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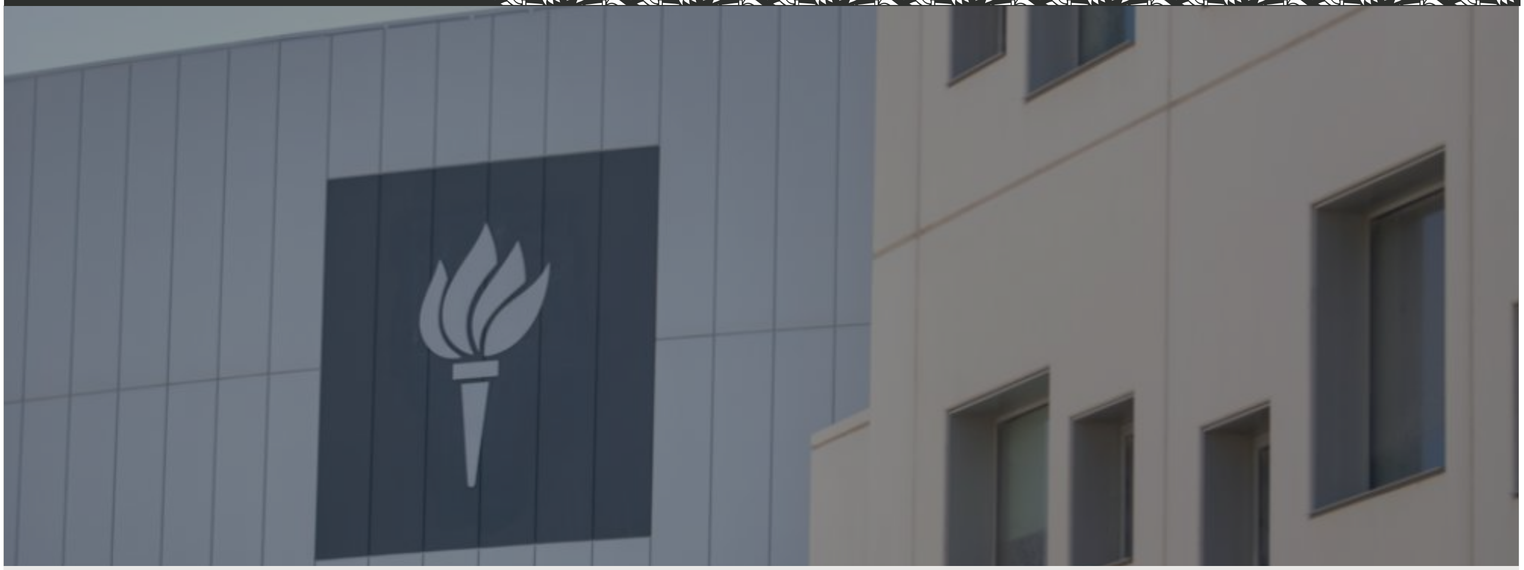

Inequality in Pre-industrial Europe (1260-1850): New Evidence from the Labour Share

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INEQUALITY IN PRE-INDUSTRIAL EUROPE (1260-1850): NEW EVIDENCE FROM THE LABOUR SHARE

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ABSTRACT: The dynamics of economic inequality and its relation with economic growth in the preindustrial world is increasingly attracting the attention of both economic historians and economists. This paper introduces new estimates of the labour share in five major European countries (England, France, Holland, Spain and Portugal) for the period 1250-1850 constructed using an innovative method based on the conversion of real wages in 2011 PPP US$. We find a complex pattern of evolution of the labour share with major fluctuations. We also establish a negative correlation between variations of GDP and variations in the labour share.

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JEL classification: N33, N01

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1. Introduction

Over the last ten years, inequality has returned to be a lively research theme in economics and also in economic history. Most of current works on income and wealth distribution are based on household level data, but the alternative 'classical' functional approach to income distribution, long neglected (Glyn 2011), is also enjoying a revival. The recent trends of the labour share in the United States and in other advanced countries are now at the centre of a scholarly attention (Karabarbounis and Neiman 2014, ILO-OECD 2015, Cette, Koehl and Philippon 2019). This renewed interest has also extended to the relations between economic growth and factor shares in historical perspective, in particular to the 19th and 20th century (Bengtsson and Waldenstorm 2018, Charpe, Bridji and Mcadam 2019, Maarek and Orgiazzi 2019, Bengtsson, Rubolino and Waldenstrom 2020). This expanding literature supplements the more established research tradition in economic history on personal income and wealth distribution (van Zanden et al. 2014, Roine and Waldenstrom 2014, Piketty and Zucman 2014, Piketty, Saez and Zucman 2018).

The literature on income distribution in the pre-industrial world is much less abundant, although growing. The conventional wisdom, dating back to Rogers (1884) classical account of the English case, argues that the historical phase after the Black Death of the mid-14th century had been a 'golden age' for the living standards of European workers and that their conditions worsened, at least in absolute terms, during the 16th and 17th century. However, this interpretation, as far as income distribution is concerned, relies on limited evidence, as we will discuss in the next Section. Indeed, this stream of literature has mostly resorted to coeval conjectures and data on taxes on property, which measure more wealth than income.

When considered, in the economic history literature, the functional distribution is proxied by either the wage/rental ratio (O'Rourke and Williamson 2005, Madsen and Strulik 2020) or by the wage/GDP ratio (Williamson 1997, 1998). The former method assumes two factors only, neglecting capital, and thus is unsuitable for moderately advanced countries, while the latter, in principle, would capture returns to all factors (including skill premia, rents and returns to capital).[1] Both measures can be expressed only as ratios, and thus are not comparable across countries (unlike the labour share), and do not take into account variations in the relative amount of factors.

[1] The returns to human capital would appear in the numerator if wages refer to all workers and in the denominator if they refer to unskilled workers only. This indicator of inequality is also susceptible of a Marxian interpretation. For Marx, the state of the income distribution between workers and capitalists is described by the "rate of exploitation": $e = (y-w)/w$, which corresponds to $w/y = 1/(1+e)$.

In this paper, we build on Williamson's (1997, 1998) intuition about the wage/GDP as indicator of inequality, with two methodological innovations. First, following Angeles (2008), we adjust for changes in labour supply – i.e. the number of days worked and the activity rates of the population for different categories of workers. We distinguish workers by gender, level of skill and type of occupation (causal or daily vs annual), each with a specific premium relative to the baseline (i.e. the males unskilled workers). Second, we convert the wage series, originally in welfare ratios (Allen 2001) into 2011 Geary-Khamis dollars, so that we can express both the numerator and the denominator in the same units and compute genuine labour shares rather than indexes. We estimate the labour share for five major European economies (England, France, Holland, Spain and Portugal), from the end of Middle Ages, or as early as possible given the available data, to 1850. Our estimates break new ground in the historical analysis of the dynamics of inequality in pre-industrial Europe. First, as already suggested by the conventional wisdom, we find a major cycle in the labour share following the Black Death. Inequality declined from mid-14th to mid-15th century, and rose until to the beginning of the 17th. Second, less predictably, we find a major divergence across Europe in the 17th century. In England and Holland, the most successful countries of the time, the labour share increased sharply until a peak in the 1680s, mostly as a consequence of an increase in activity rates and working time: the Industrious Revolution (de Vries 2008) reduced inequality. This 'second golden age' for the workers was short lived: at the beginning of the 18th century, the labour share in England and Holland was back to the level of the 1630s and it continued to decline in the second half of the century. In the three other countries, France, Spain and Portugal, the labour share grew very little or not at all during the 17th century, but it declined as well in the 18th. Thus, the Napoleonic wars marked a historical peak in inequality. Third, we find tentative evidence of a very limited rise of the labour share in the early 19th century, which unfortunately cannot be pursued in the rest of the century for lack of comparable estimates. Last but not least, our data suggest the existence of a negative relationship between the labour share and GDP per capita.

The structure of the paper is as follows. After the literature survey (Section 2) and the derivation of our framework (Section 3), in Section 4 we outline the sources of the data used. We present our results for the English case, the most documented one, in Section 5, while in Section 6 we compare them with the trends for the four other countries. There we also analyse the proximate causes of the of the variations in the labour shares using a simple decomposition. Section Seven concludes.

2. Income distribution in pre-industrial Europe

Recently, studies on inequality in pre-industrial Europe have been flourishing along two main lines. Most scholars have combed fiscal and other sources to estimate Gini coefficients of wealth distribution (Alfani 2017, 2019).[2] Almost all these data were produced to tax land and housing, and some of them include also financial assets (i.e. debts and loans). Thus the Gini coefficients measure wealth rather than income distribution. As it is well known, wealth is more unequally distributed than income. Furthermore, the Gini coefficients estimated by using fiscal data might even further underestimate trends in inequality as the sources do not include the propertyless. However, in practice, these biases might not be so serious to prevent the adoption of this approach for providing an empirical assessment of inequality trends (Alfani and Di Tullio 2019). Overall, this line of research shows that inequality in Europe was increasing 'almost monotonically' at least from mid-15th century onwards (Alfani 2019: 1177). For instance, Alfani and Di Tullio (2019) argue that the rise of inequality in Venetia was determined by the growing burden of a strongly regressive taxation. The church and feudal land were exempt from impositions and most revenue came from consumption taxes. The middle class was being hollowed out to pay for the current and, via debt servicing, past military expenditures of the *Serenissima*. In a very recent paper, Alfani, Gierok and Schaff (2020) show that wealth inequality in Germany decreased from 1350 to about 1450, rose in the following two centuries and declined for the joint effect of the 1627-1629 plague and of the Thirty Years' war. By adopting a different measure of wealth inequality, the wealth/GDP ratio, Madsen (2019) suggests a different story for England from 1200 onwards. The ratio fluctuated in the long run around a factor of five, with rising inequality after the Black Death, in the early 17th century and again in the 18th century and declining inequality from about 1430 to 1550 and in the early years of the 18th century.

