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Was there an 'Industrious Revolution' before the Industrial Revolution? An Empirical Exercise for England, c. 1300-1830[1]

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Abstract

It is conventionally assumed that the pre-modern working year was fixed and that consumption varied with changes in wages and prices. This is challenged by the twin theories of the 'industrious' revolution and the consumer revolution, positing a longer working year as people earned surplus money to buy novel goods. In this study, we turn the conventional view on its head, fixing consumption rather than labour input. Specifically, we use a basket of basic consumption goods and compute the working year of rural and urban day labourers required to achieve that. By comparing with independent estimates of the actual working year, we find two 'industrious' revolutions among rural workers; both, however, are attributable to economic hardship, and we detect no signs of a consumer revolution. For urban labourers, by contrast, a growing gap between their actual working year and the work required to buy the basket provides great scope for a consumer revolution.

JEL Codes: J22, J43, N30

Keywords: Consumer Revolution, Cost-of-Living Index, Day Wages, 'Industrious' Revolution, Industrial Revolution, Labour Supply, Standard of Living

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I. INTRODUCTION

The length of the working year touches many themes in early modern economic history. One is the standard of living. This is often measured by dividing an annual time series of daily wage rates by a cost of living index. That quotient tracks changes in material consumption from year to year only if the number of days worked per year remains the same, and that is the usual assumption — implicitly or explicitly. An invariant working year, however, is called into question by a second theme — the twin theories of the 'industrious' revolution and the consumer revolution. Together they posit an increase in the number of days worked per year as people earned surplus money to buy novel consumer goods like tea, sugar, books, and clocks. If the working year increased in this way, then labour inputs increased more rapidly than the population, leading this way to economic growth in pre-modern England.

There are scattered estimates of the length of the working year, which we will discuss shortly, but they do not provide enough information to pin down the matter on their own. In this paper, we use existing time series of wages and prices, but turn the traditional view on its head. That is, in contrast to the usual approach in the real wage literature, which assumes that the working year was constant and then computes how much annual consumption changed as wages and prices varied, we assume that workers acted to stabilize consumption over time and compute how much the working year had to change in order to achieve that given changes in wages and prices. The assumption is unusual, but it turns out to be consistent with many existing estimates of the length of the working year.

We conduct these calculations for an extensive period covering more than five centuries — i.e. between c. 1300 and 1830 — for two groups of day labourers: farm workers in southern England and London building workers. For farm labourers, the work required to buy the basket agrees reasonably well with independent estimates of the actual working year.

Since the consumption basket we use contains no novelties (no sugar, tobacco, tea, coffee etc), but only daily consumption goods that were readily available in early modern England, the fact that we largely match the actual working year suggests that something like a consumer revolution did not take place among pre-industrial farm workers. Instead, their labour supply curve appears to be largely backward-bending.[2] For London building workers, by contrast, a large and widening gap between their actual working year and the working year required to buy the basket suggests that there was great scope for a consumer revolution in the run up to the industrial revolution, harmonious with the twin theories of the 'industrious' revolution and the consumer revolution.[3]

The empirical exercise carried out in this study also provides other insights into the work-patterns of pre-industrial day labourers. For farm workers, we detect two episodes of steep increase in work-requirements: one between 1540 and 1616, and another between 1750 and 1818. The initial upsurge in labour input coincides with the removal of 49 holy days in England, conducted in 1536 as part of the Protestant Reformation. If this abolition of holy days was intended to help the poor maintaining their consumption by allowing them to work more days throughout the year, then it might have helped also more affluent groups of workers, such as urban labourers, to realize a higher desired consumption level, which in turn could have been a stimulus to the manufacturing sector. As regards the second upsurge in labour input among farm workers — that starting at the eve of the industrial revolution — this closely matches Voth's (2000; 2001) profound increase in the working year between 1750 and 1800, as well as his subsequent decrease in 1830.[4] This 'industrious' revolution among rural farm labourers at the height of the industrial revolution came out of economic hardship with no signs of a consumer revolution. In fact, our analysis shows, consistent with

[2] The backward bending supply curve of labour is a thesis that claims that as wages increase, people will substitute leisure for working.
[3] See, particularly, de Vries' (1994; 2008), but also Koyama (2009).
[4] A recent study by Bell (2009) repeats Voth's findings for East Anglia.

estimates by Horrell and Humphries (1995), that the increased dependency burden from 1750 onwards meant that by 1800 women and children had to supply nearly 20 percent of low-income agricultural household earnings to maintain basic consumption.

II. DATA AND METHODOLOGY

The fundamental idea of the study is to calculate the number of days of work necessary per year to buy a fixed consumption basket, and then comparing it to independent estimates of the actual working year found in the existing literature. To account for the fact that workers would typically provide not just for themselves but for an entire family, we compute the annual days of work required to support a representative household. For this, we need two components: annual consumption expenditures of a typical household and day wages of workers. Since we focus on two different groups of workers — farm labourers and urban builders — we need the wage rates of each group. In the case of farm labourers, we use southern England day wages for the period c. 1300-1830. For c. 1300-1450, the wages are the day wages of farm labourers outside the harvest period paid on the estates of the Bishop of Winchester as recorded by Beveridge (1936, p. 41). Labourers were paid exclusively in cash. Beveridge studied the wages of eight manors and concluded the rates were similar across southern England. For 1450-1650 the wages were paid by Oxford and Cambridge colleges and Eton College (Bowden 1967, p 864). Their estates were in southern England, the character of the work and terms of payment are the same as those on the Winchester estates, and the series before and after 1450 agree very closely at that date. The series was extended to 1750 using Bowden's (1985, p.877) agricultural wages for southern English counties. Finally, the wages were extended to 1830 using Bowley's (1898, pp. 704-7) wages for Oxfordshire. Bowley's wages applied to men paid by the day outside of the harvest and included the value of any payments in kind. Our wage series agree closely with the farm

