to the prices of the products because the cost of the inputs was a very large share of the cost of outputs for these commodities. For fuel I use the price of faggots, which would constitute the main rural fuel supply. For light and soap I use the prices of tallow candles and of tallow, the main input in making soap.

[6] I calculate the wage as $ln(w) = \theta ln(w_d) + (1-\theta) ln(w_{tc})$, where θ is the squared standard error in the estimates of $ln(w_d)$ divided by the sum of this squared error and the squared error in the estimate of $ln(w_{tc})$.

Table 3: Index of Farm Laborers' Living Costs, 1200-1669

Decade	Grain and beer	Meat	Dairy	Fuel	Light and soap	Clothing	Cost of Living
1200-9	12.6		16.9				16.5
1210-9	8.6		14.8				12.2
1220-9	10.7		15.5				14.4
1230-9	9.3		17.1				13.5
1240-9	10.4		17.8				14.6
1250-9	11.8		17.1				15.8
1260-9	10.4		13.8		23.7	21.4	14.2
1270-9	15.1		14.8		25.9	15.2	18.0
1280-9	12.8		13.9		23.7	17.0	15.9
1290-9	15.7		14.2		16.9	25.4	16.7
1300-9	12.6		14.9		28.5	26.6	16.7
1310-9	20.2		19.0		31.7	26.9	23.3
1320-9	16.2		19.8		31.0	30.2	20.7
1330-9	13.3		16.3		27.4	27.7	17.4
1340-9	12.7		16.1		26.4	25.3	16.7
1350-9	17.4		18.8		28.1	71.8	20.9
1360-9	17.6		17.8		30.9	51.7	21.2
1370-9	16.4		17.1		28.8	49.8	19.8
1380-9	12.5		15.8		25.8	37.5	16.5
1390-9	13.8		18.2		22.7	35.0	17.4
1400-9	14.9		17.6	20.8	21.9	37.1	18.1
1410-9	15.1		18.7	16.3	21.0	37.9	18.1
1420-9	12.6		17.1	16.9	21.5	36.4	16.3
1430-9	16.3		24.9	15.9	21.3	35.2	20.1
1440-9	11.8		18.2	16.5	20.4	35.9	15.8
1450-9	12.6		17.1	15.9	16.8	35.0	15.5
1460-9	12.7		15.0	16.2	18.9	36.4	15.5
1470-9	12.8		13.6	15.1	15.8	37.0	14.7
1480-9	14.8		14.6	17.3	18.7	36.6	16.7
1490-9	12.9		14.9	14.6	14.7	36.8	14.8
1500-9	14.8		19.2	14.1	15.1	36.8	16.8
1510-9	14.4		19.0	14.6	16.4	36.5	16.8
1520-9	19.0		21.0	15.8	16.6	35.2	20.0
1530-9	19.8		22.0	16.1	18.9	36.1	21.2
1540-9	22.1		29.8	17.4	21.8	38.1	24.7
1550-9	42.5		43.2	27.1	34.7	42.3	42.1
1560-9	41.2		48.0	28.4	46.6	56.9	44.9

1570-9	44.9		50.5	32.4	47.0	66.4	47.8
1580-9	53.1	53.5	52.4	39.1	51.6	71.5	55.2
1590-9	71.0	51.6	61.0	45.5	63.7	71.0	68.2
1600-9	66.6	54.2	67.3	52.2	68.7	81.1	68.4
1610-9	80.3	60.6	77.8	62.3	72.4	85.3	79.0
1620-9	76.0	64.6	75.7	72.9	72.6	87.8	77.6
1630-9	97.4	68.7	87.2	74.1	82.3	90.4	92.6
1640-9	93.5	73.0	90.7	83.3	88.0	88.1	93.4
1650-9	87.4	77.8	94.8	76.9	84.8	104.3	90.2
1660-9	85.6	77.9	70.2	94.5	89.1	95.8	87.9

Notes: The index for each commodity and overall is set to 100 for 1770-9. The commodities and the weights used for each category of good where more than one was used were: Grain and Beer: Wheat (.5), barley (.3), oats, (.2). Meat: Beef, 1580-1700 (.5), mutton, 1600-1700 (.5). Dairy: Cheese (.5), butter, (.5). Fuel: Faggots, 1400-1700. Light and Soap: Tallow candles 1280-1700 (.5), Tallow 1260-1350, 1560-1700 (.5). Clothing: wool cloth, 1400-1700 (.5), linen cloth 1400-1700 (.2), canvas 1260-1400 (.2), shoes 1550-1700 (.2).

