

Humphries, Jane; Weisdorf, Jacob

**Working Paper**

## Unreal wages? Real income and economic growth in England, 1260-1850

EHES Working Papers in Economic History, No. 121

**Provided in Cooperation with:**

European Historical Economics Society (EHES)

*Suggested Citation:* Humphries, Jane; Weisdorf, Jacob (2017) : Unreal wages? Real income and economic growth in England, 1260-1850, EHES Working Papers in Economic History, No. 121, European Historical Economics Society (EHES), s.l.

This Version is available at:

<https://hdl.handle.net/10419/247052>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

UNREAL WAGES?  
REAL INCOME AND ECONOMIC GROWTH IN  
ENGLAND, 1260-1850

Jane Humphries  
University of Oxford

Jacob Weisdorf  
University of Southern Denmark

UNREAL WAGES?  
REAL INCOME AND ECONOMIC GROWTH IN ENGLAND,  
1260-1850<sup>1</sup>

Jane Humphries\*  
University of Oxford

Jacob Weisdorf<sup>\*\*</sup>  
University of Southern Denmark

**Abstract**

Historical estimates of workers' earnings suffer from the fundamental problem that annual incomes are inferred from day wages without knowing the length of the working year. This uncertainty raises doubts about core growth theories that rely on existing income estimates to explain the origins of the wealth of nations. We circumvent the problem by building an income series of workers employed on annual rather than casual contracts. Our data suggests that existing annual income estimates based on day wages are badly off target, because they overestimate the medieval working year but underestimate the working year during the industrial revolution. Our revised annual income estimates indicate that modern economic growth began almost two centuries earlier than commonly thought and was driven by an 'Industrious Revolution'.

JEL classification: J3, J4, J5, J6, J7, J8, N33

Keywords: England; Industrial Revolution; Industrious Revolution; Labour Supply; Living standards; Malthusian Model; Modern Economic Growth; Real Wages

<sup>1</sup> We thank Bruce Campbell, Tommy Bengtsson, Steve Broadberry, Greg Clark, Jan de Vries, Sara Horrell, John Hatcher, Nuno Palma, Eric Schneider, Jaime Reis, Mauro Rota, Jacob Soll, Michelangelo Vasta, as well as the conference and seminar participants at the Fifth CEPR Economic History Symposium, the 1st Sound for Seniors Workshop, the 17th World Economic History Congress, the 8th World Congress of Cliometrics, 12th European Historical Economics Society Conference, the Economic History Society Annual Conference 2016, the Linda and Harlan Martens Economic History Forum, 'The First Modern Economy: Golden Age Holland and the Work of Jan de Vries' at the Huntington Early Modern Studies Institute, University of Southern California, 2017, and seminar participants at the Sant'Anna School of Advanced Studies, the European University Institute, at the Universities of Almeria, Madrid (Carlos III), Evora, Siena, Valencia, and Utrecht for their helpful comments and suggestions. We are grateful to Jacob Field and Roderick Floud for sharing data.

\* Jane Humphries, Professor of Economic History, All Souls College, Economics and Business, University of Oxford,  
E-mail: [jane.humphries@history.ox.ac.uk](mailto:jane.humphries@history.ox.ac.uk).

\*\* Jacob Weisdorf, Professor of Economics and Business, Department of Economics and Business, University of Southern Denmark, DK-5320 Odense,  
E-mail: [jacobw@sam.sdu.dk](mailto:jacobw@sam.sdu.dk).

**Notice**

The material presented in the EHES Working Paper Series is property of the author(s) and should be quoted as such. The views expressed in this Paper are those of the author(s) and do not necessarily represent the views of the EHES or its members

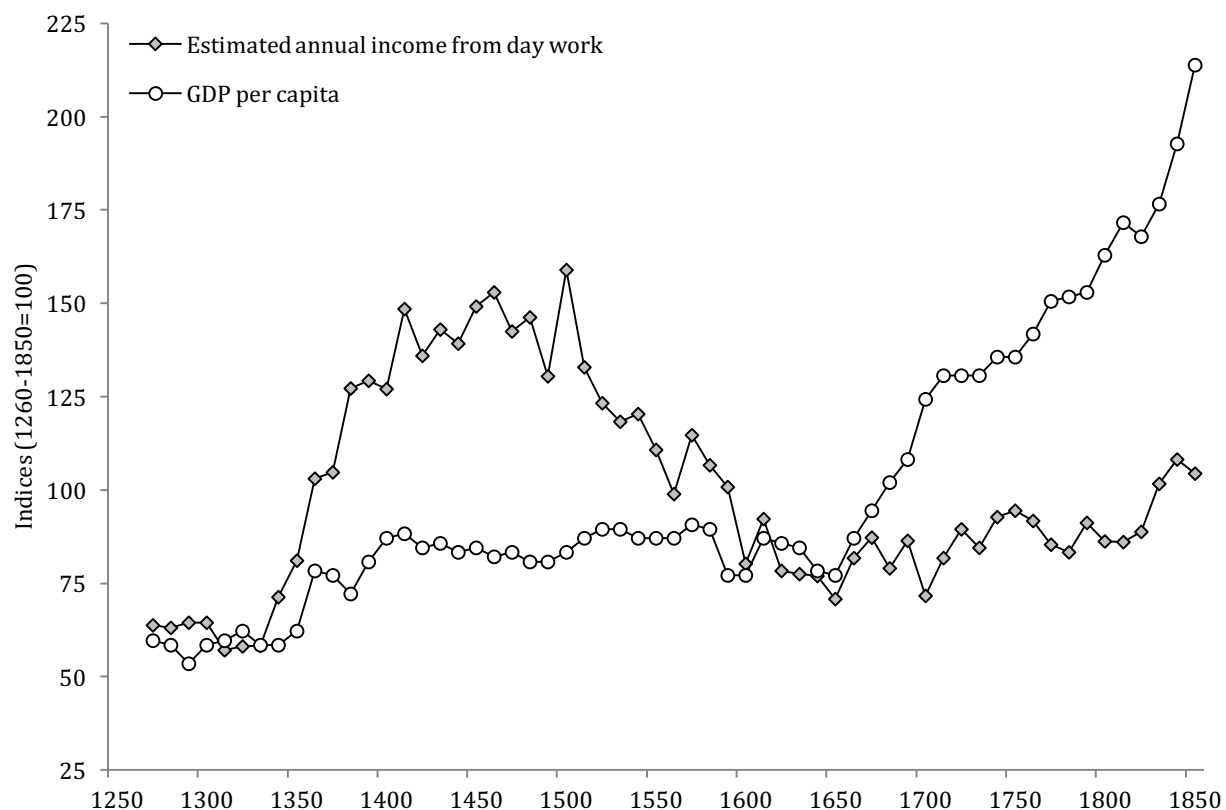
## Introduction

Historical estimates of workers' earnings are seriously out of tune with trends in GDP per capita. This inconsistency raises doubts about core theories that build on existing income estimates to answer one of the key questions in economic history: when and how did western societies grow rich? The issue is best understood in the light of two conflicting views about long-run economic development. The traditional 'Malthusian' view, articulated in Clark (2005; 2007) and Galor (2000; 2011), sees all societies worldwide as being characterised by wide swings in real earnings linked to rising and falling populations, but with no sustained income growth until the latter half of the 19th century. The competing 'Revisionist' view, expressed in De Vries (2008) and supported by recent estimates of per capita GDP presented in Broadberry et al (2015), argues it is possible to discern incremental but compounded gains in real earnings long before that time, notably in England, the cradle of the industrial revolution. The two conflicting views are illustrated by Figure 1, which shows how real incomes in England, as represented in mainstream accounts by the estimated annual earnings of day workers, rise sharply in response to the demographic disaster of the Black Death, then fall as the population recovers, and eventually stagnate during the classic years of the industrial revolution. Figure 1 also shows how per capita GDP follows a very different path, with modest economic growth in the aftermath of the Black Death gathering momentum after 1650.

The divergences between the trajectories of real incomes and per capita GDP have called for clarification. The standard response draws on two central narratives relating to changing factor payments. The first narrative, known as the 'Golden Age of Labour', refers to the period after 1350 when conventional indices of real earnings surged while per capita GDP stagnated. The Black Death, and ensuing demographic catastrophe, is thought to have caused food prices to fall and wages to rise, so benefiting workers at the expense of landowners (e.g. Postan 1966). The second narrative, known as 'Engels' Pause', refers to the period c. 1650-1830 when the standard measures of real income stagnated while per capita GDP grew. In this case, industrial technical progress supposedly skewed income in favour of profits, so this time benefiting capitalists over labourers (e.g. Allen 2009). The diverging trends shown in Figure 1 are not unique to England, but apply with equal strength to France, Germany, Holland, Italy, and Spain (e.g. Campbell 2013).

**Figure 1**

Indices of GDP per capita and estimated real annual income of day workers, 1260-1850



*Note:* Annual real income is constructed by dividing annual nominal income by 365 days multiplied by daily costs of consumption (see Table A1). Annual nominal income is inferred from day work and computed by multiplying day wages by 250 days. Real income and GDP per capita are indexed using their respective averages of the period 1260 to 1850. *Sources:* Day wages: Clark (2007, Table A2). Daily costs of consumption: Allen (Link). GDP per capita: Broadberry et al (2015).

As is made clear in the macroeconomic growth tradition, the discrepancy between trends in real incomes and per capita GDP, and hence the conflict between the Malthusian and Revisionist views, can be reconciled by variations in annual earnings caused by hypothetical changes in annual labour supply per head (e.g. Angeles 2008; Broadberry et al 2015; De Vries 2008; Hatcher 2011; Nuvolari and Ricci 2013; Palma and Reis 2016). The problem lies in giving such hypotheses empirical substance. Hitherto, annual incomes have been constructed using day rates paid to casual workers. To gross these up on an annual basis requires knowledge of the number of days worked, which is rarely provided in the surviving records. As a result, current estimates of workers' annual incomes, as shown in Figure 1, are subject to measurement error pertaining to scholarly ignorance about casual workers' annual labour input. This issue has been widely acknowledged in previous studies ever since Phelps-Brown

and Hopkins (1956) first warned against predicting workers' annual incomes from their pioneering long-run day-wage series in the absence of knowledge about the length of the working year.

In trying to side-step the issue, previous research has relied on a crude but simple conjecture. Namely that workers always worked for 250 (or sometimes 260) days per year (e.g. Allen 2001; Allen 2007; Allen and Weisdorf 2011; Allen et al 2012). This assumption underpins the standard account of the evolution of workers' incomes depicted in Figure 1. Equal to a 5-day working week plus two weeks' holiday, this conjecture is perhaps not unreasonable in today's world. But in the historical context, as Hatcher (2011) has emphasised, it involves two controversial suppositions about the days that casual workers were able, needed, or wished to work. The first supposition is that day work was always available 250 days per year, which Hatcher claims is out of touch with reality, because 250 annual working days would have made casual workers much better off than many of their land-owning counterparts. The second supposition is that casual workers always supplied 250 days of labour, which Hatcher points out involves an entirely inelastic labour supply, contradicting evidence that medieval workers set themselves goals in terms of cash and ceased to work once these were achieved (Farmer 1996; Hatcher 1998).

The historical record provides occasional indications of the length of the working year. These suggest that labour input varied widely in the past (Allen and Weisdorf 2011). For example, numbers provided by Blanchard (1978) indicate that the medieval working year was sometimes only 165 days long, while Voth's estimates suggest that the industrial-revolution working year was as long as 330 days (Voth 2000; 2001). If these numbers are even roughly correct, then existing proxies for annual income, which are based on 250 days of work, overestimate medieval incomes as much as they underestimate early industrial incomes, by some 30 per cent. The discipline's best guesses about annual incomes could well be off target. This raises questions about levels and trends in existing income estimates with ramifications for core theories of long-run growth, which build on these estimations to account for the wealth of nations, including the Malthusian model (e.g. Clark 2007), Unified Growth Theory (Galor 2011), and the so-called 'little divergence' and 'great divergence' hypotheses (e.g. Allen 2001).

This paper tackles the issue by constructing an income series for English male workers employed on *annual* contracts. Our estimates are comparable to the authoritative income series of day workers reported in Allen (2007) and Clark (2004; 2007). Yet, our new

estimates circumvent the central problem of previous studies related to estimating annual income in the absence of information about days worked.<sup>2</sup> With the exception of Clark and Van Der Werf (1998), discussed below, previous studies have ignored annual payments in the construction of long-run income series. One reason for this is that annual workers usually received board and lodging in addition to any cash payment, so complete estimates require the valuation of such perquisites to attain proper income estimates. In this paper, as explained below, we impute values for workers' board and lodging from a historical consumption basket proposed in Allen (2009). This enables the construction of a new long-run series of historical workers' annual earnings, which fits markedly better with per capita GDP compared to earnings inferred from day wages and the debatable assumption of 250 days of work.

Our new income estimates speak to a number of long-standing central debates in the field of economic history. But two key findings stand out. The first is that early modern growth began in the first half of the 17th century, nearly two centuries before the conventional date juncture. Not only do rising earnings before 1800 challenge any lingering attachment to the Malthusian model as a relevant interpretive frame for economic development in pre-industrial societies. They also suggest the escape from the so-called 'Malthusian trap' coincided with the rise in Atlantic trade, which Acemoglu et al (2005) contends was a significant stimulus to early modern economic development.

The second finding questions the common assumption used in existing studies that workers worked for 250 days per year. Clark and Van Der Werf (1998) argued that casual workers' yearly earnings varied in tandem with their annually-employed counterparts (possibly with a premium as compensation for shouldering job insecurity or a penalty for being less preferred). Clark and Van Der Werf's assumption enables us to impute the annual number of days worked by dividing our annual income estimates by the prevailing day rates. This exercise informs us that medieval workers put in 2-3 weekly days of work on average, whereas industrial-revolution workers toiled for more than six days per week. Our imputed working year fits much better with the scattered, independent estimates of working time found in the surviving records than the conventional assumption of an unchanged 250 days.

With far smaller medieval labour inputs than previously assumed, the post-Black Death 'Golden Age' of the 14-15th centuries glittered much less brightly than annual income estimates grossed up from day wages have suggested. This finding agrees with John Hatcher's

---

<sup>2</sup> Our annual payments also avoid the problem that existing annual income estimates are based exclusively on day wages paid during off-season work, i.e. when daily remunerations were markedly lower than those paid during the hay and harvest seasons or other times of high demand.

reference to previous estimates of day workers' annual earnings as 'unreal wages' (Hatcher 2011). The subsequent gradual rise in annual labour inputs, reaching well over 300 days per year after 1750, lends empirical support to Jan de Vries' idea of an 'Industrious Revolution' (De Vries 1994; 2004) and to Allen's allusion to Britain's industrial revolution as '1% inspiration and 99% perspiration' (Allen 2011, p. 33).

### **Methods and Data**

Historians have argued that the frequency of annual service, combined as it often was with co-residence, declined in the early modern period as a result of rising food prices, increasing rents, and employers' growing preference for privacy (Kussmaul 1981). But census enumerators' books, farm surveys, and oral histories have shown that annual service was under-recorded in the early occupational censuses and remained important well into the 19th century (Sheppard 1961; Devine 1984; Short 1984; Howkins 1994; Counce 1997). Thus, for much of the extended time period with which we are concerned, annual service, habitually with co-residence or board, flourished in all sectors of the economy, its neglect in the construction of historical income indices a glaring omission.

Estimates suggest that annual workers' share ranged from almost half of the work force in the mid-13th century (Campbell 2016) to some 15-20 per cent by the early 19th century (Humphries 2004). Annual contracts were particularly important in agriculture, where most of our wage data originates. The traditional service contract, which often combined commitment for a year with board and lodging in or near the place of work, made it easier for employers to align incentives; it ensured the availability of labour at key points in the agricultural cycle; and it reduced monitoring and muster costs (Woodward 2000). In return, such contracts cut the costs of travelling to and from work and insured workers against rising rents and food prices.

For most farmers, a mix of permanent and day labourers best met their needs, the ratio depending upon farm type, price variation, and the broader political and economic context (Kussmaul 1981; Foster 2002; Whittle 2015). Whereas previous long-run series of workers' earnings are solely based on payments for daily employment, the series presented here concerns payments for annually-contracted work. By weighing the payments of the two types of workers together, an exercise which we perform further below, our study offers a very first attempt to measure the annual earnings of an average workers between 1260 and 1850.



### *Payments in Kind*

While payments for annual service eliminate the need for ancillary assumptions about the length of the working year (because annual income can be read directly in historical account books), they introduce a practical obstacle explaining their neglect in previous accounts of historical income. Annual workers often received non-pecuniary benefits in addition to their cash payments, usually in the form of board and lodging. Even those who resided elsewhere, some *famuli* for example in the medieval period, enjoyed perquisites in the form of grain liveries or other supplements (Poos 1991; Hilton 1975; Hanawalt 1986). Ideally, such in-kind rewards should be valued on a case-by-case basis and added to any cash payments to determine overall remuneration. Where such computations are possible we use them to check our findings in the sensitivity section below, but in general the historical evidence on the value of perquisites is insufficient to support the construction of a comprehensive series based on a case-by-case basis.<sup>3</sup>

An alternative way to ‘monetise’ in-kinds is to assume that they covered workers’ subsistence, meaning their food, drink, clothes, and housing. Allen’s (2009) so-called ‘respectability’ consumption basket provides a practical tool for capturing historical workers’ subsistence (Humphries and Weisdorf 2015). Table 1 lists the commodities included in Allen’s basket and their quantities. The basket offers 2,500 calories per day considered to be a ‘respectable’ amount of nourishment for an adult person. In addition to food and drink, the basket also contains linen for clothes, candles and lamp oil for light, fuel for heat, and a rent allowance. Using historical prices, also provided by Allen,<sup>4</sup> the basket’s annual value for each specific year can then be added to a worker’s cash stipend, and the resulting income estimate transformed into real earnings in the standard way, as explained below. In a later sensitivity analysis, we discuss the usefulness of the Allen’s basket as a way to monetise workers’ non-pecuniary benefits by checking them against those cases where the monetary values of workers’ benefits can be read directly from the sources.

---

<sup>3</sup> The problem of monetising payments in kind is not unique to workers employed on an annual basis. Day labourers sometimes received an allowance for the money value of food and drink and sometimes did not, making it hard to provide an exact day wages based on the existing records.

<sup>4</sup> The average daily cost of the ‘respectability’ basket between 1260 and 1850, taken from Allen’s website (Allen *Link*), is summarized in Table A1 in our Appendix by decade.

**Table 1**  
Allen's 'respectability' consumption basket (for one adult person)

Good	Quantities per year	Calories per day
Bread	234 kg	1,571
Beans/peas	52 L	370
Meat	26 kg	178
Butter	5.2 kg	104
Cheese	5.2 kg	54
Eggs	52 each	11
Beer	182 L	212
Soap	2.6 kg	---
Linen	5 m	---
Candles	2.6 kg	---
Lamp oil	2.6 L	---
Fuel	5.0 M BTU	---
Rent	5% allowance	---
<b>Total</b>		<b>2,500</b>

*Source:* Allen (2009, Table 2.1).