wages reported by Clark (2001, p. 485) for south eastern and south western England for 1670-1830. For urban builders, we use London day wages for the period 1457-1830. These come from Boulton (1996), Rappaport (1989) and Schwartz (1985). For c. 1310-1456, London building wages are estimated by increasing by 25 percent the Phelps Brown and Hopkins (1955) series, which is based mainly on wages paid by Oxford and Cambridge Colleges. The 25 percent is the differential between the London and Oxbridge series for the century after 1457.

In order to compute annual consumption expenditures, we rely on a pre-modern consumption basket comprising daily consumption goods, such as foods, clothing, housing and heating. We would like to know if workers expand their working year (show 'industrious' behaviour) with the intension of obtaining novel commodities ('consumer revolution' behaviour). Therefore, no novelties or luxuries (like sugar, tobacco, potatoes, tea, coffee, books, clocks etc) are included in the basket. Items of the basket, as well as their amounts consumed per adult, are detailed in Table 1.[5] This way, an industrious revolution intended to expand consumption ought to materialize itself by a growing gap between the actual working year and the working year required to buy the basket.

[TABLE 1 ABOUT HERE]

The consumption expenditures on the basic consumption basket of a representative household are obtained by multiplying the quantities of Table 1 by the unit price of each item. Five percent is added to total consumption expenses to account for the cost of housing. Further, there is an urban premium in that we assume that the basket is 20 percent more expensive in London compared to southern England. Prices come from three sources:

[5] For a discussion of the design of the basket, see Allen (2001).

Beveridge (1936), Mitchell and Deane (1971) and Rogers (1866-1892).[6] The prices are derived from the accounts of institutions in London and its vicinity or Oxford and Cambridge. Allen (2001) discusses the interpretation of the prices in detail.

In the main analysis, it is assumed that a household consists of two adults and two and a half children, and that children consume half as much as adults. That means a household contains the equivalent of 3.25 adults. In the robustness analysis conducted further below, we will attempt to vary the family size over time, in line with what we know about increased fertility and demographic expansion, to see how this affects the results. As will become apparent later on, the reason we do not vary family size in the main analysis is that the demographic data used for that purpose does not exist before 1541.

The annual number of days of work per household (the *implied* working year) necessary to obtain the basket specified above is then calculated using the following formula:

$$\textit{days per year} = \textit{annual costs of baskets of household / day wage}$$

Figure 1 shows the annual number of days of work required by a southern England farm male labourer over the period 1310-1830 to provide for his family. Figure 2 reports comparable estimates for London builders for the period 1310-1830. The dashed lines in the Figures show the number of working days required per year in order to buy the basket, while solid line is the 10-years moving average. While the implied working year illustrated in Figures 1 and 2 assumes that the male worker provides for the entire household on his own, the role of women and children's contribution to household earnings will be discussed further below.

[FIGURE 1 ABOUT HERE]

[6] Data used to obtain *days per year* are available at http://www.nuffield.ox.ac.uk/General/Members/allen.aspx. Sources for the data are detailed there.

Also added to the Figures are the scattered, independent estimates of days of work per year found in the literature. These come from three sources: Blanchard (1974), Clark and Van Der Werf (1998), and Voth (2001). Blanchard's (1974) detailed study of farming miners of Mendip in Somerset offers five observations concerning the years 1433, 1538, 1578, 1584 and 1598. The length of the working year, which is computable from rows 3b and 3c in Blanchard's Table C2, is the sum of number of days per year spent in agriculture (135 days) plus the share of remaining labour time (265-135 days) spent in mining activities. In Figures 1 and 2, Blanchard's estimates are marked by white squares.

Clark and Van Der Werf (1998) provide observations for five time-intervals, which together cover the period 1560-1732, as well as the year 1771. Their numbers are based on estate records and household accounts from various places in England, including Bedford, Cambridge, Derbyshire, Deptford, Norfolk, and Northampton. Numbers are taken directly from Clark and Van Der Werf's Table 1, and are represented in Figures 1 and 2 by big-dotted, horizontal lines.

[FIGURE 2 ABOUT HERE]

Finally, based on court records and witnesses' accounts, Voth (2001) offers three estimates for the years 1750, 1800, and 1830 for London and Northern England. Voth's numbers, which are taken from his Table 7, come in the form of hours worked per year, but can be transformed into days of work per year under the conventional assumption that workers toiled in the neighbourhood of ten hours per day during the industrial revolution. Moreover, since Voth provides separate estimates for agriculture as well as manufacturing and trade and services, we assume that urban builders compare with non-agricultural workers

in terms of labour input; this explains why the grey squares in Figures 1 and 2, representing Voth's estimates, are not identical in the two Figures. Finally, Voth's standard errors are used to generate upper and lower bounds for each year. Marked in Figures 1 and 2 by the symbol '+', the bounds are one standard deviation away from the mean. Estimates from all three independent sources are listed in Table 2.

