WHY DID WORKING HOURS INCREASE IN EIGHTEENTH-CENTURY LONDON? LABOUR SUPPLY DECISIONS AND CONSUMER DURABLES DURING THE INDUSTRIAL REVOLUTION

Hans-Joachim Voth[*]
Clare College, Cambridge and Nuffield College, Oxford

Marx saw long hours of toil as one of the defining characteristics of the industrial era.[1] It has often been suggested that the eighteenth century witnessed a major increase in the number of hours worked. However, as N.F.R. Crafts has remarked, '[m]easurement of this supposition has never been adequately accomplished...'.[2] I begin by introducing a new method that allows us to test this hypothesis rigorously and on a broad empirical basis. The detailed time-use information contained in witnesses' accounts in court records is remarkably similar to the data used by modern sociological surveys. On the basis of more than 2,000 verbatim reports from the Old Bailey Sessions Papers, I analyse work activities during the day, the week, and the year. Change between the middle and the end of the eighteenth century was driven by two developments - 'Saint Monday' largely disappeared, and a large number of political and religious festivals lost their significance. In contrast, working hours during the day remained largely static.

In the third section, a number of competing explanations for the increase in working hours are discussed. Backward-bending labour supply curves, increasing capital/labour ratios or declining nutritional constraints are examined and rejected. I then discuss the relationship between labour-supply decisions and consumer preferences at a time when durable goods became more widely available. An alternative interpretation is offered - as leisure became more 'productive' with the increased availability of cheap consumer goods, supplying additional labour became relatively more rewarding. The host of phenomena often subsumed under the term 'consumer revolution' is briefly described, and a Beckerian model of time-use is presented. Labour supply decisions are then modelled using logit regressions.

I conclude that the real price of new consumer durables is a good predictor of the probability of finding witnesses at work. It was therefore no accident that the 'consumer revolution' and the Industrial Revolution occurred at the same time. If the interpretation advanced in this article is correct, then causation ran largely from the former to the latter. The conclusion also suggests that Stone's concept of a 'leisure revolution' may be easier to interpret in the framework proposed in this paper. Further, if the explanation described in section 3 is correct, the relative importance of demand and supply in the English economy between 1750 and 1800 may need to be reassessed. Finally, if the estimates derived from court records are accurate, current estimates of TFP growth may have to be revised substantially.

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[1]Marx 1867 [1967], p. 820.

[2]Crafts 1985, p. 82.

1 Witnesses' accounts and time-use in the past

Sociologists today use three principal methods to construct time-budgets: diaries, random hour recall, and the so-called 'beeper' method.[3] With diaries, study participants are asked to record their activities at certain hours of the day; in the case of random hour recall, researchers will interview households about their activities at a specific hour of the previous day. The third method involves the carrying of an electronic device that emits an acoustic signal at random hours of the day; individuals then note how they were spending their time.

None of these techniques can be replicated exactly with historical data. The time-use diary is unsuitable - the historical diaries we possess are not very precise about the timing of activities, and refer to a small and far from representative part of the population.[4] For obvious reasons, the individuals of interest can also neither be visited nor be provided with electronic pagers. However, this paper argues that witnesses' accounts in court records are broadly similar to data provided by the random hour recall method. A typical cross-examination before a court reads like this:

Q. How come you to be so exact as to the time?
A. I can look out at the clock, and see what a clock it is at any time.
Q. Can you take upon you to say you looked at the clock that time?
A. I looked at the clock at six o'clock at night.
Q. Dd you see the clock at seven?
A. No, I could not, then it was candle-light, I heard it strike seven; he was then coming from the Hay-market.[5]

A full range of acoustic and visual information is used to establish the timing of activities - sometimes with such precision as to arouse the suspicion of the court.[6] However, it is important to note that reasonably accurate time awareness coexisted side by side with traditional forms of time-keeping. In 1760, a shopkeeper reports that someone entered the shop 'about the dusk of the evening'.[7] Imprecise information is, of course, inappropriate for our purposes, and cases containing such statements are not used. Sometimes, cross-examinations help in identifying a poor appreciation of the time of day:

A. I am a pawnbroker, and live in Stanhope-street. The prisoner Mason was at our house on the twenty-second of September, and had left some things for a guinea. I know it was about two or three hours after we had lighted candles, but will not pretend to be exact to an hour.
Q. What time did you light the candles then?
A. I believe about five, and look upon it to be about eight when he came.
Q. At that time the sun does not go down till about six; do you light candles before the sun goes down?
A. I cannot be exact as to the time.[8]

Such cases are rare (and excluded from our analysis); in the majority of cases, whenever the timing of a crime emerged as important during the court proceedings, witnesses could tell the time with reasonable accuracy. During the middle of the eighteenth century, 68.5% of all statements were exact to within 15 minutes; another 30.7% were precise to within one hour. By 1800, 70% of all witnesses gave statements that were precise to within 15 minutes; another 15% were exact to within one hour.[9]

The parallel between witnesses accounts and random hour recall does not end with the kind of information provided about the time-use of one individual at one point in time. Crimes happen at all times of the

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[3]Juster and Stafford 1991, p. 484f.

[4]In Burnett et al.'s (1989) collection of autobiographies from the working class, only 12 refer to the period before 1800.

[5]Old Bailey Sessions Papers, Case No. 154, 1759.

[6]Urban centres are more likely to provide such information.

[7]Old Bailey Sessions Papers, Case No. 55, 1760.

[8]Old Bailey Sessions Papers, Case No. 27, 1753.

[9]For the later period, information on the accuracy of statements was only collected for a subsample of 60 cases.

day, all days of the week, and during all the seasons of the year. This probability sample of time-use can be used to reconstruct patterns of labour and leisure.[10]

The data are taken from the Old Bailey Sessions Papers, which containing full verbatim reports of court proceedings.[11] They began their existence in the 1670s as an early form of the 'yellow press'. Booksellers sent scribes into the courtroom at the Old Bailey to record the most scandalous cases. Demand for stories about sex and crime was as brisk as it is today. During the first decades of the eighteenth century, the Old Bailey Sessions Papers became gradually more respectable as the City of London stepped in and awarded monopolies to individual publishers on the condition that full verbatim reports were provided.[12] On the basis of 8,000 court cases, I have compiled a database of approximately 2,000 witnesses reports - 1,000 each from 1749-63 and 1799-1803.

2 In the sweat of their brows - labour input in London, 1750-1800

Two principal factors determine annual labour input: the number of working hours per day, and the number of working days per year. On the basis of witnesses' accounts, it emerges that a longer working year (and not longer working days) was largely responsible for the changes between 1750 and 1800.[13]

Figure 1 compares the time of starting and stopping work in both periods. Ninety-five percent confidence intervals are given.

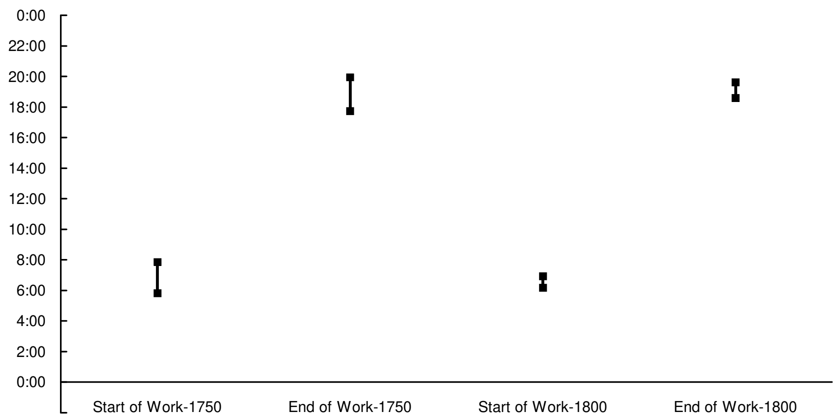

Figure 1 Time of starting and stopping work, 1750 and 1800

Time-use on a daily basis hardly changed at all. The mean time of starting paid work was reduced from 6:50 in 1750 to 6:33 in 1800; the difference is not statistically significant. The average end of work moved back by 16 minutes - 19:06 in 1800 vs. 18:50 in 1750.[14]

Change over time was driven by the disappearance of Saint Monday, and the decline of old holy days. The custom of Saint Monday - taking an additional holy day at the beginning of the week to recover from the weekend - has attracted much attention in the literature. E.P. Thompson and D. Reid, for example, have argued that it was still being observed in the nineteenth century.[15] Clearly, no day will be used for rest by everyone. As a first step, it may therefore be sensible to count as 'days off' those that (a) show a marked reduction in the number of people at work and (b) have a probability of observing people in work that is similar to a Sunday. To determine whether statistically significant differences exist, I use a logit model, regressing a dummy variable for

[10] In this regard, the method used in this paper is superior to the modern sociological studies, which often only gather information on a few days in the year.