### *Workers' Earnings and Their Sources*

We follow the traditional approach to searching for historical records of workers' payments. Some of our data comes from secondary sources and classic collections of printed primary material, such those of James Edwin Thorold Rogers and Lord William Beveridge. We also searched less known secondary sources as listed in the bibliography below. We have supplemented these records with new material from diverse archival and printed primary sources, including manorial accounts, estate accounts, farm accounts, settlement examinations, diaries, and memoirs. All sources used are listed in our Appendix.

The geographical coverage is comparable to that of the authoritative series for day workers provided by Clark (2007), whose sources we systematically revisited, alongside other depositories, many uncovered in our analogous work on women's wages (Humphries

and Weisdorf 2015). Our male income series include 6,860 annual payments in total.<sup>5</sup> Table A1 in the Appendix report their distribution across nearly six centuries of English history.

Building an income series from heterogeneous sources, as scholars engaging in comparable endeavours have previously noted, requires care and consistency. Geographically and occupationally diverse evidence must be treated with attention to avoid the introduction of misleading trends associated with compositional shifts. We have adopted three main strategies to curb such dangers. First, we endeavoured to avoid reliance on any single source or location in any specific decade. Our data (see Table 2) come mainly from the centre of England and the south, but with some northern coverage as well.<sup>6</sup> Furthermore, in order to make our series comparable to those for unskilled day workers (e.g. Allen 2007; Clark 2004; 2007), we excluded observations related to workers with managerial or financial responsibilities, ignoring also workers whose job titles implied specialist training.<sup>7</sup> We have categorised our occupations into three main groups (reported in Table 2): men and helpers, labourers, and servants. Examples of 'men' are coachmen, footmen, herdsman, horsemen, and watchmen, while 'helpers' include cook's help, groom's help, hunter's help, and so on. Sometimes, although the source reported that the work was unskilled, no occupational title was provided. This gave rise to a fourth category, unknown work, which made up about one in three workers. Our regression analysis below shows, however, that workers with no occupational designation were paid in line with men and helpers.

---

<sup>5</sup> Our 6,860 annual payments appear perhaps to be a modest number compared to the 19,417 casual payments reported in Clark (2007). However, a large share of those casual payments are not day rates, but threshing rates. Also, it is worth noting that payments for day work are much easier to find in the surviving records: a day worker can potentially be recorded 365 times each year, but as an annual worker he can be observed only once.

<sup>6</sup> Regions included in the south are the South West, the South East, as well as East Anglia. The centre includes East and West Midlands. The north includes the remaining regions (the North West and North East, as well as Yorkshire). We have excluded payments from the city of London where labour was at a premium.

<sup>7</sup> To illustrate: the Shuttleworth household in 1597 included 14 full-time male employees (Harland, 1856; Harland, 1857; Foster, 2002). The four highest paid workers were the butler and brewer, the cook, the miller and the steward, who all earned over £2 per annum that year and were excluded. The shepherd and gardener, with less status and skill, earned £1 13s 4d and £1 12s 0d, close to the wage of £1 6s 8d received by the two best-paid farm workers, all of whom were included. Four of the remaining farm workers, earning between £1 3s 4d and £1 0s 0d, were also included while the two poorest paid (on 16s and 12s) were shown by their wage trajectories to be not yet adults and so excluded.

**Table 2**  
Number of annual payments, by region and occupational category

<u>Occupation</u>	Frequency	Per cent	Cum.	<u>Region</u>	Frequency	Per cent	Cum.
Men/Helpers	2,771	40.6	40.6	South	2,342	34.3	34.3
Servants	871	12.8	53.3	Centre	3,537	51.8	86.0
Labourers	556	8.1	61.4	North	954	14.0	100.0
Unknown	2,635	38.6	100.0				
All	6,860	100		All	6,860	100	

*Source:* see the text.

Last but not least, we account for the occupational and spatial heterogeneities reported in Table 2 above by running a piecewise OLS model of the following form:

$$\ln(\text{Wage}_{it}) = \alpha_i + \sum_j \gamma_j \text{Work}_j + \sum_k \eta_k \text{Region}_k + \sum_l \varphi_l \text{Decade}_l + e_{it}$$

where  $\text{Wage}_{it}$  is a wage payment made to individual  $i$  at year  $t$ ;  $\text{Work}_j$  is a dummy for each of the four categories of work (helpers, servants, labourers, and unknown occupations) reported in Table 2 above;  $\text{Region}_k$  is a dummy for each of the three macro regions (south, centre, north) of Table 2 above; and  $\text{Decade}_l$  is a dummy capturing the decade during when the wage payment was observed.<sup>8</sup> The model is run piecewise, i.e. for each of the following periods: 1260-1349; 1350-1599; 1600-1699; and 1700-1850. This periodisation is motivated by the structural breaks in previous wage series. Our national annual income series is then predicted using the regression coefficients reported in Table A2 in the Appendix.<sup>9</sup>

Consistent with historians' expectations, the estimated coefficients show that labourers (the reference group) were often paid mildly less than the other three groups of workers. The analysis also suggests that workers in the north of England (the reference group) were

<sup>8</sup> Following Clark (2007) but using piecewise estimation to accommodate different trends by sub-period.

<sup>9</sup> The predicted nominal payments come from summing up the relevant regression coefficients (the constant plus the point estimates for each occupational group and macro region plus the decade dummy). That means the nominal payment for the 1260s is  $e(5.560-0.0563+0.0371-0.0781+0.0167+0.0127-0.0986)=e(5.3935)=220$ . This avoids compositional shifts in the data, as we give equal weight to each of the occupational groups and regions.

generally poorer paid than their central and especially southern England counterparts. However, after 1700 and during the classical years of the industrial revolution (1705-1850), which began in the north of England, northern workers were significantly better paid than their southern peers. The regression coefficients reported in Table A2 can then be used to estimate a national nominal wage by decade controlling for variation in the representation of regions and broad occupational categories.

## Results

The predicted nominal annual payments, i.e. the cash component and the monetised benefits based on Allen's basket, are reported in Table A1 in the Appendix, by decade. The nominal payments were then transformed into real incomes, also reported in Table A1, by dividing them by the annual cost of living estimates, which in turn were obtained by multiplying the daily consumer prices of Allen's 'respectability' basket described above by 365 days. The resulting estimated (and indexed) real annual incomes are illustrated in Figure 2, along with indices for per capital GDP as well as the conventional account of annual income obtained from day wages multiplied by 250 working days, as reported in Figure 1.<sup>10</sup>

Figure 2 captures three key findings. First, real incomes from annual work, illustrated by the bold, black line, exhibit systematic and large divergences from annual incomes estimated on the basis of day rates multiplied by 250 days of work. If we suppose for a moment (but discuss in detail below) that income from casual and annual work was roughly identical, arbitrated into convergence by the flexibility of employers and the mobility of workers between types of contract as argued in Clark and Van Der Werf (1998), then this suggests that annual incomes inferred from day work (squares) are heavily burdened by a misrepresentation of day workers' annual labour input (the 250 days assumption) and therefore misrepresent annual earning possibilities in the past.<sup>11</sup> This conclusion, consistent with conjectures expressed in Broadberry et al (2015) and Campbell (2013), is supported by a considerably better fit between annual incomes from annual work (solid bold line) and per capita GDP (circles) compared to annual income from day work (squares). We return to the possibility of arbitrage between annual and casual work further below, where we also discuss how this links to a varying working year.

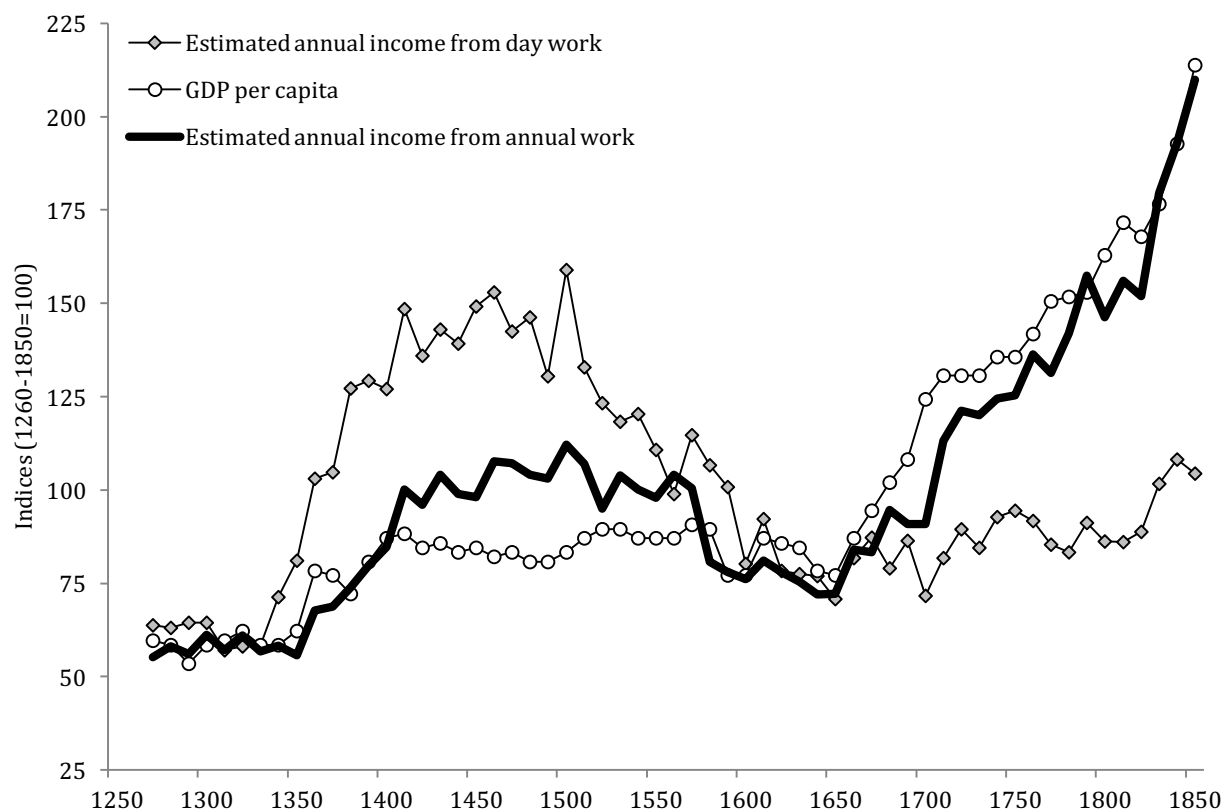
---

<sup>10</sup> Figure A1 in the Appendix shows the raw data averages against the estimated data based on the regression coefficients reported in Table A2.

<sup>11</sup> We discuss the assumption of arbitrage between casual and annual work in the sensitivity section further below.

**Figure 2**

Indices of GDP/capita and estimated real annual income in day and annual work, 1260-1850



*Note:* Annual real income is constructed by dividing annual nominal income by 365 days multiplied by daily costs of consumption (see Table A1). Annual nominal income from day work (squares) is computed by multiplying day wages by 250 days. Annual nominal income from annual work (black), which is predicted based on the regression coefficient reported in Table A2, is the sum of cash payments and monetised in-kind benefits. *Sources:* Day wages: Clark (2007, Table A2). Annual wages: see the text. Daily costs of consumption: Allen (Link). GDP per capita: Broadberry et al (2015).

The second key finding is that the post-Black Death ‘Golden Age’ glittered much less brightly than is suggested by annual income estimates from day rates plus the 250 days assumption. The Golden Age apogee according to Figure 2 (solid bold line) was lower and surpassed much earlier than other authors have proposed. Annual workers’ ‘golden’ incomes were outshone by the early 18th century rather than by the late 19th century, as posited by Clark (2007). If annual income from casual work and annual work was roughly the same, a matter we return to below, then our conclusion aligns with Hatcher’s (2011) intuition that day workers’ annual earnings during the long 15th century were much smaller than those inferred from multiplying day rates by 250 days of work.

The third and perhaps most crucial finding is that real annual incomes from annual employment rise continuously from 1650, in stark contrast to the widespread view that England did not escape its 'Malthusian trap' until after the mid-19th century (e.g. Allen 2007; Clark 2008a, 2008b). This conclusion speaks directly to the mounting dissatisfaction with the Malthusian model as a relevant scenario for the early modern period (e.g. Persson 2008; de Vries 2008; Broadberry et al 2015) by showing that the transition from so-called 'Malthusian stagnation' to modern economic growth was a gradual process rather than a sudden ('hockey-stick') event (as McCloskey (2010) has called it). Gradually rising real annual incomes also fit with the idea of an early modern 'consumer revolution' visible in the appearance of novel commodities in 17th and 18th century probate inventories (e.g. McKendrick et al 1982; Thirsk 1978; De Vries 2004).

The three findings illustrated in Figure 2 and discussed above touch on a number of long-standing debates in the field of economic history. These debates concern questions regarding the long-term evolution of labour's share; the gender pay gap and significance of the male breadwinner model; the relevance of the Malthusian model as an interpretive framework for pre-industrial economic development; the existence of an Industrious Revolution; and the presence of a so-called 'Engels' Pause'. Below, we discuss each of these matters in detail.

### *Engels' Pause*

Rising real annual incomes after 1650, and their better correspondence with trends in per capita GDP than annual income from day rates (see Figure 2), raises doubts about the presence of an 'Engels' Pause'. Engels (1845) reconciled the huge increases in output associated with the industrial revolution with the deleterious social and economic conditions that he observed in northern England (where industrialisation first took hold) by arguing that the gains from economic development accrued overwhelmingly to capitalists. Indeed, the mounting gap after 1650 between real annual incomes from casual work and per capita GDP (see Figure 2) prompted Robert Allen to suggest that a surge in inequality was intrinsic to the growth process: technical change increased the demand for capital and thus raised the profit rate and capital's share (Allen 2009). Based on annual incomes inferred from day rates, Allen envisioned that the rise in profits sustained the industrial revolution by financing investment, but only much later (after c. 1800) led workers' pay to rise. The closer fit between the trends

in real annual income from annual work and per capita GDP as displayed in Figure 2 thus presents a challenge to the hypothesis that inequality between workers and capitalists was a driving force in the industrial revolution. Indeed, if casual and annual workers could be expected to earn roughly the same, a point which we will return to below, then Engels' observation might turn out false.

**Figure 3**

Labour's share using estimated real annual income in day and annual work, 1260-1850



*Note:* The graph shows the indexed evolution in the share of real income to GDP per capita. The year 1620, where annual income is identical for both series, is set to 0.6. *Sources:* Annual wages: see the text. Day wages: Clark (2007, Table A2). Daily costs of consumption: Allen (Link). GDP per capita: Broadberry et al (2015).

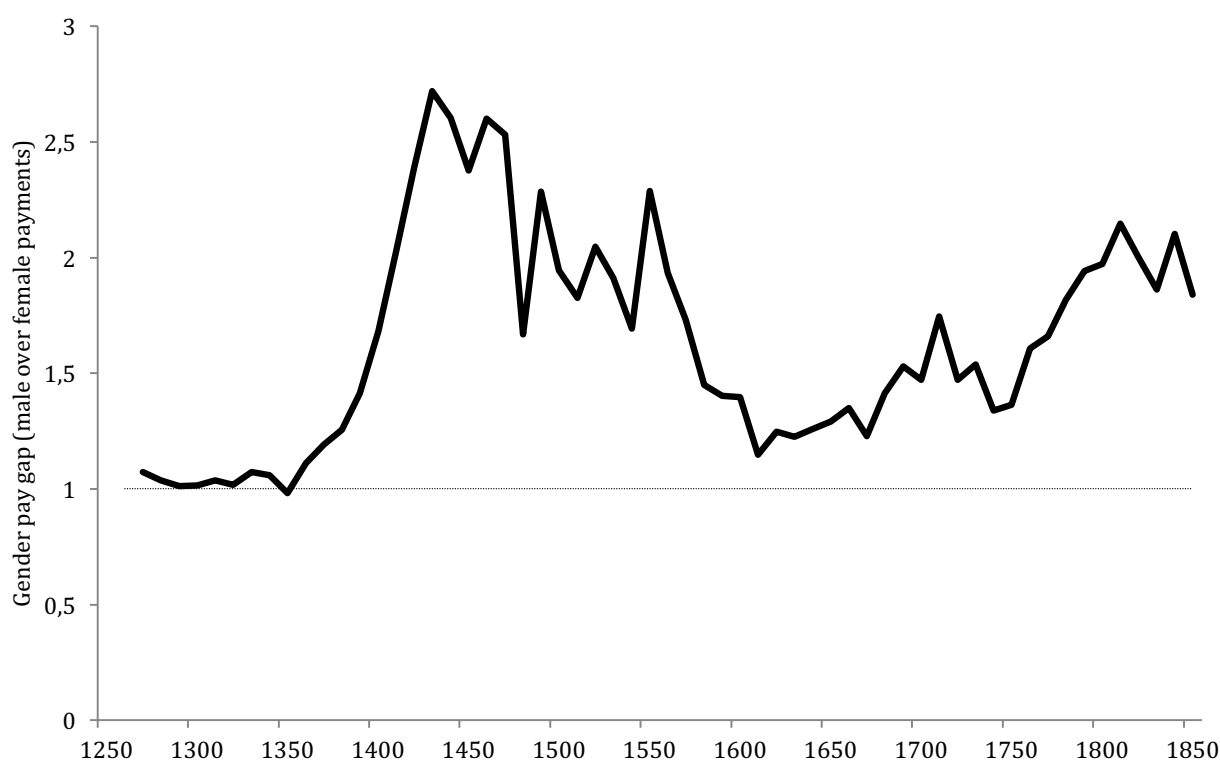
### *Labour's Share*

The idea that industrial technical progress skewed income in favour of profits, so benefiting capitalists over labourers, links to the question of how labour's share evolved during the medieval and early modern periods. Previous evidence from 20th-century data has shown that labour's share in national income stayed relatively constant over time, fluctuating between 50 and 80 per cent of total output (Gollin 2002). Figure 3 illustrates the long run



evolution of labour's share between 1260 and 1850. Estimating labour incomes by day rates multiplied by 250 assumed days of work, makes medieval developments in labour's share look dubious, reaching more than 100 per cent during the post-Black Death period. In contrast, the factor proportion computed using annual incomes from annual work usually fluctuates between 50 and 80 per cent of total output, with a modest advantage for workers manifest in the latter half of the 15th century.

**Figure 4**  
The gender pay gap, 1260-1850



Sources: Male wages: see the text. Female wages: Humphries and Weisdorf (2015, Table A1) multiplied by 260 days.