[TABLE 2 ABOUT HERE]

III. RESULTS AND INTERPRETATIONS

In the following, four observations will be made with regards to days of work per year required by farm labourers (Figure 1). The first thing to note is that our implied working year agrees reasonably well with the scattered, independent estimates of days worked per year presented in the existing literature. To begin with, this suggests that the working year of farm labourers during the Industrial Revolution was extraordinary long by pre-industrial standards,[7] a conclusion also reach by Voth (2000) in his detailed study of English work-habits between 1750 and 1830. Moreover, between the Great Famine of the 14th century (circa 1315-1317) and the ending of the Early Modern era (circa 1750), a work-load of more than 300 days per year to support a family was rarely required, except for a brief period around 1600 and during years of severe misery (the spikes in the dashed line of Figure 1). In fact, the work-requirements of Late Medieval farm labourers were fairly modest, even by modern standards, involving less than 200 days of work per year to provide for an entire family. Putting the matter this way is the flip side of the usual interpretation in real wage

[7] Note that a working year of more than 365 days per household is perfectly possible. This would simply imply that the household would either cut its consumption compared to that specified in Table A1, or that women and children would have contributed to the household's income (see the robustness section below).

studies, which find that the fifteenth century was the 'golden age of labour'.[8] For instance, Phelps Brown and Hopkins (1956) concluded that the high real wages prevalent between the ending of the Black Death (circa 1350) and the beginning of the Early Modern era (circa 1500) was not regained until the nineteenth century. Subsequent studies have confirmed that view.

The second observation to be made relates to a long-standing debate about the existence of agrarian labour surplus in pre-industrial England. The estimates of Figure 1 show that the main component of Lewis' (1954) *labour surplus theory* (i.e. surplus labour) was certainly present – particularly by the beginning of the Early Modern era. Indeed, by the middle of the fifteenth century, it needed less than half a labourer's full capacity, or around 150 working days per year, to provide for a representative household. If at this point farm labourers were somehow induced to double their labour input, then this would release fifty percent of all farm workers for non-agricultural (e.g. industrial) purposes.

This conclusion is different from that usually found in medieval economic histories, which see the pre-plague period as one of overpopulation and surplus labour, while the fifteenth century is regarded as an era of full-employment in view of the lower population. Another interpretation, however, is summarized in Dyer's (1989, p. 224) observation that "a plausible reconstruction of workers attitudes in the period 1349-1520 is that they set themselves goals in cash or consumption needs, and worked until they had achieved their aims. Then they ceased to work." This observation is not consistent with full-time, full-year work. Our calculations give numerical expression to Dyer's observation and show that it implies idle labour in the countryside in the fifteenth century.

The third observation concerns developments in standards of living. It has long been recognized that well into the Industrial Revolution, wage rates, particularly those of farm

[8] See, e.g., Postan (1972), Hatcher (1977, pp. 47-54), Dyer (1989, pp. 211-33) and Hatcher and Bailey (2001, pp. 47-9).

labourers, barely changed.[9] Voth's (2001) account of rising labour input between 1750 and 1800 reinforces the pessimistic interpretation of standards of living, since leisure declined while material standards of living hardly rose. The present estimates for farm labourers are very supportive of Voth's findings. Since our estimates of labour input agree reasonable well with existing ones, also in the centuries leading up to the industrial revolution, Voth's gloomy conclusion appears to extend all the way back to the beginning of the Early Modern era (circa 1500) from when the required working year of farm labourers began to expand. This inference, however, does not apply to the London builders, which will be discussed shortly.

The fourth observation concerns Jan de Vries' concept of an industrious revolution, according to which "a broad range of households made decisions that increased both the supply of marketed commodities and labour and the demand for goods offered in the marketplace" (de Vries, 2008, p. 249). The apparent industriousness among farm labourers in the present study, though supporting the idea of households supplying more labour over time, does not seem consistent with a consumer revolution marked by more and new goods entering the consumption basket. Rather, additional labour input of farm workers stems from the fact that daily consumption goods become harder to obtain economically. If the household did indeed increase its demand for luxuries and novelties, as hypothesized by de Vries, then the increase in labour supply among farm workers would have to be even greater than what Figure 1 suggests. That, of course, could have materialized if women and children increased their supply of marketed commodities and labour. However, as the robustness analysis below will attempt to demonstrate, women and children's contribution to rural household earnings after 1750 is attributable entirely to a growing dependency burden rather than a consumer revolution.

[9] See, e.g., Hatcher (1977, p. 49) and Clark (200

The rise in implied work-loads observed among farm labourers took place over two distinct periods, 1500-1616 and 1750-1818. Between 1500 and 1616, days of work required per year increased from around 160 to slightly more than 300.[10] Most of the rise in labour-requirements occurred between 1536 and 1616. Over this period, the number of working days per year increased from close to 180 up to 305 – a 70 percent expansion in just 80 years. Remarkably, this upsurge in days of work required coincides with the removal of 49 holy days in England, carried out in 1536 as part of the Protestant Reformation.[11] If the abolition of holy days was intended to help the poor maintain their consumption by allowing them to work more days throughout the year, then the industrial revolution might also have been encouraged by allowing more affluent workers — urban building workers among them — to realize a higher level of consumption along the lines proposed by de Vries.