Sources: Farmer (1988), pp. 787-91, 807-10. Farmer (1991), pp. 502-05, 512-16. Thorold Rogers (1866), pp. 383-90, 399-402, 511-16. Thorold Rogers (1888a), pp. 209-218, 255-277, 282-96, 474-94. Bowden (1967), pp. 815-21, 839-50. Bowden (1985), pp. 828-31, 843-6. Beveridge (1939), pp. 85-90, 143-8, 193-6, 236-240, 292-5, 313, 434-7, 457-8.

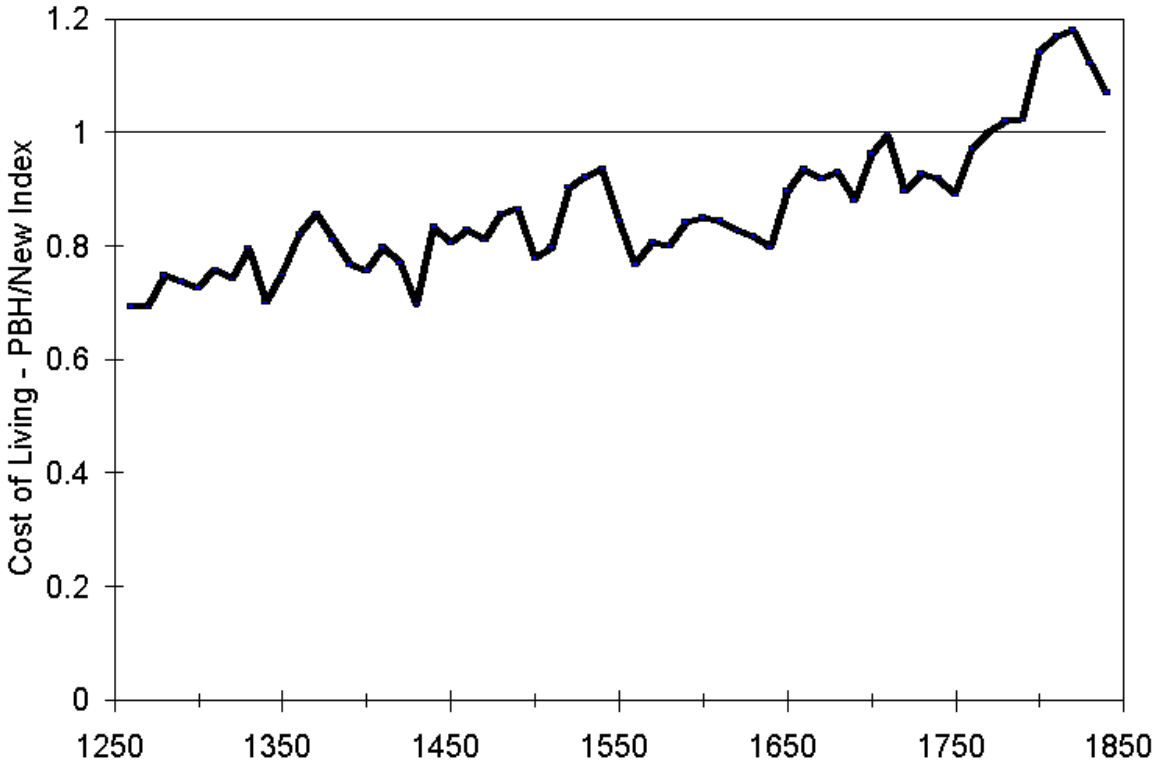
The cost of living index is formed as a geometric index of the prices of each component, with the expenditure shares used as weights. Thus it assumes constant shares of expenditure on each item as relative prices change. That is, if p_{it} is the price index for each commodity i in year t, and α_i is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

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

As we go back in time various commodity groups become unavailable. Thus there is little information on meat costs before 1580, on fuel costs before 1400. When individual series become unavailable in earlier years the weights are adjusted proportionately to still sum to 1, and the earlier index is spliced to the later using their relative level in the first five overlapping decades. The last column of table 3 shows the resulting decadal estimate of the cost of living for 1200-1669 with 1770-9 set to 100.

