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Did women have an industrious revolution? Women's time and work in London, 1750–1830

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Abstract
This article firstly advances a methodological critique of Hans-Joachim Voth's influential study of labour input during the English industrial revolution, arguing that Voth's ingenious and potentially widely applicable method of inferring time-use from court testimony has flaws such that at least the absolute figures yielded are likely unreliable. Secondly, with the method's deficiencies in mind, this article applies a version of it to the Old Bailey court records in order to examine change in women's working time in London between the 1750s and 1830. Results include that women in London did not observe Saint Monday even in the 1750s, and that the time that women in London spent in paid work increased only slightly between the 1750s and 1830.

1. Introduction

If how people in the past allocated their time is of intrinsic interest to historical sociologists, it is also important for economic historians seeking to know how much people worked, bound up as this is with questions about living standards, economic growth, labour cost, and productivity, as this article will explain. For historians of the first industrial revolution, the question of time-use was made salient by E. P. Thompson's classic article proposing that industrialisation imposed longer and more intense work on workers,[1] and has become particularly important owing to Jan de Vries's influential thesis of an *industrious revolution* that preceded and was a causal condition of the industrial revolution. On de Vries's account of the origins of the industrial revolution, the most important causal chain runs from consumer demand through labour input to economic growth; in early modern north-western Europe, according to de Vries, new tastes for consumer goods induced a concurrent increase in their supply, through households reducing their leisure time and reallocating labour 'from goods and services for direct consumption to marketed goods'[2] – in other words, increasing paid work at the expense of unpaid work and leisure.

This article seeks to query the claim of an increase in time spent in paid work and the wider narrative of an industrious revolution, in two main ways. Firstly, section 2 shows that there are serious shortcomings in the methodology of the research that is perhaps most widely cited as offering direct empirical support for the claim of increasing working time in the period of early industrialisation, Hans-Joachim Voth's work on London and northern England from ca. 1750 to ca. 1830. Arguments about historical time-use have been bedevilled by the dearth of evidence before the middle of the nineteenth century, and Voth's pioneering contribution, a rare study that provides quantitative evidence for increasing working time, has been seized on by historians (section 1.2 gives some examples of uses of Voth's results). The shortcomings that are identified, however, require his results to be treated much more cautiously than they have been in the literatures on the industrious revolution, English industrialisation, and related topics.

My critique, moreover, has significance beyond these specific topics, because the significance of Voth's research lies not just in its results but also in the potential wider applicability of its ingenious method of simulating a time-use recall study using court records, which appears to offer a way to generate 'hard numbers' on time-use from sources of a kind available in many regions and periods. The shortcomings that I identify should also be born in mind in applications of the method in other contexts (one such application was recently undertaken in this journal).[3]

Secondly, I gather from the *Proceedings of the Old Bailey*, the criminal court of eighteenth- and nineteenth-century London, a dataset of women's activities (described in section 3), and apply a version of the simulated time-use recall method, with its shortcomings in mind, to study change in women's time-use in London between the 1750s and 1830. The Old Bailey *Proceedings* were also one of Voth's main sources, along with a similar body of records from northern England, but at the time of his research neither source was digitised; the Old Bailey *Proceedings* have since been digitised. Probably partly as a result, Voth's dataset had some important deficiencies, notably the paucity of women. In none of his six samples do women exceed 24 per cent of the total. There are only 23, 41 and 25 women respectively in his northern England samples of 1760, 1800 and 1830, and 32 women in his 1830 London sample. As Voth acknowledges, 'the restricted size of our English sample makes it impossible to evaluate female work accurately. Since differences in working and leisure time between the sexes are potentially important indicators of discrimination and gender roles, future additions to our dataset may yield large returns'.[4] But the paucity of women must raise question marks, not just about issues of discrimination or gender roles, but also about Voth's conclusions about overall working time, because (as one reviewer of Voth's book noted) 'women's distinctive experience in the labor markets of the period cautions against attempting to uncover a general trend in hours of work especially from a data set in which 84.7 per cent of the observations refer to men'.[5] This deficiency is all the more important because de Vries's account, as well as the related account of Neil McKendrick, emphasises the role of increasing market-oriented work by women (and children) in driving growth in earnings and consumption.[6]

My analysis of holidays, weekly and seasonal patterns of work and the annual total hours of work and leisure (presented in section 4) yields results that

significantly differ from those arising from Voth's predominantly male samples. Probably the most important results are that Saint Monday – the practice of doing little or no work on Monday, the putative decline of which as a result of industrialisation has been at the centre of the debate on the effect of industrialisation on time-discipline initiated by Thompson – was not observed by the subjects in my dataset even in the 1750s, and that for them there was only a slight increase in time engaged in paid work from the 1750s to 1830. These results suggest that, even if women in London had an industrious revolution, it did not take place in 1750–1830, and that the overall increase in time spent in paid work in this period was much smaller than what Voth inferred. The final section explores the implications of my findings.

But first, section 1.1 will say more about the importance of time-use for economic history and section 1.2 will review existing work on time-use in the relevant period and the influence of Voth's research.

1.1 Why else is time-use important?

The hypothesis of change in time-use and working time is directly raised by the debate over industriousness, as well as by the debate over living standards insofar as increased work and reduced leisure can itself be regarded as lowering standards,[7] but revising our picture of historical working time will also have large indirect implications for the histories of living standards, economic growth, labour cost, and productivity – subjects of some of the oldest and most persistent debates in the economic history of industrialisation.

When our sources for income take the form of daily or weekly wage rates, we need estimates of the length of the working year on the one hand to turn them into estimates of total annual nominal income and estimates of the length of the working day or week on the other hand to turn them into estimates of unit labour cost. Take the issue of income first. In the debate over whether (and when) industrialisation raised or lowered living standards, as well as in the debate over the scale and timeline of economic growth during industrialisation insofar as our estimates of gross domestic product (GDP) are income-based, we are interested in individuals' and households' real income, not just on a day when they happened to be in work, but over a longer period that includes days or periods of work and non-work, typically a year. To calculate indices of annual real income, we need indices of annual nominal income (and indices of prices), and to calculate indices of annual nominal income, the daily or weekly wage rates for given years are multiplied implicitly or explicitly by an estimated or assumed number of days or weeks worked annually, and divided by the figure for the reference year.[8] The multiplication is implicit where the index of nominal income is simply an index of the daily or weekly wage rate. Letting the length of the working year be x, the explicit method explicitly requires estimates of change in x, and the implicit method assumes that x was constant across different years.

Accuracy in estimates of change in x need not be important for accurate indices of income if x can safely be assumed to have been largely constant, but recent work indicates that this is not so. Notably, Broadberry et al.'s output-based series for GDP per head during 1270–1870[9] and Humphries and Weisdorf's estimates of

annual real income during 1260–1850 based on wages of workers paid by the year[10] both differ substantially from Gregory Clark's income-based GDP per head series, whose trend is driven by the real wage series that Clark uses.[11] Whereas Clark paints a Malthusian picture of swings in real income in response to population changes but no sustained growth until the nineteenth century, Broadberry et al. and Humphries and Weisdorf locate the beginning of sustained growth much earlier.[12] One way to reconcile Clark's series with the others is to discard Clark's assumption that the rate of labour force participation in the population and the number of days worked annually were both constant.[13] 'Patently, for good reasons, labour supply per head was anything but constant over time. To take the real-wage-rate series currently in use as representative of annual living standards without further corroboration … is therefore imprudent'.[14] If Voth's estimates for the working year during the industrial revolution and:

> numbers provided by Ian Blanchard (1978) indicat[ing] that the medieval working year was sometimes only 165 days long … are even roughly correct, then existing estimates of annual incomes, which are based on 250 days of work, overestimate medieval incomes as much as they underestimate early industrial incomes, by some 30% … with serious implications for our understanding of when and how modern economic growth emerged.[15]

Similarly, change in unit labour cost cannot be directly inferred from change in daily or weekly wage rates. This poses a problem for the high-wage explanation of the British industrial revolution proposed by Robert Allen, which has for a few years been the 'prevailing explanation for why the industrial revolution occurred first in Britain in the late eighteenth century'.[16] Allen contends that the uniquely high cost of labour relative to other inputs in Britain incentivised the development and dissemination of labour-saving technology and set Britain on a new growth trajectory.[17] But if workers worked longer hours per day, a constant daily wage rate – as there was in the wage series that Allen uses during the eighteenth century – would mask a decline in unit labour cost.[18]

Since total factor productivity (TFP) consists in the ratio of output (GDP) to all inputs, and labour productivity consists in the ratio of output to labour input, revised estimates of change in labour input can have large implications for labour productivity and TFP, just as Crafts and Harley's revised estimates of output growth did.[19] For instance, while Crafts and Harley compute a total factor productivity (TFP) growth rate of 0.1 per cent per annum (p.a.) during 1760–1800 in Britain on the assumption of a 0.8 per cent p.a. labour input growth rate,[20] Voth computes a TFP growth rate of –0.2 per cent based on the 1.4 per cent p.a. labour input growth rate that he derives.[21] Our explanation of this growth and of why Britain industrialised first will depend on the relative contributions of increasing labour input and increasing labour productivity to economic growth during the British industrial revolution. For example, if, given the same estimates of GDP growth, we revise upwards the increase in labour input and thus revise downwards the increase in labour productivity, theories of the sources of economic growth during the British industrial revolution that emphasise labour-saving technology will become less plausible, and the reverse if the revisions go the other way.