[11] Harris 1984, p. 9ff.

[12] Harris 1984, p. 11ff.

[13] A more detailed application to the case of London during the 1750s, as well as a discussion of some methodological issues, can be found in Voth 1996b.

[14] Again, the difference is not statistically significant. Sample size varies between 34 and 48.

[15] Thompson, 1967, p. 64f; Reid 1976, p. 76ff.

work / no work on a dummy for the day of the week.[16] The use of a logit regression is necessary since the dependent variable is dichotomous. The relationship can be stated as

$$\zeta = \frac{1}{1+e^{-(\beta+\gamma x)}} \qquad (1)$$

where ζ is the probability of the activity an individual is involved in (in this case, paid work), β and γ are coefficients estimated from the data, x is the exogenous variable, and e is the base of the natural logarithm.[17] After taking the logarithm of both sides and arithmetic manipulation, we obtain equation (2), which can easily be estimated under OLS:

$$\log\frac{\zeta}{1-\zeta} = \beta + \gamma x + \varepsilon \qquad (2)$$

If Monday saw a sharp reduction in work activities during the middle of the eighteenth century, then we expect an odds ratio (equivalent to e^{γ}) of less than one. Figure 2 presents the main results:

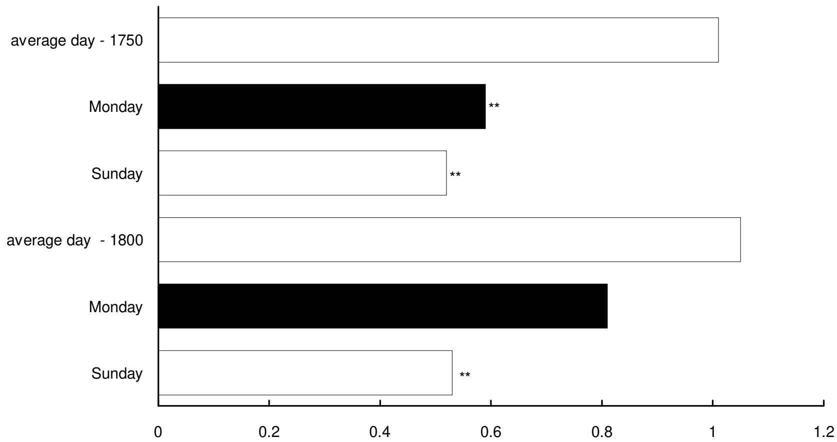

Figure 2 Changes in the odds ratio: Monday and weekdays
Note: ** indicates significance at the 95% level of confidence

In 1750, both Mondays and Sundays show a markedly reduced probability of finding individuals engaged in work (compared with other days of the week). By 1800, this is no longer true. Mondays do not register the same frequency of work; however, the coefficient on the Monday dummy is no longer significant.[18] This implies that Monday was a day of rest in 1750, and that it became almost a normal working day fifty years later.

The same method can be applied to the list of old holidays which, according to some authors, still reduced the length of the working year in the eighteenth century.[19] Figure 3 shows the changes in the odds ratio associated with individual days. In the 1750s, the reduction in the probability of observing individuals at work on an old holy day is very similar to the one seen on Sundays, Christmas and Easter. These differences are also

[16]On the underlying methodology, cf. Hardy 1993.

[17]Demaris 1992.

[18]It should be remembered that, with a logit model, we test the difference of the coefficient from unity (since e to the power of one is zero), and not from zero.

[19]Freudenberger and Cummins 1976, p. 6.

statistically significant. By 1800, the reverse is true - holy days have a higher probability of witnesses being engaged in paid work than on average, and Sundays show an even stronger reduction in the odds ratio.[20]

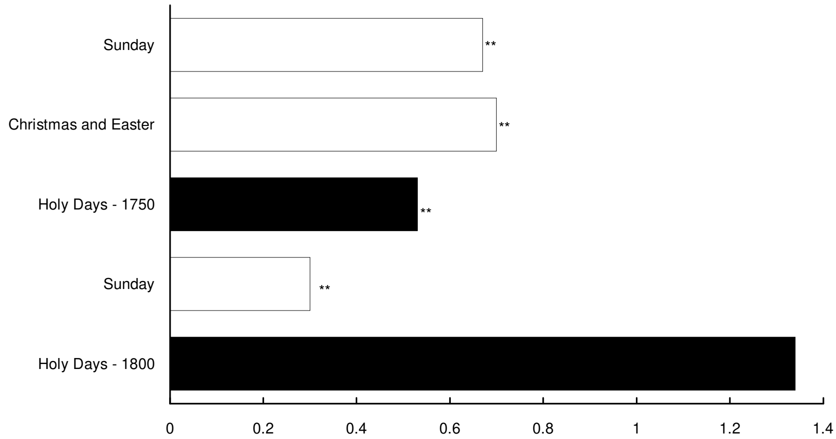

Figure 3 Changes in the odds ratio: old holy days
Note: ** indicates significance at the 95% level of confidence

It therefore emerges that there is a large and significant increase in work activities on Mondays and old holidays between 1750 and 1800. How then did the length of the working year in 1800 differ from the one in 1750? I assume that daily labour input remained unchanged. Strictly speaking, I have only demonstrated that the time of starting and stopping shows no significant differences. Theoretically, variations in the time spent on meals could have influenced actual labour input. The data from the Old Bailey, however, provide no evidence for this. From the results for Saint Monday and old holy days, we can derive changes in annual labour input in two ways:

1. In the 'naive' case, I simply assume that all work stopped on Mondays and holy days in 1750, and that work continued as normal in 1800. This is equivalent to assuming that the people that we observe in work on these days in 1750 rest at a different time. This gives an upper bound on the magnitude of change.

2. Alternatively, one could argue that those encountered at work on 'St Monday', old holy days and Sunday in 1750 did not catch up on lost leisure at some other time. Our estimate for the length of the working year in 1750 would therefore be higher, and change over time correspondingly smaller. Further, I simply assume that the odds ratio of less than one on a Monday in 1800 signifies that *some* individuals did not work.[21] Also, the odds ratio of more than unity for the old holy days in 1800 signifies above-average labour input.

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[20] Comparisons with Easter and Christmas are not possible for the second sample. For each period, I collected 1,000 court cases; this required analysing the Old Bailey Sessions Papers from 1749-63 and from 1799-1803. A larger volume of cases handled by the court sharply reduced the number of years represented in the sample.

[21] We do so despite the fact that there is no significant difference between the odds ratio on Mondays and unity. This assumption is necessary for consistency.

Table 1 Changes in labour input, 1750-1800

	number of day per year	*less: Mondays*	*Old holy days*	*Easter, Christmas, Sun*	*Number of working days*	*Δ%*	*Δ%, p.a.*
upper bound:							
1750	365	- 52	- 46	- 59	=208		
1800	365	- 0	- 0	- 59	=306	+ 47	+ 0.86
lower bound:							
1750	365	- 36.5	- 29.4§	- 41.4	=257.7		
1800	365	- 5.8	+ 5.48§	- 41.4	=323.3	+ 25	+ 0.5

Note: § adjusted for the number of shopkeepers (Schwarz 1992, p. 57).

The results from both methods are compared in table 1. *A priori*, the assumptions underlying the upper bound estimate seem more intuitive.[22] The range of our estimates is not small - the lower bound rate of annual change is only 58% of the upper bound. The following section argues that they are nonetheless historically meaningful.