The cost of living index used by PBH differs from the index used here. Figure 7 shows the relative levels of the two cost of living indices from 1260 to 1849, where they are set to equality in 1770-1779. The further back we go the lower the relative estimated cost of living of PBH compared to this paper. For the years before 1500 PBH estimated the cost of living as typically about 80% of the level estimated here. The reasons for this deviation are not entirely clear, and I have not investigated the matter closely, since there are so many variations in weighting and in the series used between this paper and PBH. But I am fairly confident that my series must be closer to correct. For if we look at grains for which there is the most information, and which constitute 46-60% of my price index, we see that prices in 1840-9 are 8.6 times Farmer's average prices for wheat, barley and oats in 1300-49. In the same interval I estimate

Figure 7: The Cost of Living in PBH Relative to this Paper



Note: The ratio is the relative cost of living by 10 year periods. Both series are set to 100 in 1770-9.

Sources: Table 3. Phelps-Brown and Hopkins (1962b).

the cost of living to have increased just 7 fold because the prices of other items like clothing, fuel, candles and soap I estimate to have increased much less. To get the 10 fold price increase in this interval which PBH find the prices of non-grain items in general – meat, dairy, clothing, fuel, candles and soap must have risen even faster than grain which is not very plausible.[7]

Real Wages, 1208-1849

Table 4 shows the estimated winter day wage, cost of living and real wage of farm workers by decade from 1200-9 to 1840-9. For real wages 1770-9 is set to 100. Figure 8 shows the real wages from table 4, and in comparison the PBH real wage index. Real farm wages in the years before the Black Death average only 63% of their level in the 1770s. Wages reach their lowest point in the entire period in the decade 1310-9, when they are only 50% of their level in 1770-9. The famine of 1315-17 is the most significant in English history and is estimated to have resulted in a 10-15% decline in population. Wages in the years 1350-1549 after the Black death averaged 35% above the level of 1770. Then there was a sharp decline in wages so that by 1600-49 wages averaged only 77% of their level in 1770-9. This, however, was still about a quarter higher than they had averaged in the years before the Black Death. Their lowest levels in the 1610s were about 40% above the terrible decade of the 1310s. But by the 1650s real wages had climbed close to their level of 1770-9, and were substantially above their pre-plague level.

[7] Though they list all the series they use it is unclear how some would be derived. For example, to estimate medieval meat prices they use the price of whole pigs from 1264 to 1460 and the price of whole sheep from 1265 to 1582, linked somehow with a series on prices of beef and pork by the pound which start respectively in 1584 and 1602. How a proper linkage was achieved is unclear. There is evidence that sheep at least were much smaller in the medieval period than they were in later years, and this will cause early meat prices to seem very low. See Clark (1991). In preference I just assume that meat prices moved in line with general prices in these years.

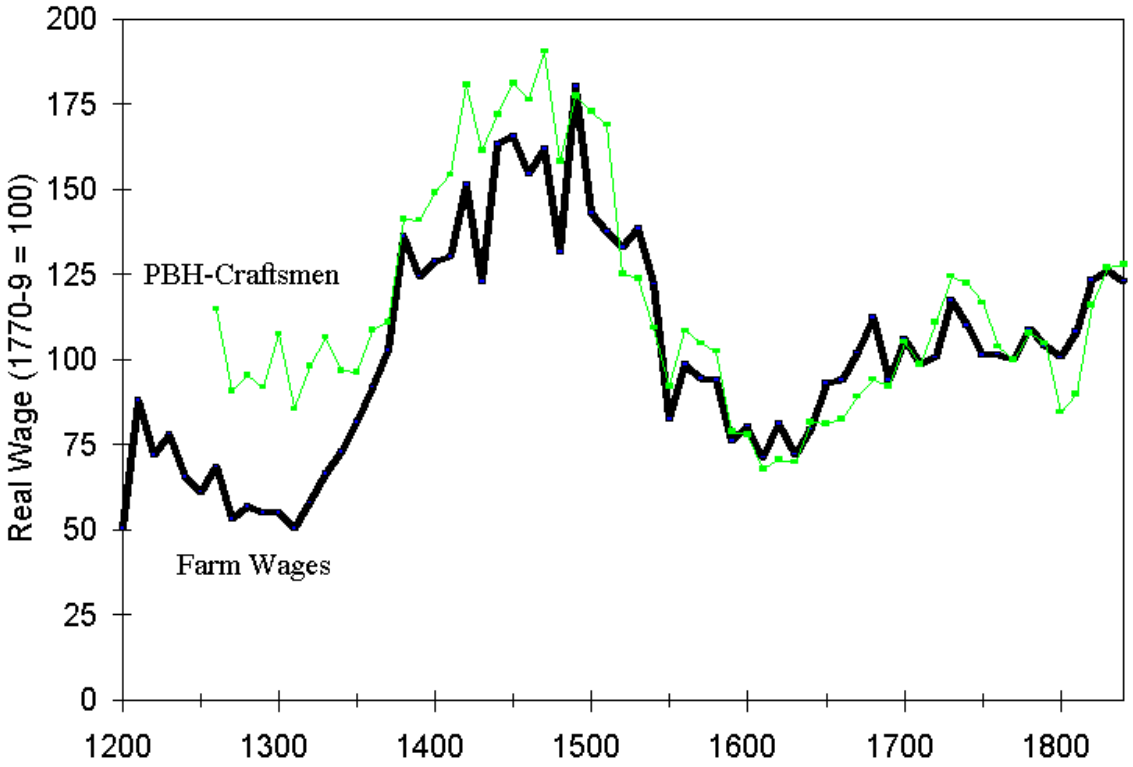
Table 4: Farm Wages, Cost of Living and Real Wages by Decade, 1200-1849