1.2 Existing work and uses of Voth's results

A serious obstacle to substantiating the claim of an increase in working time before or during industrialisation has been the difficulty of assembling data on time-use in the relevant period for the early-industrialising regions that the debate mainly concerns. In the British case, Thompson's article, the studies by Rule, Reid and Hopkins that it inspired, and the relevant part of Bienefeld's book on British industrial working hours all rely mainly on contemporary comment, prescriptive sources like factory rules or tradesmen's handbooks, and figures for single workplaces.[22] Joel Mokyr wrote in 1985, 'We simply do not know with any precision how many hours were worked in Britain before the Industrial Revolution'.[23] Subsequent articles by Harrison, Boulton, Reid and Tiratelli use the timing of weddings or mass events to study patterns in the timing of work and leisure,[24] and recent work by Whittle and Hailwood uses court records to study the timing and the gender division of work in the southwest of England,[25] but none of these studies attempt to quantify total working time. Woodward and Hatcher discover some figures for days worked, but only for limited groups of workers.[26] Some other studies are limited to single workplaces.[27] Aside from Voth's work, the widest in scope among estimates of average annual working time in England before 1850 are Clark and van der Werf's estimates of days worked annually by male agricultural labourers, which they produce by dividing the value of the annual payment in cash and kind to workers paid by the year by the daily wage of workers paid by the day. The assumption is that unit labour costs in day and annual contracts were arbitraged into equality because employers were flexible as to which kind of contract they offered, and workers were mobile between the two kinds of contract. Clark and van der Werf find little increase in labour input throughout the period from 1260 to 1850.[28]

The putative increase in working time and intensity is evidently a weak link in the industrious revolution thesis. Discussing the industrious revolution in 2009, Allen cites twelve works in evidence of new goods transforming spending patterns, but only one in evidence of 'the predicted increase in work intensity', Voth's *Time and work in England, 1750–1830*.[29] Indeed, the estimates of annual working hours in London, northern England and England as a whole during the industrial revolution that Voth offered in his book and two articles based on the same research[30] have become a central point of reference in debates about the industrious revolution and about English industrialisation, and widely cited in other contexts too.[31] To give some examples: de Vries, elaborating his industrious revolution thesis, cites Voth's conclusions about Saint Monday and holidays and his estimates of 2,700 hours and 3,300 hours as the annual working hours of the English labour force in 1750 and 1830 respectively.[32] A recent article on industriousness in early modern southern Sweden cites Voth's work as 'famous studies' that support the claim of increased industriousness,[33] while a recent article on industriousness in early modern Antwerp claims, 'For London, Hans-Joachim Voth unearthed some conclusive data about an impressive, late eighteenth-century boom in working hours'.[34] Voth's estimates are the empirical basis of the model of labour supply whereby Koyama seeks to provide microfoundations for the industrious revolution.[35] Broadberry et al. cite Voth's estimates to show that an increase in working time of the scale necessary to reconcile their and Clark's GDP per head series was possible.[36] Stephenson refers to Voth to question

the assumption of constant working hours underlying Allen's claim of high wages in late-eighteenth-century Britain.[37] Allen, defending the claim of high wages, adopts Voth's estimates of a five-day working week and eleven-hour working day in calculating the weekly output of cotton weavers.[38] Allen and Weisdorf use Voth's estimates as benchmarks against which they compare the number of days' work that they estimate to have been needed to buy a certain basket of commodities in order to test the industrious revolution thesis.[39] And Voth's estimates have been used to support arguments about other regions and comparative economic history, including by Pomeranz in an article defending his influential book on the Great Divergence.[40]

The accuracy of Voth's results is evidently of considerable importance. This article's methodological argument will put into doubt uses of Voth's absolute figures, while its substantive research will revise downwards the scale of the increase in labour input detected by Voth.

2. Methodology and problems

The ideal but unachievable method for determining how people use time is to observe them continuously without the act of observation affecting their time-use. Modern time-budget studies use methods that seek to approximate this ideal. One method is to ask subjects to record, at certain random times, what they are then doing; another – the random-hour-recall method – is to ask them subsequently to recall what they have done at certain random times. Voth devised a method for studying historical time-use that seeks to approximate the random-hour-recall method by collecting references by witnesses in court records to what they or someone else did at specific times and applied this to the London Old Bailey and Northern Circuit Assizes papers of 1749–1763, 1799–1803 and 1829–1830.

Although Voth's work has been criticised with respect to the sectoral and geographical narrowness, and smallness once disaggregated, of the dataset used,[41] and to certain inferences about change over time and causal mechanisms,[42] the methodology of trying to approximate random-hour-recall with court testimony has not been seriously questioned. Clark writes: 'This reviewer has doubts … [about] whether [Voth] has large enough samples of the appropriate types of workers … [b]ut his method is correct in principle, and if extra data can be secured they will tell us a lot.'[43] While Hugh Cunningham warns, 'So ingenious is Voth's research strategy, so exemplary the statistical tests to which he has subjected his data, that there has been a tendency to take his conclusions at face value', his qualms are not about the estimates of working hours themselves, but about Voth's explanation for the increase in working hours.[44]

I argue in this section, however, that there are biases in the recording of activities in the source which seriously limit the validity of Voth's method for calculating hours worked per day, days worked per year and hours worked per year.[45]

Voth produces two sets of figures for annual working hours, computed by the 'timing' and the 'frequency' method respectively.

2.1 The timing method

The timing method consists of establishing the number of hours worked per year by multiplying the number of days worked per year by the average number of hours

worked per day. The number of days worked per year is established by deducting from 365 the number of days of the week and holidays on which work ceased. Voth offers two ways of establishing the average number of hours worked per day, which lead to two different sets of timing-based estimates. It is either assumed as constantly eleven hours across the three time periods of his samples or established by deducting the average time of starting work and the average time spent at meals from the average time of finishing work. The timing method faces three problems.

First, it overrepresents occupations with clearly demarcated starting and finishing times. Occupations without such demarcated times, like domestic service or keeping lodgings, are neglected. Indirect evidence for the importance of this bias is the paucity of observations of starting or stopping work in my dataset. Voth writes that, in a future study of women's working hours, the 'number of additional observations would have to be sufficient to move from comparisons of starting and stopping to frequency-based measurement'.[46] In fact, I have found that I have enough observations for frequency-based measurement, but not for comparisons of starting and stopping times for either 1748–1761 or 1829–1831. There are only five observations each of starting and stopping work in my 1829–1831 sample, and three of starting and nine of stopping work in my 1748–1761 sample. As Mary Prior writes, 'Because a man's work was clearly demarcated and limited, his day had a beginning and an end', unlike many a woman's.[47] It is probable, then, that the starting and stopping times in Voth's samples underrepresent women even compared with his whole dataset, and underrepresent men engaged in occupations without clear starting and finishing times.

Using starting and stopping times to infer the length of the working day will also be inaccurate where an individual starts and stops work more than once in a day, either because references to starting or stopping work are to stopping for a break, or re-starting after one, in the middle of a day's work, or because the subject worked on more than one job in a day. The latter case may have been especially common among women. Dorothy George writes, 'A poor woman who was a lodger in a tenement would take in winding or doubling and employ others still poorer, who often divided their time between winding and "selling things about the streets"';[48] and Tim Meldrum, studying domestic servants in early eighteenth-century London, writes that, for some women, 'service may have been only one among several employments held serially or simultaneously with other metropolitan by-employments or even as a by-employment itself'.[49]

Second, as Voth notes, assuming a constant eleven-hour working day is rather arbitrary. The average times of starting and stopping work, as Voth estimates them, differ by 11 hours and 40 minutes in the 1750s, 12 hours and 34 minutes ca. 1800, and 11 hours and 15 minutes ca. 1830. In the varying-hours version of the timing method, however, Voth deducts only mealtimes. This is problematic for two reasons. Firstly, because it is assumed that no breaks from work are taken between starting and stopping work except for meals, working time is overestimated. Secondly, Voth must use the frequency method to calculate how long people spent at meals, but this calculation is perforce based on slender evidence, and is subject to the problems of the frequency method discussed in the next subsection. In his London samples, Voth has only nine observations in the 1750s and

six ca. 1800 for breakfast, 14 and 25 for dinner, and six and 16 for tea. Moreover, it is unclear whether Voth deducted time for tea from the working day, and uncertain whether it ought to be deducted, since it seems that tea was taken either shortly before or shortly after stopping work.[50]

Third, the timing method depends on arbitrarily assuming that a certain number of days each year were days of non-work in the 1760 and of work in 1800 and 1830.[51] Voth takes a list of holidays published in 1749, performs a logistic regression whereby he finds that the odds of being at work on these days were significantly lower than on other days in the 1750s, but not ca. 1800 or ca. 1830, and infers that work ceased on all the holidays on the list in the 1750s and on none of them ca. 1800 and ca. 1830. Similarly, he infers from the odds of being at work on Mondays being significantly lower than on other days in 1760, but not in 1800 or 1830, that all Mondays were days of non-work in 1760, and of work in 1800 and 1830. But these are not valid inferences.[52] Voth could not have had sufficient observations for every holiday on the list, and it is probable that not every holiday on the list was widely observed in 1760. If, illustratively, 36 of the 46 holidays were observed in 1760, while five continued to be observed ca. 1800, by the varying-hours method using Voth's estimates for daily working hours, annual working hours in 1760 and 1800 would be 2,289 and 3,100 respectively, instead of 2,184 and 3,152, cutting the increase from 44 per cent to 35 per cent. Moreover, using a single list of holidays leaves out trade-specific holidays, like St Crispin's Day for shoemakers and Bishop Blaze's Day for wool combers.[53] Such days were probably more widely observed by the relevant workers than some of the political holidays on the list by Millan used by Voth, which is one of holidays kept at public offices.[54]

Indeed, a problem specific to the use of this list is that 16 of its 46 holidays are birthdays of living members of the royal family or days relating to George II's accession (Voth says that they are 'only a few'). Voth concedes that it is to be expected that they were not observed in 1800 and 1830, but claims that this is not responsible for the insignificance of the coefficient in the logistic regression for 1800.[55] But the table to which he directs the reader for evidence, table A7, shows only that neither the holidays from Millan's list that Voth classifies as 'political', nor those he classifies as 'religious', had significantly negative coefficients in the logistic regression for being at work ca. 1800; the results do not rule out the possibility that bringing the list of political holidays up-to-date for 1800 would yield a significant negative coefficient for political holidays.[56]

2.2 The frequency method

The frequency method consists of establishing the number of hours worked annually by giving each observation of an activity between 6:00 and 23:59 a weight; summing the weights; summing the weights of observations of subjects engaged in paid work and dividing their sum by the sum of all weights; and multiplying the result by 365 days per year and 18 hours per day. The idea is that if, in a random sample of observations of people in a population, the subjects of x% of observations were engaged in paid work, we can infer that this population were, on average, engaged in paid work x% of the time. Because crimes did not take place in equal numbers in

all hours of the day and days of the week, observations are weighted to correct for the under- or oversampling of certain hours and days. For an observation of an activity taking place during y:00–y:59 on day z of the week, its weight is $\frac{S}{18b} \times \frac{S}{7c}$, where S is the total number of observations, b the number of observations during y:00–y:59, and c the number of observations on z. Observations between 0:00 and 5:59 are excluded because people did not witness events when asleep; including all observations would greatly understate sleeping time.