3 Competing hypotheses

Do the trends shown in table 1 apply to other areas of Britain as well, or are they peculiar to the conditions prevailing in London? Adam Smith certainly thought that, at least in some professions, large cities registered work intensities that were higher than normal:

> Workmen, on the contrary, when they are liberally paid by the piece, are very apt to over-work themselves, and to ruin their health and constitution in a few years. *A carpenter in London, and in some other places, is not supposed to last in his utmost vigour above eight years.*[23]

Until the exercise presented in section 2 is repeated for other localities, it will be impossible to know precisely how the rhythm of work differed. Yet even if it could be demonstrated that there existed different patterns of work in rural and urban environments, change over time may still have been very similar.

Determining what drove changes in labour input is an alternative way of assessing the wider significance of our results. There are a number of competing explanations for the lengthening of the working year documented above. They fall into two categories. Two potential explanations imply that the case of London (and other urban centres) is special. The backward-bending labour supply hypothesis argues that increasingly hard times forced people to work for longer. Since real wage trends in London seem to have diverged from the national aggregate, this would suggest that the rise in labour input was a highly localised phenomenon.[24] Freudenberger and Cummins have argued that nutritional energy was in short supply in the middle of the eighteenth century. The disappearance of this constraint allowed labour input to increase. In this case also, London would appear to be a special case, since it relied heavily on food imports. Two other explanations would suggest that the longer working year also affected other areas. If rising capital/labour ratios were responsible, then a very wide array of areas and sectors would have been affected. Finally, if the increasing lure of consumer goods favoured income over leisure, labour supply decisions in a large number of localities would have been affected. I shall discuss these alternative hypotheses in turn.

Rising capital/labour ratios

For those who see the Industrial Revolution as a period of increasing workloads, the culprit is often clear - the demands of industrial production. Rule's assessment is typical: 'The demands of a capitalising industry were progressively intensifying and before the end of the [eighteenth] century conflicting with slacker customary work

[22]In particular, it is hard to see a historical justification for the positive value for the old holy days - this is used simply for logical consistency.

[23]Smith 1776 [1991], p. 72f [my italics].

[24]Cf. Schwarz 1992, p. 172, Schwarz 1985, p. 39-41.

practices.'[25] Industrialisation is often regarded as synonymous with a large increase in the investment ratio.[26] Capital/labour ratios rise. Consequently, more and more valuable machinery is in danger of standing idle if workers insist on short working hours.[27] As one businessman allegedly told Marx: 'allowing ten minutes of overtime [per day] is equivalent to handing me £1,000 per year'.[28] Thus annual labour input increases.

There are a number of reasons why the increase in workloads during the second half of the eighteenth century cannot be explained in this fashion. That the incentive for employers to extract longer hours from their employees intensified with rising capital requirements says little about their ability to extract such an extended effort. Relative bargaining strength of both sides will have influenced any such decision at least as much as the pressure of rising capital/labour ratios. Further, the trade-off between the necessary inducement on the one hand and the economic benefits that could be reaped from an extended working year on the other will depend on the production technology and workers' utility functions. For these theoretical reasons, it would be wrong to attribute rises in annual labour input automatically to growing capitalisation in an industry.

Data from 1747 allows us to test the proposition for a cross-section of London trades. In an appendix of his *London Tradesman*, Campbell gives the 'sums necessary to set up as Master' along with average working hours for 182 'trades' ranging from bookbinder to merchant.[29] Ideally, we would want to know the change in working hours in each individual profession at different levels of capitalisation. Since these data are unavailable, I use the Campbell cross-section instead. There are no *a priori* reasons why masters in these individual professions should require different numbers of apprentices and journeymen. As a first approximation, we can therefore use the average initial outlay as an indicator of capital intensity. Prescribed working hours are clearly less useful than information on actual hours worked. Such data are, for the moment at least, unavailable at a low level of aggregation. There is no lack of identifying variance - hours ranged from 12 to 16 per day, and minimum initial outlays varied between £5 for basket makers and £5,000 for distillers.[30] If Rule et al. are correct, we would expect to find a strong positive correlation between average working hours and capital outlays. Regressing average (prescribed) hours on start-up capital yields the following equation:

$$\log H = \underset{(133.3)}{1.16} - \underset{(-2.4)}{0.0088} \log C \qquad (3)$$

$F = 5.6$ [0.019] adj. $R^2=0.02$

The regression estimated under OLS is not satisfactory. The percentage of the total variation explained is very low. Further, an examination of the residuals indicates heteroscedasticity.[31] The coefficient on the logarithm of capital is significant but negative - working hours were shorter in capital-intensive professions. The size of the coefficient suggests that not even this effect is important. Since both variables are in logs, we can directly infer the elasticity: for every 100 percent increase in the value of capital, working hours are reduced by 0.88 percent.

The strongest argument against the capitalisation hypothesis comes from national income accounting. Recent work has demonstrated not only that growth during the Industrial Revolution was much slower than had long been assumed, but that the increase in investment, long regarded as central to the very concept of an Industrial Revolution,[32] was unspectacular. Gross domestic investment was 6% of GNP in 1760. By 1801, this ratio had risen to 7.9%.[33] This small increase was almost completely offset by population pressure - the capital-labour ratio grew even less than the investment share. As Crafts has argued, 'the economy found it hard to

[25]Rule 1981, p. 59; cf. also Rule 1986, p. 218.

[26]Crouzet 1972.

[27]Unless, of course, a shift system is operated. If there are any fixed costs of employment, this will not offer sufficient compensation.

[28]Marx 1867 [1983], p. 257.

[29]Campbell 1747, appendix, p. 331-340.

[30]A value of £20,000 for bankers is not included in the sample - the use of 'capital' is very different in this case.

[31]If White-correction is applied, the results reported above are not substantially changed.

[32]Crouzet 1972, p. 19.

[33]Crafts 1985, table 4.1, p. 73.

maintain the growth of capital at a rate in excess of the labour force during the period 1760-1830'.[34] According to the most recent estimates, capital stock increased by 1.0% per annum between 1760 and 1801 while the labour force grew by 0.8%.[35] If the capital-to-labour ratio consequently rose by 0.2% p.a., the total increase over 41 years would have resulted in 8.5% more capital per member of the labour force - hardly sufficient to explain the rapid rise in annual working hours.[36]

Thus the 'capitalisation hypothesis' has to be rejected. An added incentive to alter existing practices is not sufficient to explain actual change unless the relative bargaining position of workers and employers changed markedly. Contemporary cross-sectional data does not support the notion that working hours and capital requirements were positively correlated. More importantly, the capital/labour ratio increased only very slowly. The explanation advanced by Rule and others may have applied to specific industries during certain periods (such as mining). It is no answer to the puzzle of rising labour input in London between 1750 and 1800.

Declining nutritional constraints

Freudenberger and Cummins were among the first to suggest that the gradual erosion of nutritional constraints was responsible for changes in working practices. Between the middle and the end of the eighteenth century, Freudenberger and Cummins calculate an increase in annual labour input of more than 30 percent.[37] The authors find that possibly up to half of the English population in Gregory King's day subsisted on inadequate diets[38] - an argument subsequently extended and refined by Fogel.[39] As agricultural output increased, the nutritional constraint was gradually lifted, allowing people to supply more labour.[40] The continued existence of holy days until the eighteenth century is therefore a sign of cultural adaptation. Social habits had developed to accommodate the generally 'limited productive capacity of the working population';[41] after the middle of the eighteenth century, they withered as agricultural output per capita grew.

Freudenberger and Cummins's interpretation must be rejected for two reasons. First, it is hard to prove a severe lack of energy even for the most unfortunate groups of society. Fogel's more cautious conclusions, based on much improved calculations, require a degree of accuracy which historical food balance sheets do not attain - if his calculation of mean calory production errs by as little as 13 percent, no energy shortage can be demonstrated.[42] While his case for France seems strong, the application to England is more problematic.[43] Furthermore, direct evidence from poorhouse diets is incompatible with the concept of large groups in society

[34]Crafts 1984, p. 76.

[35]Crafts and Harley 1992, table 5, p. 718.