Research on income inequality has been seriously hampered by the lack of data. Only two authors so far have been able to estimate income distribution with tax data for pre-industrial Europe. Ryckbosch (2016) finds that in the Low Countries inequality among urban population may have declined before 1550 and surely rose after 1650. He explains these trends with changes in the relative bargaining power of urban workers, which depended on the protection by their guilds against competition from rural workers. In contrast, Reis (2017) argues that inequality in Portugal sharply declined from mid-16th century to 1700 and increased slightly thereafter until 1770. Rural

[2] Overton (quoted in Broadberry et al. 2015: 301) has used probate records to measure wealth inequality in some English counties.

real wages rose thanks to the growth in production of Porto wine and the diffusion of the less expensive cereal (maize).

Lacking income data, most authors have relied on social tables[3], imperfect as they are. The key reference in this line of research is the seminal paper by Milanovic, Lindert and Williamson (2011), later updated, with some additional cases, in Milanovic (2018). The extended database includes a total of 41 tables for pre-industrial countries (defined as having a GDP per capita lower than 2,500 Geary-Khamis 1990 US$). Thirteen tables refer to early modern Europe, with an average of Gini coefficient of 47%. Milanovic, Lindert and Williamson (2011) interpret their data introducing the concept of maximum feasible inequality – i.e. the maximum value of the Gini index consistent with the survival of the mass of the population when the élite, assumed to be 10% of the population, gets all the surplus beyond subsistence, the envelope of this maximum point is defined as the inequality possibility frontier (IPF). This maximum is frequently attained when GDP is very low, as in India in 1750 and 1947 or in Kenya in 1914, whereas the current Gini coefficients for advanced countries are only a fraction of the maximum feasible inequality. Pre-industrial Europe was somehow in the middle, poor but still distant from the IPF. In his well-known synthesis book *Global inequality*, Milanovic (2016: 69) concludes that in pre-industrial societies absolute inequality fluctuated according to 'accidental or exogenous events, such as epidemics, discoveries or wars' as long as income remained low. Additionally, following the pioneering research of van Zanden (1995), Milanovic emphasizes that inequality tended to increase when income was growing. Indeed, the estimates for England (five observations) and Holland/the Netherlands (three) by Milanovic (2018) show a sizeable growth in inequality without a comparable increase in the ratio between inequality and the maximum feasible inequality.

As far as we know, there is no comprehensive work on functional distribution of income in pre-industrial Europe.[4] However, some research projects on other issues have yielded series of labour share in England, which we will discuss in more detail in Section 5. In particular, Clark (2010) estimates a new series of GDP from the income side, Madsen (2017) deals with the determinants of changes in wealth/GDP ratio, and Humphries and Weisdorf (2019) study the diffusion of casual versus annual labour contracts.

[3] Social tables are essentially educated guesses formulated by 17th and 18th century economists, such as William Petty (1623-1687) and Francois Quesnay (1694-1774), on the average income of the different social classes.

[4] Series of ratios of real wages to GDP and rents are available for Spain (Alvarez-Nogal and Prados de la Escosura 2013, 2020) and Portugal (Reis 2017) but unfortunately, as argued in the introduction, they are only an imperfect proxy of the true factor shares.

In spite of the dearth of evidence, there is a widespread consensus about the effects of the Black Death on living standards and income distribution in Europe. Real wages of unskilled workers increased (Pamuk 2007, Fochesato 2018), the skill premium in building trades fell (van Zanden 2009) and it seems likely that land rent declined as well, even if there are no data for this period. Thus, the drastic fall in the population increased the labour share of unskilled workers and, in all likelihood, also the total labour share, as the number of skilled workers was very small. The population series for England (Broadberry et al. 2015) and the recent work by Jedwab, Johnson and Koyama (2019) for cities all over Europe imply that the demographic recovery was slow. Thus, one would surmise that the golden age of workers lasted until the end of the 16th century. Afterwards, the consensus about wage trends is much less strong. In his seminal paper on the 'little divergence', Allen (2001) argues that real wages remained fairly high in England and Holland and declined in the rest of Europe. This decline can be interpreted as a standard Malthusian reaction, while trends in North-Western Europe may signal a change in the relation between population and economic growth (Fochesato 2018). However, Allen's real wage series are still controversial (Geloso 2018, Stephenson 2018, Lopez Losa and Piquero Zarauz 2020). At all events, after the 16th century any inference from the dynamic of real wages to the labour share is not straightforward as in the post-Black Death period.

3. Methods

Our accounting framework is very simple. We start from the definition of labour share (α) as the ratio of the wage bill to GDP, which can be estimated in nominal terms (subscript N) or in real terms (subscript R), respectively as:

$$\alpha_N = (W_N * L) / Y_N \quad (1)$$

and:

$$\alpha_R = (W_R * L) / Y_R \quad (2)$$

where W is the yearly wage, L is the number of workers and Y is the GDP, with the subscript N indicating nominal values.[5] Nominal wages and GDP are deflated respectively with an index of cost

[5] Note that this definition includes all labour compensations, including the labour component of the self-employed, which we assume to be equal to the prevailing wage. This avoids a major issue in the current estimates of labour share (Gollin 2002, Guerriero 2019).

of living for wage workers ($W_R = W_N / P_w$) and with the GDP deflator ($Y_R = Y_N / P_Y$), so that the relationship between the nominal and real labour shares is:

$$\alpha_N = \alpha_R * P_w/P_y \quad (3)$$

The nominal labour share measures the percentage of the wage bill on total return to factors, while the real labour share is the percentage of the total purchasing power of the population which accrues to workers. The two measures diverge if the ratio P_w/P_y changes relative to the base year: ceteris paribus (i.e. for the same distribution of nominal income) an increase in prices of wage goods lowers the workers' share on the total potential consumption – i.e. increases real inequality (Crafts 2020, Geloso and Lindert 2020).

We assume the workforce to be composed by i categories (1, 2,..n), each featuring L_i workers, who get a daily wage w_i for d_i days of work. By definition, GDP per capita is equal to GDP per capita y times total population N. Thus the labour share can be written as:

$$\alpha = \Sigma(w_i*L_i*d_i) / y*N \quad (4)$$

We compute the share of workers of the category on population (L_i/N) as the product of the share of the relevant age/gender cohort (i.e. potential workers) in the i-th category (μ_i) on population times the activity rate for that cohort (δi):

$$L_i /N= \mu_i * \delta_i \quad (5)$$

Furthermore, we express the wage of the i-th category as ratio ξ_i to the reference category (w_M) - i.e. unskilled males on daily wages ($\xi_i = w_i / w_M$). Thus, the labour share becomes:

$$\alpha = \Sigma(w_M/y* \xi_i *\mu_i* \delta_i *d_i) \quad (6)$$

Hence, our estimate needs real wages of unskilled males, GDP per capita, the composition of population by age/gender cohort (μ_i), and three parameters (ξ_i, δ_i and d_i) for as many categories of workers as possible given the available sources.

We will estimate the labour share in real terms because most available data refer to real GDP rather than to nominal one. All the available series of GDP at current prices have been obtained as elaborations of the original estimates at constant prices.[6] For modern societies, data refer to productive sectors and long term contracts are the norm, but, in pre-industrial ones, the distinction between different sectors is hard to keep, while wages and working conditions depended on the characteristics of the workers, and many of them were hired with short term contracts. In the most detailed case, for England, we consider separately six categories of workers (15-64 years), dividing by gender, and types of contract (long term or annual vs short term or daily), level of skill (skilled/unskilled, for males only).[7] We estimate separately the share of each category, with specific parameters, and then we sum to obtain the total labour share at constant prices.

4. Data and sources

We retrieve the GDP series (in 2011 US$ PPP) for England (Broadberry et al. 2015), Holland (van Zanden and van Leeuwen 2012) and Portugal (Palma and Reis 2019) from the 2018 release of the Maddison project (Bolt et al. 2018), while for Spain and France we rely on recent estimates by Prados de la Escosura, Alvarez-Nogal and Santiago-Caballero (2020) and Ridolfi and Nuvolari (2020). We measure real wages with the welfare ratios (WR), which Allen (2001: 421) defines as:

$$WR=(w_N*250)/(C*3.15) \tag{7}$$

where w_N is the nominal daily wage for the male breadwinner, who is assumed to work for 250 days per year ('Allen's standard'), C is the annual cost of a subsistence basket for an adult and 3.15 is number of baskets necessary for the survival of an average household. Allen assumes this latter to have four members (the breadwinner himself, his wife and two children) and to need three baskets (children consume half an adult basket), plus a 15% allowance for rents (5% for each consumption unit). Each subsistence basket includes food for a total of 1,940 calories per day, fuel and some basic manufactures. Some of the food items (e.g. eggs, beer and wheat bread) in Allen (2001) are actually not strictly necessary for mere biological subsistence, as they can be easily substituted by cheaper sources of calories and proteins. In fact, in later works, Allen (2009a: 36-37

[6] These nominal series are obtained by reflating the real series with a price index (Broadberry et al. 2015: 201) and then by linking the resulting index to GDP at current prices in a benchmark year. This procedure does not avoid deflation biases and, additionally, causes the level of nominal GDP, and thus ultimately the labour share, to depend on the choice of the linking year. This introduces a further source of distortion, whenever these benchmark years differ across countries and, for this reason, they refer to different price structures.