The frequency method is Voth's preferred method, because it 'provides a relatively direct estimate of the proportion of the population working – and thus, of the length of the working year', whereas 'the timing-based estimates are by construction based on many more a priori assumptions'.[57] This is true. Nonetheless, there are four problems with the frequency method.

First, the exclusion, in calculating annual total working hours, of the hours between midnight and 6:00 leads annual working hours to be underestimated because work during the excluded period is missed. It cannot be assumed that this underestimation is small. Cooperages in London often opened at 3:00.[58] One dressmaker told the Commission on the Employment of Children, 'It very frequently happens, that for three or four days in the week the hours are from 8 a.m. till one, two, four, and five the next morning'; while an employer in the same trade told the Commission:

> In those houses in which the hours of work are regulated, the common hours are from 8 a.m. till 11 p.m., but … even in these, if any particular order is to be executed, they go on often till two and three in the morning – and, if requisite, all night; while in establishments which are not so well regulated, they usually go on till one or two in the morning, and often all night.[59]

The author of the pamphlet in which these statements are quoted also writes:

> In certain parts of the metropolis, and, indeed, in some shops in every part of the city, it is by no means an uncommon circumstance for young men … to be actively employed [in arranging articles] until one, two, and, in some instances, three o'clock in the morning, for two or three months in the summer season.[60]

In my sample, 20 out of the 62 observations during the excluded period ca. 1830 are of people engaged in paid work, and 14 out of 40 in the 1750s. For instance, 'on the 18th of June, about a quarter-past five o'clock, [Mary Stewart, a servant] was cleaning the stairs'.[61] On 20 November 1755, Ann Smith, a nurse at Bartholomew's Hospital, was changing a patient's sheets at 1:30.[62]

Second, the frequency method neglects the fact that not all individuals observed were in employment or in the labour force. Voth does not define whether his estimates of average annual working hours are of only workers in employment, or also of those in the labour force who were not in employment, or of the whole population. But in his estimates of growth in labour input, he starts with indices of population size in 1800 and 1830 (1760 as reference) and adjusts them for changes in labour force participation rate and in unemployment prior to adjusting for the

changes in annual working hours that he estimates.[63] This suggests that he intends his estimates of annual working hours to be of the annual working hours of those in employment.

In sorting the data, however, except in rare cases where the subject is a young child whose age is recorded, it is seldom possible to determine whether a subject not doing a paid work activity was in employment. When observations of individuals not in employment are counted towards the estimated likelihood of being engaged in paid work, the likelihood of someone in employment being engaged in paid work, and the annual working hours of those in employment, are underestimated. Moreover, by adjusting, in his estimate of change in labour input, both for labour force participation rates and unemployment rates and for his estimates of annual working hours using the frequency method, Voth double-counts the effect of unemployment and non-participation in the labour force.

This is the least worrying of the problems, because I shall take the estimates that I derive using the frequency method as estimates, not of the annual working hours of only those in employment, but of the average annual labour input of women excluding young girls. The most serious problems concern the randomness of the activities recorded.

Third, the frequency method likely overestimates the likelihood of being engaged in paid work or leisure activities. For one thing, it is plausible that work and leisure activities are more likely to be mentioned by a witness than other non-work activities, such as mere idleness. For another, activities that have a certain duration, as work and leisure activities typically do, are more likely to be recorded than brief, albeit frequent, activities, such as other non-paid-work activities like minor household tasks. In modern time-budget studies in which subjects record activities in a diary, short telephone conversations tend to be underreported.[64]

Fourth, the frequency method overrepresents activities that were more likely to coincide with, or be otherwise related to, crime. This bias is not removed by weighting observations to correct for the uneven distribution of crime on different hours and days of the week, because such weighting does not change the relative proportions of different kinds of reported activities on a given day and in a given hour. Insofar as certain kinds of activities are overrepresented in the dataset compared with their actual occurrence, the frequency method does not approximate the random-hour-recall method of modern time-budget studies; and the estimates of annual working hours that it produces will be too high or low to the extent that the overrepresented activities are more or less likely to be paid work than other activities.

Activities liable to be underrepresented are those that do not spatiotemporally coincide with, or are otherwise related to, crime. In particular, it is plausible that work that took place indoors and did not involve the provision of services to others was less likely to be recorded. Indeed, there are few women engaged in manufacturing in my dataset – ca. 1830, only 6.7 per cent of subjects whose sector of employment can be inferred, even though 32.83 per cent of employed women in London in the 1851 census worked in the manufacturing sector.[65] It is plausible that this underrepresentation is partly because women manufacturing workers were unlikely to witness crimes, or activities related to crimes, while at work. A French visitor wrote in 1843 of Spitalfields silk-workers: 'they are bent over a

loom, throwing the shuttle thirteen to fourteen hours a day; this is the only exercise that these unfortunates take, who rarely breathe fresh air, and who only ever see the sun through the windows of their unhappy alcoves'.[66]

The kinds of activities whose overrepresentation I suspect is most significant are shop- and public-house-keeping, prostitution, and drinking in public houses. Many observations in my dataset of a shopkeeper or shop assistant at work were recorded at the Old Bailey because the activity coincided with a theft or attempted theft, or attempt to use a bad coin, in the shop. Pawnbrokers are observed keeping their shops when a thief brings stolen goods to pawn. Many of the work activities of keepers and frequenters of public houses observed were recorded because they coincided with the presence in the public house of a victim or accused near the time of the crime, or with a theft, attempted theft or attempt to use a bad coin in the public house. And when prostitutes were observed at work, this was almost always because they were accused of stealing from their client.

Voth argues that 'there is little reason to question the representativeness of [his] sample' because the sectoral origin of witnesses in his 1830 London sample is similar to the sectoral distribution of London workers in the 1841 census.[67] This is not, however, decisive. A similar distribution across sectors may mask unrepresentativeness within sectors. Moreover, there is, as Voth notes, an underrepresentation of manufacturing – 30.1 per cent in his sample compared with 36.9 per cent in the census. Most importantly, while the difference between the proportion of witnesses in his sample in a sector and that of workers in the sector in the census, as Voth notes, is small for each of the agriculture, manufacturing, public and services sectors, excepting the small agriculture sector the differences are all in the same direction (the proportions in Voth's sample are lower); thus, the difference between the proportions in Voth's sample and in the census for trade, the residual sector which Voth does not explicitly discuss, is not small. Whereas 22.7 per cent of witnesses from Voth's 1830 London sample were in the trade sector, only 12.85 per cent of workers in the census belonged to it – precisely the sector that the above discussion suggests would likely be overrepresented.[68] The overall effect of this bias is probably to overestimate the likelihood of being engaged in paid work, because the overrepresentation of keepers of shops and public houses consists in overrepresenting not their non-work but their work activities.

Given the above-discussed problems with both of Voth's methods for computing annual average working hours, the accuracy of the absolute figures that Voth computes is seriously doubtful, as are their comparability to statistics for working time in other countries and periods and the correctness of claims that rely on such comparability.[69] The fact that different biases in the calculation of annual working hours may tend in different directions does not permit one to assume that they cancel each other out. The scale of the change produced by adjusting the dataset is significant. In section 4, when calculating London women's average annual working hours in the 1750s and ca. 1830, I use first my whole dataset and then a restricted dataset from which observations coded as *closely related* to a crime, such as a shopkeeper being observed in her shop when a crime occurred there, are excluded. Using the restricted dataset reduces the estimate of annual working hours from 3,070 hours to 2,298 hours for the 1750s, a reduction of 25 per cent.

Possible error of such size warns against taking Voth's absolute figures at face value, and it is not an aim of this article to estimate London women's average labour input; it aims only to establish the broad shape of the weekly and annual patterns of work and of change between 1750 and 1830 in average labour input. Voth's method, ingenious as it seems, cannot be used to derive estimates of average working times and labour input that are significantly more accurate than estimates available through anecdotal evidence. If anything, citing precise, quantified figures tends to occlude the uncertainty of our knowledge of working times before the late nineteenth century. We would do well to recall A. W. Coats's warning that 'there is a kind of alchemy about figures which transforms the most dubious materials into something pure and precious'.[70]

Estimates of total working times in section 4 below are made as part of the calculation process for the estimation of change over time. The figures for changes over time are also affected by the problems discussed above, but the assumptions seem less hazardous. If these figures are not to significantly misrepresent the average change in women's working time, three assumptions must hold. One assumption, which seems reasonable in the absence of further information, is that activities were overrepresented in the dataset as a result of the third and fourth problems of the frequency method to a similar degree in the 1750s as ca. 1830. Another assumption is that night work did not become more common in 1830 than in 1750. This assumption is consistent with my dataset, where the proportion of cases of paid work among all observations during 0:00–5:59 was very similar in the 1750s and 1829–1831: 35 per cent and 32 per cent respectively. The final assumption is that the direction or scale of change in women's working time in sectors overrepresented in the dataset were not greatly different from the direction or scale of change in women's working time in sectors underrepresented in the dataset. Insofar as we are uncertain about this assumption, we should be circumspect even about the relative figures yielded by the frequency method.

3. The dataset

Data was collected from the *Proceedings of the Old Bailey* in the years 1748–1761 and 1829–1831.[71] The periods were chosen to facilitate comparison with the results that Voth obtains from his samples, which are composed mainly of men's activities and two of which were collected for the periods 1749–1763 and 1829–1830.[72]

Every instance of a (not necessarily adult) woman being observed engaged in some activity at a specific time on a specific day discovered in the *Proceedings* during these years was recorded, except activities that were obviously integral to a crime, an activity being considered integral if it would not have occurred if the crime did not occur. Cases where the time is given as 'between x and $x + k$ o'clock' are included when $k \leq 2$ and assigned the time $x + 0.5k$. Cases where the time is given as 'a little before/after x' are included, and assigned the time 10 minutes before/after x. In total, 361 unweighted observations were made for 1748–1761 and 521 for 1829–1831. Of these, 71 observations for 1748–1761 and 85 observations for 1829–1831 were excluded because it is unclear whether the activity recorded was paid work or not, the occurrence of the activity was disputed by

another witness, the day of the week and the date given by the witness were inconsistent and could not be corrected in light of other evidence, or the activity was upon review deemed integral to a crime. This leaves 290 observations for 1748–1761 and 436 observations for 1829–1831.