[36]The assumption here is, of course, that national trends are indicative of developments in London. In the absence of evidence to the contrary, it seems sensible to proceed on this assumption.

[37]Freudenberger and Cummins 1976, p. 6.

[38]Freudenberger and Cummins 1976, p. 7ff.

[39]Fogel 1993, p. 11f.

[40]Freudenberger and Cummins 1976, p. 9.

[41]Freudenberger and Cummins 1976, p. 5.

[42]There are two reasons for this striking sensitivity. First, Fogel does not take into account that there were numerous days of rest in the year. Hence nutrient availability on days of work was underestimated. Second, the largest part of energy intake is used for basal metabolism. Since the residual is small compared to total intake, even small variations of the latter will have large effects. For further details, cf. Voth 1996, section 13.

[43]Fogel's argument in favour of a medium degree of inequality in France is strong - with high inequality, the a considerable part of the lower classes would have starved, whereas under low inequality, the upper classes would have had to consume improbable amoutns. He then applies the same distribution to the English case (Fogel 1993, p. 11f). The reasons for this are not entirely clear. Fogel ruled out a high degree of egalitarianism in the French case because it implied very low nutritional intakes of the upper classes. Applying the same, medium-egalitarian distribution to England means that the top 10 percent would have consumed over 600 calories (or 18 percent) more than their French counterparts, the equivalent of one meal per day. There is no *a priori* reason (nor any historical evidence) to assume that this was the case. Even in the case of high egalitarianism, the English upper classes could have consistently eaten more food than the French under medium egalitarianism

lacking calories for work.[44] Second, and more importantly, the timing of the rise in labour input argues against Freudenberger and Cummins's interpretation. The period from 1730 to 1760 was one of relative plenty, as they themselves concede.[45] Thereafter, real wages began to fall.[46] Further, all evidence from production statistics suggests that rises in agricultural output did not match the enormous population increase after the middle of the century.[47] While demographic growth averaged 0.58% p.a. between 1760 and 1780, agricultural output grew at 0.13% p.a. Between 1780 and 1800, the population growth rate was 1.05% p.a., whereas Crafts puts output growth in agriculture at 0.75% p.a. (and Deane and Cole at a mere 0.65).[48] At the very time when our data from court records shows increasing labour input in the economy, less food is produced per head of population.[49]

The incompatibility is not as large as implied by the figure above. Because of the changing age composition of the population, the downturn in agricultural production per capita is overstated. Wastage may have diminished, giving greater access to digestible calories. Further, as some have argued, urban life is associated with lower energy requirements.[50] At a time of rapid urbanisation, this could have freed considerable resources. In practice, the likely effect of both factors is small. Clark, Huberman and Lindert find that food output grew too slowly if our current estimates of income growth and demand elasticities are correct. Moreover, urbanisation can at best explain up to 4 percent of this 'food puzzle'.[51] Also, the age distribution does not shift dramatically. While 12.61% of the population are aged 0-4 in 1751, this increases to 14.32% in 1801. The share of those with the highest demands for calories (aged 15-59) falls by a mere 3.5%.[52] In the absence of precise information on spoilage and food adulteration, it seems best to conclude that there is no evidence for a large increase in nutrient availability per capita during the second half of the eighteenth century. Therefore, the Freudenberger and Cummins interpretation of the lengthening working year does not stand up to close scrutiny. Both the timing and direction of changes in time-use identified by them is confirmed by our research. Their explanation, however, cannot be accepted because there is neither conclusive evidence of nutritional constraints before 1750 nor any indication of an improving food supply during the following period, when working hours increased.

Backward-bending labour supply curves

The theory of backward-bending labour supply curves posits that workers have a 'target income', and that they adjust the number of hours they are willing to supply according to the prevailing wage rate. When wages rise, less work will be undertaken. The main proponent of the theory in the case of Britain is Bienefeld, who argues that, over the course of the last six centuries, working hours were determined by a stable labour supply regime - real wages and working hours varied inversely.[53]

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[44]Shammas 1990, table 5.8, p. 142f.

[45]Freudenberger and Cummins 1976, p. 9.

[46]This is true of the national aggregate when we use the Phelps-Brown Hopkins series (cf. De Vries 1993, p. 90), and of the London series compiled by Schwarz (1985).

[47]This is the accepted view. Cf. Thomas 1985, p. 142.

[48]Wrigley and Schofield 1981, table A3.3, p. 534, Crafts 1985, table 2.10, p. 42, Deane and Cole 1969, table 17, p. 65f. Deane and Cole, whose figures refer to corn output, estimate output growth of 0.47% p.a. for 1760-80 - again less than what would have been required to check demographic pressure.

[49]Imports were unimportant for the period up to and including the early 1800s. Cf. Wrigley 1987, p. 168. Crafts 1985, p. 127 suggests that imports in 1800 were equivalent to 1/6 of total food supply; however, since he does not recalculate imports for earlier dates, it is impossible to reassess trends in food availability.

[50]Clark, Huberman and Lindert 1995, p. 226.

[51]Clark, Huberman and Lindert 1995, p. 233.

[52]Wrigley and Schofield 1981, table A3.1, p. 529. They point out (p. 449) that a rising proportion of young people in the population must have increased the demand for agricultural products relative to that for other goods.

[53]Bienefeld 1972, p. 8. For a critical assessment, cf. Mathias 1979.

The concept provides a potentially powerful explanation of our main finding, the increase in annual workloads - during the very period when this 'pre-industrial' practice supposedly disappeared.[54] Trends in the purchasing power of real wages diverged strongly between the North and South of England.[55] According to Schwarz, real wages in the London building trades were falling between 1750 and 1800 (figure 4).[56] This adverse trend was largely determined by price movements. Nominal wages were constant between 1743 and 1792. By the end of our period, they had risen by one third. At the same time, prices more than doubled.[57] Below, I attempt to test the existence of backward-bending labour supply curves in eighteenth-century England empirically. Despite the theory's apparent ability to explain some salient features, it is ultimately rejected as a possible cause of the changes in time use, 1749-1803.

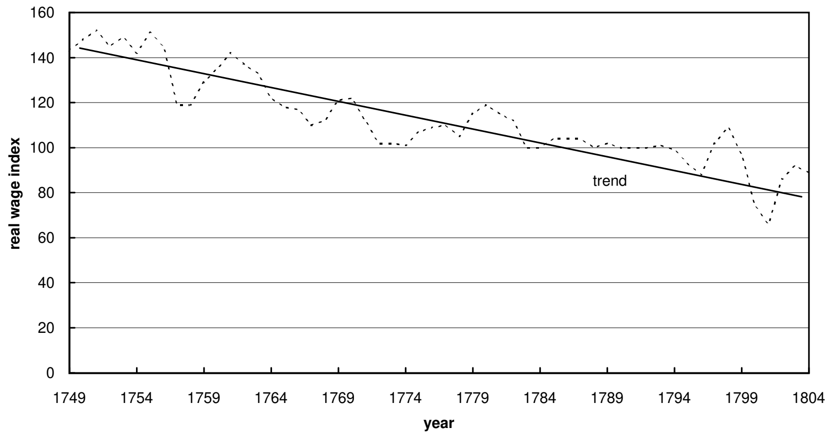

Figure 4 Real wages in London, 1749-1805

If backward-bending labour supply curves existed, the decline in real daily wages provided a powerful incentive for extra work as Londoners sought to defend their customary living standards. A fall in the real wage by 40.6% between 1749/64 and 1799/1804 was partly compensated by a 27% to 47% increase in annual workloads (cf. table 1).[58] Since workers would have received lower wages on the additional days as well, their earnings would still have fallen by a minimum of 12.7%. Changes in the length of the working year were however sufficient to 'sterilise' at least 39.5% of the fall in incomes induced by lower real wages.