[7] We omit children (5-14 age) as the available information on their activity rates before the 18th century are too scattered to be of any use.

and Allen et al. 2011) has modified the basket to reduce its cost as much as possible, while still keeping the same level of calories.[8] In particular, he assumes that people could survive eating the cheapest available cereal, such as oats in England or maize in Southern Europe. We will adopt this stripped down version of the consumption basket, aptly labelled "bare-bone basket" in Allen et al. (2011), as it enhances the intercountry comparability and makes computations easier.[9]

<Table 1 about here>

We convert the welfare ratios (WR_{it}) into yearly income for male unskilled workers in three steps. First, we compute the monetary value of the food component of the basket (Table 1) in 2011 Geary-Khamis US dollars ($C^F_{\$2011}$), using the standard formula for bilateral PPP conversion between the United States and another country j (e.g. Bolt et al. 2018):

$$C^F_{\$2011}= [(\Sigma P_{USA}*Q_j/ \Sigma P_j*Q_j)* (\Sigma P_{USA}*Q_{USA}/ \Sigma P_j*Q_{USA})]^{\wedge 0.5} \tag{8}$$

The vectors Q_{USA} and Q_j are the quantities for food items and P_j and P_{USA} are prices in local currencies from the ICP World Bank (2015) database for the 2011 round of PPPs (Table 1).[10] Second, following the World Bank approach for poverty lines, we add a fixed mark-up (15%) to food expenditures to take into account the non-food items (clothing, soap, etc.) of the subsistence basket ($C_{\$2011}=C^F_{\$2011}$ *1.15). To this amount we add the allowance for rents as in the Allen's original formula (equation 7). Thus, we obtain the yearly cost of subsistence for one adult. By dividing this amount for 365, we obtain the daily costs of the bare-bone baskets of Table 1 (inclusive of non-food items and rent). These daily costs in 2011 US$ are shown in Figure 1.

[8] In a recent article, Allen (2017) pushes forward this idea, suggesting to select the cheapest survival basket with linear programming rather than selecting it a priori. Unfortunately, his elegant approach needs a complete set of prices of all alternative foods.

[9] Some economic historians have questioned the realism of Allen's assumptions. Humphries (2013) maintains that all caloric intakes assumed by Allen are implausibly low and that the average household needed four rather than three baskets. In his response, Allen (2015) does not disagree and corrects his adult daily intake to 2,100 calories. However, this correction would not affect our result. Indeed, an increase in calories and in the number of baskets would decrease the welfare ratio but it would be compensated in equation (9) by the increase in the number and the unit cost of the basket. Lopez Losa and Piquero Zarauz (2020) argue that the basket should include the lowest-priced wheat bread, rather than the cheapest cereal, which was hardly consumed by workers, at least in cities. This suggestion, however, is hard to implement, as the quantitative evidence on the actual pattern of consumption of working classes in preindustrial Europe is limited and the anecdotal evidence points to several shifts in consumption patterns (de Vries 2019).

[10] For some cereals, the World Bank does not report prices (e.g. maize) or provides only prices for industrial products (such as cornflakes). In these cases, we estimate an implicit price as the retail price of bread times the ratios of producer prices from the FAO Statistical data-base (www.fao.org), accessed November 2019.

<Figure 1 about here>

In Figure 1 differences among countries are fairly small fluctuating around 1.25 dollars per day, a value significantly lower than the 2015 poverty line of the World Bank (1.90 US$ 2011 PPP), which features more calories (about 2,100) and also a wider range of non-food consumption items (Allen 2017: 3692). Finally, we compute the yearly real income (W_{it}) implicit in the welfare ratio (WR_{it}) as:

$$W_{it} = w_M * d = WR_{it} * C_{\$2011} * 3.15 \tag{9}$$

We have collected information for the other parameters of our framework from various country-specific sources, as fully detailed in the Appendix. As said in the introduction, our search has yielded a complete set of estimates for England, while for all other countries there are some gaps. In these cases, we proxy the missing parameters with those of some neighbouring countries, or of England or, in some extreme cases, we simplify the formulas. Table 2 gives a compact overview of the main sources used.

<Table 2 about here>

5. Results: the labour share in England

Figure 2 presents our baseline series of the real labour share for England (equation 6). We smooth yearly fluctuations with a 25 years moving average (alternative smoothing procedures are presented in Figure 5a). In the following, all quoted years without additional qualifications refer to this series – e.g. 1802 refers to the period 1790-1814, thereby covering the whole period of Napoleonic wars.

<Figure 2 about here>

In the long run, English workers got about half of the GDP (49.5%) – including children is not likely to affect the result.[11] The share fluctuated widely, from 36.9% at the very beginning of the 19th century to 63.9% in the late 15th century, at the end of the Wars of the Roses. As expected, the labour share rose significantly after the Black Death (1348-1351) and declined when the

[11] In Figure A.2 in Appendix, we provide some tentative estimates of the labour share for child workers for the period 1780-1850, for which there are probably more reliable data for children wages and activity rates (Horrell, Humphries and Weisdorf 2020). The average labour share of child workers in this period is 1.14% and the maximum level is slightly more than 1.6% during the 1820s.

population recovered. The upward swing of this Malthusian cycle lasted about one century, peaking in the 1480s. This date coincides with the trough of population, which, after the collapse of the mid-14th century (a 45% fall) continued to slide down and in 1480 was a fifth lower than at the end of the plague (Broadberry et al. 2015). The labour share remained above 60% up to the end of the 15th century and then it declined throughout the whole 16th century. In 1600, the labour share was back to the pre-plague level, while the population was still about 15% lower. The 17th century featured a sharp rise in the labour share, which hit a new peak in 1667 and then started to decline. This rise, unlike the Malthusian cycle, had no obvious relation with population trends: population rose fast to the 1630s, stalled for about a century and then rose again rapidly very fast. We will return to the broader issue of causes of this 'second golden age' for English workers in comparative perspective in Section 6. The labour share continued its decline during the first decades of the Industrial Revolution, but it started to rebound in the very early 19th century.[12] In spite of this rebound, in the 1830s the labour share was still some points lower than its long-run average.

We plot, in Figure 2, also the wage/GDP ratio (the 'Williamson w/y'), which we express, for the sake of comparability with our series, as labour share (equation 4) assuming L/N = 0.4 and d = 250 (Allen's standard). The movements of the 'Williamson w/y' only vaguely resemble our baseline series. The Malthusian cycle is much wider and, at its peak, labourers would get over 100% of the GDP, which is clearly absurd. On the other hand, the 17th century cycle is barely visible. By construction, the difference reflects our much more articulated view of historical change – and most notably in the number of working days, which we will discuss later in this Section.

Our estimate refers to the share in real terms - i.e. to the percentage of workers on total purchasing power of the English population and ultimately to their welfare (cf. Section 3). We can compute the nominal share – their percentage on total income by multiplying the real labour share by the ratio of our index of prices of bare-bone basket to the GDP deflator (Broadberry et al. 2015). In the long run, differences were predictably small but not totally negligible. The real share comes out to be inversely correlated to the price ratio (- 0.679) and thus the nominal share

[12] This pattern is consistent with the recent assessment of the overall living standard situation of English workers by Gallardo-Albarran and de Jong (2020). Our estimate may undervalue somewhat the increase in the labour share in the early 19th century, as we measure the skill premium, as standard in the literature on pre-industrial societies, with the ratio of wages of mason to unskilled workers. This measure is likely to understate the premium, as the proportion of highly skilled clerical workers was growing with industrialization. According to the 1841 census, 'professional' and 'commercial occupations' employed 207,000 male workers – i.e. about 4% of the total workforce and a quarter of our estimate of skilled workers (Mitchell 1988: 104).

fluctuates somewhat less than the real one (see, Figure A.3 in Appendix). The nominal share was higher by almost seven points at the end of our series as the Corn Laws (1815 and 1828) increased the price of cereals and prices of manufactures fell thanks to the productivity growth during the Industrial Revolution.

In Figure 3a, we compare our baseline series with the available estimates of the labour share. We focus on the three long-run series, by Clark (2010), Madsen (2017) and Humphries and Weisdorf (2019). In the long-run, our baseline (49.5%) has the lowest average of the four. The gap with the series by Madsen (57%) and Clark (61%) is significant, and even more so with the series by Humphries and Weisdorf (70%). This latter is always higher than our baseline, but it is moves quite similarly (the coefficient of correlation is of 0.58). In contrast, the series by Clark and Madsen are much more stable than our baseline, and the correlation is correspondingly lower (respectively 0.20 and 0.22). In both cases, this relative stability ultimately depends on the assumption of a constant number of working days. Clark (2010: 63) estimates the wage bill multiplying his series of daily wages by 300 and then computes the GDP from the income side by adding rents and profits. The numerator of the Madsen series, instead, is an index of labour income based on Humphries and Weisdorf series of annual wages, which assumes a constant number of working days.[13] Figure 3b plots the series by Allen (2009b) and by Crafts (2020) and the four benchmark estimates of labour shares elaborated from social tables by Allen (2019). The three series, including ours, find a clear worsening of inequality during the early stages of the Industrial Revolution – the 'Engels' pause' of the title of Allen's (2009b) famous article. The series by Crafts is very similar to ours, with different levels, while according to Allen (2009b) the decline lasted until the late 1810s with no rebound.[14] The social tables show almost no change in time – it is difficult to assess how much does this depend on the different nature of the data (nominal vs real shares) or on the procedures to transform data by social group into returns to factors.

<Figure 3a-3b about here>

Figure 4 probes deeper in the evolution of the labour share, distinguishing between daily and annual workers (Figure 4a), unskilled and skilled ones (Figure 4b) and males and females

[13] Madsen adjusts for the urban/rural premium for unskilled workers and for the skill premium and obtains the series in levels by linking it to the 1855 labour share from national accounts (Feinstein 1972).
[14] Neither Allen (2009b) nor Crafts (2020) adjust for changes in labour inputs and both use the wage series by Feinstein (1988) which covers a wider range of jobs but starts in 1770. On top of this, Allen (2009b) use Crafts and Harley (1992) index of real output. Crafts first computes the ratio between indexes of real wages and GDP and then converts it into share by linking to the level around 1800 (56%) according to the Colquhoun social table.