Decade	Day Wage (d.)	Cost of Living (1770-9= 100)	Real Wage (1770-9 = 100)	Decade	Day Wage (d.)	Cost of Living (1770-9 = 100)	Real Wage (1770-9 = 100)
1200-9[1]	1.02	16.5	50.3	**1550-9**	4.25	42.1	82.5
1210-9	1.32	12.2	88.0	**1560-9**	5.41	44.9	98.4
1220-9	1.27	14.4	71.9	**1570-9**	5.53	47.8	94.5
1230-9	1.29	13.5	78.0	**1580-9**	6.34	55.2	93.9
1240-9	1.17	14.6	65.3	**1590-9**	6.34	68.2	76.0
1250-9	1.18	15.8	61.1	**1600-9**	6.73	68.4	80.4
1260-9	1.19	14.2	68.6	**1610-9**	6.88	79.0	71.1
1270-9	1.17	18.0	53.1	**1620-9**	7.72	77.6	81.3
1280-9	1.11	15.9	56.7	**1630-9**	8.18	92.6	72.2
1290-9	1.12	16.7	54.9	**1640-9**	9.10	93.4	79.6
1300-9	1.12	16.7	55.0	**1650-9**	10.28	90.2	93.1
1310-9	1.43	23.3	50.2	**1660-9**	10.11	87.9	93.9
1320-9	1.47	20.7	58.0	**1670-9**	10.36	82.9	102.0
1330-9	1.41	17.4	66.3	**1680-9**	10.79	78.6	112.2
1340-9	1.49	16.7	73.0	**1690-9**	10.14	88.3	93.8
1350-9	2.09	20.9	81.6	**1700-9**	10.05	77.5	105.9
1360-9	2.38	21.2	91.9	**1710-9**	10.15	84.2	98.6
1370-9	2.49	19.8	102.5	**1720-9**	10.30	83.6	100.6
1380-9	2.75	16.5	136.1	**1730-9**	10.94	76.2	117.2
1390-9	2.66	17.4	124.5	**1740-9**	10.82	80.4	109.9
1400-9	2.85	18.1	128.7	**1750-9**	10.81	87.2	101.3
1410-9	2.89	18.1	130.2	**1760-9**	11.17	89.9	101.4
1420-9	3.02	16.3	151.3	**1770-9**	12.24	100.0	100.0
1430-9	3.03	20.1	123.0	**1780-9**	13.27	99.6	108.8
1440-9	3.15	15.8	163.0	**1790-9**	15.05	118.3	104.0
1450-9	3.14	15.5	165.5	**1800-9**	19.21	156.1	100.6
1460-9	2.93	15.5	154.4	**1810-9**	22.81	172.3	108.2
1470-9	2.91	14.7	161.8	**1820-9**	19.96	132.3	123.3
1480-9	2.69	16.7	131.4	**1830-9**	19.64	127.1	126.2
1490-9	3.26	14.8	180.3	**1840-9**	19.96	132.5	123.0
1500-9	2.95	16.8	143.1				
1510-9	2.83	16.8	137.4				
1520-9	3.26	20.0	133.0				
1530-9	3.58	21.2	138.3				
1540-9	3.70	24.7	122.2				

Notes: [1]Based on wage and price observations for 1208 only.