Of the 290 observations for 1748–1761, the observer was the subject doing the observed activity or one of the subjects in 208 cases, a man in 47 cases, and a woman other than the subject(s) in 32 cases; and the observers were two men in three cases, and a man and a woman other than the subject in one case. Of the 436 observations for 1829–1831, the observer was the subject or one of the subjects in 348 cases, a man in 58 cases, and a woman other than the subject(s) in 28 cases; and the observers were two women other than the subject in one case, and a man and a woman other than the subject in one case.

Observations were initially individuated by activity – observations of multiple people engaged together in an activity, or multiple recordings of the same activity (including, e.g., recordings of one continuing activity at different times on the same day), were counted as one observation. Each observation is given a weight of 1. If an observed activity extended over more than one hour of the day, the observation is replaced by observations for each of the hours in which the activity took place, and each of the new observations is weighted in proportion to how much of the activity's duration fell within that hour and such that the total weights of the new observations sum to 1. For example, Catherine Folliott recalls caring for a sick person from 10:00 to 15:00 on 1 July 1758.[73] This activity is included in the dataset under five observations each with weight 0.2 – one for each of the hours from 10:00 to 15:00. In the calculation of annual working hours in section 4, these weights are applied to observations as well as the weights correcting for the uneven temporal distribution of crime that Voth uses.

I compare the number of observations of women in Voth's London samples with the number of observations in my dataset (excluding those gathered from the 1748 and 1831 *Proceedings* to facilitate comparison) (Tables 1 and 2). Evidently, Voth did not collect data exhaustively for 1829–1830. As noted previously, the *Proceedings of the Old Bailey* had not been digitised at the time of Voth's research, an important extenuating circumstance. Voth does not say how his 1829–1830 sample was collected. This raises a major further doubt about his estimates for 1830: because of the seasonality of employment, if he examined only a few sessions of the Old Bailey, his estimates would likely be unrepresentative of the annual average. Voth does not mention his 1830 sample when discussing seasonal patterns.[74]

Table 1. Number of observations in my dataset excluding 1748 and 1831

Period	Observations (weighted)	Observations (weighted), excluding *closely related* cases
1749–1761	253	206
1829–1830	287	234

Note: The content of all tables is based on data collected by the author from the *Proceedings of the Old Bailey* unless otherwise specified.

Table 2. Number of observations of women in Voth's London samples

Period	Observations
1749–1763	236
1829–1830	32

Source: Voth, *Time and work*, 107.

4. Results

4.1 Holidays

The list of holidays used for the following regression was compiled from the 1749 list used by Voth as well as by Freudenberger and Cummins,[75] and four other lists from 1760, 1830, 1831 and 1842.[76] Details as to which holidays appeared on which of these lists, and which holidays were included in my list and how they were classified there, are given in the online supplementary material. Table 3 displays the results of logistic regressions of a dummy variable that assigns being engaged in paid work 1 and not being engaged in paid work 0 against a dummy variable that assigns holidays 1 and non-holidays 0.[77]

The coefficient for 1748–1761 is negative but insignificant, a result robust to excluding *closely related* cases, to fine graining the independent variable by replacing the holiday dummy variable with two dummy variables for religious and non-religious holidays respectively, and to doing both. (Results for regressions with fine-grained independent variables are not displayed.) During 1748–1761, London women, it seems, did not tend to abstain from paid work on days on my list of holidays.

The coefficient for 1829–1831 is significant and positive. It remains positive, though significant only at 95 per cent level, when *closely related* cases are excluded. When the independent variable is fine-grained, the coefficients remain positive, though significant only at 95 per cent level; and when *closely related* cases are excluded *and* the independent variable is fine-grained, the coefficients remain positive, that for religious holidays is significant at 95 per cent level, but that for non-religious holidays is not significant. During 1829–1831, London women, it seems, were *more* likely to do paid work on days on my list of holidays.

Table 3. Logistic regression: odds of doing paid work on holidays compared with odds of doing paid work on non-holidays

Period	Coefficient	Odds Ratio	Wald χ^2-statistic	Significance
1748–1761	−0.261	0.770	0.66	0.416
1748–1761, excluding *closely related* cases	−0.143	0.867	0.15	0.698
1829–1831	0.847**	2.33	7.34	0.00675
1829–1831, excluding *closely related* cases	0.823*	2.28	5.43	0.0198

Note: **, * and • denote significance at 99%, 95% and 90% level respectively.

This is a *prima facie* puzzling result. It is unlikely to be a mere quirk of my sample, or explained by the substitution at work of women for men observing holidays, because it echoes Voth's finding for a predominantly male sample from ca. 1800 – Voth finds that the change in odds of being engaged in paid work on political holidays was not significant, but subjects were *more* likely to be engaged in paid work on religious holidays on the two more liberal of his three definitions of work.[78] Since the tendency to be more likely engaged in paid work on holidays is more pronounced in Voth's 1800 sample on his w3 definition of work (viz. when shopkeeping is included), and in my 1829–1831 sample when *closely related* cases (which are preponderantly of subjects working in retail and hospitality or as prostitutes) are included, the tendency may well at least partially be explained by the hypothesis that holidays were especially busy days for the retail and hospitality sectors and for prostitutes. In Birmingham, for example, 'the ale houses and taverns … were the chief resort' during wakes (some of which were holidays for several decades from the mid-eighteenth century onwards).[79] The emergence of the tendency only from ca. 1800 onwards may be evidence of greater commercialisation of the holidays still observed than in the mid-eighteenth century.

4.2 Weekly and seasonal patterns

Dummy variables were created for: whether the subject was engaged in paid work; each of the days of the week; each of the months of the year; each of the seasons of the year (winter [December–February], spring [March–May], summer [June–August] and autumn [September–November]); the warm (April–September) and cold (October–March) halves of the year; and each of four divisions of the day (morning [6:00–11:59], afternoon [12:00–17:59], evening [18:00–23:59] and night [0:00–5:59]).

In 1748–1761, there is no discernible seasonal pattern of work. Subjects were doing paid work in 55 out of 125 cases (44.0 per cent) in the cold half of the year, and 60 out of 146 cases (41.1 per cent) in the warm half. In 1829–1831, subjects are somewhat more likely to be doing paid work in the warm than in the cold half of the year, but the significance of the difference awaits further analysis: subjects were doing paid work in 94.5 out of 221.75 cases (42.6 per cent) in the cold half, and 96.5 out of 196.5 cases (49.1 per cent) in the warm half. Table 4 displays the percentage of cases of paid work during each season. The absence of seasonality in the percentage of cases of paid work in 1748–1761 accords with Voth's findings for the mid-eighteenth century and ca. 1800.[80]

There is a clear weekly pattern of work in 1748–1761, as Table 5 shows: Sunday was a day of rest, as in Voth's sample; unlike in Voth's sample, Monday was not a

Table 4. Percentage of cases of paid work by season

Period	Winter	Spring	Summer	Autumn
1748–1761	44.8	46.3	37.1	42.1
1829–1831	38.9	45.4	49.2	50.6

Table 5. Percentage of cases of paid work by day of the week

Period	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1748–1761	19.5	49.7	50.0	45.9	52.1	44.7	39.4
1829–1831	37.7	51.4	45.3	45.5	35.7	42.2	58.6

day of rest. In 1829–1831, Sunday, although still one of the two days on which the percentage of cases of paid work was lowest, no longer stands out as a day of rest.

The above observations can be confirmed or made more precise through regression analysis. For both 1748–1761 and 1829–1831, a logistic regression was performed with doing paid work as dependent variable and 20 independent variables: six days of the week (Sunday as reference category), eleven months of the year (January as reference category) and three divisions of the day (night as reference category).[81]

In 1748–1761, the coefficients of all the day-of-the-week variables were positive, and significant at 90 per cent level; those of Tuesday and Wednesday were significant at 95 per cent level and those of Monday and Thursday at 99 per cent level.[82] The coefficients for no other variables were significant.[83] The coefficients' insignificance is robust to respecifying the variable capturing variation over the course of the year by replacing months with seasons or with warm and cold halves. Likewise, for periods of the day, months, seasons and halves of the year, regression against any one of these four sets of variables without including other independent variables yields no significant coefficients.

I therefore set aside the variables other than days of the week. To discern more clearly the weekly pattern of paid work, I report the results of regressing the dependent variable against each of the day of the week variables individually (that is, comparing each day of the week with the rest of the week, instead of comparing every other day of the week with Sunday) (Table 6). These results contrast with those of Voth, whose subjects ca. 1760 were significantly less likely to do paid work both on Sunday and on Monday than on other days. These results also contrast with those of Tiratelli's recent study of the timing of political events. Two of Tiratelli's datasets concern northern English towns, but he also uses Tilly's dataset of contentious gatherings mainly covering southeast England, in which events from London preponderate. For this dataset, Tiratelli finds that, for most of the period 1758–1834, the proportion of political events is greatest on Mondays and least on Sundays, and declines throughout the week from Monday to Sunday, providing some evidence for the pattern of Saint Monday followed by increasing work intensity through the week proposed by Thompson.[84] Tiratelli is uncertain about the gender composition of the people documented by his sources, but suggests that they are probably mostly men.[85] My results, however, suggest that, in London, even in the 1750s, women did not practise Saint Monday.

In 1829–1831, the logistic regression with 20 independent variables yields no coefficient significant at 95 per cent level, though the coefficient for Saturday has a p-value on the cusp thereof (0.056). Replacing months with the warm half as variable pushes Saturday's p-value below 0.05 (to 0.045) and yields a

Table 6. Logistic regressions: odds of paid work on a given day of week compared with odds of paid work in the rest of the week, 1748–1761

	Coefficient	Odds Ratio	Wald χ^2-statistic	Significance
Sunday	−1.135**	0.321	8.12	0.0044
Monday	0.369	1.45	1.28	0.26
Tuesday	0.137	1.15	0.12	0.73
Wednesday	0.324	1.38	0.81	0.37
Thursday	0.252	1.29	0.48	0.49
Friday	0.0964	1.10	0.068	0.80
Saturday	−0.0725	0.930	0.040	0.84

Note: **, * and • denote significance at 99%, 95% and 90% level respectively.

positive coefficient for the warm half with p-value 0.086. Replacing months with seasons (winter as reference category) reduces Saturday's p-value further to 0.027 and yields positive coefficients for summer and autumn that are, respectively, almost significant at 99 per cent level (p-value 0.013) and significant at 90 per cent level (p-value 0.059).