(Figure 4c). For each of these pairs, we plot on the left the shares on GDP, which sum up to the total labour share, and on the right the proportion of, respectively, annual workers, skilled workers and females on total return to labour. Movements for annual workers (Figure 4a) were modest, partly by construction. We have assumed, for lack of data, that they accounted for a fifth of the workforce for males, while for females, following Horrell, Humphries and Weisdorf (2020), we have assumed that women age 15-24 were employed with annual contracts, and women age 25-64 were employed on daily contracts (on average the share of women with annual contracts amounts to about 30%). Furthermore, we have considered that all annual workers were employed for a fixed number of days (d = 260). Their share on the total labour share (Figure 4a, right) fluctuated between a tenth and a sixth, because the wider cycles in the wages of casual workers, especially during the Malthusian cycle, were compensated by counteracting variations in working days.

In the late 13th and the first half of the 14th century, skilled workers were paid comparatively well, about double the unskilled ones, but there were few of them and thus they got about 6.5% of English GDP (Figure 4b, left). The skill premium halved after the Black Death and the labour share of skilled workers on GDP decreased by 1.5 percentage point immediately afterwards in the 1350s. In the next three centuries, the skill premium fluctuated around 1.5, without any clear trend, and the proportion of skilled workers rose up to a maximum in the late 17th century. Thus, this group benefited handsomely of the second golden age of English workers, getting over a quarter of the labour share (Figure 4b right) and about 15% of the English GDP (Figure 4b, left). These levels were not maintained in the 18th and early 19th century, even if, as warned, our estimate may understate somewhat the skill premium, and thus the overall share of skilled workers after the Industrial Revolution.

The movements of the female shares (Figure 4c) until 1500 depends only on the gender gap, as we assume, for lack of information, that the activity rate remained constant at 40% (vs. 90% for males). According to de Plejit and van Zanden (2018), the pay of women declined from 84% of males after the Black Death to 71% in the second half of the 15th century. In the 16th century, the relative pay of women decreased, and the rise of activity rate to a half could not prevent the return to women work to sink to 6.5% of GDP (Figure 4c, left) and to 15% of the labour share (Figure 4c, right) in the 1580s. This was a veritable 'dark age' for British women workers, also because possibly their status was worsened by the legislation (Humphries and Weisdorf 2015). The tide turned in the early 17th century, in spite of a further widening of the gender gap, thanks to the growth of the activity rate. The upward trend of women labour share was reinforced by the increase of their relative pay after 1650. The labour share of women workers peaked in the 1730s at around 15% of the GDP, corresponding to almost one third of the wage bill and then declined substantially. The gender gap widened again to about a half, but most of the decline reflects the partial retreat of women from the labour market during the Industrial Revolution, down to a 45% activity rate around mid-century (Horrell and Humphries 1995).[15]

<Figure 4a-4b-4c about here>

How robust are these results? In principle, using our framework, one could produce a large number of alternative series of the labour share using different sources (e.g. Allen's wage series) or making different assumptions concerning the parameters. It turns out that our estimates are actually robust both to changes in the main data sources and to plausible variations in the selected parameters. For the sake of brevity, here we illustrate this point with four representative sensitivity tests.

First, Figure 5a plots the original (unfiltered) data and series with three alternative smoothing procedures, the 25 years moving average of our baseline estimate, 11 years moving average, and a local polynomial smoothing, with confidence intervals of 95%, constructed with an Epanechnikov kernel function. Notably, all series feature the same twin peaks pattern, although the 17th century peak is much less sharp with the local polynomial method.

<Figure 5a about here>

Second, we explore the impact of different series of a key-parameter, the number of working days for casual workers (Figure 5b). We re-estimate the labour share with the series of working days by Humphries and Weisdorf (2019) and by Horrell and Humphries (2019) as well as with Allen's standard of 250 days. This latter yields an implausibly high share in the 15th century and a low one in the 18th and early 19th century. The three other estimates coincide almost perfectly after the mid-17th century and quite well in the first four centuries. Our baseline estimate exceeds on average the Humphries and Weisdorf series (2019) by five percentage points, and the Horrell and Humphries (2019) by two percentage points. However, movements are pretty similar, with coefficients of correlation respectively 0.75 and 0.66.

[15] The long run dynamics in the women labour share is very similar using the alternative series of the gender gap by Humphries and Weisdorf (2015).

<Figure 5b about here>

Third, we test the effect of computing the labour share with an alternative series of wages and skill premium with the data from Allen, that have been widely used in the literature (Figure 5c).[16] The movements are almost identical (coefficient correlation 0.97), even if in this case our series comes out slightly lower.

<Figure 5c about here>

Fourth, we re-compute our series of the labour share assuming that all workers were casual ones (Figure 5d). This hypothesis is clearly an oversimplification, since we know that there were many workers with long-term contracts. We pursue this sensitivity test because we have been forced to omit annual workers in our estimates for other countries for total lack of data. As expected, the labour share with only casual workers is somewhat higher than the baseline because the wages of annual workers were lower to compensate for the greater security of their jobs (Humphries and Weisdorf 2019). However, the correlation between the two series is almost perfect (coefficient of correlation of 0.995) and the gap is fairly small. On average, the gap fluctuates around five percentage points, with few peaks around eight in the mid-15th century.

<Figure 5d about here>

We can find additional confirmation for our labour share series from two pieces of independent evidence, the already quoted series of wealth/GDP ratio by Madsen (2019) and the estimates of heights by Galofré-Vilà, Hinde and Guntupalli (2018). The movements of the former, as sketched out in Section 2, are apparently in total contrast with our estimate. However, Madsen estimates the wealth/GDP ratio as the sum of net savings, which depend on the distribution of income, and capital gains, which do not. Thus, the correct comparison is with the saving component of Madsen (2019, fig. 17) estimates, which we expect to move inversely to the labour share as very few pre-industrial workers were able to save anything. The results are mixed. On the one hand, in contrast with our results and with the conventional wisdom, the saving component

[16] We compute the alternative series as an average of wages of agricultural workers for Southern England and construction workers in Oxford and London, weighted with the shares of agriculture on total workforce from Broadberry et al. (2015). In Figure 5c, we deflate with the cost of the bare-bone basket estimated using Clark's prices, as in our baseline series. However, the difference with the prices from Allen's website is negligible (see Figure A.1 in Appendix). Allen wage and price series are available at https://www.nuffield.ox.ac.uk/people/sites/allen-research-pages (accessed on February 2020).

remained essentially flat during the long Malthusian cycle of the 14th-15th centuries. Afterwards, its movements tally fairly well with our estimate: savings rose to a maximum around 1550, when labour share was low, and declined to a minimum in the early 18th century.

Also trends in heights are broadly consistent with our estimate. Heights remained constant for people born in the late 13th -early 14th centuries, rose to an all times maximum (174.3 cm.) for people born around 1440 and remained high until the mid-17th century. The 18th century was not a prosperous period for workers: the heights of people born after 1750 declined to 169.3 cm, a level not witnessed since the 10th century.

6. Results: labour share in pre-industrial Europe

Figure 6 compares our baseline estimate of the labour share for England with the series for the other four major European countries. These series have been constructed relying on recent series of wages and GDP but, as show in Table 2, country-specific information for some parameters is lacking and thus estimates are less robust than for the English case.

<Figure 6 about here>

First and foremost, our data confirm that pre-industrial societies were highly unequal. In the long run, labour claimed between two fifths and a half of the GDP, with values ranging from 43% for the Iberian countries to 49.5% for England, with France (47.1%) and Holland (47.6%) somewhat in the middle. Pairwise comparisons for the same period show that the labour share was about 5% higher in England than in France and Holland, and about 15% than in Spain and Portugal. The maximum figure in the whole database is 72.1% (Holland in 1442) and the minimum 27.2% (again Holland, in 1795) but most of the estimates range between 40% and 60%. Our estimate does not include all incomes accruing to workers' households, as smallholders got income from land and most farmers and artisans also some income from capital. Even taking into account this point, the share of labour was decidedly lower than nowadays. The average nominal share for G20 countries at factor costs, adjusted for self-employment, declined from 70% in the 1960s and 1970s to 62-63% around 2010 (ILO-OECD 2015). The mean for less developed countries, which are arguably more comparable to pre-industrial Europe, was likewise substantially higher - about 65% in the last two decades of the 20th century (Guerriero 2019).

Second, the available series for the 13th and 14th centuries confirm the extent of the Malthusian cycle. The pattern of France is quite similar to the English one: the labour share was around 45% before the plague and afterwards it rose for about a century, peaking in the 1460s. The series for Holland covers only the final stage of the upswing of the Malthusian cycle, which in that country peaked in the 1440s, a bit earlier than England and France. The downswing lasted until the late 17th century in Holland (33.3% in 1588) and in England (40% in 1600), and until the 1630s in France (38.8% in 1635). The 16th century was a bleak period also for the Spanish workers, who got only less than one third of the GDP at mid-century. The labour share for Portugal is available only from 1539 and it is somewhat comparable to that of England and France up to the 1570s, but then reached a higher level in the first decades of the 17th century. In a nutshell, the labour share of all five countries converged around a level of 40%-50% in the first decades of the 17th century. Since then, trends diverged quite markedly for over a century.