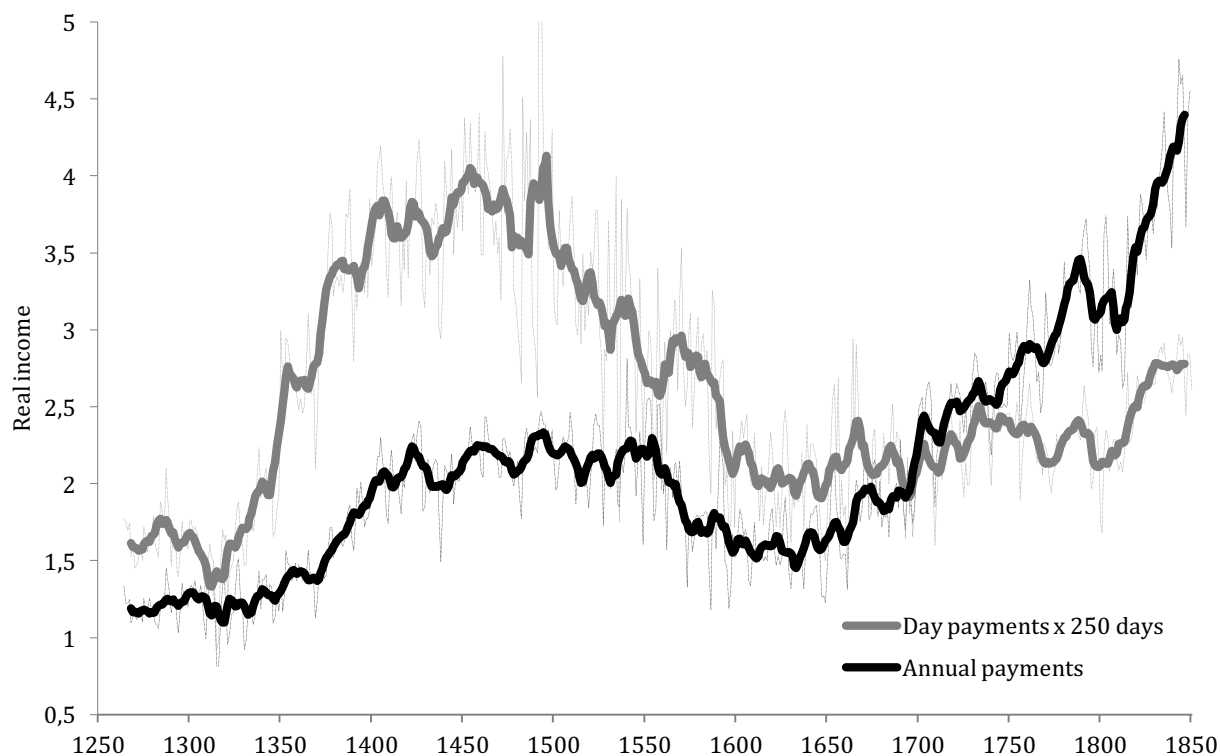
### *The Gender Pay Gap*

Annual wages for female labour, provided in Humphries and Weisdorf (2015), in combination with the male wages provided in this study enable us to compute how much more men on yearly contracts earned compared to similar women over the long run. Figure 4 shows that the gender gap between male and female payments varied considerably: from virtually zero before the Black Death to more than double in some instances in the post Black-Death period. A widening gender gap appears to coincide with periods of tight labour markets, such as in

the post-plague period and during the Napoleonic wars, when men in particular were in short supply, but further work is needed to confirm this hypothesis.

**Figure 5**

Estimated real annual incomes from day rates (grey) and annual rates (black), 1260-1850



*Note:* Annual real income (see Table A3) is computed by dividing nominal income by 365 days multiplied by daily costs of consumption. Annual nominal income for day work (grey) is obtained by multiplying day wages by 250 working days. Annual nominal income from annual work (black), which is predicted based on the regression coefficient reported in Table A2, is the sum of cash payments and monetised in-kind benefits. The bold lines show the 10-year moving averages. *Sources:* Casual wages: Clark (2007, Table A2). Annual wages: see the text. Daily costs of consumption: Allen (Link).

### *The Male Breadwinner Model*

Men and women's earning possibilities in the past connect with the question of the relevance of a 'male breadwinner model' for pre-industrial societies. Figure 5 takes a closer look at real annual earnings from annual work vis-à-vis those estimated from day rates multiplied by 250 days of work. The graph reports the number of Allen's so-called 'respectability' baskets that

an annual income could buy, which Allen (2009) calls 'welfare ratios'.<sup>12</sup> Thin lines show the size of real annual payments, which were greatly influenced by year-by-year price fluctuations. The solid lines show the 10-year moving averages. On the assumption presented in Clark and Van Der Werf (1998) that casual and annual workers earn largely the same over the course of a year, the black line in Figure 5, which is based on incomes of annual workers, confirms a dramatically different trend in real annual earnings than does the grey line inferred from day rates and the assumption of 250 working days per year. The continuous rise in real annual incomes starting in the 17th century again shows that economic growth took off nearly two centuries earlier than commonly thought, contesting the conclusion reached in Clark (2007, p. 99) that '[t]here is no sign of secular trends towards higher living standards in the pre-industrial era'.

Figure 5 also shows that, although our estimates of real annual incomes improved significantly in the aftermath of the Black Death, some ground was lost after c. 1500 and only after c. 1700 could an unskilled man's annual income purchase more than two consumption baskets. That is, support himself and a wife. Moreover, in spite of rising real income during the first half of the 17th century, it was not until the 19th century that an unskilled male's annual income was able to provide a 'respectable' living for a contemporaneously average family comprising two adults and three children, equivalent to three and a half adults when children count as half an adult, as Allen (2009) assumes. Figure 5 thus confirms that a male breadwinner model appears irrelevant before 1800. Not just during the early modern period, as earlier scholarship has already pointed out. But also during medieval times where previous estimates of male earning possibilities supported the idea of a male breadwinner society.

### *The Malthusian Conundrum*

Perhaps one of the most contentious accounts of economic development in pre-industrial societies is the Malthusian model (e.g. Clark 2008b; Persson 2008). While an affirmative answer to the question of whether the pre-industrial world was Malthusian or not requires an advanced econometric approach, previous studies have used simple means to good effect. Going back more than a half millennium before 1800, Clark (2007) demonstrated that English day wages plotted against national population levels provide strong support for a basic tenet

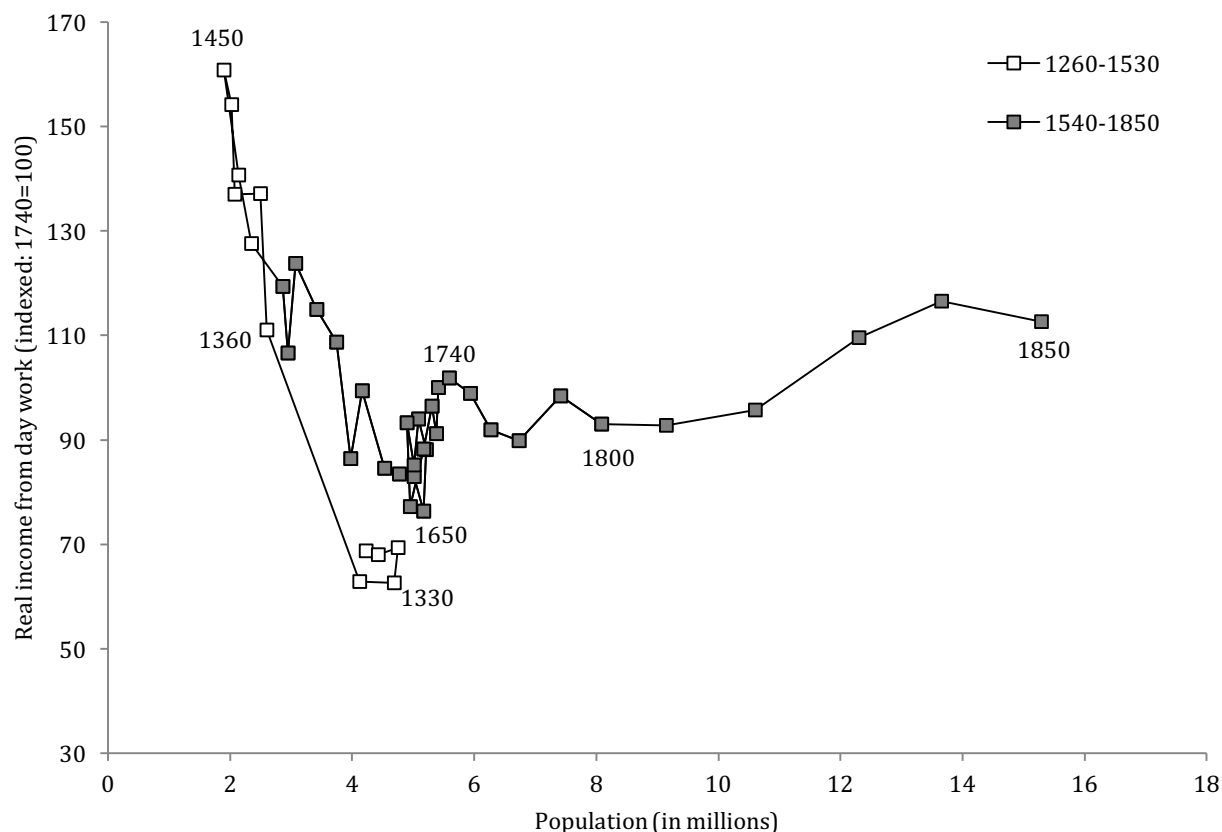
---

<sup>12</sup> Allen's original welfare ratios were computed on the assumption that an average family was made up of two adults and three children (Allen 2007). Here, because the size of historical families arguably varied considerably during the period of observation, we simply compute the number of consumption basket that one male salary could afford. In order to compare our numbers with Allen's original numbers, our numbers must be divided by 3.25 (as children consumer half as much as adults).

of the Malthusian model. Figure 6 replicates Clark’s graph, showing that population and real annual income inferred from day rates are either unrelated or inversely correlated until 1800, after which population growth still appears to constrain improvement in real incomes.<sup>13</sup>

**Figure 6**

Estimated real annual incomes from day work against population levels, 1260-1850

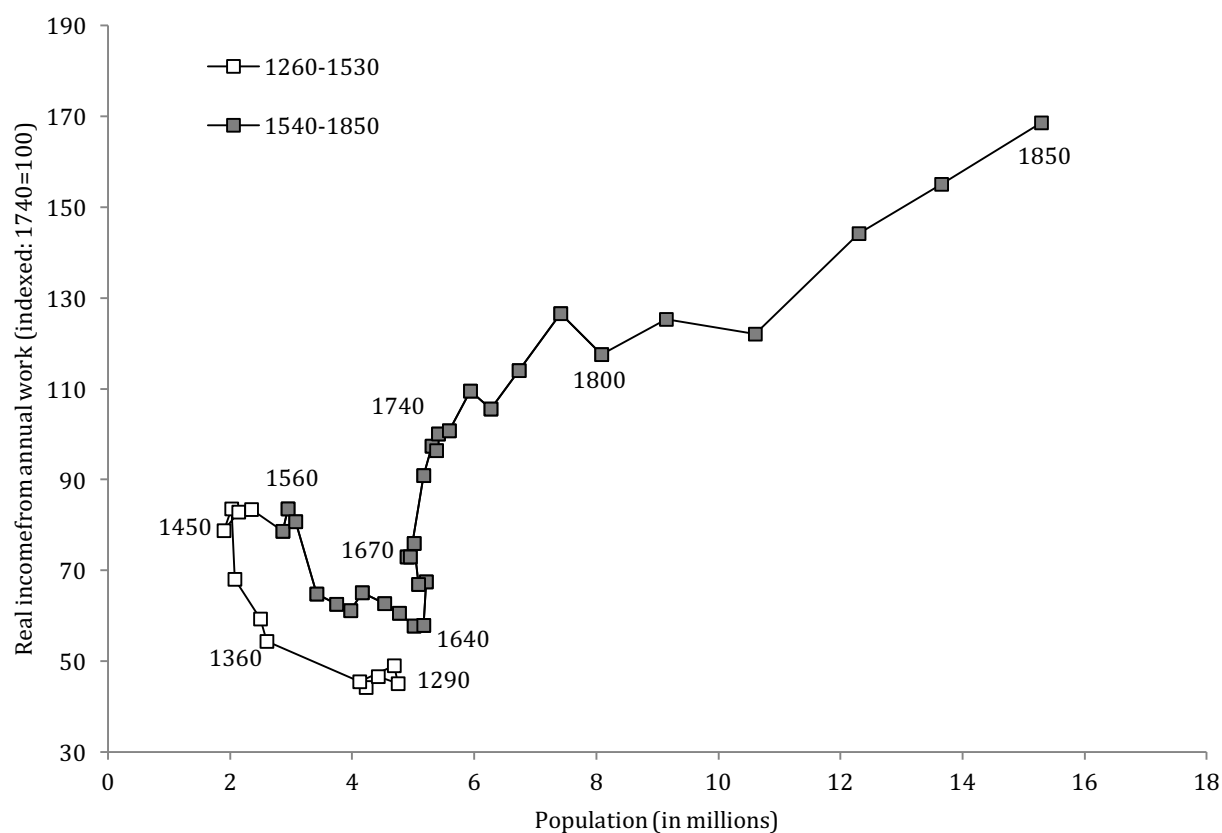


*Note:* Annual real income is computed by dividing annual nominal income by 365 days multiplied by daily costs of consumption (see Table A1). Annual nominal income from day work is obtained (as conventionally) by multiplying day wages by 250 working days. *Sources:* Day wages: Clark (2007, Table A2). Daily costs of consumption: Allen (Link). Population levels: Broadberry et al (2015, Table 1.06) and Wrigley and Schofield (1981, pp. 715ff).

<sup>13</sup> The day rates presented by Clark (2005), although they do not rise at the same pace and to the same extent as we observe in Figure 5, do enable Clark to see ‘the beginning of the escape of the Malthusian stagnation’ in the 17th century, where ‘the efficiency of the economy shows the first signs of significantly exceeding medieval levels in the 1640s’ (*ibid*, pp. 1311-2). But Clark also observes a pause in wage growth at the eve of the classic years of the industrial revolution, captured by the negative relationship between real income and population in Figure 6.

**Figure 7**

Estimated real annual incomes from annual work against population levels, 1260-1850



*Note:* Annual real income is computed by dividing annual nominal income by 365 days multiplied by daily costs of consumption (see Table A1). Annual nominal income from annual work is the sum of cash payments and monetised in-kind benefits. *Sources:* Annual wages: see the text. Daily costs of consumption: Allen (Link). Population levels: Broadberry et al (2015, Table 1.06) and Wrigley and Schofield (1981, pp. 715ff).

Our revised incomes derived from annual contracts suggest a very different story. Figure 7 shows that the same negative relationship between population and real income is somewhat apparent in the medieval data, even if there are upward moving trends distinguishing the 16th century from earlier centuries. The initial visitation of the Black Death in 1348-9 was followed by periodic re-visitations that left the age structure of the population unbalanced, and destroyed the social fabric of many communities, impeding demographic recovery.<sup>14</sup> As Figure 7 suggests, the exogenous drop in labour supply first drove up incomes as the dependent variable, after which slow recovery was associated with a downward drift in

<sup>14</sup> The plague and resulting demographic stagnation were exogenous to economic development in Britain: '[T]he trigger [was] likely to have been ecological stress arising from a sudden change in weather, leading to a crossover of infection, either directly from sylvatic rodents to humans or indirectly to commensal rodents and then humans' (Campbell, 2016, p. 286).

incomes towards (though not entirely back to) pre-plague levels. The graph also shows that population growth and economic growth show an overall positive correlation after the middle of the 17th century, when the Malthusian mechanism appears to have been broken.

### *The Industrious Revolution*

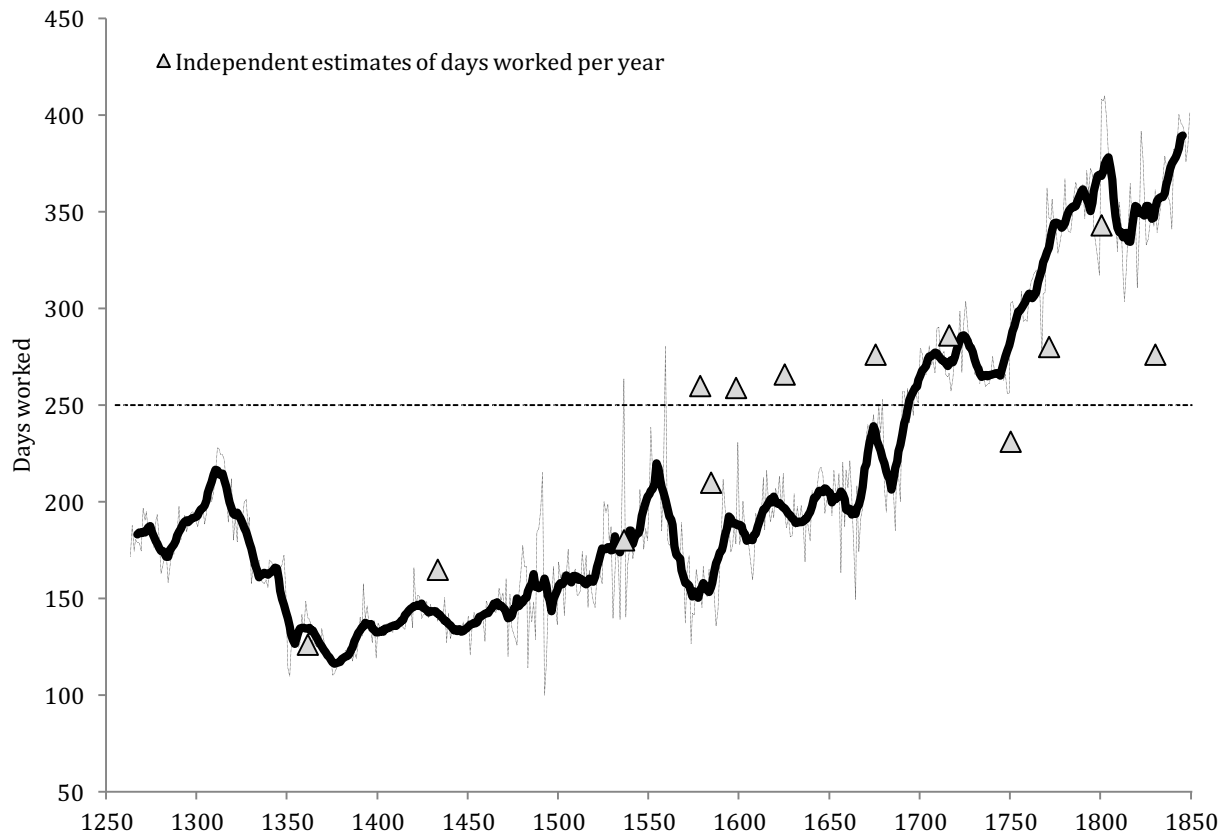
The questions of whether or not an Industrious Revolution preceded the industrial revolution is heavily debated among economic historians and long-run growth theorists. But because annual labour supplies per head are rarely provided in the surviving records, the debate is hard to settle.

The concept of the Industrious Revolution is perhaps most famously endorsed by Jan De Vries, who proposed that the spread of new and desirable market commodities raised the utility of money and inspired a reduction in people's leisure time as they sought higher incomes (De Vries 1998; 2004). In turn, the increased demand for marketed goods and services promoted the technological progress associated with the industrial revolution. A hallmark of De Vries' Industrious Revolution is that of increased workdays. If the working year increased during the early modern period rather than staying flat, as previous accounts of worker's earning possibilities have assumed, then this might potentially bridge the gap between the Malthusian and Revisionist views of pre-industrial economic development described in the introduction.