Regressing paid work against the variables for cold and warm halves alone does not yield any coefficient significant at 90 per cent level. Mann-Whitney *U* Tests with paid work as dependent variable and the warm half or one of the seasons as independent variable allow the rejection of the null hypothesis at the 90 per cent significance level only in the case of winter compared with other seasons (p-value 0.080). Tables 7 and 8 display the results of regressing against, respectively, each of the seasons individually, and three seasons with summer as reference category. These results provide some evidence of seasonal fluctuation in the likelihood of a woman in London being engaged in paid work ca. 1830, with the likelihood being higher in summer and autumn and, more markedly, lower in winter. Higher levels of unemployment or underemployment in winter accords with daylight being briefer in winter than summer and with the overall seasonal fluctuations of the London economy produced by weather, the season, and the timing of shipping arrivals.[86] Comparison with a mainly male sample is not here possible, as Voth's sample for 1830 was too small to permit analysis of seasonality.

Table 7. Logistic regressions: odds of paid work in a given season compared with odds of paid work in the rest of the year, 1829–1831

	Coefficient	Odds Ratio	Wald χ^2-statistic	Significance
Winter	−0.394 •	0.674	3.05	0.081
Spring	−0.0432	0.958	0.040	0.84
Summer	0.271	1.311	1.38	0.24
Autumn	0.212	1.236	0.80	0.37

Note: **, * and • denote significance at 99%, 95% and 90% level respectively.

Table 8. Logistic regression: odds of paid work in a given season other than summer compared with odds of paid work in summer, 1829–1831

	Coefficient	Odds Ratio	Wald χ²-statistic	Significance
Autumn	−0.0408	0.960	0.020	0.89
Winter	−0.499 •	0.607	3.16	0.075
Spring	−0.238	0.788	0.77	0.38

Note: **, * and • denote significance at 99%, 95% and 90% level respectively.

Table 9. Logistic regressions: odds of paid work on a given day of week compared with odds of paid work in the rest of the week, 1829–1831

	Coefficient	Odds Ratio	Wald χ²-statistic	Significance
Sunday	−0.362	0.696	1.49	0.22
Monday	0.157	1.170	0.32	0.57
Tuesday	0.0204	1.021	0.0058	0.94
Wednesday	0.00716	1.007	0.00058	0.98
Thursday	−0.484	0.616	2.62	0.11
Friday	−0.0252	0.975	0.0086	0.93
Saturday	0.553*	1.738	4.26	0.039

Note: **, * and • denote significance at 99%, 95% and 90% level respectively.

More surprisingly, in 1829–1831, whilst the likelihood of doing paid work, as noted above, is significantly greater on Saturdays than on other days of the week, the lesser likelihood of doing paid work on Sundays than on other days of the week is no longer statistically significant. I regress doing paid work against each day of the week individually (Table 9). There is still no evidence of Saint Monday, which accords with what Voth finds for his (mainly male) 1830 sample.[87] My results, however, suggest that, during 1760–1830, women in London also lost a day of non-work, albeit Sunday instead of Monday. But whilst corroborating a substantial rise in the likelihood of doing paid work on Sundays and Saturdays, the figures in Table 9 also show a substantial decrease in the likelihood of doing paid work on Thursdays. Along with the modest increase in annual total hours of paid work (see section 4.3), this suggests that increasing dispersion of work throughout the week, as well as greater incidence of Sunday working, was responsible for the statistical insignificance of Sunday's distinctiveness.

4.3 Annual totals

Applying the frequency method to my dataset, I obtained the estimates of London women's annual working hours in Table 10, where they are displayed alongside Voth's frequency-based and timing-based estimates and indices of change with the figures for the mid-eighteenth century as 100. The increase from the mid-

Table 10. Estimated annual hours of paid work in London

	Women (hours/year)	Index	Voth: frequency-based (hours/year)	Index	Voth: timing-based, varying hours/day (hours/year)	Index
1748–1761 (1749–1763 for Voth)	3,070	100	2,431	100	2,184	100
1829–1831 (1829–1830 for Voth)	3,169	103	3,350	138	3,274	150

Source for Voth's results: Voth, *Time and work*, 123–124.

eighteenth century to ca. 1830 is only 3 per cent in my dataset, compared with 38 per cent in Voth's frequency-based estimates and 50 per cent in his timing-based estimates. There was, it appears, little increase in women's annual working hours from the mid-eighteenth century to ca. 1830.

A comparison of the absolute figures that I calculate with those of Voth is risky because of possible differences in how we collected and categorised data. The figures in Tables 1 and 2 suggest that I was either more complete in finding observations with specific times in the source, or more liberal than Voth in including them in the dataset, but it is hard to know which. We can, however, bolster confidence in the direction and scale of the change observed by calculating alternative estimates using a restricted dataset from which observations coded as *closely related* to crime are excluded. Among observations thus coded are being in a shop or public house when a crime occurred there, handling goods that would later become or previously had been involved in crime, and working as a prostitute when a theft allegedly occurred. The results are displayed in Table 11. As noted in section 2.2, there are sizeable reductions in the estimates compared with using the full dataset. The direction of the diachronic change is still positive; its magnitude becomes greater, at 10 per cent. Nonetheless, this remains much smaller than the change found by Voth.

The same method can also be applied to leisure activities and to unpaid work (Tables 12 and 13). Only specified leisure activities (e.g., drinking in a public house, or being at the theatre) are counted as leisure, rather than the whole residual from paid or unpaid work, eating and sleeping. This is partly because the data do not readily allow the latter, residual category to be delineated, as many observations (e.g., of someone walking) do not indicate whether or not the activity observed took place during paid or unpaid work and have not been counted either as paid or unpaid work or as leisure. There was a small decline in unpaid work between 1748–1761 and 1829–1831, and a dramatic increase in

Table 11. Estimated annual hours of paid work of London women, excluding *closely related* cases

	(Hours/year)	Index
1748–1761	2,298	100
1829–1831	2,538	110

Table 12. Estimated annual leisure hours of London women

	All cases		Excluding *closely related* cases	
	(Hours/year)	Index	(Hours/year)	Index
1748–1761	313	100	346	100
1829–1831	552	176	680	197

Table 13. Estimated annual unpaid work hours of London women

	All cases		Excluding *closely related* cases	
	(Hours/year)	Index	(Hours/year)	Index
1748–1761	1,086	100	1,275	100
1829–1831	939	86	1,086	85

leisure activities. The decline in unpaid work accords with the hypothesis of an industrious revolution. The increase in leisure activities is not necessarily inconsistent with it, for it may be that people spent more time on leisure activities (which often involve consumption) while spending less time overall outside of paid and unpaid work, eating and sleeping. It should also be noted that, in both 1748–1761 and 1829–1831, women spent much less time on unpaid work than on paid work (the size of the difference – compare Table 13 with Tables 10 and 11 – makes this conclusion relatively safe, despite the problems with the frequency method that I have raised). This accords with what Whittle and Hailwood found for (mostly rural) southwest England from 1500 to 1700, and supports, with data from an urban context and a later period, their criticism of models that assume that most of early modern women's working time was taken up by unpaid housework and care work.[88]

5. Further discussion

The main methodological contribution of this article is to show that the simulated time-use recall method – seemingly a promising method for generating data on historical time-use – is subject to important shortcomings. Those shortcomings should be borne in mind in interpreting the results of my own research using this method. One limitation has been noted above: the sectoral distribution of subjects in my dataset may not be representative. The well-known problems of mid-nineteenth-century censuses as sources for women's employment make it difficult to know whether a dataset is sectoraly representative,[89] but the comparisons of my 1829–1831 sample with the 1841 and 1851 censuses in Appendix 1 in the online supplementary material suggest overrepresentation of trade and hospitality and underrepresentation of manufacturing (6.7 per cent in my 1829–1831 sample compared with 32.8 per cent in the 1851 census as categorised by Schwarz[90]).

Another limitation, however, is independent of shortcomings of the simulated time-use recall method: this study concerns only London, the characteristics of and trends in which cannot be assumed to hold for England at large. As Leigh Shaw-Taylor warns, 'patterns of female employment … were extremely geographically diverse'.[91]

This study suggests that the amount of time that women in London spent on paid work increased very little from the 1750s to 1830, by no more than 10 per cent, and that women in London did not observe Saint Monday either in the 1750s or ca. 1830. In contrast, for his mainly male sample, Voth found that there was a dramatic increase of 38 per cent–50 per cent in time spent on paid work from the 1750s to 1830, and that Saint Monday was observed in the 1750s but not ca. 1830. These differences again confirm – as Jane Humphries, Sara Horrell and colleagues have argued for some years[92] – that attending to gender difference, rather than extrapolating from data that exclusively or largely concern men, is essential if the study of overall economic conditions and trends during British industrialisation is to be put on a sound basis.

Voth's estimate of the overall increase in working time over this period needs to be revised downwards, but exactly how much it needs to be revised downwards is less clear. We could assume that the women in Voth's 1830 London sample had the same average working time as those in my 1829–1831 sample; then, since we know the respective numbers of women and men in Voth's 1830 sample, and the average working time of Voth's 1830 sample as a whole, we can infer the average working time of the men in Voth's 1830 sample. And if we know the ratio of women to men in London, we can then infer the average working time of the whole London population. However, given that the number of women in Voth's 1830 sample is very small and as such at high risk of being unrepresentative, the assumption that the women in that sample had the same average working time as those in my 1829–1831 sample is quite likely inaccurate. Moreover, in the absence of data on the gender ratio in London, we may have to use data for England at large, but it is hazardous to assume that the gender ratio in London was identical to that in England at large. Thus, the inference exercise just described would be poorly grounded, and is not undertaken here.