In England and Holland, it is clearly visible a new shorter cycle in the labour shares, which peaked in the 1670s. Dutch and English workers got almost two thirds of the GDP – i.e. roughly as much as at the peak of the Malthusian cycle two centuries before. This 'second golden age' set them apart from workers in the other countries, whose relative conditions did improve little (Spain and France) or even worsened (Portugal). Unlike the Little Divergence in real wages (Allen 2001), however, this divergence was short lived. The labour share started to decrease in England and Holland in the 1690s and in France, Spain and Portugal in the 1720s, and this decline went on until to all-time low in the last decade of the century.[17] In the 19th century, we have only three country series (England, France and Portugal). In all three countries the labour share recovered by several percentage points (up to 15 in Portugal), but the levels in the early 1830s in France and England were still a third lower than the all-time maximum of the Malthusian cycle.

Two simple exercises can bring some relevant insights on the determinants of this complex pattern. First, we decompose changes in the labour share among wages, GDP and a 'residual', which includes the combined effects of all other parameters. For the sake of comparability, we prefer to use the same periodization for all countries, even if this approach does not capture perfectly the country specific movements. We have selected six sub-periods – before the Black Death (until 1350), the upswing (1350-1460) and the downswing (1460-1600) of the Malthusian cycle, the 'short' 17th century (1600-1680), the 'long' 18th century (1680-1800), and the 19th

[17] The minimum of the series was 36.9% in England (reached 1801), 33.8% in France (1783), 34.0% in Portugal (1789), 31.8% in Spain (1788) and 27.2% in Holland (1795). In the two last cases, the minimum level coincides with the end of the series and thus one cannot rule out a further decline.

century (from 1800 to the end of the series). We report the results, in Figure 7, by means of histograms plotting the yearly rates of change.

<Figure 7 about here>

Figure 7 highlights a complex pattern, especially after 1600. The Malthusian cycle was driven by wages. They determined the rise of the labour share in France, England and also Holland (although the period is short and thus potentially not representative), and its decline in France and England. In both countries, changes in GDP and residual were small, but this is not the case for Holland. The decline in wages after 1460 was compensated by an increase in working days and the share of skilled workers in total employment, so that ultimately the downswing was determined by the growth of GDP per capita.

As already hinted, the 'short 17th century' (1600-1680) was a golden age for Dutch and English workers mostly because of the Industrious Revolution (de Vries 2008). The female activity rate grew by 40% in both countries and the number of working days by 25% in England and by 15% in Holland. The increase in the residual accounted for almost two thirds of the rise of the labour share in Holland (with the rest almost equally divided between the growth of wages and the decrease of GDP) and for all the increase in England, where the growth in wages was offset by the increase in GDP. The residual and the real wages increased also in the three other countries, although much less than in two North-Western powerhouses. In France and Spain, this rise contributed to the increase in the labour share, while the growth of Portuguese GDP dragged down the labour share in that country.

The decline in wages caused the labour share to diminish in four countries out of five during the 'long 18th century' (1680-1800). It accounted for half of the decline in the labour share in Holland (the rest was almost equally divided between the residual and the increase in GDP per capita), for all the decline in France and Spain and it would have caused a veritable collapse in the Portuguese labour share if the GDP had not declined and the number of days of work had not increased by a third.

The fifth country was England, which deserves special attention given the historical role of the Industrial Revolution. Over the whole period, wages and the residual remained stable, and thus the decline of the labour share reflects the 60% rise in GDP per capita. However, a closer look suggests to divide this phase in three sub-periods. In the first one, until 1705, the workers lost three quarters of the gains of the previous rise, going back to the level of the labour share of the

1630s, because the GDP per capita increased by 30% (Broadberry et al. 2015) and real wages declined by 6%. In the next 35 years, the labour share remained roughly constant around its long-term level or increased very little and it resumed its decline after 1740. The rise in GDP per capita during the early stages of the Industrial Revolution (1741-1802) accounted for two thirds of the further decline of the labour share, the residual for a fourth and the small decrease in wages for the rest.[18] All the recovery in the first decades of the 19th century is driven by rise of wages, which according to Clark's series rose by almost a half, while the Feinstein's (1988) series, taking into account unemployment, increased by only 8%.[19] Our decomposition exercise illustrates also a methodological point. Indeed, changes in the labour supply, as captured by the residual, were an important determinant of variations in the labour share, and therefore simple ratios, such as w/y, of returns to factors are potentially misleading as inequality indicator. The 'golden age' of workers after the Black Death coincided with an increase in leisure, while workers paid dearly the 17th century rise in labour share with a significant reduction of their leisure.

Our second exercise is a binscatter plot of labour shares and GDP per capita, which shows a negative relation, with significant variance (Figure 8). This negative relationship is still alive also when distinguished by countries (see Figure A.4 in Appendix). A negative relation for pre-industrial Europe was first suggested by van Zanden (1995), with the then available Dutch data. The hypothesis has been further rekindled by Milanovic (2018: 1035) with cross-country data from social tables. Our results provide further corroboration for this hypothesis.

<Figure 8 about here>

7. Conclusions

In the last decade, there has been an outpouring of research on different dimensions of economic performance in pre-industrial Europe. In this paper, we have exploited the availability of new sophisticated estimates of GDP, real wages and labour supply, for different categories of workers. Relying on these materials, we have generated new series of the labour share for five major European countries. To this aim, we have developed an innovative method to express a standard measure of real wages, Allen's welfare ratio (in a nutshell, a fixed-weight price index), into 2011 US$ PPP and we have put forward a general framework to estimate labour shares. In

[18] The decline of the residual is driven by the concomitant decline of the female activity rate and widening of the gender gap.

[19] According to Feinstein (1988), the increasing in real earnings without considering unemployment was 14%.

this way, we have provided a fresh perspective on inequality, complementing the ongoing research on the same theme based on other type of data such as tax returns and social tables.

Our estimate confirms the existence of a major Malthusian cycle, caused by the Black Death, in the labour share over the period 1350-1600. The peak of this cycle corroborates the notion that the mid-15th century was a 'golden age' for European labourers.

We also show that paths in inequality diverged after 1600. Dutch and English workers experienced some decades of relative prosperity, by means of a significant reduction of leisure, consistently with the Industrious Revolution hypothesis (de Vries 2008). The condition of workers in France, Portugal and Spain did not improve that much, and the 18th century featured a generalized decrease of the labour share, with a minimum at the end of the century.

Finally, we find an inverse relation between GDP per capita and inequality (as measured by the labour share) in pre-industrial Europe. This relation exhibits considerable noise since it was affected by exogenous shocks, most notably the Black Death.

In a nutshell, we uncover a very complex pattern and the challenge for further research will be to develop models that can probe into its possible causes.

Table 1. Bare-bone baskets used for the conversion of Welfare Ratios in 2011 PPP US $ (quantities and prices)

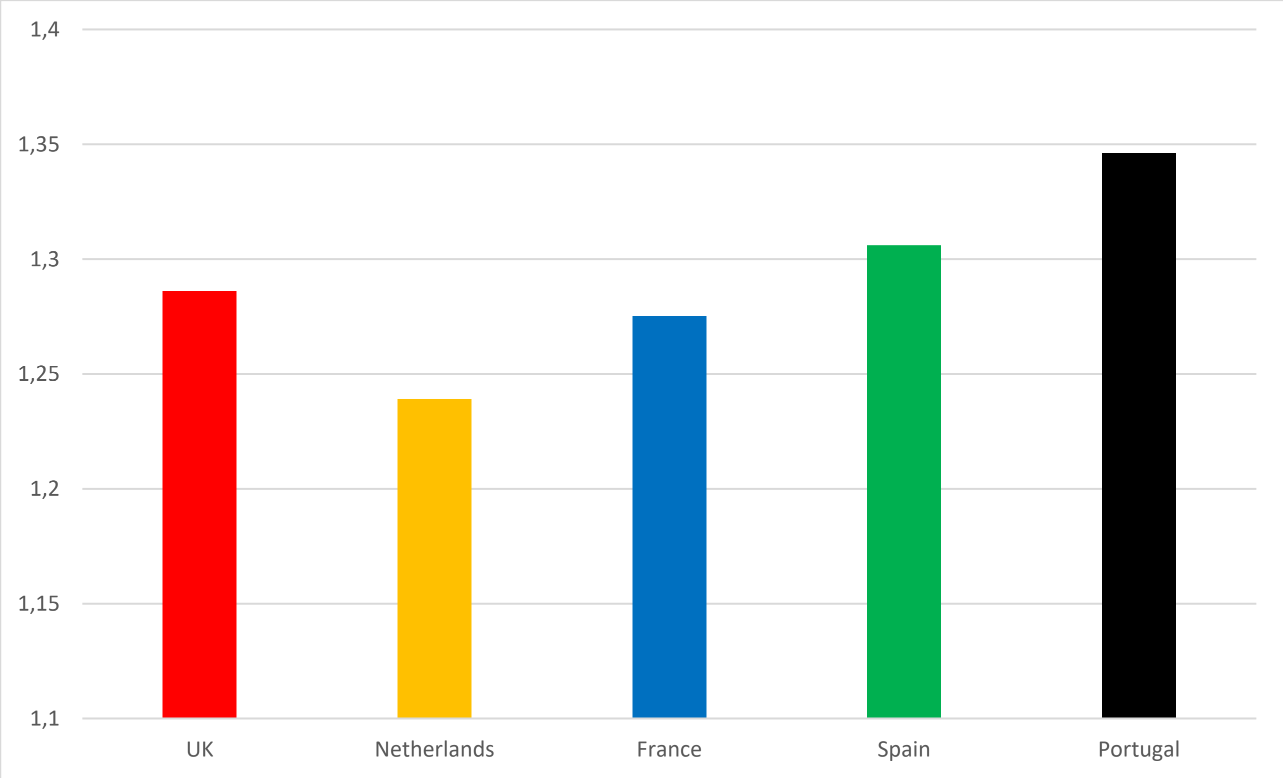
Good	UoM	England	France	Holland	Spain	Portugal	USA	England (£)	France (€)	Holland (€)	Spain (€)	Portugal (€)	USA ($)
Oats	kg	155	155	155				1.27	2.39	1.61			1.69
Barley	kg				170	170					2.43	3.70	1.65
Maize	kg						165	1.30	2.47	1.83	2.71	3.92	1.68
Meat	kg	5	5	5	5		5	5.38	5.32	9.84	5.60	7.29	6.81
Beans	kg	20	20	20	20	20	20	1.53	2.06	1.95	1.55	1.54	3.43
Butter	kg	3	3	3			3	5.52	5.94	5.94	8.58	6.53	10.70
Olive oil	l.				3	3					3.70	4.11	8.80

Sources: Allen et al. (2011), World Bank (2015), http://www.fao.org/faostat (last access 1 March 2020).