In their seminal article from 1998, Gregory Clark and Ysband Van der Werf pointed out that day rates in combination with annual rates facilitate the computation of the working year needed in day labour in order to obtain the income that could be earned in annual work (Clark and Van der Werf 1998). Based on wage assessments and estate records, Clark and Van der Werf found that the average working week grew modestly, from five to six days between the late 16th and the late 17th centuries. Our new and more comprehensive series of annual rates, in combination with Clark's (2007) full series of day rates, enable the replication of Clark and Van der Werf's exercise using a greatly expanded dataset and covering an extended time period.

**Figure 8**

The implied working year and independent estimates, 1260-1850



*Note:* The graphs show the number of days in casual work needed to earn an annual worker's yearly income (see Table A3). The solid line shows the 10-year moving average. Triangles report independent estimates of annual days worked per person. *Sources:* Day wages: Clark (2007, Table A2). Annual wages: see the text. Daily costs of consumption: Allen (Link). Independent working days: from Blanchard (1978), Clark and van der Werf (1998), and Voth (2001) as explained in Allen and Weisdorf (2011, pp. 720-21), and from Booth (2003) in which 21 workweeks paid a full year's salary.

The evidence illustrated in Figure 8 proposes a remarkable change in annual labour input between the pre-Black Death period and the end of the classical years of the industrial revolution. While some four days of casual work per week would provide the same income as that enjoyed by an annual worker before the plague, steeply rising day rates combined with more modestly growing annual rates in the aftermath of the plague meant that as few as two to three days of casual work per week were sufficient to match an annual worker's yearly

remuneration.<sup>15</sup> The shorter working year after c. 1350 agrees with Hatcher's (2011) supposition that the post-Black Death labour market did not gild the peasantry's world to the extent previously thought, either because day workers could not find enough work or because their labour supply curves bent backwards. The latter conclusion accords with historians' description of medieval workers' *mentalities*: 'A plausible reconstruction of workers' attitudes in the period 1349-1520 is that they set themselves goals in cash or consumption needs, and worked until they had achieved their aims. Then they ceased to work' (Dyer 1989, p. 224).

Furthermore, Figure 8 chimes with the view that the simplifying but crude assumption of 250 days of work overlooks the possibility of a 'preference switch' in workers' evaluation of the labour-leisure trade-off as described in De Vries' concept of an Industrious Revolution (De Vries' 1994, 2008). The work-year estimates of Figure 8 are also more in line with Voth's derivation of time use from 18th- and 19th-century court records, confirming his assessment that the period 1760-1830 saw 'the longest years' (Voth 2001, title). Overall, the implied working year agrees reasonably well with the trend in the scattered, independent estimates of annual days worked per person (the triangles in Figure 8) found in the literature (Allen and Weisdorf 2011; Booth 2003; Broadberry et al 2015). Perhaps more than anything, Figures 2 and 8 together support the argument that the two conflicting views about long-run economic development described in the opening paragraph of this article can be reconciled by allowing the historical working year to vary along the lines shown in Figure 8, as anticipated in Campbell (2013) and elsewhere.

### Sensitivity

This section considers two major sensitivity checks. The first check concerns the possibility that Allen's 'respectability' basket is an inadequate representation of the benefits of board and lodging. Although the basket provides sufficient food, clothing, housing, and heating to establish a 'respectable' standard of living, including 2500 calories per day, the board and lodging privileges that annual workers *actually* received could have differed from the

---

<sup>15</sup> While this seems like a rather short working year, payments made in 1361-62 reported in Booth (2003) reveal that full-year salaries were paid for no more than 21 weeks' work. If the working week back then was five or six days long, then this meant that Booth's labourers supplied somewhere between 105 and 126 days of work per year. Moreover, our sensitivity analysis below shows that, if annual workers accepted non-trivial wage cuts in exchange for job security, then the working year immediately after the Black Death would have been some 130-140 days long.



contents of the basket. This is perhaps especially relevant during the medieval era when workers were sometimes paid in grains that could be either consumed or sold for cash, or during the early modern period when novel commodities appeared on the market potentially within reach of working-class consumers. In either case, the possibility that the value of Allen's basket is out of tune with workers' actual privileges threatens the aptness of the methodology and thus the validity of the conclusions drawn in the previous section.

The second sensitivity check explores the possibility of a pay gap between annual and casual work (for example if casual workers received a premium for job insecurity) and what such a pay gap would imply with respect to the earnings of an *average* worker. This check also conjectures that the share of workers on annual contracts did not remain constant over time, exploring how changes in the composition of the labour force would have influenced the earning of an average worker.

#### *The Relevance of Allen's 'Respectability' Basket*

We begin by examining whether or not the value of Allen's *one-size-fits-all* consumption basket offers a good representation of annual workers' actual board and lodging benefits. Following de Vries' idea that an early modern Consumer Revolution was paid for by an Industrious Revolution (de Vries 1998, 2008), it is not implausible that novelty commodities, which emerged during the early modern period, but which Allen's basket does not include, increasingly made their way into workers' non-pecuniary payments. Moreover, earlier in time, post-plague labour scarcity might have prompted employers to increase not only workers' cash stipends, but also their payments in kind. Because Allen's basket is not designed to accommodate such non-pecuniary pay raises, the new income estimates presented above might underestimate annual workers' *actual* remunerations, both during the medieval era and the early modern period.

Fortunately, we can resort to the historical record for occasional evidence which can be used to check whether the monetary value of Allen's baskets approximates the actual value of annual workers' in-kind benefits. Starting with the medieval period, Gerald Lui's study of medieval workers' remuneration provides us with valuations for grain wages on the Pitlington manorial demesne in Durham and the Lullington manorial demesne in East Sussex between 1390 and 1450 (Lui 2012). Although Durham is situated in the North-East of England, and Sussex in the South, the total wages (paid in cash or grains or both) during this

period were remarkably similar in size, thus building confidence that Lui's grain wages are more widely representative. Grain liveries from other secondary or printed-primary sources have also been collected (see Table A4 in our Appendix). Where these are valued within the source, we take this estimate; otherwise, we have imputed a value based on the grain mix specified using time-specific grain prices.

Furthermore, in our search for workers' payments from the early modern period, we sometimes came across records of payment made to workers who were *boarded out*. Although these *board wages* were usually paid in cash, they conflated the cost of board and lodging with an allowance related to the servant's usual wage. Still, these cases, along with the total remunerations including grain wages from the medieval period, can be compared directly to our estimates in Figure 5 of wages plus in-kinds valued by Allen's basket.

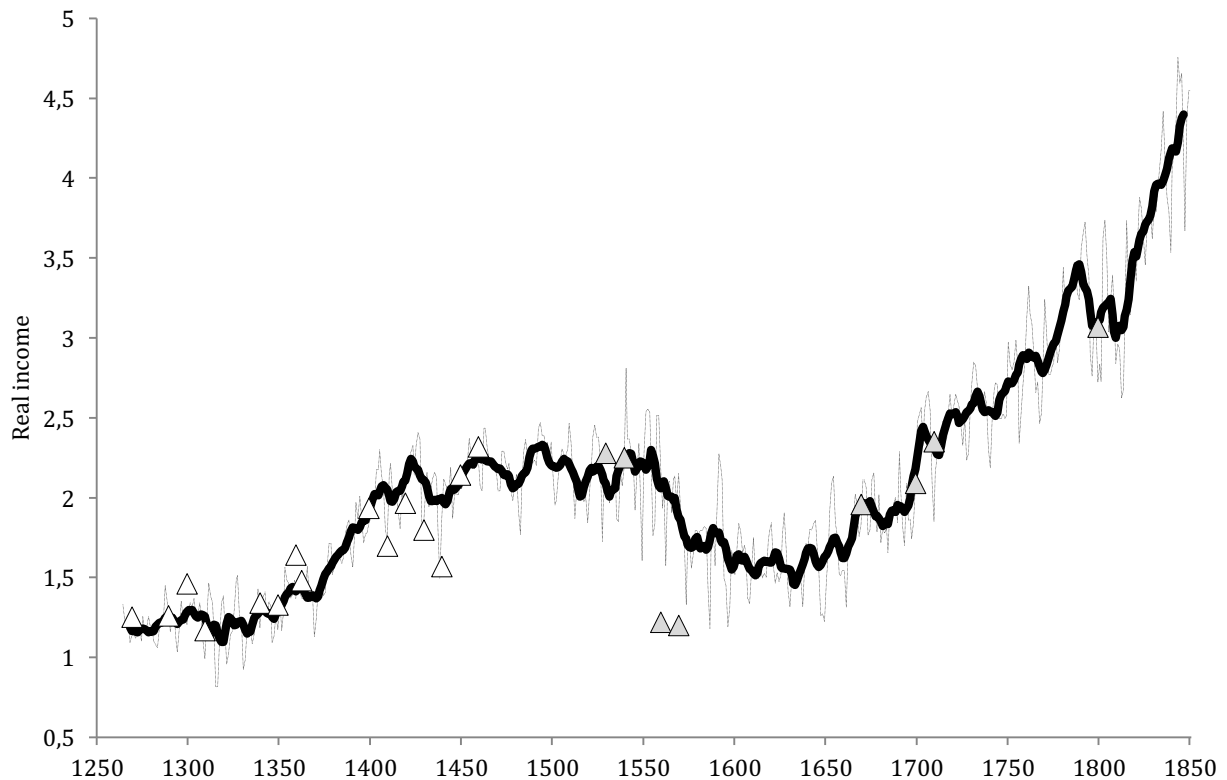
Figure 9 plots the cases where payments were made to workers which combined their wage with a monetary subvention in place of their usual in kinds (triangles), against our original data (the solid lines), which imputes those benefits by adding the monetary value of Allen's basket to the observed cash wages. Although the values of Allen's basket appear slightly off target during the first half of the 15th century and the middle of the 16th century when our estimates overshoot the evidence of workers' actual payments, their values generally appear to be in line with annual workers' *actual* remuneration including non-pecuniary benefits. Thus, independent historical evidence suggests that the use of the Allen basket to capture the value of annual servants' perquisites might have mildly upgraded the 'Golden Age', which (judged by the triangles) looks slightly gloomier than our benchmark case (black lines). So, if anything, our baseline downgrading of the workers' post-plague Eldorado might not have gone far enough. Also, our conclusion above, that early modern growth began nearly two centuries earlier than commonly thought, survives the spot check on the validity of the Allen basket as an approximation for the value of annual workers' payments in kinds.<sup>16</sup>

---

<sup>16</sup> One question that springs to mind from this is how the cash component in workers' annual earnings evolved over time. Figure A1 in the Appendix sheds light on this question. Before the Black Death, cash payments comprised less than 20 per cent of workers' total compensation. But, as Figure A1 shows, the cash component rose markedly in the aftermath of the plague reaching nearly 50 per cent during the 15th and 16th centuries. Then, as the population recovered, cash payments also returned to their pre-plague level, reaching slightly less than 25 per cent of total income just before 1600. Cash payments then once gradually again increased in importance to reach 70 per cent of workers' compensation around 1850.

**Figure 9**

Estimated incomes using Allen's basket and independent grain and board wages, 1260-1850



*Note:* The triangles report the monetary value of grain and board wages. Annual real income is computed by dividing nominal income by 365 days multiplied by daily costs of consumption (see Table A1). The bold line is the 10-year moving averages. *Source:* Annual wages: see the text. Grain and board wages: see Table A4. Daily costs of consumption: Allen (Link).

### *The Earnings of an Average Worker*

Our initial assumption, inspired by the supposition presented in Clark and Van Der Werf (1998) that casual and annual workers could expect to earn roughly the same per year, has taken us a long way by enabling annual incomes to proxy for the earnings of an average worker. However, if labour market regulations, or compensating differential, or still other selection effects meant that casual workers earned systematically more (or less) per annum than did annual workers, then the incomes of annual workers would systematically under- (or over-) estimate average earnings. Worse still, the size of such mis-estimation would vary with the relative shares of casual and annual workers in the economy in ways that are explicated below. Of course, this problem is not unique to our study, but applies with equal strength to existing income estimates based on casual earnings.

To address these issues, we can consider a simple model for a segmented labour market: one segment for casual work and one for annual work. The annual earnings of an average worker are then the weighted average of workers' earnings in the two sub-markets. In other words, average annual earnings can be expressed as  $e = \alpha e_A + (1 - \alpha)e_C$ , where  $e_C$  and  $e_A$  are annual incomes in casual and annual work, respectively, and where  $\alpha$  denotes the share of workers employed in annual work. If we suppose that earnings in the two segments of the labour market are proportional, i.e. that  $e_C = \beta e_A$ , then average earnings can be written as  $e = (\alpha + (1 - \alpha)\beta)e_A$ . It follows from this that if  $\beta = 1$  – i.e. if there are no labour market specific premium or selection effects, so that casual and annual workers earn the same over the course of a year – then  $e = e_A = e_C$ . In this case, the share of labour engaged in annual work ( $\alpha$ ) plays no role in determining the earnings of an average worker. This is the scenario upon which the conclusions reported in the result section build.

However, if it turned out that  $\beta \neq 1$  (i.e. a premium or selection effect applied), then average annual earnings becomes  $e = (\alpha + (1 - \alpha)\beta)e_A$ . In this case,  $\alpha$  (the share of annual workers) and  $\beta$  (the casual-annual pay gap) will both influence average earnings. This means that yearly incomes from annual work,  $e_A$ , is a more or less accurate indicator of *average* earnings,  $e$ , depending on changes in the magnitudes of  $\alpha$  and  $\beta$  over time. For example, in the standard interpretation,  $\beta$  would have exceeded unity because day workers required compensation for shouldering labour market risk and were more mobile and therefore better able than their annual counterparts to take advantage of labour scarcity and bargain more aggressively. If so, then the higher the day worker premium was, the more the payments in annual work underestimate average earnings (i.e.  $d(e/e_A)/d\beta > 0$ ). Moreover, if the share of annual workers declined over time, as is usually assumed in the literature, the more annual earnings underrate average earnings ( $d^2(e/e_A)/d\beta d\alpha < 0$ ). Although the historical values of  $\alpha$  and  $\beta$  are not well known for the period we observe, we can still make educated guesses about their magnitudes and trends to see if the resulting average earnings challenge the conclusions of the previous section.

The conventional view is that  $\alpha$  declined over the course of the pre-industrial era. Here, we firm up the fragmentary evidence derived from the literature with reference to research on social structure, which has identified socio-economic groups by number and size of household. This enables us to compute rough estimates of the number of live-in servants relative to wage-earners and subsistence producers. Starting at the beginning of our time

period, the Social Table constructed by Campbell (2016, Table 3.4) for the end of the 13th century divides the population into eight social groups.<sup>17</sup> For each group, Campbell estimates the number of households, household size, population, various measures of landholdings, and incomes. On the basis of household size, landholding, and income, it is assumed that those in group (1) had four annual male servants; those of group (3) had two annual male servants; and those in groups (2) and (4) had one annual male servant. We also assume that groups (6) to (8), characterised by small households ( $\leq 3.5$  persons) and living below Campbell's poverty line, contained no annual servants, although it is assumed that half of group (8), which contains soldiers and sailors, were employed on annual contracts. Adding the numbers up comes to a total of 444,000 workers employed on annual contracts.<sup>18</sup> Further, households in groups (1), (6), and (7) are assumed to have contained one male day labourer, which gives a total of 530,000 day workers. Adding together annual servants and day labourers gives a total of 974,000 wage earners. Next, adding to this the total landowners, yard-landowners, and smallholders (501,000), and the remaining 25,000 from group (8), assuming they are unwaged subsistence workers. This gives a total male labour force of 1,500,000,<sup>19</sup> meaning that annual workers comprised 46 per cent of the waged labour force in the latter half of the 13th century.

For 1688, we used Gregory King's celebrated Social Table (King 1696, reproduced in Barnett 1936) as the basis for a similar exercise. By this date, the proportion of annual servants in the male labour force was down to 23 per cent, an estimate roughly consistent with Peter Laslett's claim (based on household listings) that 29 per cent of households in British pre-industrial communities (1564-1821) contained servants of one kind or another. Finally, for an estimate towards the end of our period, we resorted to the first population censuses.<sup>20</sup> In agriculture, where live-in service persisted longest, by 1871 16 per cent of hired workers were annual servants. A conservative but not implausible estimate is therefore

---

<sup>17</sup> These are: (1) landowners (spiritual lords, aristocracy, gentry, clergy); (2) minor clergy, professionals, lawyers, merchants, tradesmen, craftsmen, builders, urban labourers; (3) substantial tenants; (4) yardlanders; (5) smallholders; (6) cottagers and agricultural labourers; (7) rural craftsmen, non-agricultural labourers, labourers, paupers, vagrants; and finally (8) men-at-arms, miners, fishermen and sailors.

<sup>18</sup> Our estimates of servants in the households of landowners (i.e. 84,000) fit reasonably well with Claridge and Langdon's (2016) estimate of 94,000 *famuli* employed on English demesnes in 1300.

<sup>19</sup> If half of the population in 1290, which consisted of 4,746,000 people in total, was male, and if 65 per cent of them were in the working-age group, then this suggests a male labour force of 1,542,450, which is consistent with our 1,500,000 male work force.

<sup>20</sup> The censuses suggest considerable variation by type of community: in rural Lancashire, where traditional family farms survived, 28 per cent of households continued to harbour servants; Preston at 10 per cent; Nottingham at 12 per cent; and the potteries at 9-11 per cent were more typical.

that  $\alpha$  gradually (we assume linearly) declined from 46 per cent in the 1260s, to some 25 per cent in the 1680s, and further around 16 per cent in the 1850s.

Turning to  $\beta$ , it is commonly thought that the casual-annual income premium was persistently positive, even if it varied over time. In the 13th century, some annual workers appear to have been relatively well paid compared with day labour.<sup>21</sup> By contrast, in the post-Black Death period, especially shortly after the plague, it is widely held that day labourers were best able to exploit the labour scarcity and hold up landowners in order to force wage concessions, while annual remunerations remained anchored to customary levels or levels set by law and were slower to respond, as we also noted of our own data (see Figure 5 above). Differential bargaining power explains the widespread accounts of medieval workers' preference for casual employment and the coercive prominence given to yearlong contracts in the labour legislation of the 14th century (Putnam 1908; Bailey 1994; Penn and Dyer, 1990, pp. 367-9; McIntosh 1986, pp. 161). Under these circumstances, the casual-annual pay gap probably grew larger and remained inflated until labour scarcity abated.