Source: Tables 1, 2, 3.

Figure 8: Real Agricultural Day Wages, 1200-1849



Notes: The figure shows decadal averages of real wages from 1200-9 to 1840-9.

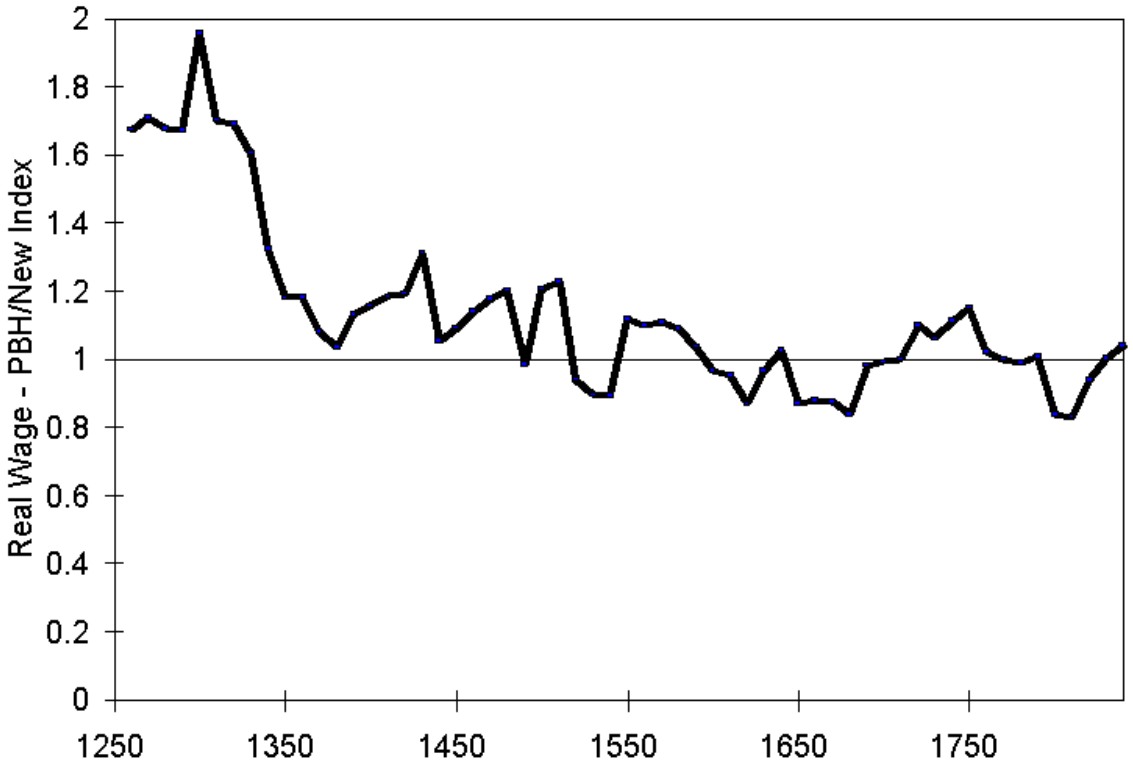
Sources: Table 4. Phelps Brown and Hopkins (1962b).

Figure 8 also shows the real wages of building craftsmen as calculated by PBH. As can be seen though the wage and cost of living indices developed here are very different, the differences sometimes are offsetting and sometimes compounding in calculating real wages. PBH calculate craftsmens' wages before the Black Death as equivalent to their level in 1770-9, and at nearly double the relative level calculated here for farm laborers. Figure 9 shows the relative real wage of craftsmen as calculated by Phelps Brown compared to the real wage of farm workers calculated here, with 1770-9 set at 1. The earlier in time we go the greater the disparity between the measure developed here for agricultural real wages and the PBH measure of real wages.