In the century after circa 1616, there was a modest decrease in working days required for farm workers to purchase the consumption basket. However, that trend turned again in the eighteenth century. From 1750 onwards, the implied working year grew by 56 percent, from around 250 working days per year to a staggering 391 in 1818.[12] By that time, a male worker was no longer able to support an entire family on his own, not even toiling every day of the year. As we will discuss in more detail further below, that could well explain why women and children's labour appears to have increased during the Industrial Revolution[13] — they were forced to in order to maintain the household's basic consumption. However, from 1818 onwards, and over little more than a decade, work-requirements fell dramatically, from around 391 days of work per year to a manageable 285. The fact that the drop in days of work

[10] The numbers reported in this and subsequent paragraphs are taken from the 10-years moving average series, so as to avoid confusing them with year-by-year variation in prices and wages.
[11] See de Vries (2008, p. 87). This practise was later followed by other countries, such as the Netherlands in 1574, France in 1666, and Austria in 1754 (*ibid.*).
[12] By comparison, Voth (2001) observes a 48 percent increase of annual hours worked between 1750 and 1800.
[13] E.g. Horrell, S. and J. Humphries (1995a; 1995b).

required closely matches Voth's (2001) estimates of labour input for farm labourers during the industrial revolution (see Figure 1) strongly suggests that the labour supply curve among this group of workers could have been almost perfectly backward-bending.

Turning now to the labour-requirements of London building workers, as illustrated in Figure 2, this provides a picture quite different from that of farm labourers, at least from 1600 on. That is, from the ending of the fourteenth century and up until the beginning of the seventeenth century, the implied working year of rural and urban labourers is more or less the same. But then the two start to diverge. While the work-requirements of farm labourers continue to rise well into the seventeenth century, the labour input required by London builders drops quite substantially, from around 275 days per year to a mere 140 annual days of work, between 1600 and 1750. Remarkable, the independent estimates suggest the opposite, namely a steady growth of labour input between 1600 and 1750 up to a point where urban labourers toiled for more than 300 days per year (Table 2). If we take the independent estimates to be a good proxy for the actual working year, and since this rises steadily between 1600 and 1750, Figure 2 offers great support in favour of the idea that an industrious revolution instrumented a consumer revolution. Indeed, a large and widening gap in the run up to the Industrial Revolution between the actual working year and the working year required to buy the basket suggests a work-year far in excess of what was required for basic subsistence. In fact, at the doorstep into the Industrial Revolution, urban builders work twice has hard as is required in order to uphold a decent standard of living.

IV. ROBUSTNESS OF RESULTS

The analysis above assumes that the dependency structure of the family is constant (two adults and two and a half children), and that men's earnings alone have to provide for this. In the following, we will attempt to vary family requirements over time, in line with what we

know about increased fertility and demographic expansion, to see how this affects the results. We will also discuss the extent to which women and children contributed to household earnings to see whether that has implications for the findings above.

We will use two different measures of dependency burden in the robustness analysis below: the *dependency ratio* and the *net reproduction rate*. Numbers for both are provided by Wrigley et al. (1997, Table A9), but unlike the data used in the previous section, which goes back to the beginning of the fourteenth century, neither of the two data series used here are available before 1541. The reproduction rate is the average number of daughters that would be born to a female if she passed through her lifetime conforming to the age-specific fertility rates of a given year. By contrast to the *gross* reproduction rate, the *net* reproduction rate, which we will use here, takes into account that some females die before completing their childbearing years. By comparison to the flat dependency structure, which was used above, the net reproduction rate thus provides a more accurate picture of how many children an average family had to support at a certain point in time. Since we are assuming that children consume half of what adults do, the household size used below to when computing the implied working year is therefore two plus the net reproduction rate.

The other measure used for robustness analysis – the dependency ratio – is defined by Wrigley et al. (1997) as 1,000 times the number of people aged 0-14 and 60 plus, divided by number of people between 15 and 59 years of age. This number, which for most years analyzed fall between 700 and 800, needs to be transformed into something that relates to family size. In the year 1756, two plus the net reproduction rate was 3.26 – or very close to the flat 3.25 assumed above. Below, we therefore construct a dependency ratio index, where we normalize the dependence ratio, so that year 1756 = 3.25.

[FIGURE 3 ABOUT HERE]

Figure 3 shows the evolution of the dependency ratio and two plus the net reproduction rate (2+NNR), as well as the flat dependency structure of 3.25 adults. The illustration demonstrates that the two time-series – the dependency ratio and two plus the net reproduction rate – tend to follow each other quite closely, and that the constant dependency structure usually overestimates the two before 1600 and after 1750, but underestimates them in the intermediate years.

[FIGURE 4 ABOUT HERE]

Does the variation over time in the dependency burden undermine the conclusions reached in the previous section? Figures 4 plots the annual working days required by each of the two groups – rural farm workers (left) and urban building workers (right) – to buy the basket when family size is estimated by the dependency ratio. The dashed line shows the year-by-year requirement, and the solid line the 10-year moving average. For comparative purposes, the 10-year moving average of the days required assuming a constant dependency structure is also added (the small-dotted line). Figure 5 illustrates the same, but with two plus the net reproduction rate instead of the dependency ratio. As is evident from the Figures, rural farm workers still work largely as much as it takes to buy the basket, although they underperform somewhat after 1750 compared to Figure 1. Similarly, urban workers still experience a rising gap between actual and implied working year between 1600 and 1750, even if the contraction of the gap after 1750 is more pronounced than is the case in Figure 2.

[FIGURE 5 ABOUT HERE]

On the whole, the conclusions from the previous section thus still remain, but with twist: The increased dependency burden after 1750 (see Figure 3) absorbs some of the surplus purchasing power of urban workers (although the gap is still large). For farm workers, it appears that the increased family burden made it impossible to maintain household consumption at the levels dictated by the basket if the family was relying on the husband's income only. As mentioned earlier, this could have been compensated for by women and children contributing to the family's income. But how much would be required?