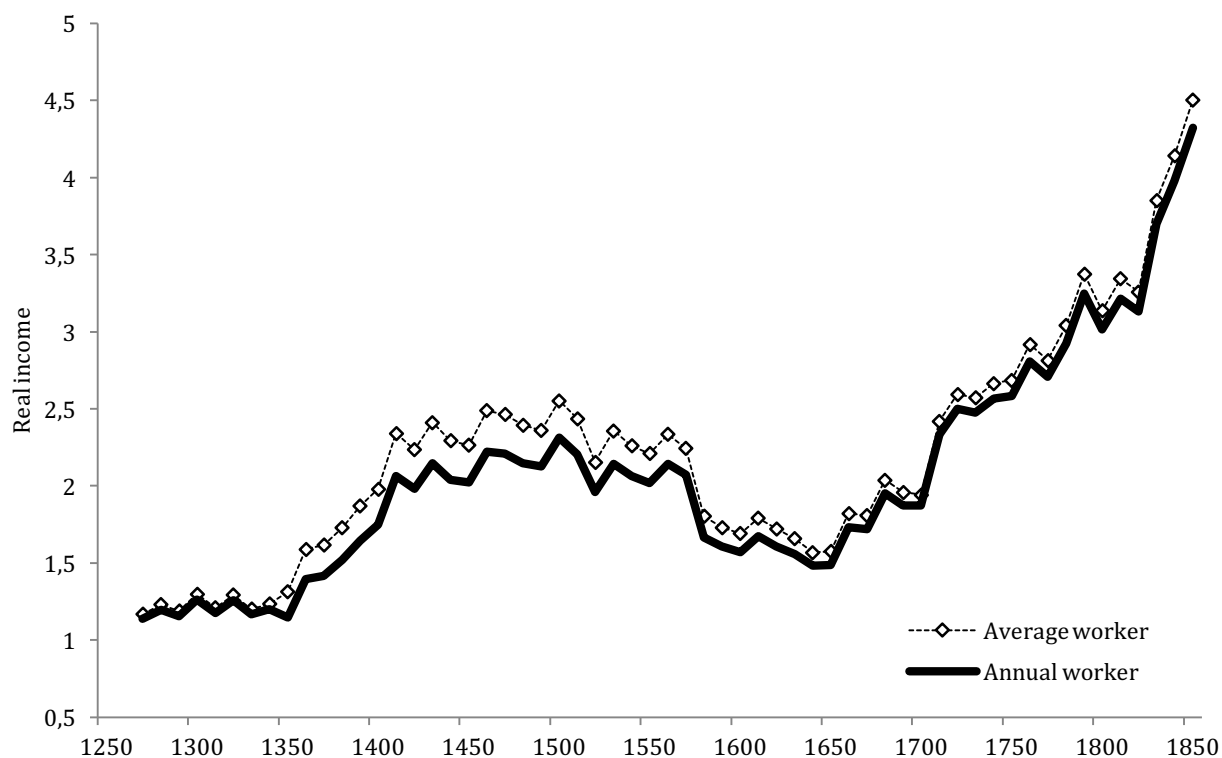
Moreover, with population growth in the 18th century, the supply of younger workers seeking berths as servants and apprentices grew, while a growing preference for privacy on the part of employers, perhaps alongside increasing recognition of the real costs of live-in servants, continued to ensure a day-labour premium. A plausible scenario, then, is that  $\beta$  was 1.05 before the Black Death rising to 1.25 when the plague first hit (c. 1350), after which it gradually (again we assume linearly) fell back to 1.05 after the population had re-stabilised (c. 1700), staying at this level to the end of our period. Based on these suppositions about the magnitudes and trends in  $\alpha$  and  $\beta$ , we can now compute and illustrate the earnings of an *average* worker against the estimated earnings of *annual* workers. Figure 10 above shows that despite the introduction of a significant pay gap between the two types of labour, the magnitudes and trends in yearly incomes were roughly similar for annual and average workers, even if the 'Golden Age' for an average worker would have been slightly brighter under the probable assumptions about  $\alpha$  and  $\beta$  explained above.

---

<sup>21</sup> According to Claridge and Langdon (2016), however, there were groups within the *famuli* that did not fare so well. David Farmer has suggested that *famuli* on medieval estates, while employed year-round, were not full-time workers, since they held farmland of their own on which they would simultaneously have worked (Farmer 1996, pp. 228-9). This originally discouraged Clark and Van Der Werf from using such workers' annual wages to impute the length of the working year. We have corrected for this matter in the data collection by paying careful attention to those instances when workers were paid by the term, often in differing cash amounts, aggregating up to the annual wage rather than simply multiplying out. Besides, even for the medieval period our estimates of days worked per year presented below do not just rely on the wages of *famuli*, but instead include many other types of workers and of domestic servants (see Table 2).

**Figure 10**

Estimated real annual incomes of an annual worker and an average worker, 1260-1850



*Note:* Annual real income is constructed by dividing annual nominal income by 365 days multiplied by daily costs of consumption (see Table A1). Annual nominal income from annual work (black) is the sum of cash payments and monetised in-kind benefits. Annual nominal income of an average worker (squares) is equal to  $(\alpha+(1+\alpha)\beta)e_A$ , where  $e_A$  is the annual nominal income of an annual worker (black). *Sources:* Annual wages: see the text. Daily cost of consumption: Allen (Link).

## Conclusion

The leading theory of long-run developments in real incomes in Western Europe, known as the 'little divergence' hypothesis, holds that the North Sea region, notably England and the Low Countries, diverged from the rest of Europe between 1500 and 1750, in terms of real annual incomes inferred from day rates (Allen 2001). The income estimates used to sustain the 'little divergence' hypothesis also have a central role in the 'great divergence' debate, where they feature as illustrations of Western European advancement in comparison with Africa, Asia, and the Americas (e.g. Allen et al 2011, 2012; Broadberry and Gupta 2006; Frankema and van Waijenburg 2012). Furthermore, real incomes similar to those provided by Allen (2001, 2009) and Clark (2007) are the central pillars in the Malthusian model used to describe economic development in pre-industrial societies (e.g. Clark 2008), which in turn

frames Unified Growth Theory (Galor 2011). If the annual earnings supporting these theories are subject to measurement error of the kind and extent suggested here, then that challenges the leading theories informing about long-run economic developments. At risk are not just core theories, such as the Malthusian model and the 'little' and 'great divergence' hypotheses, but also the findings of a large number of studies in economic, social, and demographic history, which rest on conceivably misleading accounts of the long-run evolution of annual earnings based on potentially improper estimates of the length of the working year.

Moreover, in a discipline increasingly captured by the idea that the industrial revolution was a product of scientific advancement or inventive genius, the post-1600 continuous increase in the length of the working year and the intensification of this growth in the run-up to industrialisation, provides a salutary reminder of the relevance of other factors. The evidence for a leisurely medieval Golden Age and an early modern Industrious Revolution presented here not only challenges the assumption that medieval and early modern England had an unchanging working year but carries over to oppose such a conjecture in any pre-industrial context. Whether the English increase in labour input was voluntary, as workers gave up leisure for material goods, or imposed as a consequence of structural changes in employment, or the erosion of alternatives to wage labour, or shifts in bargaining power, remains to be examined.



## Primary Sources

*Beveridge Archive, LSE*

Beveridge Price History Collection

*British Library*

Blenheim Collection,

Add MS 19592.

Add MS 61472.

Add MS 61680.

Add MS 33149, Reel 7 Vol10/18.

Add MS 78406.

*Bodleian Library*

Harcourt Collection,

MS. DD Harcourt e. 1-2

North Collection,

MS. North b.12

*Buckinghamshire Record Office*

Chester of Chicelely

D/C/2/59

Dashwood of West Wycombe Collection,

D-X 1548

Drake Collection,

D/DR/5/113-115

D/DR/5/121

D/DR/2/89

D/DR/2/181-4

D/DR/2/176

Farrer of Cold Brayfield Collection,

D-X 762

Fortescue of Salden House Collection,

D-X 1280/11

Hampden of Great Hampden

D-MH/31/9

Paget of Marlow Collection,

D-X 728

Ramsden of Bulstrode

D/RA/5

*Cornwall Record Office*

Accounts of the Reverend William Sandys, 1816-1817,

AD 2073/3

Diary and Accounts Ventonwyn St Stephen,

AD 2129/1

Farm Accounts of Toby Tooker,

CN/1740

*Devon Record Office*

Courtenay of Powderham

1508M/0/E

*Durham Record Office*

Fleming Family of Tudhoe,

D/Fle 2/3/36

D/Fle 2/3/51

Ralph Watson Memorandum Book,

D/X 637/1

Londonderry Estates,

D/Lo F 950, 951, 953, 955-6

*Huntington Library, Pasadena*

Account Book of Thomas Mort, 1703-1725,

mss HM 7281

Allicocke Family Volumes, 1699-1923,  
mss HM 82446-448  
Thomas Wood's Account Books, 1696-1736,  
Mss HM 81035-36

*Kent History Centre*

H.W. Knocker Collection  
U55/E7  
Weller Collection  
U38/A1

*Oxfordshire History Centre*

Lee-Dillon Collection,  
DIL I/L/33a-e.  
DIL I/O/13.

*Shakespeare Birthplace Trust Library*

Compton Verney Collection,  
DR98/1799-1816.  
Willoughby De Broke Collection,  
DR98/1713

*Walthamstow Vestry Museum*

Settlement examinations, 1817-23  
Settlement examinations, 1798-1817

*Wiltshire Record Office*

Account book of Thomas Browne Calley of Burderop House, 1178/24

## Printed Primary Sources

Adams, S., ed., 'Household Accounts and Disbursement Books of Robert Dudley, Earl of Leicester, 1558-1561, 1584-1586', In *Camden Fifth Series*, Cambridge, Cambridge University Press, 1995.

Ashmore, O., 'The Whalley Abbey Bursars' Account for 1520', In *Transactions of the Historic Society of Lancashire and Cheshire*, Vol. 114, 1963.

Bird, M. ed., *The Diary of Mary Hardy, 1773-1809*, (four volumes), Burnham, 2004.

Batho, G.R., ed., 'The Household Papers of Henry Percy Ninth Earl of Northumberland, 1564-1632', In *Camden Miscellany*, Vol. XCIII. London, Royal Historical Society, 1962.

Baxter, J., ed., 'Settlement Examinations, 1720-1844, Rawreth and Rayleigh, Essex', In *Essex Society for Family History*, Benfleet Essex, Circle Services, 1985.

Beamont, W., ed., 'A Reeve's Account of a Cheshire Manor, from Michaelmas 46 Edw. III (1373) to Michaelmas in the following year', In *Transactions of the Historic Society of Lancashire and Cheshire*, Vol. IV, Liverpool, Adam Holden, 1875.

Berryman, B., ed., 'Mitcham Settlement Examinations. 1784-1814', In *Surrey Record Society*, Vol. XXVII. Guildford, 1973.

Betty, J., ed., 'Wiltshire Farming in the Seventeenth Century', In *Wiltshire Record Society*, Vol. 57, Trowbridge, 2005.

Booth, P.H.W. ed., *Accounts of the Manor and Hundred of Macclesfield, Cheshire, Michaelmas 1361-Michaelmas 1362*, Record Society of Lancashire and Cheshire, CXXXVIII, 2003.

Bosworth, J., P. Hudson, M. Johnson, and D. Shillitoe, eds., *The Middleton Papers: The Financial Problems of a Yorkshire Recusant Family in the 16th and 17th Centuries*, Yorkshire Archaeological Society, Woodbridge, Suffolk, Boydell, 2010.

Bowen, L., ed., *Family and Society in Early Stuart Glamorgan: The Household Accounts of Sir Thomas Aubrey of Llantrithyd, c. 1561-1641*, Cardiff, South Wales Record Society, Llandybie Carmarthenshire, Dinefwr Press Ltd, 2006.

Brassley, P., A. Lambert, and P. Saunders, 'Accounts of the Reverend John Crakanthorpe of Fowlmere, 1682-1710', In *Cambridgeshire Records Society*. Vol. 8, 1988.

Bray, W., 'An Account of some Customs in Husbandry and the Prices of Various Articles Relating Thereto, in the Time of King Richard II', *Archaeologia: Or Miscellaneous tracts relating to antiquity* (1817): 281-86.

Britnell, R., ed., 'Durham Priory Accounts, 1277-1310', In *Surtees Society*, Vol. CCXVIII, 2014.

Cardigan, the Earl of, 'Domestic Expenses of a Nobleman's Household: 1678', In *Bedfordshire Historical Record Society*, Vol. XXXII. Streatley, 1951.

Cobban, A.B., *English University Life in the Middle Ages*, London, UCL Press, 1999.

Cole, J., ed., 'Marlborough Poor Law Union Examinations and Removals', In *Wiltshire Family History Society*, Vol. 3. 2005.

Darwall-Smith, R.H., ed., (transcribed by A.D.M. Cox), *Account Rolls of University College*, Vol. I 1381/2- 1470/1, Oxford, 1999.

Darwall-Smith, R.H., ed., (transcribed by A.D.M. Cox), *Account Rolls of University College*, Vol. II 1471/2-1596/7, Oxford Historical Society, 2000.

Denney, A.H., ed., 'The Sibton Abbey Estates. Select Documents 1325-1509', In *Suffolk Records Society*, Vol. 11. 1960.

Dymond, D., ed., 'The Register of Thetford Priory. Pt I, 1482-1517', In *Norfolk Record Society*, 1995.

Emmison, F.G., 'The Relief of the Poor at Eaton Socon, 1706-1834', In *Bedfordshire Historical Record Society*, Vol. XV., 1933.

Farr, M.W., ed., 'Accounts and Surveys of the Wiltshire Lands of Adam de Stratton', In *Wiltshire Archaeological and Natural History Society*, Vol. XIV, 1959.

Fegan, E.S., ed., *Journal of Prior William More*, Worcestershire Historical Society, 1914.

France, R.S., 'A Stanley Account Roll, 1460', In *Transactions of the Historic Society of Lancashire and Cheshire*, Vol. 113, 1962.

Fussell, G.E., ed., 'Robert Loder's Farm Accounts, 1610-1620', In *Camden Third Series*, Vol. LIII, London, Royal Historical Society, 1936.

Gardiner, M., and C. Whittick eds., 'Accounts and Records of the Manor of Mote in Iden, 1442-1551, 1673', In *Sussex Record Society*, Vol. 92, 2011.

Gibson, A.C., ed., 'Everyday Life of a Country Gentleman of Cheshire in the 17<sup>th</sup> Century As Shewn in the Private Expenditure Journal of Colonel Henry Bradshaw of Marple and Wybersleigh', In *Transactions of the Historic Society of Lancashire and Cheshire*, Vol. III. Liverpool, 1863.

Gray, T., ed., *Devon Household Accounts, 1627-59*, Exeter, Devon and Cornwall Record Society, 1995-6.

Greatrex, J., ed., *Account Rolls of the Obedientiaries of Peterborough*, Northamptonshire Record Society, 1984.

Griffiths, E., ed., 'William Windham's Green Book, 1673-1688', In *Norfolk Record Society*. Vol. LXVI, 2002.

Griffiths, R.A., ed., *The Household Book (1510-1551) of Sir Edward Don, An Anglo-Welsh Knight and his Circle*, Buckinghamshire Record Society, 2004.

Harland, J., ed., 'The House and Farm Accounts of the Shuttleworths of Gawthorpe Hall in the County of Lancaster at Smithills and Gawthorpe', In *Chetham Society*, Vol. 35, 1856.

Harland, J., ed., 'The House and Farm Accounts of the Shuttleworths of Gawthorpe Hall in the County of Lancaster at Smithills and Gawthorpe', In *Chetham Society*, Vol. 41, 1857-8.

Halliwell, J.O., ed., 'The Private Diary of Dr John Dee', In *Camden Society*, Vol. 19, 1842.

Haslop, G.S., 'A Selby Kitchener's Roll of the Early Fifteenth Century', In *Yorkshire Archaeological Journal*, Vol. 48, 1976.

Hickley, A., ed., 'John Aldrich of Eaton Farm Accounts', In *Norfolk Record Society*, Vol. LXX, 2006.

Hitchcock, T. and Black, J., eds., 'Chelsea Settlement and Bastardy Examinations, 1733-1766', In *London Record Society*, Vol. xxii, 1999.

Hockey, S.F., ed., 'The Account Book of Beaulieu Abbey', In *Camden Fourth Series*, Vol.16, 1975.

Hudleston, C. R., ed., 'Naworth Estate and Household Accounts, 1648-1660', In *Cumberland and Westmorland Antiquarian and Archaeological Society*, Vol. IX, 1958.

Hume, Rev. Canon A., 'Rural Life and Manners,—in the Neighbourhood of Bidstone and Upton,—a hundred years ago', In *Transactions of the Historic Society of Lancashire and Cheshire*, Vol II, 1873-4.

Kleineke, H., and S.R. Hovland, Eds., 'The Estate and Household Accounts of William Worsley, Dean of St Pauls Cathedral, 1479-1497', In *Richard III and Yorkist History Trust*, 2004.

Layton, W.T., 'Changes in the Wages of Domestic Servants during Fifty Years', *Journal of the Royal Statistical Society*, Vol. LXXI, 1908

Le Hardy, W. ed., *Calendar to the Session Records*, Vol. I., 1678-1694, Aylesbury, 1933.

Le Hardy, W.ed., *Herfordshire County Records. Calendar to the Session Minute Books of the Country of Herford, 1619-1657*, Hertford, 1928.

Linnell, C.D., 'The Diary of Benjamin Rogers, Rector of Carlton, 1720-71', In *Bedfordshire Historical Record Society*, Vol. XXX, 1950.

Lodge, E.C., ed., *The Account Book of a Kentish Estate, 1616-1704*, London, 1927.

Lomas, R.A., 'A Northern Farm at the End of the Middle Ages: Elvethall Manor, Durham', *Northern History*, Vol. 18, 1982.

Lui, G., 'Agricultural Wage Labour in Fifteenth Century England,' Durham thesis, Durham University, 2012. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk>.

Martin, J.D., ed., 'The Account Book of Clement Taylor of Finsthwaite, 1712-1753, In *Record Society of Lancashire and Cheshire*, Vol. CXXXV, 1997.

Master, J., 'The Expense-book of James Master Esq AD 1646-1676', transcribed by Mrs Dalison and edited and with an introduction by Canon Scott Robertson, In *Archaeologia Cantiana*, Vol. XV, 1883.

Master, J., 'The Expense-book of James Master Part II 1655-7', In *Archaeologia Cantiana*, Vol. XVI, 1886.

Mellows, W.T., and P.I. King, eds., 'The Book of William Moreton', In *Northamptonshire Record Society*, Vol. XVI, 1954

Munby, L.M., ed., 'Early Stuart Household Accounts', In *Hertfordshire Record Society Publications*, Vol. 2, 1986.



Munckton, T., *Chancellor's Farm Accounts, 1766-67*, Weston-Super-Mare, 1994.

Myddleton, W.M., *Chirk Castle Accounts*, Horncastle, 1931.

Neave, S. and D. Neave, eds., *John Courtney of Beverley, 1759-1768*, Otley, West Yorkshire, 2001.

Noble, C. 'Farming and Gardening in Late Medieval Norfolk. Norwich Cathedral Priory Gardeners' Accounts, 1329-1530', In *Norfolk Record Society*, Vol. 61, 1996.

Orde, A., ed., 'Matthew and George Culley, Farming Letters 1798-1804,' In *Surtees Society*, Vol. CCX, 2006

Page, F.M., ed., 'Wellingborough Manorial Accounts AD 1258-1323', In *Northamptonshire Record Society*, Vol. VIII, 1935.

Penney, N., ed., *The Household Account Book of Sarah Fell of Swarthmoor Hall*, Cambridge, 1920.

Phillips, E., 'Account Rolls of the Great Hospital, Norwich, 1549-50 and 1570-71', In *Norfolk Record Society*, Vol. LXXVII, 2013.

Pilbeam, N., and I. Nelson., eds., 'Poor Law Records of Mid-Sussex', In *Sussex Record Society*, Vol. 83, 1999.