My results also (on the supposition that women's wages did not increase more rapidly than men's) count against Neil McKendrick's thesis that increased women's and children's earnings fueled a late-eighteenth-century growth in demand;[93] at least in London the part of any increase in earnings that resulted from increased working time rather than increased wages would seem to have come from men rather than women. My results are equivocal as to the vexed debate on whether women's work opportunities improved or narrowed during the industrial revolution, since longer or shorter hours do not *ipso facto* indicate improving or narrowing work opportunities. Longer hours might have been worked out of necessity,[94] because better work opportunities had been closed off.

The disparity in the increase in women's and men's working time points to the need for gender-sensitive explanations of increasing working time. Voth canvasses four possible explanations: decreasing morbidity, the lifting of a nutritional constraint, an increasing dependency burden, and 'the sirens of consumption'.[95] The first two of these do not plausibly explain either an aggregate increase in working

time over 1750–1830 or a gender difference in change.[96] Was the gender difference because the increasing dependency burden both caused women to do more unpaid work in the household and thus have less time for paid work, and demanded a higher household income, pushing men to do more paid work? This hypothesis is not supported by my data (Table 13 above), according to which women spent less time on unpaid work, not more, in 1829–1831 than in 1748–1761. But if the elimination of alternatives makes attractive the hypothesis of industriousness being driven by the desire for market-produced goods, still it should be asked why the hypothesised industrious revolution affected men more than women in London during 1750–1830.

That women in London did not have an industrious revolution during 1750–1830 leaves open whether this was because they already had their industrious revolution before ca. 1750, or because they never had an industrious revolution. A possible reason that women's hours of paid work did not increase during 1750–1830, then, is that they were already high ca. 1750 and could not easily become higher. Unfortunately, the simulated time-use recall method does not (as I have argued) yield reliable absolute figures, nor is it clear whether, among my calculations of annual working hours, it is those excluding *closely related* observations (yielding 2,298 hours/year in 1748–1761) or those including them (yielding 3,070 hours/year in 1748–1761) that are more comparable with Voth's calculations (yielding 2,431 hours/year in 1748–1761). However, that in London women did not observe Saint Monday in the 1750s, while men did, may support the view that women had by then already had their industrious revolution. This possibility would in fact accord better than Voth's findings with de Vries's account, on which the industrious revolution largely took place before 1750.[97] The higher of my 1748–1761 figures is close to what a recent study by Verhoeven finds for a mixed-gender sample (70 per cent men) in another northwest European commercial city, Antwerp. Verhoeven gives estimated annual working hours of above 3,300 hours for 1585–1750 and above 3,100 hours for 1776–1790 and finds that women spent a little less time in paid work than men.[98] Was it, then, English or London men who were exceptional in working less in the mid-eighteenth century? But Verhoeven's study uses the same simulated time-use recall method; the shortcomings of this method that I have identified demand caution with regard to the absolute figures that it yields, and the possibility of differences in the categorization of observations also makes comparison between Verhoeven's, Voth's and my results difficult.

Even if the speculation that I have just entertained were correct, it would shift (to the period before 1750) rather than resolve the problem of gender difference. Remaining within de Vries's consumer-demand-driven model, one potential explanation of gender difference (whether before or after 1750) worth exploring is the different occupational distributions of female and male workers. In de Vries's argument, the industrious revolution saw a simultaneous shift in the (upward-sloping) labour supply curve and the labour demand curve, as households sought to increase earnings in order to purchase market-produced consumer goods and the firms producing these goods expanded production in response to increasing demand.[99] The shift in aggregate labour demand, however, would not have been equally reflected in the labour demand curves of all firms, because only some firms

produced the goods for which demand increased; and in industries with a greater shift in labour demand (the more dynamic industries), the increase in labour input would be greater. Thus, if the distribution of workers in less and more dynamic industries had a gender bias, and the labour market was gender-segmented, the impact of increasing demand for market-produced goods would differ by gender; and if which industries were the more dynamic ones, or the gender biases in different industries, changed over time, this could explain why increases in working time took place at different times for women and men. Substantiating this hypothesis may give new impetus to old literatures about the nature and timeline of changes in consumer demand and about gender differences in specific occupations and gender barriers to occupational mobility.

Notes

1 E. P. Thompson, 'Time, work-discipline and industrial capitalism', *Past and Present* **38** (1967), 56–97.
2 J. de Vries, 'The industrial revolution and the industrious revolution', *Journal of Economic History* **54** (1994), 257. De Vries claims that the industrious revolution thesis solves the paradox of simultaneously increasing consumption and stagnating or declining real wages in early modern northern Europe. See also de Vries, 'Between purchasing power and the world of goods: understanding the household economy in early modern Europe', in J. Brewer and R. Porter eds., *Consumption and the world of goods in the seventeenth and eighteenth centuries* (London and New York, 1993), 85–132; de Vries, *The industrious revolution: consumer behaviour and the household economy, 1650 to the present* (Cambridge, 2008); de Vries, *The price of bread: regulating the market in the Dutch Republic* (Cambridge, 2019), 359–60. Similar views are expressed in E. Gilboy, 'Demand as a factor in the industrial revolution' (originally published 1932), in R. M. Hartwell ed., *The causes of the industrial revolution* (London, 1967), 121–38, and N. McKendrick, 'Home demand and economic growth: a new view of the role of women and children in the industrial revolution', in N. McKendrick ed., *Historical perspectives: studies in English thought and society in honour of J. H. Plumb* (London, 1974), 152–210. Thompson, by contrast, emphasised the coercive aspects of change and was concerned with what happened during or as an effect of industrialisation.
3 Gerrit Verhoeven, 'Fashionably late? Time, work and the industrious revolution in early modern Antwerp (1585–1795)', *Continuity and Change* **35** (2020), 255–79. I am grateful to a reviewer for bringing this article to my attention.
4 H.-J. Voth, *Time and work in England, 1750–1830* (Oxford, 2000), 246. Nonetheless, Voth tends to neglect the problem posed by gender imbalance for his conclusions. For example, table 3.36 on ibid., 134, purporting to display the 'sectoral origin of witnesses' *tout court*, displays figures identical to those in table 4 on Voth, 'The longest year', 1072, where it is revealed that the figures are in fact the 'sectoral origin of male witnesses'.
5 J. Humphries, 'Review of *Time and work in England, 1750–1830* by Hans-Joachim Voth' (2002), https://eh.net/book_reviews/time-and-work-in-england-1750-1830/ [accessed 21 February 2020].
6 McKendrick, 'Home demand and economic growth'; de Vries, *The industrious revolution*, 107–9, 142–3.
7 N. F. R. Crafts, *British economic growth and the industrial revolution* (Oxford, 1984), 110–11; Voth, *Time and work*, 238–41.
8 The method in explicit or implicit form is used in the much-used estimates of P. Lindert and J. Williamson, 'English workers' living standards during the industrial revolution: a new look', *Economic History Review* **36** (1983), 1–25, and of C. Feinstein, 'Pessimism perpetuated: real wages and the standard of living in Britain during and after the industrial revolution', *Journal of Economic History* **58** (1998), 625–58, and in G. Clark, 'Farm wages and living standards in the industrial revolution: England, 1670–1869', *Economic History Review* **54** (2001), 477–505, and J. Humphries and J. Weisdorf, 'The wages of women in

England, 1260–1850', *Journal of Economic History* **75** (2015), 405–7. On difficulties with inferring earnings from wages, see J. Hatcher and J. Z. Stephenson eds., *Seven centuries of unreal wages: the unreliable data, sources and methods that have been used for measuring standards of living in the past* (Cham, 2018), and J. Humphries and J. Weisdorf, 'Unreal wages? Real income and economic growth in England, 1260–1850', *Economic Journal* **129** (2019), 2867–87. See also F. W. Botham and E. H. Hunt, 'Wages in Britain during the industrial revolution', *Economic History Review* **40** (1987), 396; R. C. Allen and J. L. Weisdorf, 'Was there an "industrious revolution" before the industrial revolution? An empirical exercise for England, c. 1300–1830', *Economic History Review* **64** (2011), 715–29; S. Broadberry, B. M. S. Campbell, A. Klein, M. Overton, and B. van Leeuwen, *British economic growth, 1270–1870* (Cambridge, 2015), chapter 6; J. Z. Stephenson, 'Working days in a London construction team in the eighteenth century: evidence from St Paul's Cathedral', *Economic History Review* **73** (2020), 409–30.

9   Broadberry et al., *British economic growth*, chapter 6.

10   Humphries and Weisdorf, 'The wages of women'.

11   G. Clark, 'The macroeconomic aggregates for England, 1209–1869', *Research in Economic History* **27** (2010), 51–140.

12   Broadberry et al., *British economic growth*, 247–66.

13   Another way to reconcile them is to modify assumptions about labour's share of GDP. Conversely, with accurate estimates of real income based on accurate estimates of labour input, we can compute labour's share of GDP, a measure of inequality, by comparing income per head with GDP per head.

14   Broadberry et al., *British economic growth*, 266.

15   Humphries and Weisdorf, 'The wages of women', 2869, citing I. Blanchard, 'Labour productivity and work psychology in the English mining industry, 1400–1600', *Economic History Review* **31** (1978), 1–24.

16   J. Humphries and B. Schneider, 'Spinning the industrial revolution', *Economic History Review* **72** (2019), 126.

17   R. C. Allen, *The British industrial revolution in global perspective* (Cambridge, 2009).

18   J. Z. Stephenson, 'Mistaken wages: the cost of labour in the early modern English economy, a reply to Robert C. Allen', *Economic History Review* **72** (2019), 763. M. Kelly, J. Mokyr, and C. Ó Gráda, 'Precocious Albion: a new interpretation of the British industrial revolution', *Annual Review of Economics* **6** (2014), 369–70 similarly note, criticising Allen, that change in wage rate inaccurately proxies change in unit labour cost if labour productivity also changed.

19   Crafts, *British economic growth*, 78–91; N. F. R. Crafts and C. K. Harley, 'Output growth and the British industrial revolution: a restatement of the Crafts-Harley view', *Economic History Review* **45** (1992), 717–9.