In order to find out, we need to look at the difference between the income earned by a male labourer and the costs of the basket. By 1800, a male farm worker would put in 343 days per year (Table 2), but were required to work for 425 days in order to support the household (Table A2). So, in order to make ends meet, women and children would have been required to take home (425-343)*100/425 = 19.3 percent of the household's income. That percentage is not completely arbitrary. In fact, it is almost identical to the number provided by Horrell and Humphries (1995). They report that between 1787 and 1815 the contribution of women and children to family earnings in low-income agricultural families was 18.4 percent (*ibid*., Table 2). Evidently, the increased family burden after 1750 meant that by 1800 women and children had to supply nearly 20 percent of rural household earnings to maintain basic consumption.

This brings us to the second issue with potential implications for the conclusions of the previous section: Do women and children's contribution to the household's earnings modify our general findings above? Two main matters deserve attention. First, was the apparent industriousness of urban male workers a way of compensating for lack of job opportunities of other family members rather than to increase consumption? Second, could there have been an invisible consumer revolution going on in the countryside, made possible

by supplementary income generated by women and children? The main analysis above offers no direct insights in this regard – but what can be deduced if we try to read a bit into the data?

Turning to the first question – was urban industriousness a response to declining job opportunities of women and children – we need a couple of reference points. In accordance with Jan de Vries hypothesis, industriousness begins around 1600. By that time, the earnings of an urban building worker would amount to 3,108 pence per year (259 working days at a rate of 12 pence per day). By 1800, urban builders are earning 8,320 pence per year (320 working days at a rate of 26 pence per day).[14] If we follow Horrell and Humphries (1995) estimates, using a 20-percent contribution by women and children to the household's earnings, then by 1800 an urban family's total income would have reached 10,400 pence per year. All of this means that if the industriousness of urban builders was a pure response to declining job opportunities of women and children, then by 1600 the income-contribution of women and children would have been equal to (10,400-3,108)*100/10,400 = 70 percent, more than two-thirds of the family's earnings. In light of existing estimates, that percentage sounds abnormally high. With the exception of factory families, where women and children took home an extraordinary 47-percent share of household earnings, Horrell and Humphries' numbers (although they concern mainly the 19th century) come nowhere near a 70 percent income-contribution by women and children.

What are the implications for the conclusions reached in the previous section? Certainly, if by 1600 the income-contribution of women and children were 70 percent or more, then that would completely eliminate the scope for a consumer revolution among urban labourers in the run up to the industrial revolution. If by 1600 the contribution of women and children fell of between 20 and 70 percent of household's earnings, then some of the increased industriousness of male urban workers could well have been a response to lack of

[14] Wage rates in 1600 and 1800, as described above, are based on numbers from Bowden (1967) and Bowley (1898), respectively, while working days are taken from Table 2.

job opportunities of other family members. In that case, there would still be scope for a consumer revolution, but to a lesser extent than what Figure 5 suggest. Last but not least, however, it is worth noting that Jan de Vries puts emphasis on the *increased* work-effort of women and children. Taking Horrell and Humphries' number for circa 1800 at face value, de Vries' hypothesis would then imply that by 1600 the income-contribution of women and children was *less* than 20 percent. If this was true, then that would raise the scope of a consumer revolution among urban labourers *beyond* what our Figures suggest.

Finally, if we take the latter point to countryside, then would that not suggest that an invisible consumer revolution went on among rural families, made possible by supplementary income generated by women and children? It was indicated above that around 1800 Horrell and Humphries' near 20-percent income-contribution of women and children was indeed necessary for low-income agricultural families to obtain basic basket. So, if we depart from a zero earnings-contribution of women and children by 1600, then, while up until 1750 the supplementary income generated this way could well have led to increased consumption, after 1750 increased labour input by women and children would have functioned exclusively as a means of maintaining basic consumption. By 1800, therefore, there was no consumer revolution among rural farm-worker households.

V. CONSUMER REVOLUTION OR BACKWARD-BENDING LABOUR SUPPLY CURVE?

The contrasting experiences of farm workers and urban labourers show how important it is to distinguish between different groups of workers when analysing labour inputs and patterns of consumption in pre-industrial times. By comparison with independent estimates, our numbers do indicate that 'industrious' revolutions did indeed occur among farm labourers. However, these appear to have come out of economic hardship with no signs that they were associated

with consumer revolutions. This conclusion is maintained even when including estimates of earning-contributions by women and children, whose labour input appear to have served as a means of maintaining basic consumption when the dependency burden increased after 1750. The exercise also suggests that farm workers had a largely backward-bending supply curve, which in turn would mean that our estimates of the implied working year can be used as a proxy for the actual working year among farming day-labourers from the Late Middle Ages through the Industrial Revolution. Finally, by contrast to farm workers, more well-off workers, such as urban labourers, between 1600 and 1750 display strong signs of industrious behaviour not related to economic hardship, hence providing great scope for a consumer revolution in urban areas over this period.