Raban, S., ed., *The Accounts of Godfrey of Crowland, Abbot of Peterborough, 1299-1321*, Northamptonshire Record Society, 2011.

Rea, W.F., ed., 'The Rental and Accounts of Sir Richard Shireburn, 1571-77', In *Transactions of the Historic Society of Lancashire and Cheshire*, Vol. 10, 1959.

Redstone, L.J., ed., 'The Cellarer's Account from Bromholm Priory, Norfolk, 1415-1416', In *Norfolk Record Society*, Vol. XVII, 1944.

Rosenheim, J.M., ed., 'The Notebook of Robert Doughty 1662-1665', In *Norfolk Record Society*, Vol. LIV, 1989.

Salzman, L.F., ed., 'Minister's Accounts of the Manor of Petworth, 1347-1353', In *Sussex Record Society*, Vol. LV, 1955.

Tachell, M. 'The Accounts of the Hospital of the Savoy for the Year 17 to 18 Henry VIII', In *Transactions of the London and Middlesex Archaeological Society*, Vol. 20, 1961.

Tittler, R., ed., 'Accounts of the Roberts Family of Boarzell Sussex c. 1568-1582', In *Sussex Record Society*, Vol. 71, 1977-9.

Wells-Furby, B., *The Berkeley Estate, 1281-1417*, Bristol, 2012.

Willan, T.S., 'A Bedfordshire Wage Assessment of 1684', In *Bedfordshire Historical Record Society*, Vol. XXIV, 1946.

Wilson, J.M., ed., 'Accounts of the Priory of Worcester for the Year 13-14 Henry VIII AD 1521-2', In *Worcestershire Historical Society*, 1907.

Winchester, A.J.L., 'The Castle Household and Demesne Farm Accounts at Millom in 1513-14', In *Transactions of the Cumberland and Westmoreland Antiquarian and Archaeological Society*, Vol. LXXXIII, 1983.

Winchester, A.J.L., 'The Diary of Isaac Fletcher of Underwood Cumberland, 1756-1781', In *Cumberland and Westmorland Antiquarian and Archaeological Society Extra Series*, Vol. XXVII, 1994.

Woodward, D., ed., *The Farming and Memorandum Books of Henry Best of Elmswell, 1642*, London, 1984.

## Secondary Sources

Barriser, R.A. 'The Borough Business of a Suffolk town, (Orford), 1559-1660', In *Royal Historical Society Transactions*, Vol. XIV, 1931.

Coutie, H., *The Diary of Peter Pownall. A Bramhall Farmer, 1765-1858*, Congleton, 1989.

Field, J. F., 'Domestic service, gender, and wages in rural England, c.1700-1860', *Economic History Review*, Vol. 66, No.1, 2012.

Foster, C.F. *Seven Households. Life in Cheshire and Lancashire, 1582-1774*, Arley, 2002.

Giroud, F.F., 'Wages AD 1621 and innkeepers' bills AD 1668', In *Archaeologia Cantiana*, Vol. XVI, 1886.

Hadfield, M., *Gardening in Britain*, London 1960.

Kelsall, R.K., 'A century of wage assessment in Herefordshire, 1666-1762, in *Wage Regulation in Pre-Industrial England*, edited and introduced by W.E. Minchinton, comprising work by R.H. Tawney and R.K. Kelsall, Newton Abbot, 1972.

Musgrave, T., *The Head Gardeners: Forgotten Heroes of Horticulture*, London, 2007.

Poos, L.R., *A Rural Society after the Black Death: Essex 1350-1525*, Cambridge, 1991

Richie, N., 'Labour conditions in Essex in the reign of Richard II', *Essays in Economic History Vol 2*, edited by E.M. Carus Wilson, London, 1962.

Rogers, J.E.T., *A History of Agriculture and Prices in England*, Oxford, 1866-1902.

Rogers, J.E.T., *Six Centuries of Work and Wages: The History of English Labour*, Electronic Resource, Bodleian Library, Oxford, 2001.

Wark, K.R., 'Domestic servants in Leeds and its neighbourhoods in the eighteenth century', In *Thoresby Society*, Vol. 8, 1998

Whittle, J., and E. Griffiths, *Consumption and Gender in the Early Seventeenth-century Household: The World of Alice Le Strange*, Oxford, 2012.

Willan, T.S., *Abraham Dent of Kirby Stephen. An Eighteenth-Century Shopkeeper*, Manchester, 1970.

Willes, M., *The Gardens of the British Working Class*, New Haven, 2014.

Youngs, D., 'Servants and Labourers on a Late Medieval Demesne: The Case of Newton Cheshire 1498-1520', *Agricultural History Review*, no. 47, 1999.

## References

Acemoglu, D., S. Johnson, and J. Robinson (2005), "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth," *American Economic Review* 95, pp. 546-579.

Allen (*Link*):

<http://www.nuffield.ox.ac.uk/People/sites/Allen/SiteAssets/Lists/Biography%20Sections/EditForm/london.xls>.

Allen, R.C. (2001), "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War", *Explorations in Economic History* 38, pp. 411-447.

Allen, R.C. (2009a), "Engel's Pause: Technical Change, Capital Accumulation, and Inequality in the British Industrial Revolution." *Explorations in Economic History* 46, pp. 418-435.

Allen, R.C. (2009b), *The British Industrial Revolution in Global Perspective*. Cambridge: Cambridge University Press.

Allen, R.C. (2011), *Global Economic History: A Very Short Introduction*, Oxford: Oxford University Press.

Allen, R.C. (2014), "The high wage economy and the industrial revolution: a restatement", *Economic History Review* 68, pp. 1-22.

Allen, R.C., and J. Weisdorf (2011), "Was there an Industrious Revolution before the Industrial Revolution: An Empirical Exercise for England, c. 1300-1830", *Economic History Review* 64, pp. 715-29.

Allen, R.C.; T. Murphy; and E. Schneider (2012), "The Colonial Origins of the Divergence in the Americas: A Labour Market Approach", *Journal of Economic History* 72, pp. 863-894.

Angeles, L. (2008), "GDP per capita or real wages? Making sense on conflicting views on pre-industrial Europe", *Explorations in Economic History* 65, pp. 147-163.

Archbold, W.A.J. (1897), "An Assessment of Wages for 1630." *English History Review*, Vol. XII (XLVI): 307-311.

Armstrong, W.A. 1972, "A Note on the Household Structure of Mid-Nineteenth Century York in Comparative Perspective." In *Household and Family in Past Time*, edited by Peter Laslett and Richard Wall. Cambridge: Cambridge University Press.

Bailey, M. (1994), "Rural Society." In *Fifteenth-century Attitudes: Perceptions of Society in Late Medieval England*, edited by Rosemary Horrox. Cambridge: Cambridge University Press.

Beveridge, Lord (1995), "Westminster Wages in the Manorial Era." *Economic History Review*, no. 8: 18-35.

Blanchard, I. (1978), "Labour productivity and work psychology in the English mining industry, 1400-1600," *Economic History Review* XXXI, pp. 1-24.

Broadberry, S.N. and B. Gupta (2006), "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800", *Economic History Review* 59, pp. 2-31.

Broadberry, S.N., B.M.S. Campbell, A. Klein, M. Overton, B. van Leeuwen (2015), *British Economic Growth 1270-1870*. Cambridge: Cambridge University Press.

Campbell, B. M. S. (2013), "National incomes and economic growth in pre-industrial Europe: insights from recent research", *Quaestiones Medii Aevi Novae* 18, pp. 167-96.

Campbell, B. M. S. (2016), *The Great Transition: Climate, Disease and Society in the Late-Medieval World*, Cambridge: Cambridge University Press.

Counce, S. (1997), "Farm Servants and the Development of Capitalism in English Agriculture." *Agricultural History Review* 45:49-60.

Clark, G. (2005), "The Conditions of the Working Class in England, 1209-2004." *Journal of Political Economy* 113, pp. 1307-40.

Clark, G. (2007), "The Long March of History: Farm Wages, Population and Economic Growth, England 1209-1869." *Economic History Review* 60, pp. 97-136.

Clark, G. (2008a), *A Farewell to Alms: A Brief Economic History of the World*. Princeton: Princeton University Press.

Clark, G. (2008b), "1381 and the Malthus delusion," *Explorations in Economic History* 50, pp. 4-15.

Clark, G., and Y. Van Der Werf (1998), "Work in Progress? The Industrious Revolution", *Journal of Economic History* 58, pp. 830-843.

Devine, T.M. (1984), *Farm Servants and labour in Lowland Scotland, 1770-1914*. Edinburgh: John Donald.

De Vries, J. (1994), "The Industrial Revolution and the Industrious Revolution", *Journal of Economic History* 54, pp. 249-270.

De Vries, J. (2008), *The Industrious Revolution: Consumer Behavior and the Household Economy*, New York: Cambridge University Press.

Dyer, C. (1988), "Changes in Diet in the Late Middle Ages," *Agricultural History Review* 36, No. 1, pp. 21-37.

Dyer, C. (1989), *Standards of Living in the Later Middle Ages*, Cambridge: Cambridge University Press.

Engels, F. (1845), *The Condition of the Working Class in England*, Leipzig, Otto Wigand.

Farmer, D. (1996), "The Famuli in the Later Middle Ages." In *Essays presented to Edward Miller*, edited by R.H. Britnell and J. Hatcher, Cambridge: Cambridge university Press.

Farmer, D. L., 'Prices and wages, 1350-1500', in E. Miller (ed.), *The agrarian history of England and Wales*, vol. 3 (Cambridge, 1991),

Field, J. (2013), "Domestic service, gender, and wages in rural England, c. 1700-1860." *Economic History Review*, no. 66: 249-272.

Foster, C. F. (2002), *Seven Households: Life in Cheshire and Lancashire 1582-1774*, Northwich, Cheshire: Arley Hall Pres.

Frankema, E.H.P., and M. van Waijenburg (2012), "Structural impediments to African growth? New evidence from real wages in British Africa, 1880-1960", *Journal of Economic History* 72, pp. 895-926.

Galor, O. (2011), *Unified Growth Theory*, Princeton: Princeton University Press.

Galor, O., and Weil, D.N. (2000), "Population, technology, and growth: from Malthusian stagnation to the demographic transition and beyond", *American Economic Review* 90, pp. 806-28.

Goldberg, P.J.P. (1986), "Female labour, service and marriage in the late Medieval urban economy." *Northern History*, no. 22, pp. 18-38.

Gollin, D. (2002), "Getting income shares right." *Journal of Political Economy* 110: 458-74.

Hanawalt, B. (1986), *The ties that bound: peasant families in medieval England*. Oxford, Oxford University Press.

Harland, J. (1856), *The house and farm accounts of the Shuttleworths of Gawthorpe Hall in the County of Lancashire at Smithills and Gawthorpe*. Chetham Society, Vol. XXXV part I.



Harland, J. *The house and farm accounts of the Shuttleworths of Gawthorpe Hall in the County of Lancashire at Smithills and Gawthorpe*. Chetham Society, Vol. XLI part II, 1857.

Hatcher, J. (1998), "Labour Leisure and Economic Thought before the Nineteenth Century," *Past And Present* 160: 76-80.

Hatcher, J. (2011), "Unreal Wages: Long-Run Living Standards and the 'Golden Age' of the Fifteenth Century." In B. Dodds and C.D. Liddy, eds. *Commercial Activity, Markets and Entrepreneurs in the Middle Ages*. Woodbridge, Boydell Press.

Howkins, A. (1994), "Peasants, Servants, and Labourers: The Marginal Workforce in British Agriculture c. 1870-1914," *Agricultural History Review* 42: 49-62.

Hilton, R.H. (1975), *The English Peasantry in the Later Middle Ages*, Oxford: Clarendon.

Humphries, J. (2004), "Household Economy." In *The Cambridge Economic History of Modern Britain*, edited by Roderick Floud and Paul Johnson, Cambridge: Cambridge University Press.

Humphries, J. (2010), *Childhood and Child Labour in the British Industrial Revolution*, Cambridge: Cambridge University Press.

Humphries, J., and J. Weisdorf (2015), "The Wages of Women in England, 1260-1850." *Journal of Economic History* 75, pp. 405-447.

King, G. (1696), *Natural and Political Observations*. In *Two Tracts by Gregory King*, edited by E. Barnett, Baltimore: Johns Hopkins University Press.

Kusmaul, A. (1981), *Servants in Husbandry in Early Modern England*, Cambridge: Cambridge University Press.

Lomas, R.A. (1982), "A Northern Farm at the End of the Middle Ages: Elvethall Manor, Durham, 1443/4-1513/14," *Northern History* 18, pp. 27-53.

Lui, G. (2012), 'Agricultural wage labour in fifteenth century England,' Durham thesis, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk>.

McArthur, E.A. (1898), "A Fifteenth-Century assessment of Wages," *English Historical Review* Vol. XIII, No. L, pp. 299-302.

McCloskey, D.N. (2010), *Bourgeois Dignity: Why Economics Can't Explain the Modern World*. University of Chicago Press.

McIntosh, M.K. (1986), *Autonomy and community. The royal manor of Havering, 1200-1500*. Cambridge, Cambridge University Press.

McKendrick, N., J. Brewer, and J.H. Plumb (1982), *The Birth of Consumer Society: The Commercialization of Eighteenth-Century England*, London: Europa.

Nuvolari, A., and M. Ricci (2013), "Economic Growth in England, 1250-1850: Some New Estimates using a Demand Side Approach", *Rivista di Storia Economica* 29, pp. 31-53.

Palma, N., and J. Reis (2016), "From Convergence to Divergence: Portuguese Demographic and Economic Growth, 1500-1850," *GGDC Memorandum No 161*.

Penn, S.A.C., and C. Dyer (1990), "Wages and earnings in late medieval England: evidence from the enforcement of the labour laws," *Economic History Review* 43, pp. 356-376.

Persson, K.G. (2008), "The Malthusian Delusion", *European Review of Economic History* 12:2, pp. 165-173.

Poos, L.R. (1991), *A Rural Society after the Black Death: Essex 1350-1525*. Cambridge, Cambridge University Press.

Postan, M.M. (1966), "Medieval Agrarian Society in its Prime: England", in Postan, M.M. (ed.), *The Cambridge Economic History of Europe, Vol. I: The Agrarian Life of the Middle Ages*, second edition, Cambridge: Cambridge University Press, pp. 549-632.

Richardson, F. (2016), *Rural Change in North Wales during the Period of the Industrial Revolution: Livelihoods, Poverty and Welfare in Nantconwy, 1750-1860*, Oxford University PhD thesis.

Sheppard, J.A. (1961), "East Yorkshire's Agricultural Labour Force in the Mid-Nineteenth Century," *Agricultural History Review*, 9, pp. 43-51.

Short, B. (1984), "The Decline of Living-in Servants in the Transition to Capitalist Farming, a Critique of the Evidence," *Sussex Archaeological Collection*, 122, pp. 147-64.

Snell, K.D.M. (1985), *Annals of the Labouring Poor. Social Change and Agrarian England 1660-1900*. Cambridge, Cambridge University Press.

Stone, L. (1966), "Social Mobility in England, 1500-1700," *Past and Present*, 33, pp. 16-55.

Thirsk, J. (1978), *Economic Policy and Projects: The Development of a Consumer Society in Early Modern England*, Oxford: Clarendon.

Voth, H.-J. (2000), *Time and Work in England 1750-1830*, Oxford: Oxford University Press.

Voth, H.-J. (2001), "The Longest years: new estimates of labour input in England, 1760-1830," *Journal of Economic History* 61, pp. 1065-82.

Wells-Furby, B. (2012), *The Berkeley Estate 1281-1417: Its Economy and Development*, Bristol: The Bristol and Gloucestershire Archaeological Society.

Whittle, J. (2015), "Servants in Rural England 1560-1650: Kussmaul Revisited", *Exeter University Working Paper No XX*.

Woodward, D. ed., (1984), *The Farming and Memorandum Books of Henry Best of Elmswell, 1642*, London: British Academy.

Woodward, D.(2000), "Early Modern Servants in Husbandry Revisited," *Agricultural History Review*, 48, pp. 141-50.

Youngs, D. (1999), "Servants and labourers on a late medieval demesne: The case of Newton Cheshire 1498-1520." *Agricultural History Review*, no. 47: 145-60.

## Appendix

**Table A1**  
Estimated payments, in pence and real terms, by decade, 1260-1850

Years in decades	Annual payments					Casual payments			Other variables	
	Number of payments	Estimated cash pay	Implied benefits	Implied income	Real income	Day payment	Implied income	Real income	CPI per day	GDP per capita
<b>1260s</b>	101	27	193	220	1.14	1.28	321	1.66	0.53	48
<b>1270s</b>	179	39	197	236	1.20	1.29	323	1.64	0.54	47
<b>1280s</b>	126	31	197	228	1.16	1.32	330	1.67	0.54	43
<b>1290s</b>	245	52	197	249	1.26	1.32	331	1.68	0.54	47
<b>1300s</b>	631	39	223	262	1.18	1.32	331	1.48	0.61	48
<b>1310s</b>	148	62	241	303	1.26	1.46	364	1.51	0.66	50
<b>1320s</b>	105	42	248	290	1.17	1.51	376	1.52	0.68	47
<b>1330s</b>	157	40	201	241	1.20	1.49	372	1.85	0.55	47
<b>1340s</b>	235	31	212	243	1.15	1.78	446	2.11	0.58	50
<b>1350s</b>	338	95	241	336	1.39	2.58	645	2.68	0.66	63
<b>1360s</b>	38	108	259	367	1.42	2.82	705	2.72	0.71	62
<b>1370s</b>	56	124	237	361	1.52	3.14	784	3.31	0.65	58
<b>1380s</b>	79	148	230	378	1.64	3.09	772	3.36	0.63	65
<b>1390s</b>	48	174	234	408	1.75	3.08	771	3.3	0.64	70
<b>1400s</b>	76	241	226	467	2.06	3.49	873	3.86	0.62	71
<b>1410s</b>	72	239	245	484	1.98	3.46	864	3.53	0.67	68
<b>1420s</b>	28	276	241	517	2.15	3.58	895	3.72	0.66	69
<b>1430s</b>	27	266	256	521	2.04	3.7	924	3.62	0.70	67
<b>1440s</b>	33	246	241	487	2.02	3.73	933	3.87	0.66	68
<b>1450s</b>	97	290	237	527	2.22	3.77	943	3.97	0.65	66
<b>1460s</b>	76	291	241	532	2.21	3.57	892	3.70	0.66	67
<b>1470s</b>	82	272	237	509	2.15	3.6	901	3.80	0.65	65
<b>1480s</b>	108	288	256	543	2.13	3.46	866	3.39	0.70	65
<b>1490s</b>	57	306	234	540	2.31	3.86	965	4.13	0.64	67
<b>1500s</b>	58	294	245	539	2.20	3.38	844	3.45	0.67	70
<b>1510s</b>	90	256	266	522	1.96	3.41	854	3.20	0.73	72
<b>1520s</b>	65	321	281	602	2.14	3.46	864	3.07	0.77	72
<b>1530s</b>	67	303	285	588	2.07	3.56	890	3.13	0.78	70
<b>1540s</b>	19	375	369	744	2.02	4.24	1060	2.88	1.01	70
<b>1550s</b>	102	601	526	1127	2.14	5.4	1350	2.57	1.44	70
<b>1560s</b>	73	571	533	1104	2.07	6.36	1589	2.98	1.46	73
<b>1570s</b>	57	401	602	1003	1.67	6.67	1668	2.77	1.65	72
<b>1580s</b>	63	392	646	1038	1.61	6.77	1693	2.62	1.77	62