20   Crafts and Harley, 'Output growth', 718.

21   Voth, *Time and work*, 229–34.

22   J. Rule, *The experience of labour in eighteenth-century industry* (London, 1981), 52–61; J. Rule, *The labouring classes in early industrial England, 1750–1850* (London and New York, 1986), 130–8; D. A. Reid, 'The decline of Saint Monday 1766–1876', *Past and Present* **71** (1976), 76–101; E. Hopkins, 'Working hours and conditions during the industrial revolution: a re-appraisal', *Economic History Review* **35** (1982), 52–66; M. A. Bienefeld, *Working hours in British industry: an economic history* (London, 1972), 20–41.

23   J. Mokyr, 'The industrial revolution and the new economic history', in J. Mokyr ed., *The economics of the industrial revolution* (Totowa, 1985), 32.

24   M. Harrison, 'The ordering of the urban environment: time, work and the occurrence of crowds 1790–1835', *Past and Present* **110** (1986), 134–68; J. Boulton, 'Economy of time? Wedding days and the working week in the past', *Local Population Studies* **43** (1989), 28–46; D. A. Reid, 'Weddings, weekdays, work and leisure in urban England 1791–1911: the decline of Saint Monday revisited', *Past and Present* **153** (1996), 135–63; M. Tiratelli, 'The working week in the long nineteenth century: evidence from the timings of political events in Britain', *Social Science History* **46** (2022), 291–313. M. Dribe and B. van de Putte, 'Marriage seasonality and the industrious revolution: southern Sweden, 1690–1895', *Economic History Review* **65** (2012), 1123–46 uses the timing of weddings to study change to the working year in the Swedish province of Scania. I am grateful to two reviewers for bringing Tiratelli's and Dribe and van de Putte's articles respectively to my attention.

25   M. Hailwood, 'Time and work in rural England, 1500–1700', *Past and Present* **248** (2020), 87–121; J. Whittle and M. Hailwood, 'The gender division of labour in early modern England', *Economic History Review* **73** (2020), 3–32. Similar uses of court records in other contexts include S. Ogilvie, *A bitter*

living: women, markets, and social capital in early modern Germany* (Oxford, 2003), and the work of Ågren and colleagues on gender and work in early modern Sweden, e.g., M. Ågren, 'The complexities of work: analyzing men's and women's work in the early modern world with the verb-oriented method', in R. Sarti, A. Bellavitis and M. Martini eds., *What is work? Gender at the crossroads of home, family, and business from the early modern era to the present* (New York, 2018), 226–42.

26 D. Woodward, *Men at work: labourers and building craftsmen in the towns of northern England, 1450–1750* (Cambridge, 1995), 122–35, for builders in northern English mainly in the seventeenth century; J. Hatcher, 'Labour, leisure and economic thought before the nineteenth century', *Past and Present* **160** (1998), 89–92, for several northern and midland collieries at different times from the late sixteenth to the late eighteenth century. L. H. Rosenband, 'The industrious revolution: a concept too many?', *International Labor and Working-Class History* **90** (2016), 213–43, gives figures for hours worked per day in papermaking at several workplaces in France, England and elsewhere in Europe in the eighteenth century.

27 S. Peers, 'Negotiating work: absenteeism at Quarry Bank Mill, Cheshire in 1790', *Transactions of the Historic Society of Lancashire and Cheshire* **158** (2009), 29–58; P. Kirby, 'Attendance and work effort in the Great Northern Coalfield, 1775–1864', *Economic History Review* **65** (2012), 961–83, on one Northumberland colliery; A. L. Murphy, 'Clock-watching: work and working time at the late eighteenth-century Bank of England', *Past and Present* **236** (2017), 99–132; Stephenson, 'Working days', on construction at St Paul's Cathedral.

28 G. Clark and Y. van der Werf, 'Work in progress? The industrious revolution', *Journal of Economic History* **58** (1998), 830–43.

29 Allen, *The British industrial revolution*, 13.

30 H.-J. Voth, 'Time and work in eighteenth-century London', *Journal of Economic History* **58**, 1 (1998), 29–58; H.-J. Voth, 'The longest year: new estimates of labor input in England, 1760–1830', *Journal of Economic History* **61**, 4 (2001), 1065–82.

31 Often Voth's work is cited in support only of a general trend of increasing working time: e.g., T. Bickham, 'Eating the empire: intersections of food, cookery and imperialism in eighteenth-century Britain', *Past and Present* **198** (2008), 76; C. Muldrew, *Food, energy and the creation of industriousness: work and material culture in agrarian England, 1550–1780* (Cambridge, 2011), 291–3; J.-Y. Grenier, 'Temps de travail et fêtes religieuses au XVIIIe siècle', *Revue Historique* **314** (2012), 609, which judges that 'the overall picture' that Voth sketches of an increase in annual working hours to a uniquely high level in European history, achieved mainly through increasing days worked per year rather than hours worked per day, 'appears sound and has hardly been debated' ('*Ce constat d'ensemble paraît solide et il n'a guère été discuté*'). Sometimes, specific figures from Voth are cited: e.g., M. Huberman, 'Working hours of the world unite? New international evidence of worktime, 1870–1913', *Journal of Economic History* **64**, 4 (2004), 987, which adopts Voth's estimate of annual working hours in 1830; Murphy, 'Clock-watching', 121, which cites Voth's estimate of the length of the working day in London.

32 de Vries, *The industrious revolution*, 91–2.

33 K. E. Gary and M. Olsson, 'Men at work. Wages and industriousness in southern Sweden 1500–1850', *Scandinavian Economic History Review* **68**, 2 (2020), 112.

34 Verhoeven, 'Fashionably late?', 270.

35 M. Koyama, 'The transformation of labor supply in the pre-industrial world', *Journal of Economic Behavior and Organization* **81**, 2 (2012), 505–23.

36 Broadberry et al., *British economic growth*, 263–4.

37 Stephenson, 'Mistaken wages', 763.

38 R. C. Allen, 'The hand-loom weaver and the power loom: a Schumpeterian perspective', *European Review of Economic History* **22** (2018), 386–7.

39 Allen and Weisdorf, 'Was there an "industrious revolution"', 716, 720–3.

40 K. Pomeranz, 'Beyond the East-West binary: resituating development paths in the eighteenth-century world', *Journal of Asian Studies* **61** (2002), 553, 557, citing Voth and de Vries to argue that declining daily real wage is insufficient to show that 'China was on a radically different and less promising path'; P. Parthasarathi, *Why Europe grew rich and Asia did not: global economic divergence, 1600–1850* (Cambridge, 2011), 42; P. Malanima, 'The long decline of a leading economy: GDP in central and northern Italy, 1300–1913', *European Review of Economic History* **15** (2011), 203; B. Blondé and G. Verhoeven, 'Against the clock: time awareness in early modern Antwerp, 1585–1789', *Continuity and Change* **28** (2013), 215.

41 L. D. Schwarz, 'Review of *Time and work in England, 1750–1830* by Hans-Joachim Voth', *Albion* **34** (2002), 667; G. Clark, 'Review of *Time and work in England, 1750–1830* by Hans-Joachim Voth', *Journal of Economic History* **61** (2001), 1123–4.

42 Humphries, 'Review'; H. Cunningham, *Time, work and leisure: life changes in England since 1700* (Manchester, 2014), 55.

43 Clark, 'Review', 1123.

44 Cunningham, *Time, work and leisure*, 55. Rosenband, 'The industrious revolution', which also casts doubt on Voth's explanation for change in working hours, nonetheless speaks of 'Voth's ingenious use of English court records' as 'the most compelling' of the studies prompted by de Vries's industrious revolution paradigm.

45 Voth, *Time and work* argues compellingly against the objections that access to clock time was strongly biased towards the wealthy (47–54), that the change in working hours that he finds was due to a change in the population's age structure (147–9), and that the time-lag between the events recalled and the giving of testimony made recollections inaccurate (141–5). Voth's claim that access to clock time was widespread throughout the urban population is supported by the more recent work of P. Glennie and N. Thrift (*Shaping the day: a history of timekeeping in England and Wales 1300–1800* (Oxford, 2009), sections 4.3–4.4 and chapter 5). In my dataset, there is a slight improvement in the precision with which times are reported from 1748–1761 to 1829–1831. Observations referring to a quarter of an hour (e.g., 'at quarter past twelve') or having a similar or greater level of precision account for 4.2% of observations in 1748–1761 and 9.4% in 1829–1831; observations referring to a half of an hour or an hour (e.g., 'at half past five', 'about six o'clock') or having a similar level of precision account for 59.7% of observations in 1748–1761 and 61.5% in 1829–1831; observations using 'between x and $x + 1$ o'clock' or having a similar level of precision account for 32.6% of observations in 1748–1761 and 27.1% in 1829–1831; and less precise observations account for 3.5% of observations in 1748–1761 and 1.8% in 1829–1831. These figures are plausible (and contrast with the puzzling distributions reported by Voth (*Time and work*, 56)).

46 Voth, *Time and work*, 246 n. 20.

47 M. Prior, 'Women and the urban economy: Oxford 1500–1800', in M. Prior ed., *Women in English society 1500–1800* (London, 1985), 95.

48 M. D. George, *London life in the XVIIIth century* (London, 1925), 184.

49 T. Meldrum, *Domestic service and gender 1660–1750: life and work in the London household* (Harlow, 2000), 31.

50 Voth, *Time and work*, 78–80.

51 Voth, 'The longest year', 1067 acknowledges this problem.

52 This point is made by Clark ('Review', 1123) and (for holidays alone) Schwarz ('Review', 667).

53 R. W. Malcolmson, *Popular recreations in English society 1700–1850* (Cambridge, 1973), 52.

54 J. Millan, *Coins, weights & measures. Ancient & modern, of all nations. Reduced into English on above 100 tables, collected & methodiz'd from Newton, Folkes, Arbuthnot, Fleetwood, &c.*, 6th edn (London, 1749), 15.

55 Voth, *Time and work*, 102 n. 116.

56 Ibid., 281; Millan, *Coins, weights & measures*, 15.

57 Voth, *Time and work*, 127.

58 C. Behagg, 'Controlling the product: work, time, and the early industrial workforce in Britain, 1800–1850', in G. Cross ed., *Worktime and industrialization: an international history* (Philadelphia, 1988), 48.

59 Quoted in R. B. Grindrod, *The wrongs of our youth: an essay on the evils of the late-hour system* (London, 1843), facsimile in *Demands for early closing hours: three pamphlets* (New York, 1972), 6.