Real Wages, Population, and Economic Growth

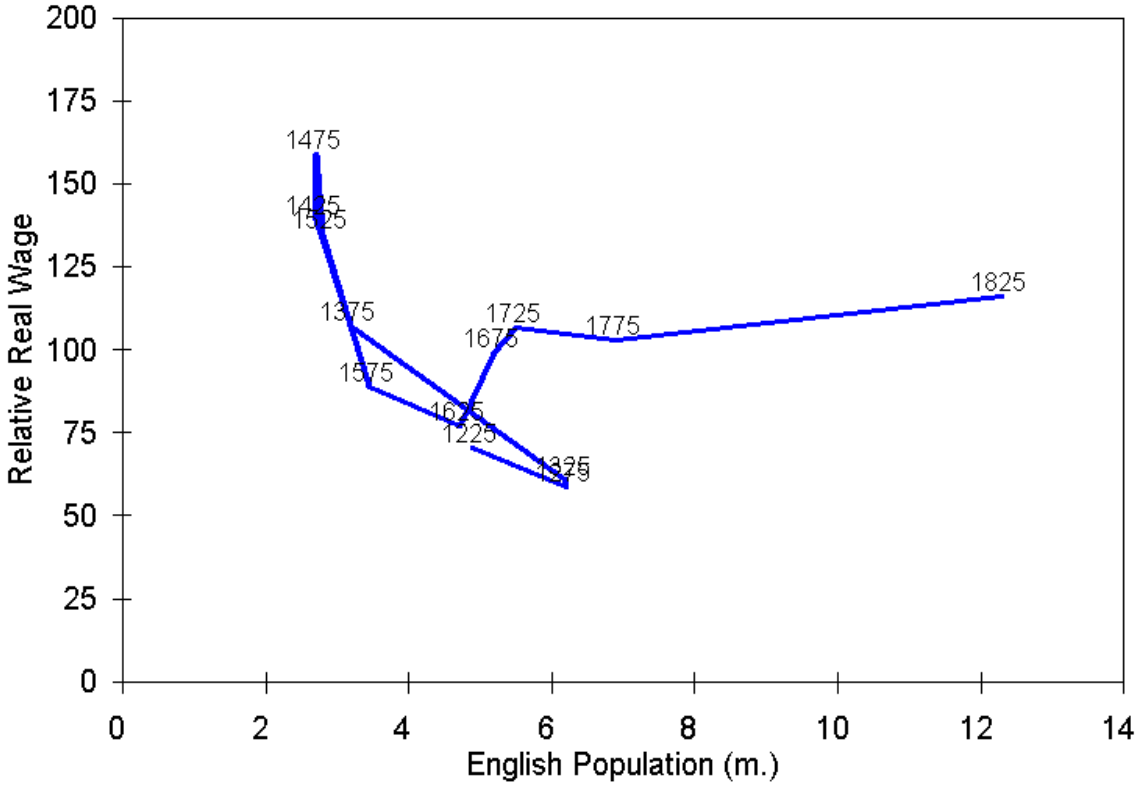
Figure 10 shows farm real wages, by half century, against the level of population as in figure 1. The observations from 1200-49 to 1600-49 lie along the same line, suggesting no improvement in the productivity of the economy in this long interval. However, between the first and second halves of the seventeenth century, the productivity of the economy seemingly grew for the first time since 1200. Real wages in the late seventeenth century were between 30% and 40% higher than would be expected from wages in the pre-plague era when population was similar. By 1700-49 real wages were 50-75% above what the medieval experience would have suggested. Thus the years 1600-49 to 1700-49 witnessed substantial economic growth. This improvement continued from 1700-49 to 1750-99, and very markedly in the years 1750-99 to 1800-49.

Figure 9: Relative Real Wages, PBH versus Farm Wages



Source: Table 4. Phelps Brown and Hopkins (1962b).

Figure 10: Real Agricultural Day Wages and Population, 1200-1849



Notes: The observation for 1250-1299 lies in the same place as that of 1300-49 since both population and real wages are estimated to be approximately the same in these periods.

Sources: Real wages, table 4. Population, Wrigley, Davies, Oeppen, and Schofield (1997), pp. 614-5. Population, 1540-1850. Wrigley, Davies, Oeppen, and Schofield (1997), pp. 614-5. Population, 1250-1530. Hatcher (1977), Poos (1991), Hallam (1988).