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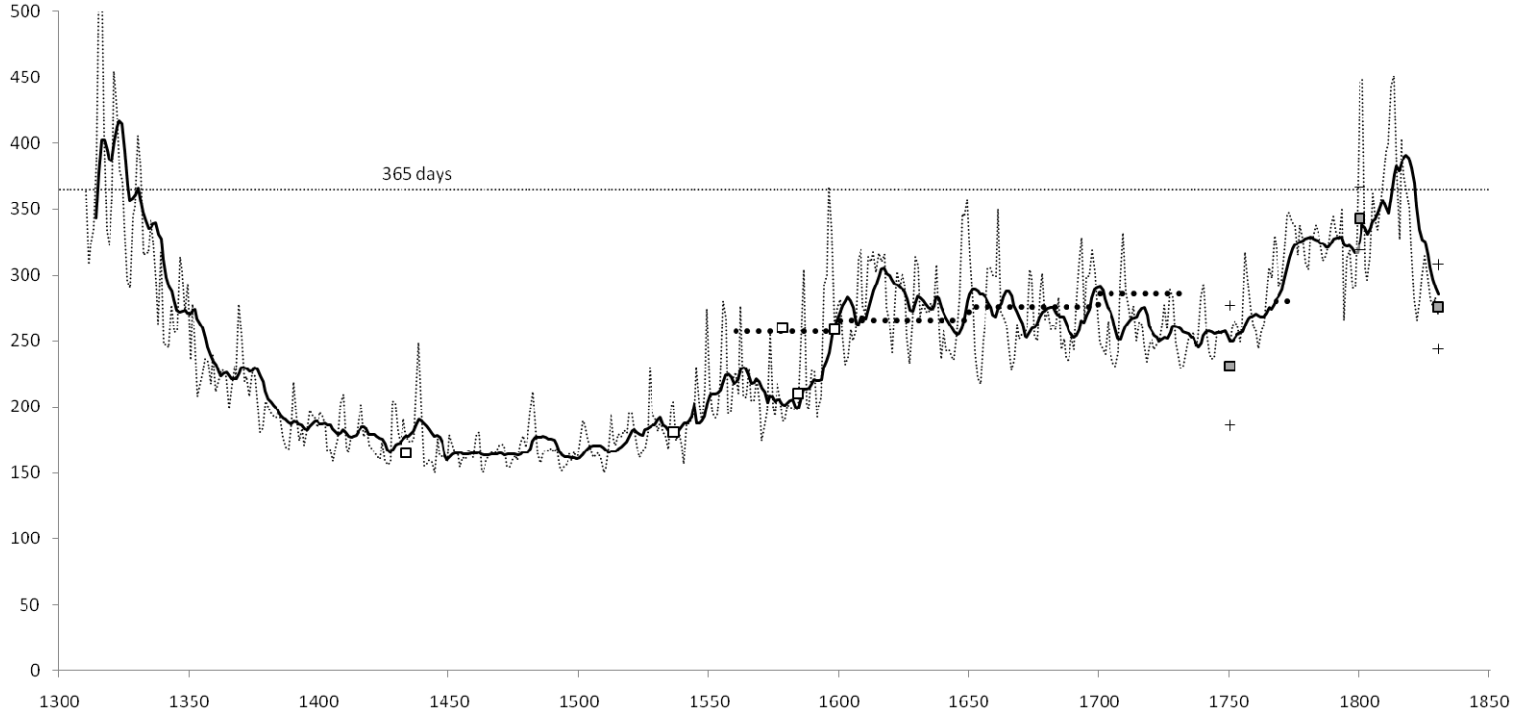

Figure 1

Number of Working Days per Year of Rural Farm Workers, 1310-1830

(dashed line = implied working year; solid line = implied working year 10yma)