60 Grindrod, *The wrongs of our youth*, 18–19.

61 *The Proceedings of the Old Bailey*, https://www.oldbaileyonline.org/ [accessed 17 February 2020], 16 July 1829, case no. 157.

62 Ibid., 4 December 1755, case no. 27.

63 Voth, *Time and work*, 215–20.

64 Ibid., 18.

65 L. D. Schwarz, *London in the age of industrialisation: entrepreneurs, labour force and living conditions, 1700–1850* (Cambridge, 1992), 15.

66 L. Faucher, 'Études sur l'Angleterre. I. White-chapel', *Revue des Deux Mondes*, new series **4** (1843), 78: '[I]ls sont courbés sur un métier, lançant la navette treize à quatorze heures par jour; c'est là le seul exercice que prennent ces malheureux, qui respirent rarement un air libre, et qui ne voient jamais le soleil qu'à travers les fenêtres de leurs tristes réduits.' The English translation is mine.

67 Voth, *Time and work*, 135.

68 Ibid., 134–5.

69 Put into doubt are de Vries's, Huberman's, Allen's and Allen and Weisdorf's uses of Voth cited above, as well as the explanation that Voth (*Time and work*, 242–68) provides for the extraordinarily high working times in England during the industrial revolution, that England experienced exceptionally long working hours because it was the first to industrialise.

70 A. W. Coats, 'Economic growth: the economic and social historian's dilemma', in N. B. Harte ed., *The study of economic history: collected inaugural lectures, 1893–1970* (London, 1971), 337.

71 The raw data collected is available in a spreadsheet from the author.

72 A disadvantage of this choice is that it does not allow us to see how far Voth's findings depend on the conditions of the years sampled. Voth (*Time and work*, 41–7) argues that the periods sampled had similar conditions, but this is uncertain. Sampling other years may be fruitful. At least I avoid, out of Voth's three periods, the one where the labour market was most likely to be affected by exceptional conditions, 1799–1803: whereas conditions in the 1750s were mostly good, except a minor depression in 1754, 1800–1801 had 'conditions verging on famine' (T. S. Ashton, *Economic fluctuations in England* (Oxford, 1959), 20–1, 25–6, 148–51; Schwarz, 'Review', 667).

73 *Proceedings of the Old Bailey*, 13 September 1758, case no. 24.

74 Voth, *Time and work*, 93–9.

75 Millan, *Coins, weights & measures*, 15; H. Freudenberger and G. Cummins, 'Health, work, and leisure before the industrial revolution', *Explorations in Economic History* **13** (1976), 1–12.

76 *A complete guide to all persons who have any trade or concern with the City of London, and parts adjacent*, 8th edn (London, 1760), 194; *The British almanac, of the Society for the Diffusion of Useful Knowledge, for the year 1830* (London, no date), 7; *The British almanac, of the Society for the Diffusion of Useful Knowledge, for the year 1831* (London, no date), 7; F. Summerly ed., *A hand-book for holidays spent in and near London* (London, 1842), 51–62.

77 The *odds* that a dummy variable has value 1 are the probability that it has value 1 divided by the probability that it has value 0. In a logistic regression, the *odds ratio* for an independent variable is how many times greater the odds that the dependent variable has value 1 are when this independent variable has value 1 than when this independent variable has value 0; the logistic *coefficient* is the natural logarithm of the odds ratio.

78 Voth, *Time and work*, 281.

79 D. A. Reid, 'Interpreting the festival calendar: wakes and fairs as carnivals', in R. D. Storch ed., *Popular culture and custom in nineteenth-century England* (London, 1982), 126, quoting [J. Jaffray], 'Hints for a history of Birmingham' [Birmingham Reference Library 174534], chapter 16.

80 Voth, *Time and work*, 93–4. Voth uses a Mann-Whitney *U* Test to show that there was no significant difference in the likelihood of a subject being at work during the cold half of the year compared with during the warm half. The logistic regressions to which I refer below convey the same result. Alternatively, a Mann-Whitney *U* Test on my sample, with being in the warm half as independent variable, yields a test statistic with an insignificant p-value of 0.375.

81 That is, the regression compares the odds, for each day of the week other than Sunday, that a random subject on this day is doing paid work with the odds that a random subject on Sunday is doing paid work, while controlling for the month of the year and the division of the day variables; the same goes *mutatis mutandis* for months of the year and divisions of the day.

82 Thus, it is statistically-significantly more likely on every other day of the week for a random subject to be doing paid work than on Sunday.

83 Thus, it is not statistically-significantly either more or less likely in any month or division of the day for a random subject to be doing paid work than in January or at night respectively.

84 Tiratelli, 'The working week in the long nineteenth century', 304–5.

85 Ibid., 309.

86 D. R. Green, *From artisans to paupers: economic change and poverty in London, 1790–1870* (Aldershot, 1995), 34–40; Schwarz, *London in the age of industrialisation*, 103–11. In the early nineteenth century, late spring and late summer to autumn were the peaks of shipping arrivals at the Port of London, and the Season lasted from the middle of spring to early summer. Seasonality's greater significance ca. 1830 than in the 1750s may be because of changes in the timing of the London Season. Before the late eighteenth century, the Season began in winter and ended in late spring, and perhaps compensated for the impact on employment of shorter daylight and slack shipping arrivals during winter.

87 In contrast to Voth, Tiratelli finds that (in Tilly's dataset) the pattern of the likelihood of political events being highest on Monday and then declining through the week persists from the 1750s to the 1830s, merely undergoing trendless fluctuation. But comparison between Tiratelli's, Voth's and my results is complicated by the fact that Tilly's dataset expands in scope after 1828 to cover the whole of Britain, not just southeast England. Tiratelli's, Voth's and my findings for London or southeast England all differ from the pattern that Tiratelli finds in northern English towns, where Saint Monday was widely practised in the late eighteenth and early nineteenth centuries and begins to decline only thereafter (broadly in with Thompson's timeline for the decline of Saint Monday). Tiratelli, 'The working week in the long nineteenth century', 300–5.

88 Whittle and Hailwood, 'The gender division of labour', 7, 18–23.

89 On women's work in the censuses, see S. Alexander, 'Women's work in nineteenth-century London; a study of the years 1820–1850', in J. Mitchell and A. Oakley eds., *The rights and wrongs of women* (Harmondsworth, 1976), 63–6; E. Higgs, 'Women, occupations and work in the nineteenth century censuses', *History Workshop Journal* 23 (1987), 59–80; B. Hill, 'Women, work and the census: a problem for historians of women', *History Workshop Journal* 35 (1993), 78–94; E. Higgs and A. Wilkinson, 'Women, occupations and work in the Victorian censuses revisited', *History Workshop Journal* 81 (2016), 17–38; and the essays by Shaw-Taylor, Higgs and Michael Anderson in N. Goose ed., *Women's work in industrial England: regional and local perspectives* (Hatfield, 2007).

90 Schwarz, *London in the age of industrialisation*, 15.

91 L. Shaw-Taylor, 'Diverse experiences: the geography of adult female employment in England and the 1851 census', in Goose ed., *Women's work in industrial England: regional and local perspectives* (Hatfield, 2007), 50.

92 Recent work includes S. Horrell, J. Humphries and J. Weisdorf, 'Beyond the male breadwinner: life-cycle living standards of intact and disrupted English working families, 1260–1850', *Economic History Review* 75 (2022), 530–60; S. Horrell, J. Humphries and J. Weisdorf, 'Malthus's missing women and children: demography and wages in historical perspective, England 1280–1850', *European Economic Review* 129 (2020), article 103534.

93 McKendrick, 'Home demand and economic growth'.

94 One recent debate on the industrious revolution thesis concerns whether, even if there was an increasing in working time, it was driven by necessity and not, as de Vries would have it, changing tastes. See, e.g., Gary and Olsson, 'Men at work'.

95 Voth, *Time and work*, 181–210.

96 Voth argues against these two explanations in *Time and work*, 161–74, 181–4, 188–91.

97 De Vries himself, however, thought that Saint Monday was a symptom of 'binge leisure' resulting from an overall intensification of work and emerged after 1780 ('The industrial revolution', 260).

98 Verhoeven, 'Fashionably late?', 258, 268, 270–2.

99 de Vries, 'The industrial revolution', 249.

French Abstract

En premier lieu cet article offre une critique méthodologique de l'ouvrage marquant de Hans-Joachim Voth, d'influence notable sur le domaine, une étude du facteur travail en Angleterre pendant la révolution industrielle. Nous soutenons que la méthode ingénieuse de Voth, en principe largement applicable, qui consiste à évaluer le temps passé au travail, en prenant pour source les témoignages enregistrés lors des affaires judiciaires, présente de tels biais que, pour le moins, les chiffres absolus produits ont peu de chance d'être fiables. En second lieu, tout en tenant compte des lacunes de la méthode proposée alors, nous en avons appliqué la recette à une séries de procès qui furent traités au tribunal d'Old Bailey, afin d'étudier l'évolution du temps de travail des femmes à Londres, de 1750 à 1830. Il en ressort, entre autres résultats, qu'elles n'observaient déjà plus le lundi férié dans les années 1750, et que le temps que les Londoniennes consacraient à un travail rémunéré n'augmenta que bien légèrement entre 1750 et 1830.

German Abstract

Dieser Beitrag widmet sich im ersten Schritt einer methodologischen Kritik an Hans-Joachim Voths einflussreicher Untersuchung über den Arbeitseinsatz während der Industriellen Revolution in England und argumentiert, dass Voths originelle und wohl auf viele Fälle anwendbare Methode, aus Zeugenaussagen vor Gericht auf die Zeitverwendung zu schließen, zumindest insofern fehlerhaft ist, als die von ihm vorgelegten absoluten Zahlen vermutlich unglaubwürdig sind. Im zweiten Schritt wird, eingedenk solcher Defizite, eine Variante dieser Methode auf die Gerichtsakten des Old Bailey angewendet, um zu untersuchen, inwieweit sich die Arbeitszeit von Frauen in London zwischen 1750 und 1830 verändert hat. Die Ergebnisse zeigen unter anderem, dass Frauen in London schon in den 1750er Jahren den Blauen Montag nicht einhielten und dass die Zeit, die Frauen in London auf bezahlte Arbeit verwendeten, zwischen 1750 und 1830 nur leicht anstieg.