Table A1 cont'd	Annual payments					Casual payments			Other variables	
	Number of payments	Estimated cash pay	Implied benefits	Implied income	Real income	Day payment	Implied income	Real income	CPI per day	GDP per capita
<b>1590s</b>	65	497	872	1369	1.57	7.27	1817	2.08	2.39	62
<b>1600s</b>	146	538	799	1337	1.67	7.66	1916	2.4	2.19	70
<b>1610s</b>	135	584	960	1544	1.61	7.82	1956	2.04	2.63	69
<b>1620s</b>	249	575	1033	1608	1.56	8.32	2079	2.01	2.83	68
<b>1630s</b>	221	541	1121	1662	1.48	8.97	2242	2.00	3.07	63
<b>1640s</b>	112	624	1278	1901	1.49	9.4	2350	1.84	3.50	62
<b>1650s</b>	155	851	1161	2012	1.73	9.86	2466	2.12	3.18	70
<b>1660s</b>	105	836	1164	2000	1.72	10.55	2638	2.27	3.19	76
<b>1670s</b>	178	1139	1197	2336	1.95	9.84	2459	2.05	3.28	82
<b>1680s</b>	27	948	1084	2032	1.87	9.74	2436	2.25	2.97	87
<b>1690s</b>	29	1127	1292	2419	1.87	9.62	2404	1.86	3.54	100
<b>1700s</b>	25	1527	1146	2673	2.33	9.75	2437	2.13	3.14	105
<b>1710s</b>	35	1619	1080	2699	2.50	10.04	2510	2.32	2.96	105
<b>1720s</b>	320	1670	1132	2801	2.48	9.94	2486	2.20	3.10	105
<b>1730s</b>	301	1732	1106	2838	2.57	10.66	2665	2.41	3.03	109
<b>1740s</b>	214	1713	1080	2793	2.59	10.61	2652	2.45	2.96	109
<b>1750s</b>	60	2079	1150	3229	2.81	10.96	2741	2.38	3.15	114
<b>1760s</b>	141	2226	1303	3529	2.71	11.55	2888	2.22	3.57	121
<b>1770s</b>	139	2748	1427	4175	2.93	12.36	3090	2.16	3.91	122
<b>1780s</b>	109	3148	1402	4550	3.25	13.29	3323	2.37	3.84	123
<b>1790s</b>	92	3502	1737	5239	3.02	15.58	3896	2.24	4.76	131
<b>1800s</b>	31	4956	2237	7193	3.21	20.02	5005	2.24	6.13	138
<b>1810s</b>	72	5260	2467	7727	3.13	22.77	5694	2.31	6.76	135
<b>1820s</b>	73	5145	1905	7050	3.70	20.12	5031	2.64	5.22	142
<b>1830s</b>	42	5411	1818	7229	3.98	20.43	5108	2.81	4.98	155
<b>1840s</b>	21	6322	1902	8224	4.32	20.65	5161	2.71	5.21	172

*Note:* Implied annual incomes are estimated using the regression coefficients reported in Table A2. Implied benefits are computed as 365 days multiplied by the daily costs of consumption. Implied nominal income in annual work is the sum of cash payments and the implied benefits. Implied nominal income in day work is 250 days multiplied by the daily cash payment. Real annual income computed as the nominal annual income divided by 365 days multiplied by the daily costs of consumption. *Sources:* Annual wages: see the text. Day wages: Clark (2007). Daily costs of consumption (CPI per day): Allen(2007)/Allen (*Link*). GDP per capita index (1700=100): Broadberry et al (2015).

**Table A2**  
Estimated coefficients of the OLS regression

<i>Variables</i>	Nominal annual payment	Nominal annual payment	Nominal annual payment	Nominal annual payment
	<b>1260-1349</b>	<b>1350-1599</b>	<b>1600-1699</b>	<b>1700-1850</b>
<b>Helper</b>	-0.0563*** (0.00443)	0.0230** (0.0113)	0.0882*** (0.0320)	0.0990*** (0.0169)
<b>Servant</b>	0.0371 (0.0935)	0.0173 (0.0163)	0.00536 (0.0330)	-0.000166 (0.0236)
<b>Occ. unknown</b>	-0.0781*** (0.00557)	0.106*** (0.0110)	0.0876*** (0.0313)	0.107*** (0.0180)
<b>Labourer (ref)</b>	-	-	-	-
<b>South</b>	0.0167** (0.00709)	0.0538*** (0.0136)	0.0835*** (0.0175)	-0.0814*** (0.0201)
<b>Centre</b>	0.0127*** (0.00291)	-0.00614 (0.0117)	0.0940*** (0.0171)	0.0454** (0.0180)
<b>North (ref)</b>	-	-	-	-
<b>1260s</b>	-0.0986*** (0.00698)			
<b>1270s</b>	-0.0281*** (0.00846)			
<b>1280s</b>	-0.0628*** (0.00885)			
<b>1290s</b>	0.0268*** (0.00852)			
<b>1300s</b>	0.0750*** (0.00815)			
<b>1310s</b>	0.223*** (0.00932)			
<b>1320s</b>	0.177*** (0.00921)			
<b>1330s</b>	-0.00603 (0.00692)			
<b>1340s (ref)</b>	-			
<b>1350s</b>		-1.406*** (0.0194)		
<b>1360s</b>		-1.316*** (0.0224)		
<b>1370s</b>		-1.334*** (0.0220)		
<b>1380s</b>		-1.288*** (0.0265)		
<b>1390s</b>		-1.211*** (0.0257)		
<b>1400s</b>		-1.075*** (0.0244)		
<b>1410s</b>		-1.041*** (0.0312)		
<b>1420s</b>		-0.974*** (0.0401)		
<b>1430s</b>		-0.966*** (0.0288)		
<b>1440s</b>		-1.034*** (0.0275)		
<b>1450s</b>		-0.955*** (0.0228)		

Table A2 cont'd	Nominal annual payment <b>1260-1349</b>	Nominal annual payment <b>1350-1599</b>	Nominal annual payment <b>1600-1699</b>	Nominal annual payment <b>1700-1850</b>
<b>1470s</b>		-0.989*** (0.0260)		
<b>1480s</b>		-0.925*** (0.0259)		
<b>1490s</b>		-0.931*** (0.0374)		
<b>1500s</b>		-0.933*** (0.0314)		
<b>1510s</b>		-0.965*** (0.0264)		
<b>1520s</b>		-0.822*** (0.0260)		
<b>1530s</b>		-0.845*** (0.0248)		
<b>1540s</b>		-0.610*** (0.0443)		
<b>1550s</b>		-0.196*** (0.0245)		
<b>1560s</b>		-0.216*** (0.0267)		
<b>1570s</b>		-0.312*** (0.0337)		
<b>1580s</b>		-0.277*** (0.0275)		
<b>1590s (ref)</b>		-		
<b>1600s</b>			-0.593*** (0.0342)	
<b>1610s</b>			-0.449*** (0.0367)	
<b>1620s</b>			-0.408*** (0.0341)	
<b>1630s</b>			-0.375*** (0.0363)	
<b>1640s</b>			-0.241*** (0.0367)	
<b>1650s</b>			-0.184*** (0.0366)	
<b>1660s</b>			-0.190*** (0.0376)	
<b>1670s</b>			-0.0348 (0.0374)	
<b>1680s</b>			-0.174*** (0.0388)	
<b>1690s (ref)</b>			-	
<b>1700s</b>				-1.124*** (0.0565)
<b>1710s</b>				-1.115*** (0.0481)
<b>1720s</b>				-1.077*** (0.0387)
<b>1730s</b>				-1.063*** (0.0385)
<b>1740s</b>				-1.080*** (0.0394)
<b>1750s</b>				-0.935*** (0.0438)
<b>1760s</b>				-0.846*** (0.0423)



Table A2 cont'd	Nominal annual payment <b>1260-1349</b>	Nominal annual payment <b>1350-1599</b>	Nominal annual payment <b>1600-1699</b>	Nominal annual payment <b>1700-1850</b>
<b>1770s</b>				-0.678*** (0.0412)
<b>1790s</b>				-0.451*** (0.0431)
<b>1800s</b>				-0.134*** (0.0430)
<b>1810s</b>				-0.0622 (0.0452)
<b>1820s</b>				-0.154*** (0.0438)
<b>1830s</b>				-0.129*** (0.0448)
<b>1840s (ref)</b>				-
<b>Constant</b>	5.560*** (0.00988)	7.029*** (0.0195)	7.696*** (0.0562)	8.844*** (0.0458)
<b>Observations</b>	1,927	1,873	1,357	1,675
<b>R-squared</b>	0.714	0.882	0.560	0.745

*Note:* Nominal annual payment is the sum of cash payments and the implied benefits. Robust standard errors in parentheses (\*\*\*) p<0.01, \*\* p<0.05, \* p<0.1). *Sources:* annual wages, see the text.

**Table A3**  
The real income of unskilled annual male workers, 1260-1850

<b>1265</b>	1.22	<b>1300</b>	1.31	<b>1335</b>	1.08	<b>1370</b>	1.24	<b>1405</b>	2.30
<b>1266</b>	1.22	<b>1301</b>	1.34	<b>1336</b>	1.14	<b>1371</b>	1.43	<b>1406</b>	2.14
<b>1267</b>	1.25	<b>1302</b>	1.31	<b>1337</b>	1.28	<b>1372</b>	1.41	<b>1407</b>	2.07
<b>1268</b>	1.09	<b>1303</b>	1.37	<b>1338</b>	1.43	<b>1373</b>	1.50	<b>1408</b>	1.79
<b>1269</b>	1.14	<b>1304</b>	1.27	<b>1339</b>	1.19	<b>1374</b>	1.39	<b>1409</b>	1.74
<b>1270</b>	1.14	<b>1305</b>	1.27	<b>1340</b>	1.38	<b>1375</b>	1.41	<b>1410</b>	2.14
<b>1271</b>	1.12	<b>1306</b>	1.34	<b>1341</b>	1.38	<b>1376</b>	1.57	<b>1411</b>	2.22
<b>1272</b>	1.18	<b>1307</b>	1.27	<b>1342</b>	1.41	<b>1377</b>	1.71	<b>1412</b>	2.04
<b>1273</b>	1.18	<b>1308</b>	1.10	<b>1343</b>	1.24	<b>1378</b>	1.71	<b>1413</b>	2.04
<b>1274</b>	1.10	<b>1309</b>	0.99	<b>1344</b>	1.35	<b>1379</b>	1.52	<b>1414</b>	2.04
<b>1275</b>	1.26	<b>1310</b>	1.24	<b>1345</b>	1.32	<b>1380</b>	1.57	<b>1415</b>	1.91
<b>1276</b>	1.16	<b>1311</b>	1.46	<b>1346</b>	1.09	<b>1381</b>	1.59	<b>1416</b>	1.80
<b>1277</b>	1.18	<b>1312</b>	1.39	<b>1347</b>	1.13	<b>1382</b>	1.62	<b>1417</b>	2.04
<b>1278</b>	1.26	<b>1313</b>	1.34	<b>1348</b>	1.27	<b>1383</b>	1.62	<b>1418</b>	1.97
<b>1279</b>	1.18	<b>1314</b>	1.16	<b>1349</b>	1.17	<b>1384</b>	1.59	<b>1419</b>	2.14
<b>1280</b>	1.17	<b>1315</b>	0.82	<b>1350</b>	1.37	<b>1385</b>	1.62	<b>1420</b>	2.21
<b>1281</b>	1.10	<b>1316</b>	0.82	<b>1351</b>	1.17	<b>1386</b>	1.76	<b>1421</b>	2.25
<b>1282</b>	1.08	<b>1317</b>	1.11	<b>1352</b>	1.29	<b>1387</b>	1.83	<b>1422</b>	2.29
<b>1283</b>	1.06	<b>1318</b>	1.34	<b>1353</b>	1.57	<b>1388</b>	1.86	<b>1423</b>	2.33
<b>1284</b>	1.19	<b>1319</b>	1.39	<b>1354</b>	1.49	<b>1389</b>	1.64	<b>1424</b>	2.14
<b>1285</b>	1.21	<b>1320</b>	1.20	<b>1355</b>	1.46	<b>1390</b>	1.57	<b>1425</b>	2.33
<b>1286</b>	1.21	<b>1321</b>	0.96	<b>1356</b>	1.37	<b>1391</b>	1.77	<b>1426</b>	2.41
<b>1287</b>	1.45	<b>1322</b>	1.02	<b>1357</b>	1.39	<b>1392</b>	1.97	<b>1427</b>	2.37
<b>1288</b>	1.38	<b>1323</b>	1.15	<b>1358</b>	1.49	<b>1393</b>	1.87	<b>1428</b>	1.82
<b>1289</b>	1.29	<b>1324</b>	1.16	<b>1359</b>	1.37	<b>1394</b>	2.01	<b>1429</b>	1.85
<b>1290</b>	1.16	<b>1325</b>	1.30	<b>1360</b>	1.47	<b>1395</b>	1.87	<b>1430</b>	2.06
<b>1291</b>	1.25	<b>1326</b>	1.48	<b>1361</b>	1.43	<b>1396</b>	1.72	<b>1431</b>	2.16
<b>1292</b>	1.27	<b>1327</b>	1.51	<b>1362</b>	1.37	<b>1397</b>	1.77	<b>1432</b>	1.94
<b>1293</b>	1.10	<b>1328</b>	1.26	<b>1363</b>	1.37	<b>1398</b>	1.77	<b>1433</b>	2.06
<b>1294</b>	1.03	<b>1329</b>	1.24	<b>1364</b>	1.41	<b>1399</b>	1.84	<b>1434</b>	2.12
<b>1295</b>	1.18	<b>1330</b>	0.92	<b>1365</b>	1.57	<b>1400</b>	1.87	<b>1435</b>	2.16
<b>1296</b>	1.35	<b>1331</b>	0.98	<b>1366</b>	1.45	<b>1401</b>	1.90	<b>1436</b>	2.12
<b>1297</b>	1.25	<b>1332</b>	1.19	<b>1367</b>	1.35	<b>1402</b>	1.97	<b>1437</b>	1.81
<b>1298</b>	1.27	<b>1333</b>	1.19	<b>1368</b>	1.41	<b>1403</b>	2.18	<b>1438</b>	1.49
<b>1299</b>	1.20	<b>1334</b>	1.19	<b>1369</b>	1.13	<b>1404</b>	2.18	<b>1439</b>	1.86

Table A3  
cont'd

<b>1440</b>	2.12	<b>1475</b>	2.18	<b>1510</b>	2.35	<b>1545</b>	1.92	<b>1580</b>	1.77
<b>1441</b>	2.08	<b>1476</b>	2.21	<b>1511</b>	2.13	<b>1546</b>	2.16	<b>1581</b>	1.79
<b>1442</b>	2.05	<b>1477</b>	2.04	<b>1512</b>	1.87	<b>1547</b>	2.34	<b>1582</b>	1.79
<b>1443</b>	2.08	<b>1478</b>	1.98	<b>1513</b>	2.06	<b>1548</b>	2.07	<b>1583</b>	1.82
<b>1444</b>	2.19	<b>1479</b>	2.08	<b>1514</b>	2.10	<b>1549</b>	1.60	<b>1584</b>	1.81
<b>1445</b>	1.87	<b>1480</b>	2.15	<b>1515</b>	2.00	<b>1550</b>	2.28	<b>1585</b>	1.43
<b>1446</b>	2.02	<b>1481</b>	1.91	<b>1516</b>	2.03	<b>1551</b>	2.54	<b>1586</b>	1.18
<b>1447</b>	2.02	<b>1482</b>	1.77	<b>1517</b>	1.97	<b>1552</b>	2.56	<b>1587</b>	1.77
<b>1448</b>	2.02	<b>1483</b>	2.05	<b>1518</b>	2.00	<b>1553</b>	2.54	<b>1588</b>	1.82
<b>1449</b>	2.08	<b>1484</b>	2.29	<b>1519</b>	1.84	<b>1554</b>	2.24	<b>1589</b>	1.57
<b>1450</b>	2.05	<b>1485</b>	2.36	<b>1520</b>	2.04	<b>1555</b>	1.76	<b>1590</b>	1.92
<b>1451</b>	2.12	<b>1486</b>	2.25	<b>1521</b>	2.21	<b>1556</b>	1.84	<b>1591</b>	2.28
<b>1452</b>	2.22	<b>1487</b>	2.25	<b>1522</b>	2.38	<b>1557</b>	2.51	<b>1592</b>	2.19
<b>1453</b>	2.22	<b>1488</b>	2.25	<b>1523</b>	2.45	<b>1558</b>	2.51	<b>1593</b>	2.11
<b>1454</b>	2.37	<b>1489</b>	2.21	<b>1524</b>	2.38	<b>1559</b>	2.19	<b>1594</b>	1.49
<b>1455</b>	2.25	<b>1490</b>	2.24	<b>1525</b>	2.38	<b>1560</b>	1.93	<b>1595</b>	1.45
<b>1456</b>	2.25	<b>1491</b>	2.20	<b>1526</b>	2.21	<b>1561</b>	2.07	<b>1596</b>	1.19
<b>1457</b>	2.18	<b>1492</b>	2.43	<b>1527</b>	1.73	<b>1562</b>	1.57	<b>1597</b>	1.31
<b>1458</b>	2.22	<b>1493</b>	2.47	<b>1528</b>	2.07	<b>1563</b>	2.09	<b>1598</b>	1.67
<b>1459</b>	2.25	<b>1494</b>	2.39	<b>1529</b>	2.09	<b>1564</b>	2.10	<b>1599</b>	1.58
<b>1460</b>	2.07	<b>1495</b>	2.39	<b>1530</b>	2.07	<b>1565</b>	1.91	<b>1600</b>	1.52
<b>1461</b>	2.04	<b>1496</b>	2.27	<b>1531</b>	1.97	<b>1566</b>	2.12	<b>1601</b>	1.67
<b>1462</b>	2.44	<b>1497</b>	2.35	<b>1532</b>	2.07	<b>1567</b>	2.13	<b>1602</b>	1.84
<b>1463</b>	2.44	<b>1498</b>	2.24	<b>1533</b>	2.10	<b>1568</b>	1.97	<b>1603</b>	1.79
<b>1464</b>	2.31	<b>1499</b>	2.35	<b>1534</b>	2.22	<b>1569</b>	2.15	<b>1604</b>	1.65
<b>1465</b>	2.24	<b>1500</b>	2.13	<b>1535</b>	1.87	<b>1570</b>	1.94	<b>1605</b>	1.70
<b>1466</b>	2.20	<b>1501</b>	1.95	<b>1536</b>	1.85	<b>1571</b>	1.83	<b>1606</b>	1.65
<b>1467</b>	2.20	<b>1502</b>	1.98	<b>1537</b>	2.16	<b>1572</b>	1.72	<b>1607</b>	1.37
<b>1468</b>	2.20	<b>1503</b>	2.13	<b>1538</b>	2.07	<b>1573</b>	1.33	<b>1608</b>	1.34
<b>1469</b>	2.14	<b>1504</b>	2.23	<b>1539</b>	2.19	<b>1574</b>	1.69	<b>1609</b>	1.54
<b>1470</b>	2.04	<b>1505</b>	2.31	<b>1540</b>	2.81	<b>1575</b>	1.76	<b>1610</b>	1.75
<b>1471</b>	2.04	<b>1506</b>	2.27	<b>1541</b>	2.37	<b>1576</b>	1.56	<b>1611</b>	1.51
<b>1472</b>	2.29	<b>1507</b>	2.27	<b>1542</b>	2.37	<b>1577</b>	1.65	<b>1612</b>	1.53
<b>1473</b>	2.29	<b>1508</b>	2.31	<b>1543</b>	2.28	<b>1578</b>	1.79	<b>1613</b>	1.49
<b>1474</b>	2.21	<b>1509</b>	2.47	<b>1544</b>	2.26	<b>1579</b>	1.79	<b>1614</b>	1.57