We can now strengthen the argument in favour of backward-bending labour supply curves by examining the probability of people engaging in work at different points in time. Real wages often varied dramatically from year to year. Wages were nominally rigid, and real wage fluctuations largely determined by price changes. Did these variations influence the odds of finding witnesses in paid employment? Using logistic regressions on the dichotomous work variable introduced earlier, I examine the effect of changing real wages on the incidence of work activities. Using builders' wages as a proxy for wages in all strata of society is inaccurate. I nonetheless begin by using the Schwarz series before discussing the sensitivity of results to the use of other real wage indicators. Data from both periods were pooled and the incidence of work regressed on the Schwarz index in the appropriate year. Equation 1 in table 2 suggests that this effect was large and statistically significant. A fall of one point in the Schwarz index (labelled PBH; 1790=100) increased the odds of finding anyone engaged in work by 0.014. Between the two periods for which we have data, the Schwarz index (based on prices from the Phelps-Brown Hopkins index) fell by an average of 54 points. This implies a doubling of the odds of observing witnesses in work activities.

As regressions 2-5 demonstrate, the magnitude and significance of the effect is reasonably stable across specifications. Neither shifts in the gender composition (regression 2) nor the changing occupational background (regression 5) caused this finding. Also, different weekdays show some influence, but since the coefficient on

[54]De Vries 1993, p. 111.

[55]Cf. also Hunt 1986, Botham and Hunt 1987.

[56]Based on Schwarz 1985, appendix II, p. 39f.

[57]Calculated from Schwarz 1985, appendix I and II, p. 36ff.

[58]Schwarz 1985, appendix I and II, p. 36ff.

PBH is largely unchanged, shifts in sample composition are not responsible for our finding of a significant and inverse relationship between paid work and real wages (regression 3 and 4).[59]

Table 2 Incidence of paid work, 1749-1803

	Regression				
	1	2	3	4	5
Independent Variable					
PBH	-0.0139**	-0.0133**	-0.0142**	-0.0136**	-0.013**
Monday			0.38*	0.34	
Tuesday			0.72**	0.78**	
Wednesday			1.01**	1.03**	
Thursday			0.77**	0.83**	
Friday			1**	1.05**	
Saturday			1.068**	1.11**	
Sex		1.22**		1.27**	
Agriculture					1.31**
Public					0.27
Manufacturing					0.81**
Services					0.78**
Trade					1.3**
Constant	1.44**	0.385**	0.72**	-0.39	0.77**
χ^2	86.4**	180.8**	130.6**	229.2**	187.4**
% correct	60.48	63.82	61.54	63.77	64.77

Note: *significant at the 90 percent level, ** significant at the 95 percent level. The Wald-statistic found by Hauck and Donner (1977) was used to determine confidence levels. PBH refers to the Phelps Brown-Hopkins index.

A fall in the daily real wage in the London building trades coincided with a rise in the number of days worked. The statistical case relating these two developments appears strong. This does not, however, prove that there is a causal relationship between them. Several reasons argue against such an interpretation.

1. The data contradict an important prediction of the theory of backward-bending labour supply curves. If workers have a target income, and adjust the number of hours they supply accordingly, then this mechanism should operate more strongly over the short term - it is inherently unlikely that workers aim to maintain the living standards they (or their ancestors) enjoyed decades ago.[60] If we use the data on the incidence of work and wage rates over the period 1749 to 1763, however, I find a markedly smaller coefficient on the wage variable. The period itself is not exactly short, spanning 15 years. Over these years, there were important fluctuations in real wages, providing sufficient identifying variance. The value real wage coefficient, however, is 0.0038, less than a third of the results reported in table 2. The variable is also statistically insignificant. Even if it were significant, the change in real wages between the middle and the end of the eighteenth century would predict only one third of the total increase in labour input. Therefore, we find that precisely within the time frame suggested by the theory of backward-bending labour supply curves, there is no evidence for workers attempting to maintain a target income.

2. We cannot be certain that real wages are exogenous in our regressions. Let us assume that, for other reasons, there was an autonomous rise in the number of hours workers were willing to supply. With the labour supply curve shifting outwards, the equilibrium in the labour market would *ceteris paribus* be achieved at a lower wage. Such a difficulty would introduce serious simultaneity problems into our regressions.

[59]Note that these results are not affected if alternative price indices (such as in Feinstein 1994) are used.

[60]Cf. Mathias 1979.

3. Finally, the course of living standards over the second half of the eighteenth century is far from certain. Not only is there considerable disagreement about the appropriate cost-of-living index. Nominal wages are also available from numerous sources, and the superiority of Schwarz's index for builders is only partly established.[61] Tucker compiled wages for London artisans, arguably an occupational group that should be as similar to the witnesses in our sample as members of the building trades.[62] Since nominal wages of London artisans rose even less than those of bricklayers, the fall in real wages was even more dramatic. Re-estimation of the appropriate equations would result in even larger coefficients. If, however, national trends in nominal earnings - such as those found by Lindert and Williamson - are used, there would hardly be a reduction of daily real wages.[63] We simply cannot rule out that national rather than local wage series are better indicators of trends in earnings opportunities in London 1750-1800.

I therefore reject backward-bending labour supply curves as an important factor. This is in line with Adam Smith's assessment:

> Where wages are high, accordingly, we shall always find the workmen more active, diligent, and expeditious than where they are low... Some workmen, indeed, when they can earn in four days what will maintain them through the week, will be idle the other three. This, however, is by no means the case with the greater part. Workmen, on the contrary, when they are liberally paid by the piece, are very apt to over-work themselves, and to ruin their health and constitution in a few years.[64]

The three interpretations traditionally advanced in the literature therefore have to be rejected. Neither increasing capital/labour ratios, nor declining nutritional constraints, nor backward-bending labour supply curves provide a sufficient explanation of the changes in time-allocation summarised in section 2.

The lure of consumer goods

At the same time when annual working hours were rising rapidly, there occurred - according to some historians - a 'consumer revolution'. I will argue that there was a causal relationship between these two phenomena: labour input rose because of the lure of new and increasingly affordable consumer goods. There is an entire literature on the issue of a 'consumer revolution' in eighteenth-century England.[65] Work on 'material culture' builds on earlier research, predominantly carried out by economic historians, who stressed the role of demand in English economic development during the early modern period.[66] According to its proponents, the consumer revolution consisted of five interrelated developments that occurred simultaneously:

1. consumer spending reached an unprecedented level during the eighteenth century - 'men, and in particular women, bought as never before'.[67]
2. for the first time, all classes participated in this development in approximately equal measure.
3. thanks to radically improved manufacturing and distribution processes, new commodities reached the mass market.
4. rapid changes in fashion only became a general feature of the economy during this period.
5. a 'leisure revolution' provided a multitude of new entertainments - leisure time could be enjoyed more.

Spending on an altogether novel scale, according to McKendrick, was one of the main features of the eighteenth century's consumer revolution. The inclination to buy and enjoy new goods was not new; rather, the means for

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[61] Schwarz (1985, p. 25f) lists a number of reasons why his index should be considered more reliable than Tucker's. The faults in the latter's series are, however, also partly present in his own index of nominal wages.

[62] Tucker 1936.

[63] No econometric results are presented since the LW index is not available on a yearly basis before 1781. Note that the increase in inequality shown in figure 14.4 is probably spurious: Feinstein 1988b.

[64] Smith 1776 [1991], vol. 1, p. 72f.

[65] Cf. McKendrick, Brewer and Plumb 1982.

[66] Thirsk 1978. Gilboy 1932.