Table 2. Sources used in the construction of the labour shares estimates

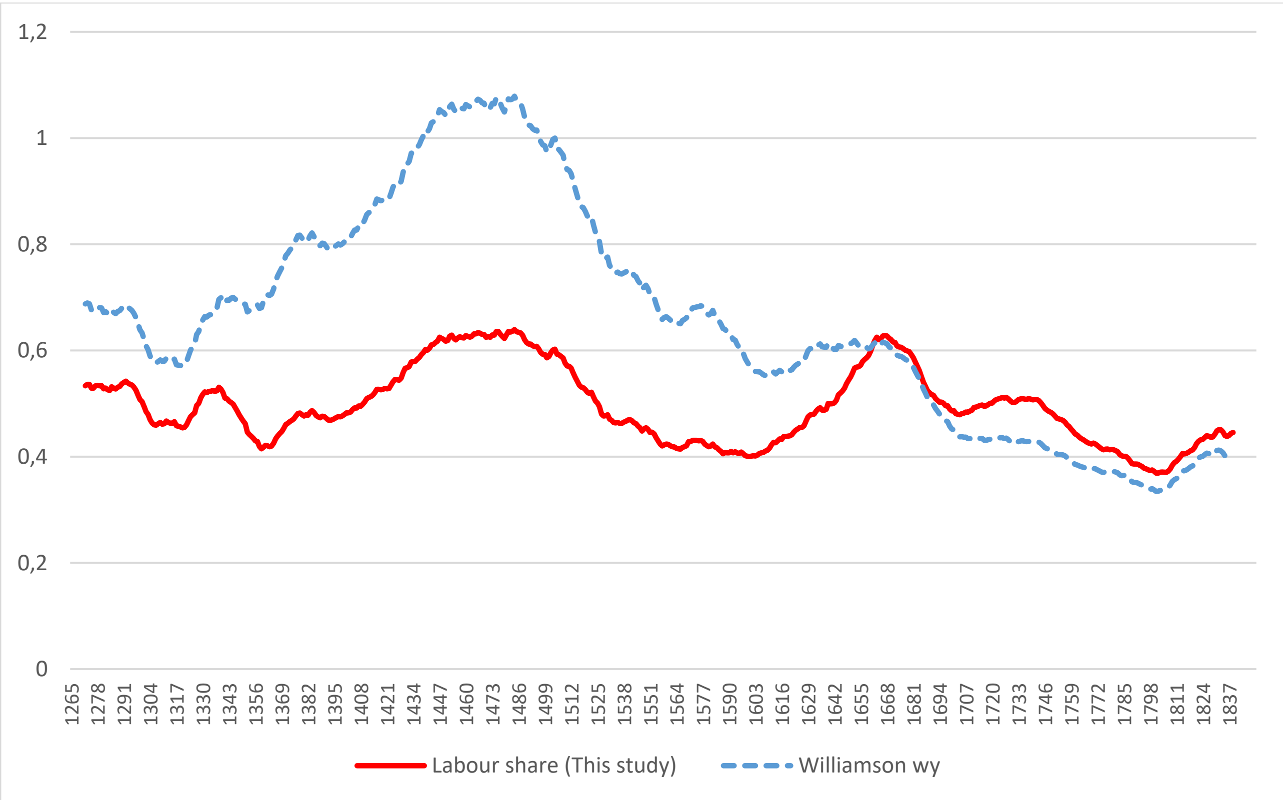
Variable	England (1260-1850)	France (1276-1850)	Holland (1410-1808)	Spain (1501-1800)	Portugal (1527-1850)
Daily nominal male wages	Farm wages (Clark 2007); building wages (Clark 2005)	Ridolfi (2019)	Allen (personal communication)	Lopez Losa & Piquero Zarauz (2020)	Palma & Reis (2019)
Cost of bare-bone basket	Clark (2010)	Ridolfi (2019)	Allen et al. (2011)	Lopez Losa & Piquero Zarauz (2020)	Palma & Reis (2019)
GDP 2011 US$	Broadberry et al. (2015)	Ridolfi & Nuvolari (2020)	van Zanden & van Leeuwen (2012)	Prados de la Escosura, Alvarez-Nogal and Santiago-Caballero (2020)	Palma & Reis (2019)
Working days for casual workers	This study (based on Blanchard, 1994); Allen (2001), Humphries & Weisdorf (2019), Horrell & Humphries (2019)	Ridolfi (2019)	de Vries & van der Woude (1997: 616-617); De Vries (2008); van Leeuwen & van Zanden (2012)	As in Portugal	Palma & Reis (2019)
Working days for annual workers	Humphries & Weisdorf (2019)	No	No	No	No
Share of working age cohorts	Wrigley et al. (1997)	As in England	As in England	Prados de la Escosura (personal communication)	As in Spain
Activity rate for males	This study and Allen (2019)	As in England	As in England	Prados de la Escosura (personal communication)	As in Spain
Activity rate for females	This study, Allen (2019) and Horrell & Humphries (1995)	As in England	As in England	Prados de la Escosura (personal communication)	As in Spain
Gender gap (female wages/male wages)	de Pleijt & van Zanden (2018)	de Pleijt & van Zanden (2018)	de Pleijt & van Zanden (2018)	de Pleijt & van Zanden (2018)	de Pleijt & van Zanden (2018)
Share of male skilled workers on male workforce	Broadberry et al. (2015: 195); de Pleijt & Weisdorf (2017)	Allen (2000); as in England for non-rural areas	de Vries & van der Woude (1997: 61); as England for non-rural areas	Prados de la Escosura (personal communication); England for non-rural areas	Palma & Reis (2019)
Skill premium (wages of skilled workers/wages of unskilled workers)	Clark (2005)	Ridolfi (2019)	Allen (2001)	Lopez Losa & Piquero Zarauz (2016)	Palma & Reis (2019)
Share of annual workers in total workforce	Broadberry et al. (2015)	No	No	No	No
Wage gap of annual workers (annual wages/casual wages)	Humphries & Weisdorf (2019)	No	No	No	No

Figure 1. Daily cost of PPP bare-bone basket in 2011 US$



Note: our own elaborations based on Table 1.

Figure 2. Comparison between our labour share and Williamson w/y, England (1260-1850)



Note: Williamson w/y is computed assuming 250 working days and L/N = 0.4.

Figure 3.a Comparison between our labour share and other estimates, England (1260-1850)

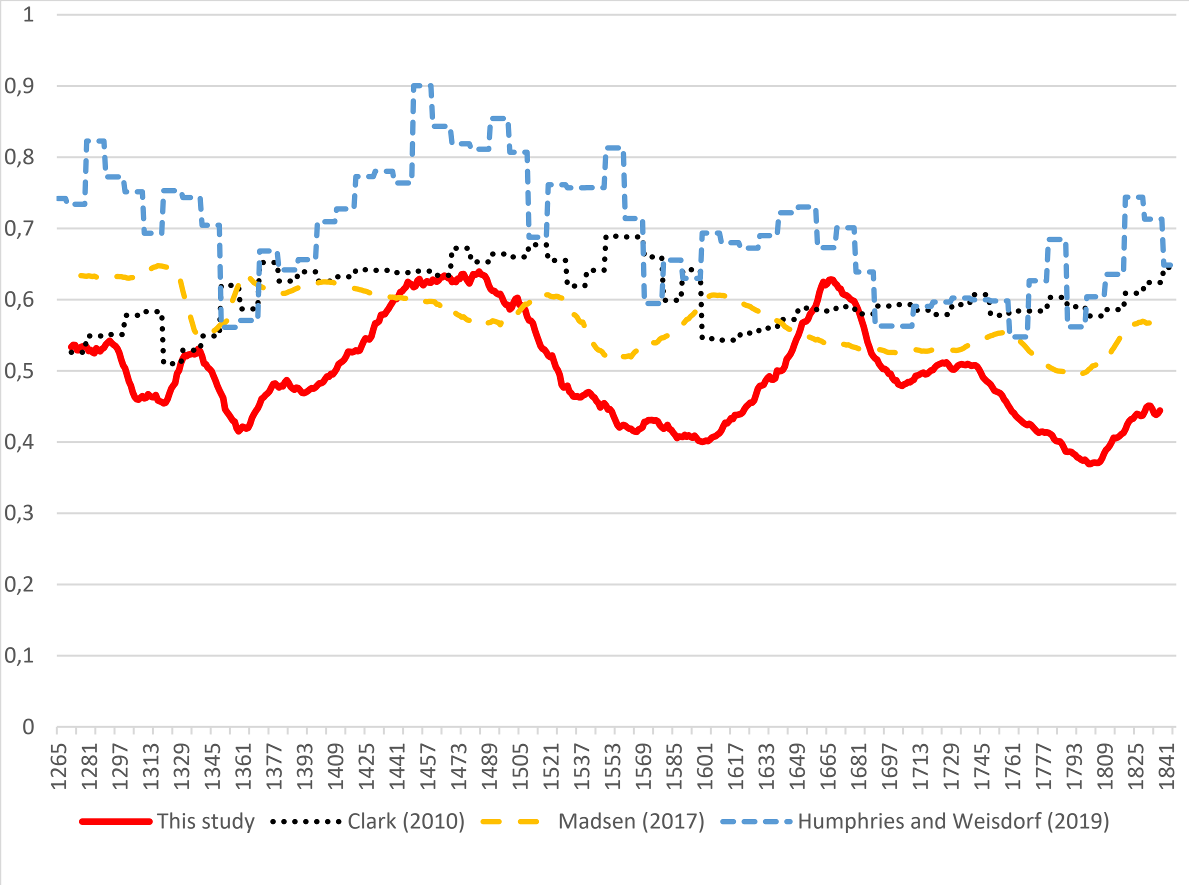


Figure 3.b Comparison between our labour share and other estimates, England (1688-1850)