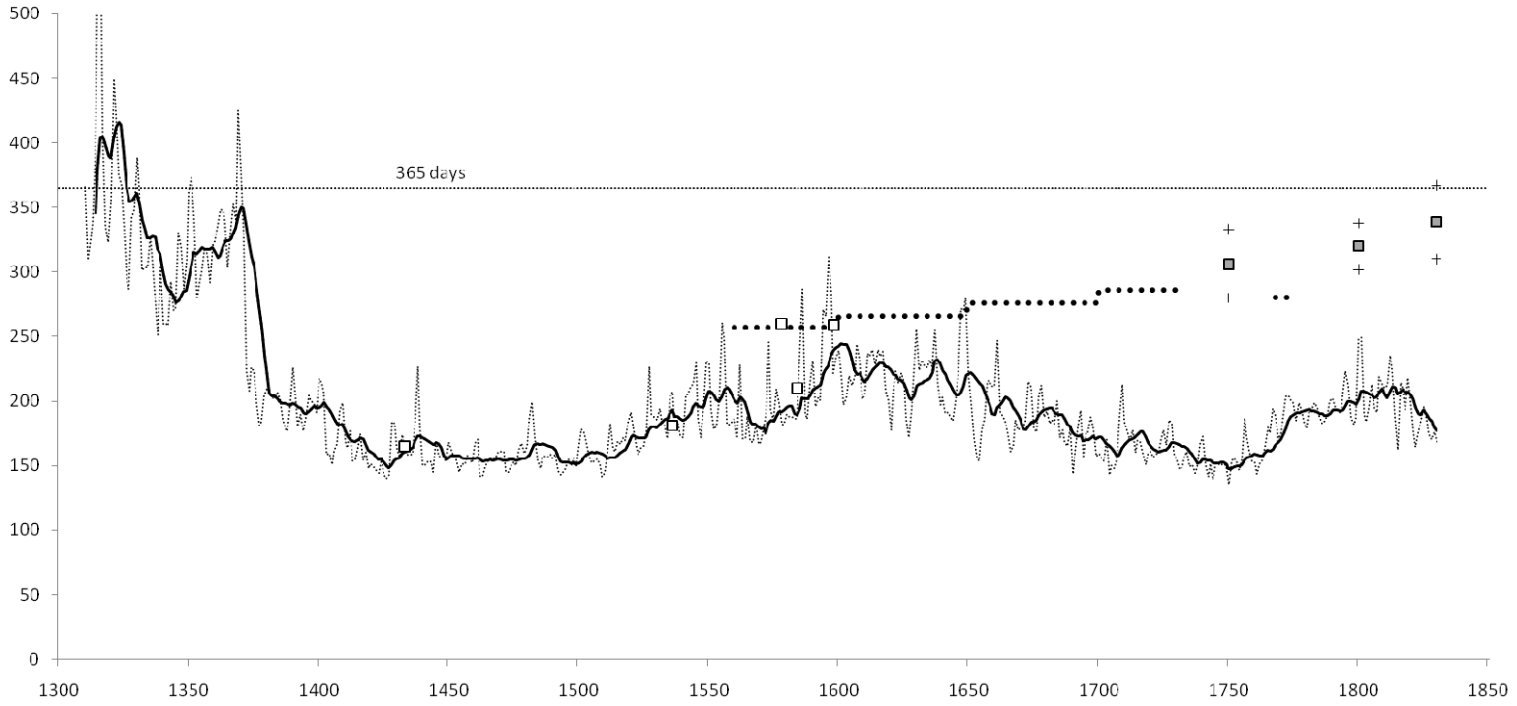

Figure 2

Number of Working Days per Year of Urban Building Workers, 1310-1830

(dashed line = implied working year; solid line = implied working year 10yma)

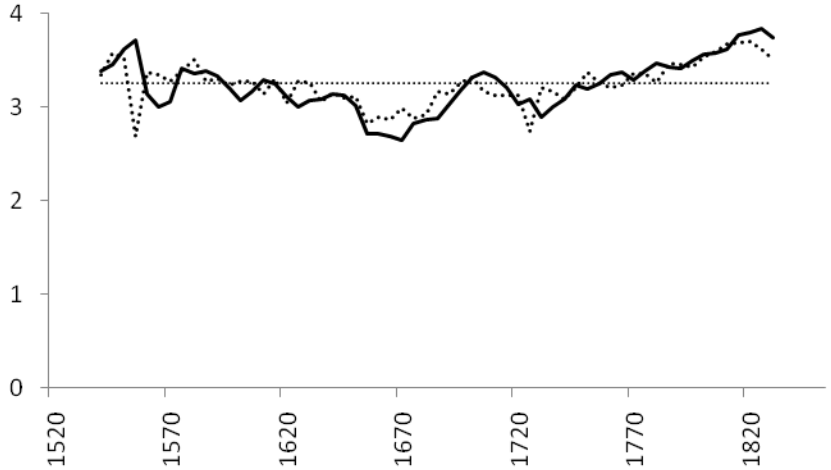

Figure 3

A Comparision between Dependency Ratio (solid), 2+NNR (big dots), and a flat 3.25 (small dots)

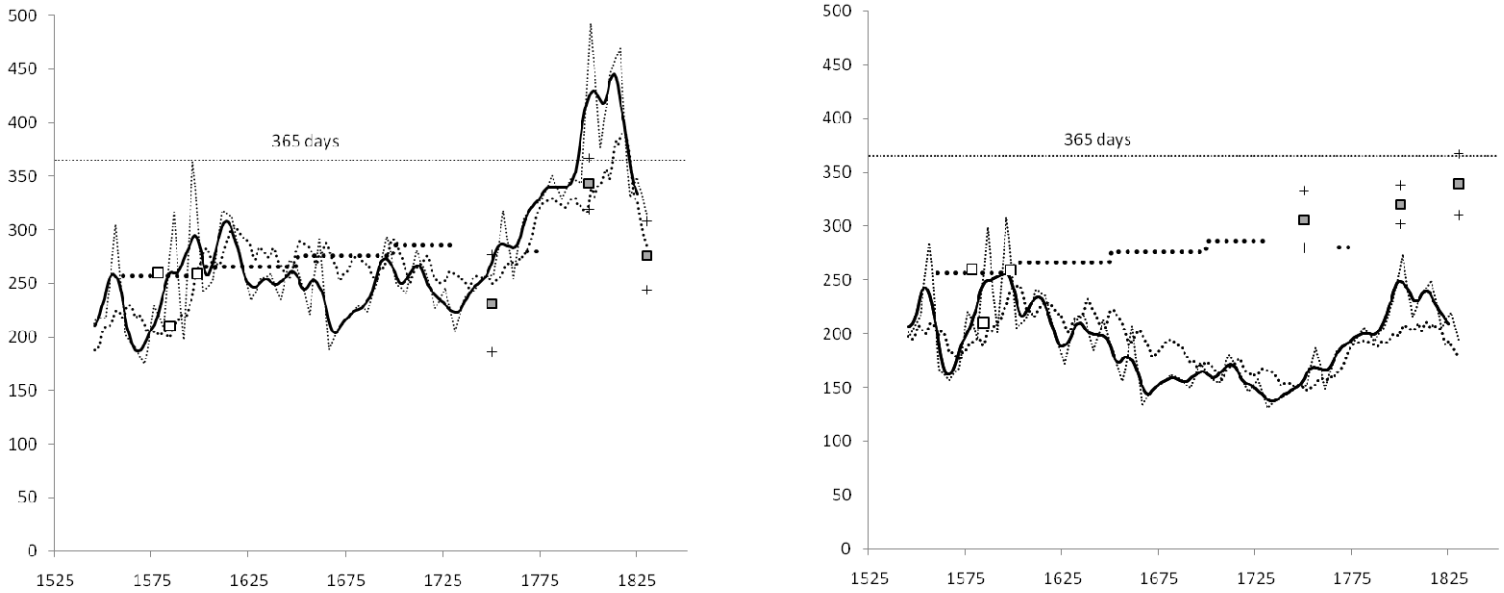

Figure 4

Number of Working Days per Year of Rural Farm Workers (Left) and Urban Building Workers (Right) using Dependency Ratio, 1551-1830