Table A3  
cont'd

<b>1615</b>	1.50	<b>1650</b>	1.49	<b>1685</b>	1.92	<b>1720</b>	2.57	<b>1755</b>	2.82
<b>1616</b>	1.53	<b>1651</b>	1.66	<b>1686</b>	1.86	<b>1721</b>	2.65	<b>1756</b>	2.34
<b>1617</b>	1.50	<b>1652</b>	1.91	<b>1687</b>	1.96	<b>1722</b>	2.60	<b>1757</b>	2.52
<b>1618</b>	1.72	<b>1653</b>	2.09	<b>1688</b>	2.00	<b>1723</b>	2.57	<b>1758</b>	2.71
<b>1619</b>	1.79	<b>1654</b>	2.13	<b>1689</b>	1.84	<b>1724</b>	2.45	<b>1759</b>	2.86
<b>1620</b>	1.84	<b>1655</b>	1.84	<b>1690</b>	2.29	<b>1725</b>	2.33	<b>1760</b>	3.13
<b>1621</b>	1.58	<b>1656</b>	1.76	<b>1691</b>	2.05	<b>1726</b>	2.49	<b>1761</b>	3.32
<b>1622</b>	1.47	<b>1657</b>	1.52	<b>1692</b>	1.82	<b>1727</b>	2.24	<b>1762</b>	3.15
<b>1623</b>	1.53	<b>1658</b>	1.51	<b>1693</b>	1.70	<b>1728</b>	2.28	<b>1763</b>	3.09
<b>1624</b>	1.47	<b>1659</b>	1.54	<b>1694</b>	2.09	<b>1729</b>	2.59	<b>1764</b>	2.90
<b>1625</b>	1.52	<b>1660</b>	1.54	<b>1695</b>	1.86	<b>1730</b>	2.71	<b>1765</b>	2.66
<b>1626</b>	1.76	<b>1661</b>	1.31	<b>1696</b>	1.86	<b>1731</b>	2.85	<b>1766</b>	2.72
<b>1627</b>	1.91	<b>1662</b>	1.70	<b>1697</b>	1.74	<b>1732</b>	2.83	<b>1767</b>	2.46
<b>1628</b>	1.69	<b>1663</b>	1.72	<b>1698</b>	1.84	<b>1733</b>	2.68	<b>1768</b>	2.53
<b>1629</b>	1.42	<b>1664</b>	1.76	<b>1699</b>	2.08	<b>1734</b>	2.60	<b>1769</b>	2.79
<b>1630</b>	1.32	<b>1665</b>	1.86	<b>1700</b>	2.47	<b>1735</b>	2.58	<b>1770</b>	3.24
<b>1631</b>	1.51	<b>1666</b>	2.02	<b>1701</b>	2.52	<b>1736</b>	2.55	<b>1771</b>	3.03
<b>1632</b>	1.46	<b>1667</b>	1.95	<b>1702</b>	2.56	<b>1737</b>	2.66	<b>1772</b>	2.77
<b>1633</b>	1.49	<b>1668</b>	1.76	<b>1703</b>	2.32	<b>1738</b>	2.59	<b>1773</b>	2.77
<b>1634</b>	1.49	<b>1669</b>	1.83	<b>1704</b>	2.54	<b>1739</b>	2.31	<b>1774</b>	2.83
<b>1635</b>	1.46	<b>1670</b>	2.11	<b>1705</b>	2.63	<b>1740</b>	2.19	<b>1775</b>	2.84
<b>1636</b>	1.49	<b>1671</b>	2.11	<b>1706</b>	2.66	<b>1741</b>	2.50	<b>1776</b>	3.05
<b>1637</b>	1.32	<b>1672</b>	2.07	<b>1707</b>	2.55	<b>1742</b>	2.67	<b>1777</b>	2.84
<b>1638</b>	1.58	<b>1673</b>	1.77	<b>1708</b>	2.09	<b>1743</b>	2.72	<b>1778</b>	2.93
<b>1639</b>	1.71	<b>1674</b>	1.80	<b>1709</b>	1.85	<b>1744</b>	2.71	<b>1779</b>	3.11
<b>1640</b>	1.69	<b>1675</b>	2.12	<b>1710</b>	2.16	<b>1745</b>	2.50	<b>1780</b>	3.44
<b>1641</b>	1.80	<b>1676</b>	2.15	<b>1711</b>	2.26	<b>1746</b>	2.50	<b>1781</b>	3.17
<b>1642</b>	1.80	<b>1677</b>	1.87	<b>1712</b>	2.36	<b>1747</b>	2.52	<b>1782</b>	3.19
<b>1643</b>	1.84	<b>1678</b>	1.79	<b>1713</b>	2.25	<b>1748</b>	2.50	<b>1783</b>	3.22
<b>1644</b>	1.86	<b>1679</b>	2.02	<b>1714</b>	2.48	<b>1749</b>	2.51	<b>1784</b>	3.30
<b>1645</b>	1.72	<b>1680</b>	1.72	<b>1715</b>	2.35	<b>1750</b>	2.98	<b>1785</b>	3.40
<b>1646</b>	1.55	<b>1681</b>	1.81	<b>1716</b>	2.37	<b>1751</b>	2.84	<b>1786</b>	3.47
<b>1647</b>	1.26	<b>1682</b>	1.78	<b>1717</b>	2.52	<b>1752</b>	2.80	<b>1787</b>	3.39
<b>1648</b>	1.27	<b>1683</b>	1.81	<b>1718</b>	2.65	<b>1753</b>	2.85	<b>1788</b>	3.28
<b>1649</b>	1.22	<b>1684</b>	1.65	<b>1719</b>	2.51	<b>1754</b>	2.99	<b>1789</b>	3.23

Table A3  
cont'd

<b>1790</b>	3.56	<b>1803</b>	3.74	<b>1816</b>	3.31	<b>1829</b>	3.62	<b>1842</b>	4.34
<b>1791</b>	3.66	<b>1804</b>	3.50	<b>1817</b>	3.15	<b>1830</b>	3.83	<b>1843</b>	4.76
<b>1792</b>	3.72	<b>1805</b>	3.04	<b>1818</b>	3.37	<b>1831</b>	3.79	<b>1844</b>	4.59
<b>1793</b>	3.51	<b>1806</b>	3.24	<b>1819</b>	3.52	<b>1832</b>	3.95	<b>1845</b>	4.65
<b>1794</b>	3.38	<b>1807</b>	3.39	<b>1820</b>	3.36	<b>1833</b>	4.09	<b>1846</b>	4.10
<b>1795</b>	2.90	<b>1808</b>	3.20	<b>1821</b>	3.60	<b>1834</b>	4.18	<b>1847</b>	3.67
<b>1796</b>	2.76	<b>1809</b>	2.84	<b>1822</b>	3.88	<b>1835</b>	4.42	<b>1848</b>	4.37
<b>1797</b>	3.11	<b>1810</b>	2.96	<b>1823</b>	3.81	<b>1836</b>	4.11	<b>1849</b>	4.55
<b>1798</b>	3.09	<b>1811</b>	2.93	<b>1824</b>	3.64	<b>1837</b>	3.88	<b>1850</b>	4.55
<b>1799</b>	2.72	<b>1812</b>	2.62	<b>1825</b>	3.46	<b>1838</b>	3.79		
<b>1800</b>	2.84	<b>1813</b>	2.67	<b>1826</b>	3.71	<b>1839</b>	3.53		
<b>1801</b>	2.73	<b>1814</b>	3.09	<b>1827</b>	3.78	<b>1840</b>	4.06		
<b>1802</b>	3.62	<b>1815</b>	3.73	<b>1828</b>	3.79	<b>1841</b>	4.17		

*Note:* Real annual income is computed as the annual income by decade (see Table A1) divided 365 multiplied by the daily costs of consumption. *Sources:* Annual wages: see the text. Daily costs of consumption: Allen (2007)/Allen (*Link*).

**Table A4**

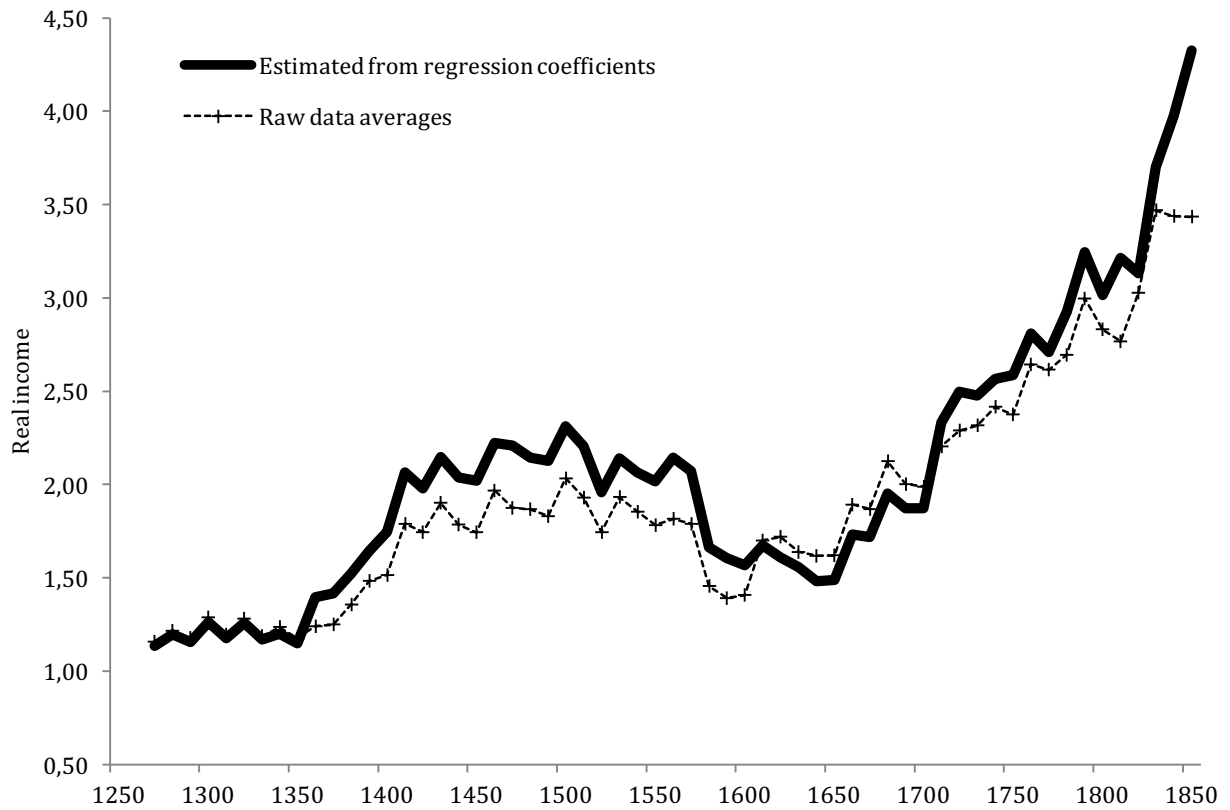
The real income of unskilled annual male workers from board and grain wages, 1260-1850

Years decades	Cash equivalent	CPI per day	Real income	Source used
<b>1260-70</b>	242	0.53	1.25	Rogers (1866)
<b>1280-90</b>	249	0.54	1.26	Wells-Furby (2012)
<b>1290-1300</b>	288	0.54	1.46	Raban (2011)
<b>1300-10</b>	260	0.61	1.17	Britnell (2014); Raban (2011)
<b>1330-40</b>	269	0.55	1.34	Wells-Furby (2012)
<b>1340-50</b>	281	0.58	1.33	Salzman (1955); Wells-Furby (2012)
<b>1350-60</b>	396	0.66	1.64	Salzman (1955)
<b>1360-70</b>	384	0.71	1.48	Booth (2003)
<b>1390-1400</b>	452	0.64	1.94	Lui (2002)
<b>1400-10</b>	384	0.62	1.70	Lui (2002)
<b>1410-20</b>	481	0.67	1.97	Lui (2002)
<b>1420-30</b>	434	0.66	1.80	Lui (2002)
<b>1430-40</b>	401	0.70	1.57	Lui (2002)
<b>1440-50</b>	516	0.66	2.14	Lui (2002)
<b>1450-60</b>	551	0.65	2.32	Lui (2002)
<b>1520-30</b>	640	0.77	2.28	Bailey (2007)
<b>1530-40</b>	640	0.78	2.25	Bailey (2007)
<b>1550-60</b>	640	1.44	1.22	Adams (1995)
<b>1560-70</b>	640	1.46	1.20	Adams (1995)
<b>1660-70</b>	2280	3.19	1.96	Betty (2005)
<b>1690-1700</b>	2702	3.54	2.09	Betty (2005)
<b>1700-10</b>	2696	3.14	2.35	Betty (2005)
<b>1790-1800</b>	5340	4.76	3.07	Orde (2006)

*Note:* Annual real income is the annual cash payment divided by 365 times the daily costs of consumption. *Sources:* Annual wages: as listed. Daily consumption costs: Allen (Link).

**Figure A1**

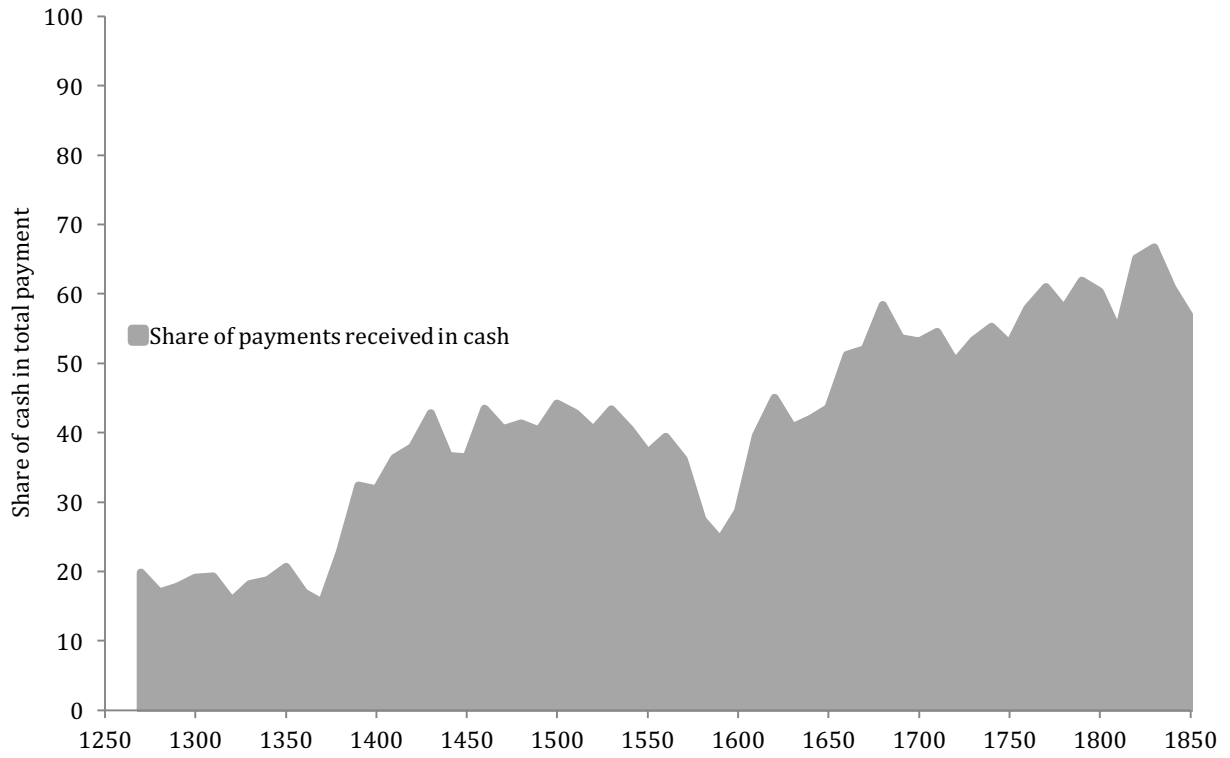
Raw data averages and estimates based on regression coefficients, by decade, 1260-1850



*Note:* Annual real income is constructed by dividing annual nominal income by 365 days multiplied by daily costs of consumption (see Table A1). Annual nominal income is the sum of cash payments and monetised in-kind benefits. Annual nominal income estimates are predicted based on the regression coefficient reported in Table A2. *Sources:* Annual wages: see the text. Daily cost of consumption: Allen (Link).

**Figure A2**

The share of cash in annual workers' total remuneration, 1260-1850



Sources: Annual wages: see the text. Daily consumption costs: Allen (Link).



## EHES Working Paper Series

### Recent EHES Working Papers

#### 2017

- EHES 120 The Gains from Import Variety in Two Globalisations: Evidence from Germany  
*Wolf-Fabian Hungerland*
- EHES 119 The long-term relationship between economic development and regional inequality:  
South-West Europe, 1860-2010  
*Alfonso Díez-Minguela, Rafael González-Val, Julio Martínez-Galarraga, M. Teresa Sanchis and Daniel A. Tirado*
- EHES 118 Openness and growth in a historical perspective: a VECM approach  
*Giovanni Federico, Paul Sharp, Antonio Tena-Junguito*
- EHES 117 The Bank of England as Lender of Last Resort: New historical evidence from daily  
transactional data  
*Mike Anson, David Bholat, Miao Kang, Ryland Thomas*
- EHES 116 Harbingers of Modernity: Monetary Injections and European Economic Growth,  
1492-1790  
Nuno Palma
- EHES 115 'Rational' Farmers and the Emergence of Modern Accounting in Danish Dairying  
Markus Lampe, Paul Sharp
- EHES 114 Missed opportunities? The development of human welfare in Western Europe,  
1913-1950  
Daniel Gallardo Albarrán
- EHES.113 Portugal's wine globalization waves, 1750-2015  
*Pedro Lains*

All papers may be downloaded free of charge from: [www.ehes.org](http://www.ehes.org)

The European Historical Economics Society is concerned with advancing education in European economic history through study of European economies and economic history. The society is registered with the Charity Commissioners of England and Wales number: **1052680**