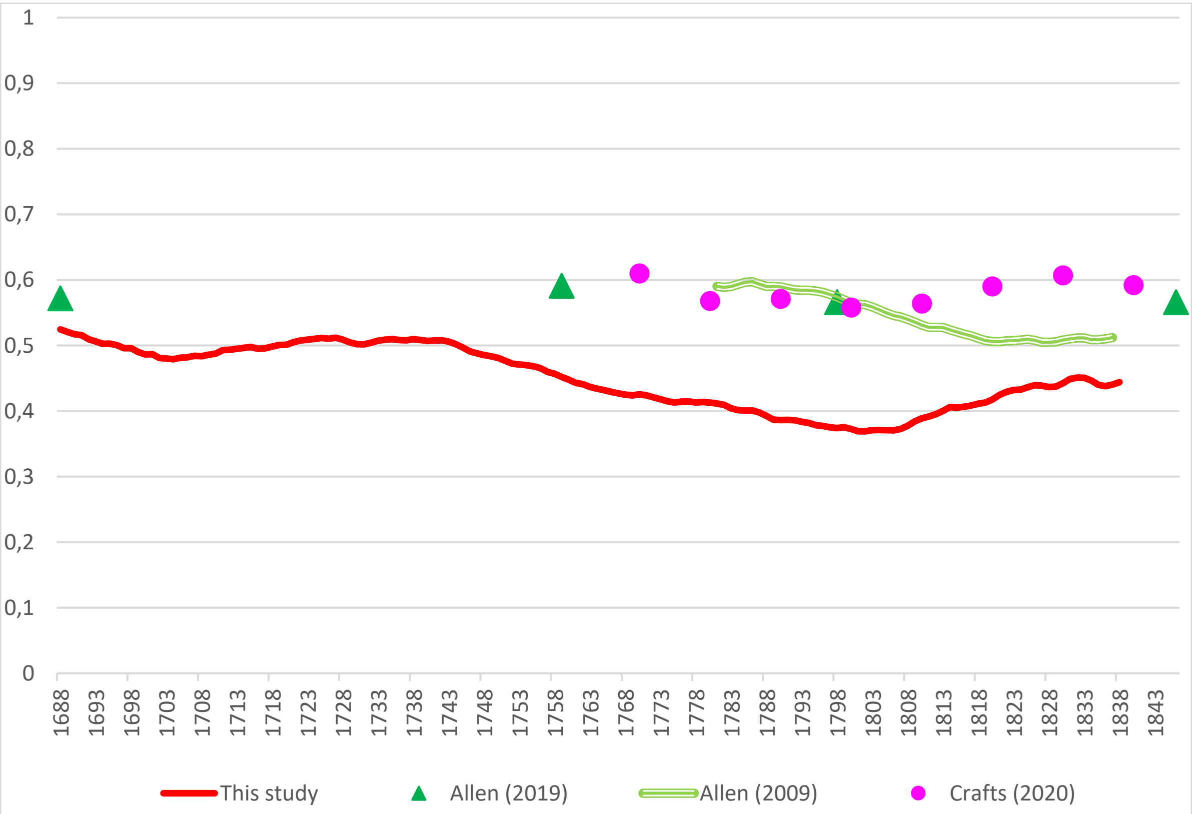


Figure 4a: Decomposition of labour share: daily vs. annual workers

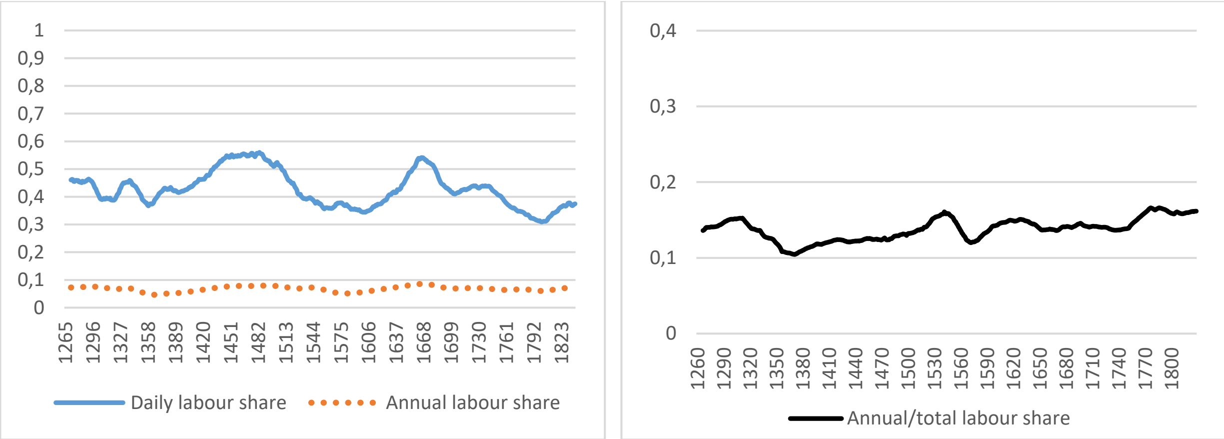


Figure 4b. Decomposition of labour share: unskilled vs skilled

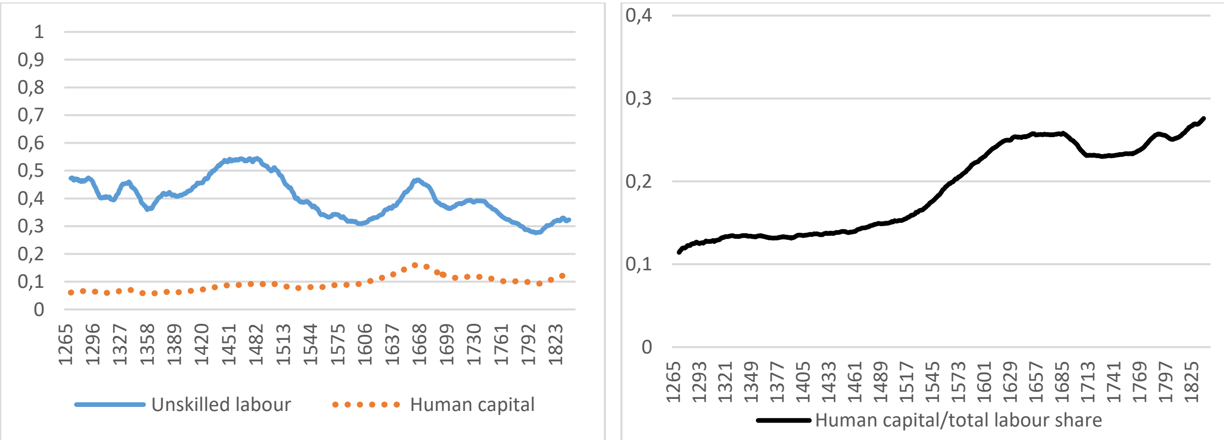


Figure 4c. Decomposition of labour share: male vs female

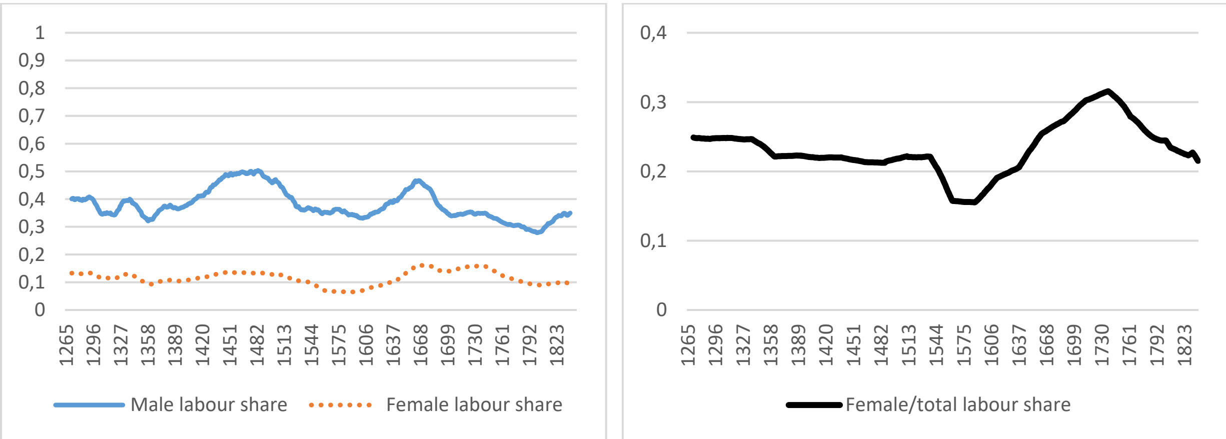


Figure 5a. Robustness check: different smoothing procedures, England (1260-1850)