[67] McKendrick 1982, p. 9.

doing so only then became available. From the perspective of scholars of consumption, there was a 'convulsion of getting and spending, ... an eruption of new prosperity, and such an explosion of new production and marketing techniques, that a greater proportion of the population than in any previous society in human history was able to enjoy the pleasures of buying consumer goods.'[68] McKendrick's argument is largely based on the writings of contemporaries. Foreign visitors to England commented on the speed with which its inhabitants seemed to spend their money,[69] and Englishmen from Packwood to Wedgwood nurtured and exploited the phenomenon.[70] As early as the 1750s, Henry Fielding could write of a 'torrent of luxury which of late years hath poured itself into this nation ...'.[71]

Descriptions of a bout of consumer spending during the early stages of the Industrial Revolution contradict the macroeconomic trends inferred from the national accounts. Crafts estimates that, between 1700 and 1801, per capita consumption grew by only 6.1 percent (equivalent to 0.058 percent p.a.).[72] It would of course be possible to resolve this apparent contradiction by postulating that only a small percentage of total consumer spending was devoted to durable goods. If, say, 95 percent of all expenditure was devoted to food, shelter, and services in 1700, then a six percent rise in consumer spending could have allowed a disproportionate increase in consumer goods purchases. If income spent on non-durables remained constant, expenditure on consumer goods could have risen by 120 percent.[73]

What made the 'consumer revolution' remarkable was that it was not restricted to a small social group. Indeed, the proponents of the concept of a 'consumer revolution' see the width and depth of change in consumer behaviour as one of its defining characteristics.[74] As a German visitor to England observed in the 1790s: 'All classes enjoy the accumulation of riches, luxury and pleasure.'[75] Contemporary comment is replete with the social repercussions of these developments. Lamentations abound:

> ...the nobleman will emulate the grandeur of a Prince, and the gentleman will aspire to the proper state of the nobleman; the tradesman steps from behind the counter into the vacant place of the gentleman, nor doth the confusion end here: it reaches the very dregs of the people...[76]

Henry Fielding's gloomy assessment serves as an explanation of the 'late increase of robbers' (the title of his pamphlet from 1751), and we partly owe the large number of court records analysed in section 2 to such conditions. Not only did the lure of luxury prove increasingly irresistible, the germs of temptation were also spread through more potent channels. Domestic servants were vital in this process of transmitting the attractions of fashion from the higher and middle classes to the rest of the social pyramid. While some of this was undoubtedly nothing more than a continuation and acceleration of earlier developments,[77] there can be little doubt that in no century did this process become more effective than during the eighteenth.[78]

Servants were not the only economically disadvantaged group that began to share in the pleasures of a consumer society. Evidence from probate inventories suggests that a wide range of groups at the lower end of the

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[68]McKendrick 1982, p. 9.

[69]McKendrick 1982, p. 10.

[70]McKendrick 1982, p. 100ff, 146f.

[71]Fielding 1751, p. 6.

[72]It should be remembered that such a long-term average is influenced by the exceptionally high prices in 1801. Some periods, such as the 1770s, showed a higher level of per capita spending than 1801. Yet even if we use 1770 as a benchmark, growth would have been a mere 13.5 percent (or 0.18 percent p.a.). Crafts 1985, table 5.2, p. 95.

[73]Assume that, of 106 units of income in 1801, 95 are devoted to non-durables. Then there will be 11 units of income left for spending on goods. In 1700, there would only 5 units would have been available for this purpose.

[74]McKendrick 1974, p. 170ff.

[75]Archenholz 1791, cit. in McKendrick, Brewer and Plumb 1982, p. 10.

[76]Fielding 1751, p. 6.

[77]Cf. Earle 1989, p. 281, Weatherill 1988.

[78]Hecht 1956, McKendrick 1982, p. 21.

social scale participated. King has recently compared pauper inventories with probate inventories.[79] Whereas the former were largely drawn up after 1730, the majority of the latter refer to the years before 1710. The probate inventories primarily contain information on the property of husbandmen and labourers. Pauper inventories were produced by parishes when elderly residents became chargeable.[80] In return for regular payments, the parish would 'inherit' their material possessions. King uses a number of indicators such as the existence of fires in bedrooms and the amount of linen in the inventory to show that pauper inventories refer to a substantially poorer part of the population:

> ...the eighteenth century pauper inventories may well cover a subgroup of working people that was positioned lower on the social scale than the subgroups whose goods were listed in the probate inventories of husbandmen and labourers... This makes it all the more interesting that by the mid to late eighteenth century even that relatively low subgroup of the labouring poor owned a much greater variety of household goods and of decorative or semi-luxury items than that seen in the slightly more affluent subgroup of husbandmen and labourers ... A fifth to a quarter of pauper inventories include these items [looking glasses, clocks and watches]. The ownership of earthenware increased threefold. Candlesticks were now owned by half of the households ..., instead of 6 per cent. [81]

Another crucial element of the 'consumer revolution' is the flood of new commodities that descended on the English during the eighteenth century. From the late seventeenth century onwards, there was growing interest in the more fashionable items of clothing such as calicoes and other cottons wrought in the East Indies.[82] After the middle of the eighteenth century, there is overwhelming evidence concerning the fall in prices of numerous manufactured commodities (with cotton being the most prominent example).[83] Clothing is the most famous example of the application of new manufacturing technology, leading to price reductions that made fashionable textiles affordable even for the lower classes. For other products, innovations in distribution and a new labour regime were more important. Josiah Wedgwood's successful attempt to impose greater discipline in Burslem,[84] and his new methods of advertising his wares,[85] made pottery a mass product.[86] Considerable uncertainty surrounds the speed with which prices of the 'new commodities' fell during the eighteenth and early nineteenth century.[87] Yet even the more pessimistic measures demonstrate rapid reductions in the price of clothing in real terms (i.e. when deflated by an overall price index). Before 1780, information is particularly scarce, but Tucker's index of institutional prices provides a convenient estimate of the reduction in real terms.

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[79]King 1996.

[80]King 1996, tables 1 and 2.

[81]King 1996, section V.

[82]Lemire 1991, p. 3ff.

[83]Crafts 1985, p. 22ff; Crafts and Harley 1992. Cf. also the recent exchange between Cuenca Esteban (1994, 1995) and Crafts and Harley (1995). Even the more pessimistic side in this debate believes in a rapid fall in (real) textile prices.

[84]McKendrick 1961, p. 30ff.

[85]McKendrick 1982, p. 124-6.

[86]As McKendrick has noted, Wedgwood often enhanced his brand name by charging more than marginal cost, thus exploiting a 'Veblen effect' (for some goods, demand increases with price because the real commodity on offer is social exclusivity). In most cases, however, innovations in advertising and distribution widened the market. One could even go as far as to see both strategies as complementary - using Veblen pricing was necessary because the ability to buy pottery itself no longer distinguished one from those on the lower rungs of the social ladder.

[87]Cf. Feinstein 1994. There is no reliable method that would allow us to establish how representative clothing prices are of other 'new' commodities.

Table 3 Price of clothing, selected benchmark years 1750 - 1800

	1750	*1755*	*1760*	*1800*
PBH index	100.00	98.01	109.63	266.60
clothing (nominal prices)	100.00	102.19	101.54	98.07
clothing (real prices)	100.00	104.26	92.62	36.79

Note: The nominal price of clothing was taken from Tucker (1936, p. 27ff). The nominal price series was deflated by the Phelps-Brown Hopkins price series.

Compared to an overall price index such as the one compiled by Phelps-Brown and Hopkins (which is dominated by food items), the real price of clothing fell by almost two thirds between the middle and the end of the eighteenth century.[88]

Fashion, of course, was not invented during the eighteenth century.[89] According to McKendrick and others, this period distinguished itself by the speed with which fashions came and went, the extent to which they affected the masses, and, as noted above, the ability to purchase the latest designs. This was partly a self-reinforcing mechanism - new manufacturing processes made the purchase of more varied clothes possible. This led to an even greater taste for fashion; increased fashion consciousness in turn spurred the development of a fashion industry.[90] Goods that were once expected to last a lifetime (or longer) could now be purchased with such frequency as to become the object of fashion:

> What men and women had once hoped to inherit from their parents, they now expected to buy for themselves. ... What were once available only on high days and holidays through the agency of markets, fairs and itinerant peddlers were increasingly made available every day but Sunday through the additional agency of an ever-advancing network of shops and shopkeepers.[91]

Even for those who had to buy their clothes second-hand, there was an enormous variety of manufactured trimmings. Because of the large running stitches and simple cutting of eighteenth-century clothes, alterations could be carried out at home.[92] Fashionable dress did not presuppose the ability to buy new clothes at a high frequency. The diffusion of fashion was partly due to the disseminating influence of the servant class. What added a new quality to the eighteenth century was the importance of publications such as *The Lady's Magazine.* This journal produced its first fashion print in the 1770s; over the following thirty years, no fewer than 14 women's magazines appeared featuring information on the latest fashions.[93] It was also during the eighteenth century that cotton became, in Lemire's words, 'fashion's favourite'.[94]

On balance, there is overwhelming evidence in favour of a 'consumer revolution' in eighteenth-century England. Even if the concept of a 'revolution' has been subject to debate,[95] there is little doubt that this period saw an unprecedented rise of 'material abundance ... aligned with a general, emulative acquisitiveness by means

[88]Much improved cost-of-living indices (Feinstein 1994, Lindert and Williamson 1985) are only available from 1780 onwards and thus unsuited to our task.