(dashed line = days required; solid line = days required 10yma; small dots = days required 10yma with 3.25 flat)

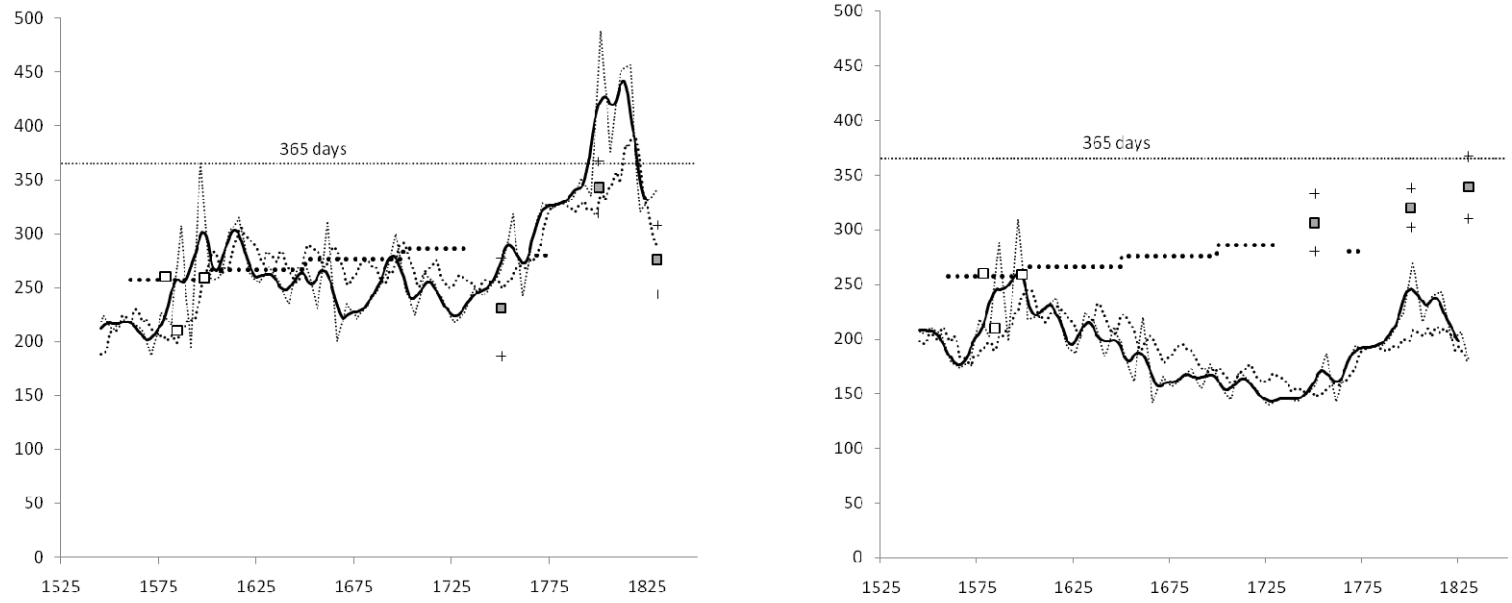

Figure 5

Number of Working Days per Year of Rural Farm Workers (Left) and Urban Building Workers (Right) using 2+NRR, 1551-1830

(dashed line = days required; solid line = days required 10yma; small dots = days required 10yma with 3.25 flat)

TABLE 1:

BASKET OF GOODS

Items	*Quantity/Person/year*
Bread	182 kg
Beans/peas	52 liter
Meat	26 kg
Butter	5.2 kg
Cheese	5.2 kg
Eggs	52 each
Beer	182 liter
Soap	2.6 kg
Linen	5.0 meter
Candles	2.6 kg
Lamp oil	2.6 liter
Fuel	5.0 millions BTU*

Source: Allen (2001). *One BTU is the amount of energy required to raise the temperature of one pound of water one degree Fahrenheit.

TABLE 2:

INDEPENDENT ESTIMATES OF

DAYS OF WORK

Places/Years	*Days/Year*
Mendip[1]	
1433	165
1536	180
1578	260
1584	210
1598	259
England[2]	
1560-1599	257
1600-1649	266
1650-1699	276
1700-1732	286
1771	280
London[3]	
1750	231(277/186)/306(333/280)
1800	343(367/319)/320(338/302)
1830	276(308/244)/343(367/310)

Sources: [1]Estimates computed are based on Blanchard (1978, Table C2). [2]Estimates from Clark and Van Der Werf (1998, Table 1). [3]Estimates from Voth (2001, Table 7) assuming a 10-hours working day; the first number is days per year of farmers, the second the average of days per year for non-farmers; numbers in parentis are upper and lower bounds, which are one standard deviation away from the mean.