Thus the real wage series presented here points to a break from the pre-industrial economic stasis located in the middle of the seventeenth century, 100-150 years before the classic Industrial Revolution. Such a break would be more consistent with the evidence of urbanization than the PBH wage series. For an economy without much external trade the level of urbanization is usually a good indictor of the level of income per capita. Higher income consumers spend proportionately more on manufactured items produced in urban areas. De Vries suggests that about 13% of the population in England lived in towns of more than 10% people in 1700, while the comparable proportion in 1300 would have been 3% or less.[8]

[8] de Vries (1984), pp. 39-43

Manuscript Sources on Wages

Day Wages (1200-1739)

Beveridge Collection, Robbins Library, London School of Economics: Battle Abbey (Boxes H6, H8, W4), Brooke, Isle of Wight (Box I11), Croyland (Oakington) (Box W4), Delisle Accounts (Box W2), Eton (Box I19), Exeter Accounts (Box W5), Hinderclay (Suffolk) (Box G14), Pelham Papers (Box H12), Penshurst (Boxes W2), Stowe Papers (Box H2),, St Bartholomew's Hospital, Sandwich (Box E9), Trinity College, Cambridge (Box W2), Winchester College (Box W2), Westminster Abbey (Box P9, P10).

Bedford Record Office. Boteler, TW 800, TW 802, TW 805, TW 809. Chester, BC 482, CH938.
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Hertford Record Office. Broadfield Hall, 70474A. Hatfield, 26294. Rolt, D/EAS/21710.
Huntingdon Record Office. Bernard, ddM5/4/1. Houghton, ddM/44D.
Lent Record Office. Darell, U386/A1.
Lancashire Record Office. Clifton, DDCI 399. Farington, DDF 31. Molyneaux, DDM/1/141.
Leicester Record Office. Ferrers, 26D53/2335, 26D53/2465-6. Rothley, 2D31/241.
Northampton Record Office. Dryden, D(CA) 305-8, D(CA) 312. Fitzwilliam Misc. Vols. 6, 8, 23, 50, 74, 157, 189, 191, 790. Howe, YZ 997. Isham, IL 3945.
Nottingham Record Office. Portland, DD5P/1-150. Savile, DDSR/A4/49/1.
Northumberland Record Office (Berwick). Haggeston, ZHG IV/3. Simpson, ZS1/1-4, ZS1/56.
Northumberland Record Office (Newcastle). Allgood, ZAL Box 44/1, Box 44/10, Box 60. Blackett, ZBH 273/2. Swinburne, ZSW.
Reading University Library. Wyche of Hockwold, NORF, 14/1/1, 15/1/1.
Sheffield City Library. Oakes, 1518.
Somerset Record Office. Carew, DD/TB/Boxes 13, 14/6, 14/12. Hylton DD/HY Box 12. Parsonage, DD/X/REE/C/1308. Popham DD/PO/32/2-97. Willoughby DD/WO/Box 49/10/pt 2.
Stafford Record Office. Leveson-Gower, D593/F/2/18-35, D593/F/3/1/1-4, D593/F/3/25-27.
Surrey Record Office (Guildford). Howard, 1/53/4, 1/53/7-8. More-Molyneux, LM 1087/1/8, LM 1087/1/10. LM 1087/2/5/1, LM 1087/2/16. Nicholas, 22/1/2. Wyatt, LM 1087/2/8.
Warwick Record Office. Barker, CR233. Northampton, CR556/275-6.
West Suffolk Record Office. Stanton Accounts, E1/11/2. Warner, 1341/5/2.
Wiltshire Record Office. Ashe, 118/140B, 118/141. Ballard, 1195/22. Blandy, 116/21. Burdett, 1883/192/1. Chippenham, 811/207. Enford, 415/86.
Yorkshire Record Office (Sheepscar). Ingram/Irwin, TN/EA/12/11. Robinson/Weddell, NH 2187.

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Westminster Abbey (Aldenham, Eybury, Hyde, Kingsborne, Knightsbridge, Morden, Oakham, Westerham) (Boxes P5, P10).

Farmer Collection, Library, University of Saskatchewan: Winchester (Downton, Ebbesbourne, Farnham, Ivinghoe, Meon, Meon Church, Overton, Witney, West Wycombe), Westminster (Ashford, Birdbrook, Eybury, Halliford, Hyde, Islip, Knightsbridge, Oakham), Queen's College (Gussage, Werrore and Corsham), Bircham, Claret, Deerhurst, Farley, Hinderclay, Maldon, Pershore, Redgrave, III.B.45, III.B.48.

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