[89]Cf. the enlightening essay by Jones 1973.

[90]Cf. the argument by Kusamitsu 1991, p. 117. There were also increased dangers for manufacturers who failed to adopt to the change in attitudes. Cf. Kusamitsu 1991, p. 134-5.

[91]McKendrick 1982, p. 1.

[92]Fine and Leopold 1993, p. 131.

[93]McKendrick 1982, p. 47.

[94]Lemire 1991.

[95]Styles 1993, p. 535.

of commercialised sales promotion and marketing techniques.'[96] The impression of 'material abundance' need not be synonymous with growing per capita incomes[97] nor with stocks of more valuable possessions.[98] Even if per capita incomes was stagnant or slightly falling, the advent of rapidly changing fashions stimulated the senses, enhanced choice and novelty and provided variety where uniformity had once ruled. This effect was compounded by the arrival of various new goods, such as affordable cotton clothing and pottery. While the number of hours spent in leisure probably did not rise, there were, by the end of the eighteenth century, numerous new ways to spend it in a more varied and stimulating way.

The 'New Household Economics' allows us to understand consumer preferences, the availability of new consumer goods and changes in the world of production interacted to produce the changes documented above. Becker focuses on the household as a provider of material and immaterial goods.[99] In order to produce 'consumption events',[100] the household combines inputs of goods, services, and time. In this way, time becomes a 'raw material' which is equally vital to the satisfaction of needs as tangible inputs. Note that both consumption and production time now have characteristic productivities. While capital equipment (and human capital) combine with workers' time inputs in the production process, giving rise to a certain output per hour, consumer durables, human capital and leisure time constitute inputs in the consumption process. It is sensible to assume that the productivity of consumption per unit of time increases with the stock of leisure goods, just as output per worker tends to rise with the capital/labour ratio.[101] *Homo oeconomicus* then allocates time, just as any other scarce commodity, to competing activities under the assumption of utility maximisation.[102]

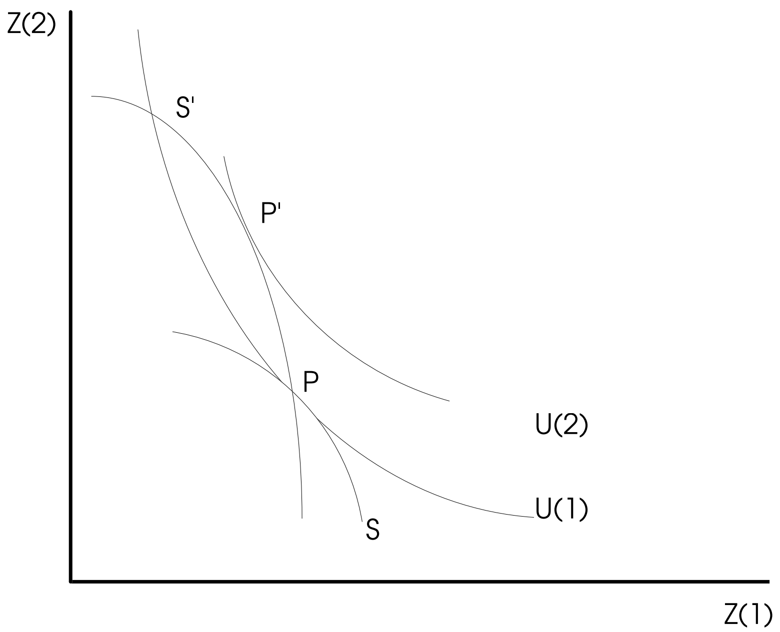

Figure 5 Time Allocation in the Becker Model

What are the predictions of Becker's model for a change in the hourly wage? Including the cost of time alters the utility maximising condition to

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[96]Styles 1993.

[97]The latest calculations suggest that per capita income rose from 400 to 430$ (U.S. 1970) between 1760 and 1800. Harley 1993, table 3.4, p. 194.

[98]Cf. De Vries 1993, table 5.1, p. 103.

[99]Becker 1965 and Becker 1976.

[100]The befitting term is from Gell 1992, p. 206.

[101]Juster and Stafford 1985, p. 2f.

[102]Becker 1965, p. 495.

$$U_i = T(p_i b_i + L_i) \qquad i = 1,...,m \qquad (4)$$

where $p_i b_i$ is the direct and L_i is the indirect (time) component of the marginal price. Consider the case of a two-commodity world for some of the implications (figure 5).[103] A household consumes two commodities, Z_1 and Z_2. Let us also assume that Z_1 is the more time-intensive commodity, whereas Z_2 causes higher monetary costs of consumption. The budget constraint now takes the form of S, reflecting the fact that consumption has both a pecuniary and a time-cost. In the initial situation, the optimum is equal to the tangent P of the full income opportunity curve S and the indifference curve U(1). Let us now assume that hourly earnings increase, and that this rise is compensated fully by a fall in other income. The old full-income opportunity curve would be rotated clockwise through P so as to give the new full income opportunity curve S' and the new tangent P'. If the increase in earnings were fully compensated by a decline in other earnings, a household would reduce the consumption of the more earnings-intensive good.

The crucial element in Becker's analysis is that not only labour productivity, but also the productivity of consumption matters. The latter measures the amount of utility created per unit of consumption time.[104] His model can help us shed new light on the puzzling trend in total working hours, 1750-1800. Labour productivity per head grew at lacklustre rates - especially if the effect of additional working hours is taken into account.[105] At the same time, the 'wave of gadgets'[106] (in the immortal words of a schoolboy cited by T.S. Ashton) that swept England during the eighteenth century increased the 'productivity of consumption'. The amount of satisfaction derived per unit of time will grow because of two effects. First, the effects of fashion mean that, for any given stock of material goods, more 'sensual arousal' will be provided. Second, the change in relative prices will also help to raise the productivity of consumption time. If more durable goods (i.e. clothing) become relatively more attractive than other items of consumption (i.e. food and drink), the induced substitution effects will lead to an increased availability of consumption goods per unit of time. It is important to emphasise how these changes were related to the issue of time use. A quickening pace of consumption means that more goods were being consumed per unit of time - a point that is strikingly illustrated by the declining importance of inherited goods. In a lifetime, per decade or per hour, there was more to be consumed. It is precisely this phenomenon which Becker has termed a rise in the productivity of consumption. There is therefore every indication that the productivity of consumption grew faster than the productivity of production. Of course, the former can only be hinted at, but the conclusion seems a safe one largely because the productivity of production changed barely at all. If this assessment is correct, the Becker framework predicts exactly the change in working hours observed in section 2:

> Assume a uniform increase only in the productivity of consumption time, which is taken to mean a decline in all t_i, time required to produce a unit of Z_i, by a common percentage. The relative prices of commodities with large forgone earnings would fall, and substitution would be induced towards these and away from other commodities, causing hours of work to fall. Since the increase in productivity would also produce an income effect, the demand for commodities would increase, which, in turn, would induce an increased demand for goods. But since the productivity of working time is assumed not to change, more goods could be obtained only by an increase in work. That is, the higher real income resulting from an advance in the productivity of consumption time would cause hours of work to *increase*.[107]

This is precisely what happened in eighteenth century England. Our hypothesis receives further confirmation when we examine the incidence of paid work among our witnesses in the long run. I use the pooled sample introduced in the previous subsection, combining observations from 1749/63 and 1799/1803. The incidence of

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[103]Becker 1965, p. 500.

[104]Ordinal, not cardinal measurement of utility, of course.

[105]Crafts 1985, p. 80-81, Harley 1993.

[106]Ashton 1948, p. 58.

[107]Becker 1965, p. 506 (his italics). Real income in this context means the total amount of satisfaction that can be obtained.

work is regressed on Tucker's clothing price index (in real terms, based on the estimates in table 3).[108] The latter serves as a proxy for changes in the relative price of new commodities. Note that, as a first approximation, the explanatory variable can also be interpreted as an index of the productivity of consumption relative to the productivity of production. If output per capita had remained unchanged, then all the variance in the ratio of both indices could be attributed to changes in the productivity of consumption. Crafts shows that national product per head indeed grew only very slowly - by 0.01 percent p.a. 1760-80, and by 0.35 percent p.a. between 1780 and 1800.[109] Therefore, production per head was only 7.4 percent higher in 1800 than in 1760. Combined with the fact that the Tucker index falls by 63.2 percent in real terms between 1750 and 1800, and that other clothing price indices show even larger declines, it emerges that almost all of the identifying variance in a productivity of consumption vs. production series comes from the consumption side. In the absence of annual productivity estimates, it therefore seems sensible to regress the probability of finding witnesses at work on the deflated clothing price index.

Table 4 Incidence of paid work, 1749-1803

	Regression				
	1	2	3	4	5
Independent Variable					
PCloth	-0.0087**	-0.0082**	-0.0089**	-0.0085**	-0.0081**
Monday			0.36*	0.32	
Tuesday			0.71**	0.76**	
Wednesday			1.0**	1.03**	
Thursday			0.77**	0.84**	
Friday			1.02**	1.03**	
Saturday			1.06**	1.10**	
Sex		1.22**		1.27**	
Agriculture					1.32**
Public					0.33
Manufacturing					0.83**
Services					0.77**
Trade					1.3**
Constant	0.84**	-0.188**	0.12**	-0.98**	0.2**
χ^2	79.3**	173.7**	124.4**	223.1**	180.6**
% correct	60.42	64.10	61.37	63.77	64.55

Note: * significant at the 90 percent level, ** significant at the 95 percent level

As table 4 shows, we find a strong and highly significant inverse relationship between the real price of clothing and the probability of finding individuals at work.[110] The lower the price of such fashionable items compared to all other goods, the more likely our witnesses are to report that they worked. Note that in this case - in contrast to backward-bending labour supply curves - it is sensible to expect a response to changes in relative prices only over longer periods. The productivity advances in the cotton industry required time to feed through, and consumer preferences will only have adapted slowly.

All the specifications are reasonably successful in explaining total variation. The χ^2 statistic is highly significant in every single case. More importantly, the coefficient on the real price of clothing is robust to changes in the specification. Neither controlling for gender composition, the day of the week or the sector that individuals worked in changes the size or significance of PCloth. How accurately does our equation predict the

[108] I deflated by the Phelps-Brown Hopkins index since it is the only one that is available for the entire period. Cf. Phelps-Brown and Hopkins 1955.

[109] I refrain from using the new estimates by Cuenca Esteban (1994, 1995) because of factual and methodological shortcomings (cf. Crafts and Harley 1995).

[110] The effect constitutes a lower bound since the Tucker series shows the smallest decline of all price series whenever comparable data are available. The Tucker index from the nearest year for which data is available was used as a regressor for the observations.

shift between 1749/63 and 1799/1803? The probability of observing individuals in work rose from 43.4 to 56.5 percent, a change in the odds ratio by a factor of 1.69.[111] The coefficient on PCloth (specification 1) implies a factor of 1.63, equivalent to a rise of the percentage working to 55.7. The difference between prediction and observed percentage is equivalent to 1.5% of the latter's value. It would seem unreasonable to expect higher explanatory power when using historical data.

The explanation for changes in working time can therefore be summarised as follows: differences in the relative growth rates of the productivity of consumption and production were responsible for the growth in annual working hours. McKendrick's work on the 'consumer revolution' is centred on the equal importance of production and consumption: '...the increased *desire* to spend is accompanied by an increased *ability* to do so.'[112] I argue precisely the opposite - it is the asymmetry between the two that drives the increase in the number of working days. Narrative accounts of patterns of consumption, a theoretical argument derived from the 'New Household Economics', as well as empirical evidence strongly suggest that the lure of consumer goods was responsible for a longer working year. Since the 'consumer revolution' was a national phenomenon, there is every reason to believe that the trends identified in section 2 were not restricted to London.

4 Implications

Witnesses' accounts are a readily available source of information on time-use in the past. They provide a unique opportunity for historians to obtain data that is similar to that yielded by modern sociological methods. The estimates of working time inferred from the time-use of more than 2,000 witnesses during the second half of the eighteenth century point to a dramatic increase in labour input. It therefore emerges that an important part of the 'Industrious Revolution' - the intensification of labour practices identified by De Vries - coincided with the early stages of the Industrial Revolution.[113]

The interpretation advanced in section 3 - that the productivity of consumption grew faster than the productivity of production - can also help us understand why the same period that saw a marked increase in the working year also witnessed the rise of a leisure industry. Lawrence Stone has recently argued that the eighteenth century saw not only a consumer revolution, but a 'leisure revolution' as well.[114] Stone describes in great detail the late eighteenth-century boom in spas and playhouses.[115] From newspapers to pleasure gardens, a significant proportion of the economy was employed to serve the leisure of Englishmen. Stone is correct in pointing to the growing number of leisurely pursuits that Englishmen could engage in. Much of the literature on the 'consumer revolution' has focused on consumer durables, on the clothes, pottery, and furniture that the historian encounters in probate inventories. The value of Stone's contribution lies in his emphasis on other, more fleeting forms of consumer spending - the purchase of services. Instead of buying an intermediate good, which yields benefits over a number of years, the bought 'object' is consumed immediately. If a desire for instant gratification was central to the 'consumer revolution', precisely this type of spending should have seen the largest increases. That more active forms of leisure, involving more (and more conspicuous) expenditure should have facilitated the growth of a leisure industry is not surprising. While labour productivity hardly increased at all, the sirens of the world of consumption became increasingly irresistible. Consequently, people worked harder, both at their workplaces and at their leisure, than previous generations had done.

When Mokyr dismantled the idea that demand and supply were somehow equally important in engendering economic change during the eighteenth century, he made one exception. His main conclusion, namely that supply was solely responsible for the Industrial Revolution, may have to be modified if labour supply and consumption were related. As Mokyr himself acknowledged,

> ... it can indeed be maintained that demand factors mattered insofar as the supply of labor, the demand for leisure, and the demand for goods are simultaneously determined. If there was an increase in the "demand for income," economic growth would occur, but only at the expense of leisure.[116]

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[111]Note that the relative change (+30.2%) is very safely within the interval estimated in table 1. Thus, both measures corroborate each other.

[112]McKendrick 1982, p. 23. [his italics]

[113]De Vries 1993, p. 107-110. De Vries 1994.

[114]Stone 1994, p. 5.

[115]Stone 1994, p. 4ff.

[116]Mokyr 1977, p. 985.

Therefore, 'rehabilitating the Industrial Revolution'[117] may arguably require less of an emphasis on the world of production, as well as further research into the patterns and productivity of consumption.

There is one additional feedback mechanism that needs to be emphasized. This paper saw sluggish productivity growth as partly responsible for the growth in annual labour input. If the evidence presented in section 2 is correct, then total factor productivity (TFP) measures will have to be revised substantially. At present, all estimates agree that labour input grew by 0.8 percent per annum between 1760 and 1800.[118] Correcting for higher rates of change would reduce the rate of total factor productivity growth still further.

The findings presented in this paper therefore serve to reinforce the new orthodoxy about the Industrial Revolution. Following the path-breaking work of Crafts and Harley, the period after the middle of the eighteenth century is now largely seen as exhibiting only sluggish increases in productivity, output and the investment ratio.[119] At the same time, structural change was dramatic. If the argument made in this paper about the wider significance of changes in labour input in London is correct, a rapid rise in working hours will have to be added to the other areas in which structural discontinuities were conspicuous, such as the re-allocation of the labour force and the unevenness of productivity advance.

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[117]This is the title of an article by Berg and Hudson (1992).

[118]Crafts and Harley 1992, p. 718.

[119]Crafts 1985, p. 80-88, p. 115-7. Crafts and Harley 1992, p. 720. For a dissenting view, cf. Berg and Hudson 1992, p. 44.

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