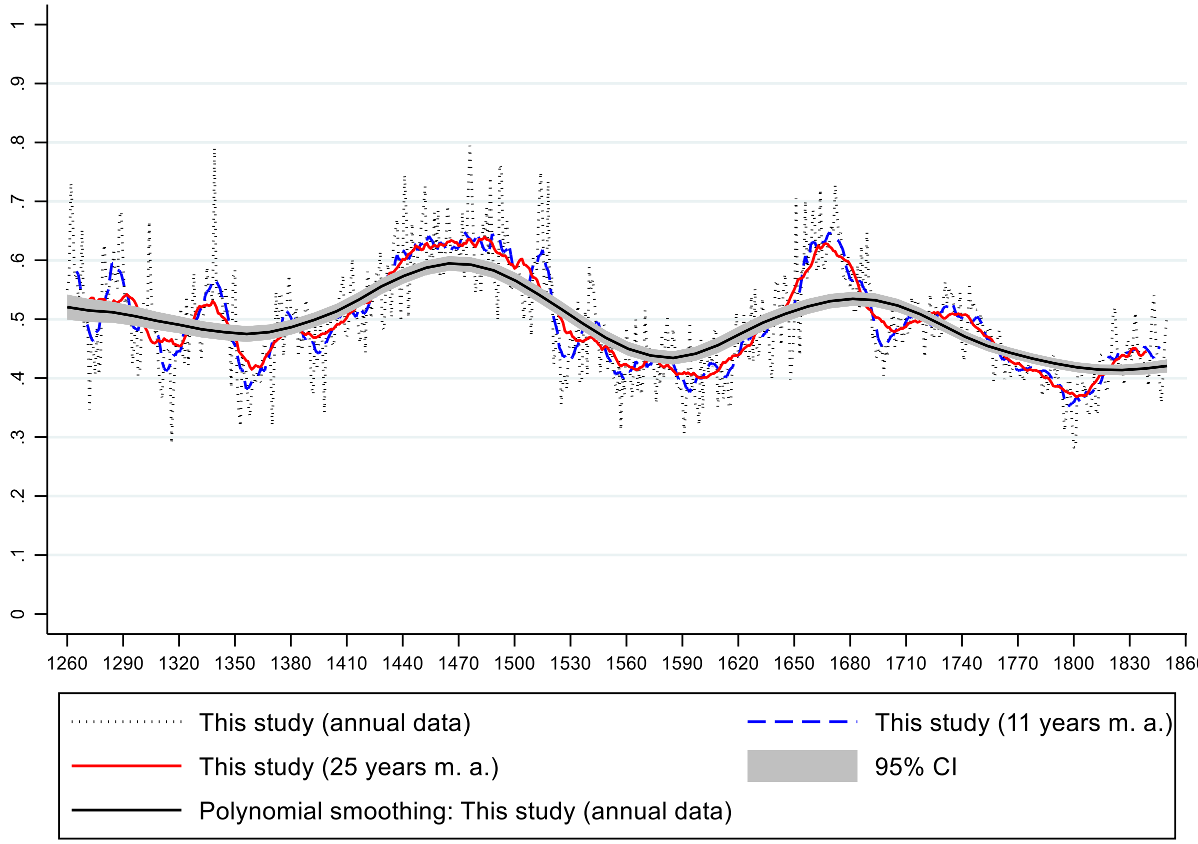


Figure 5b. Robustness check: working days, England (1260-1850)

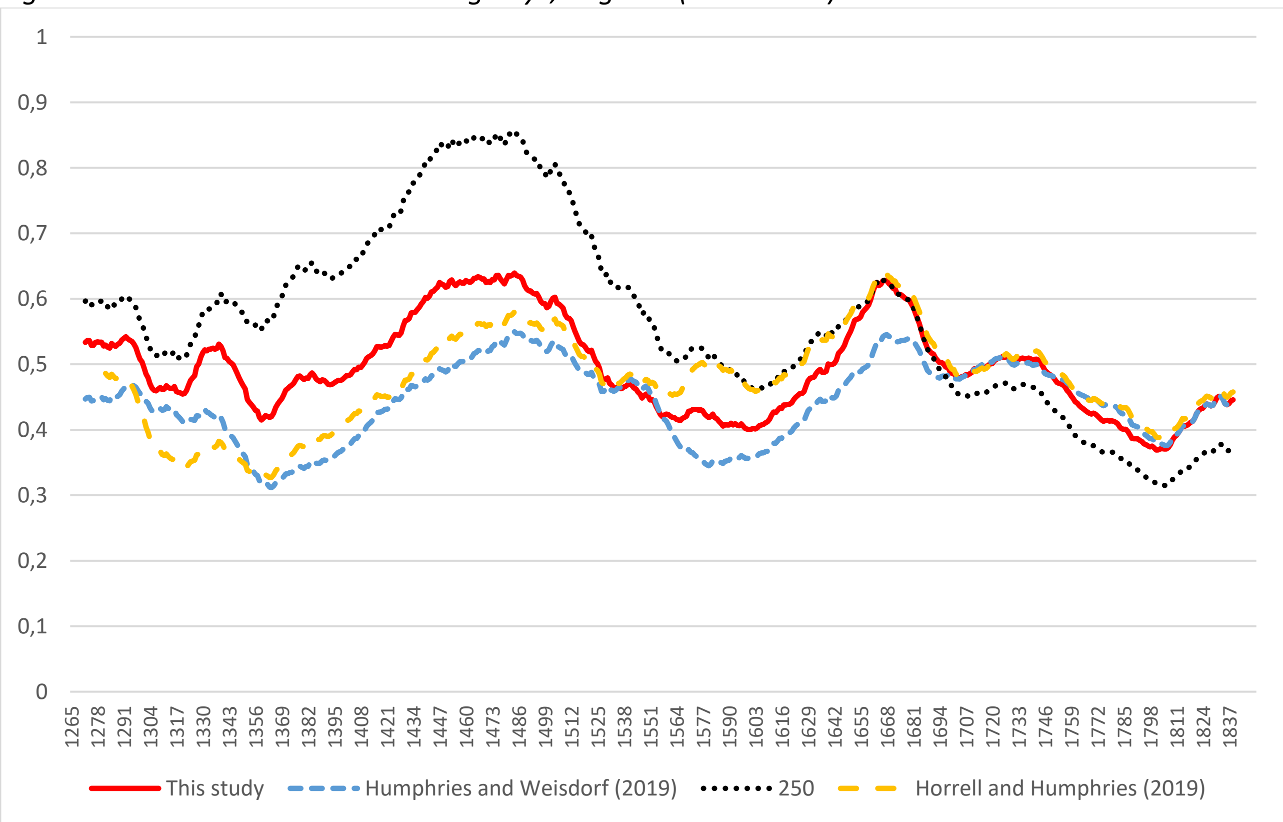


Figure 5c. Robustness check: wage sources, England (1260-1850)

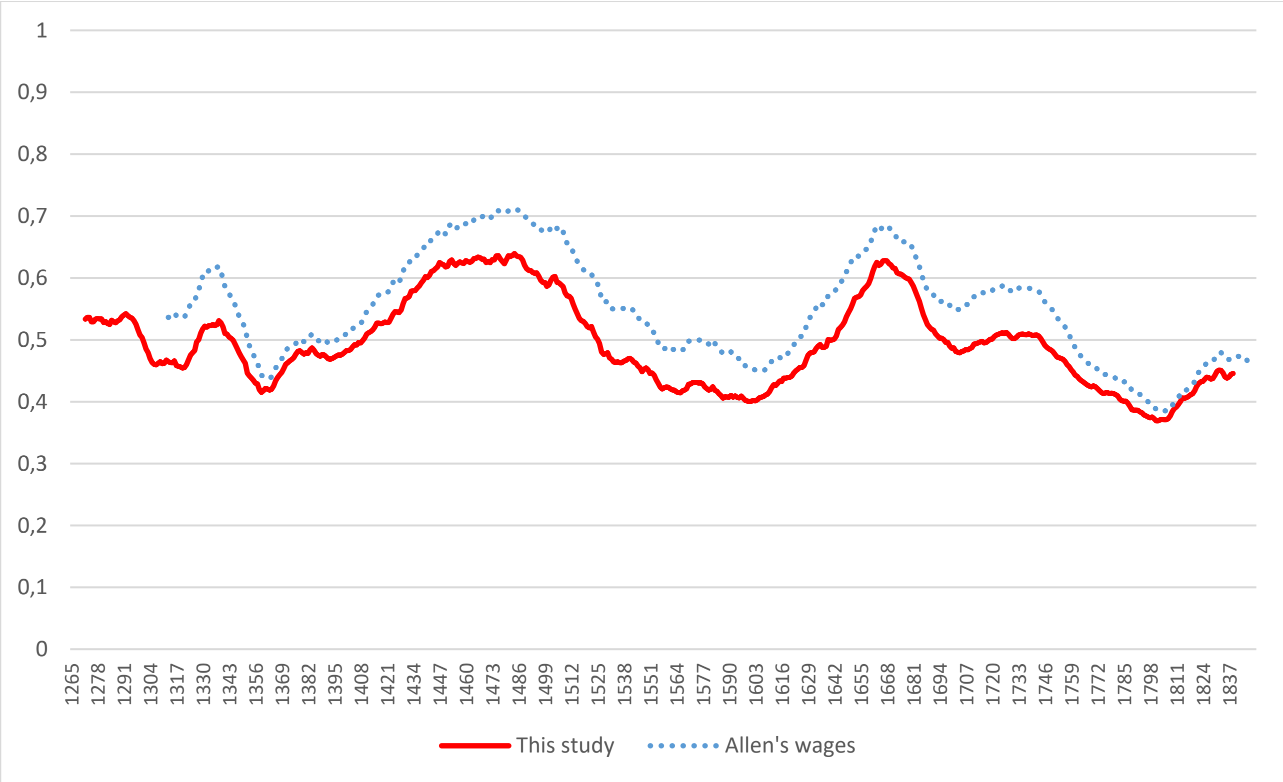


Figure 5d. Robustness check: only daily workers, England (1260-1850)

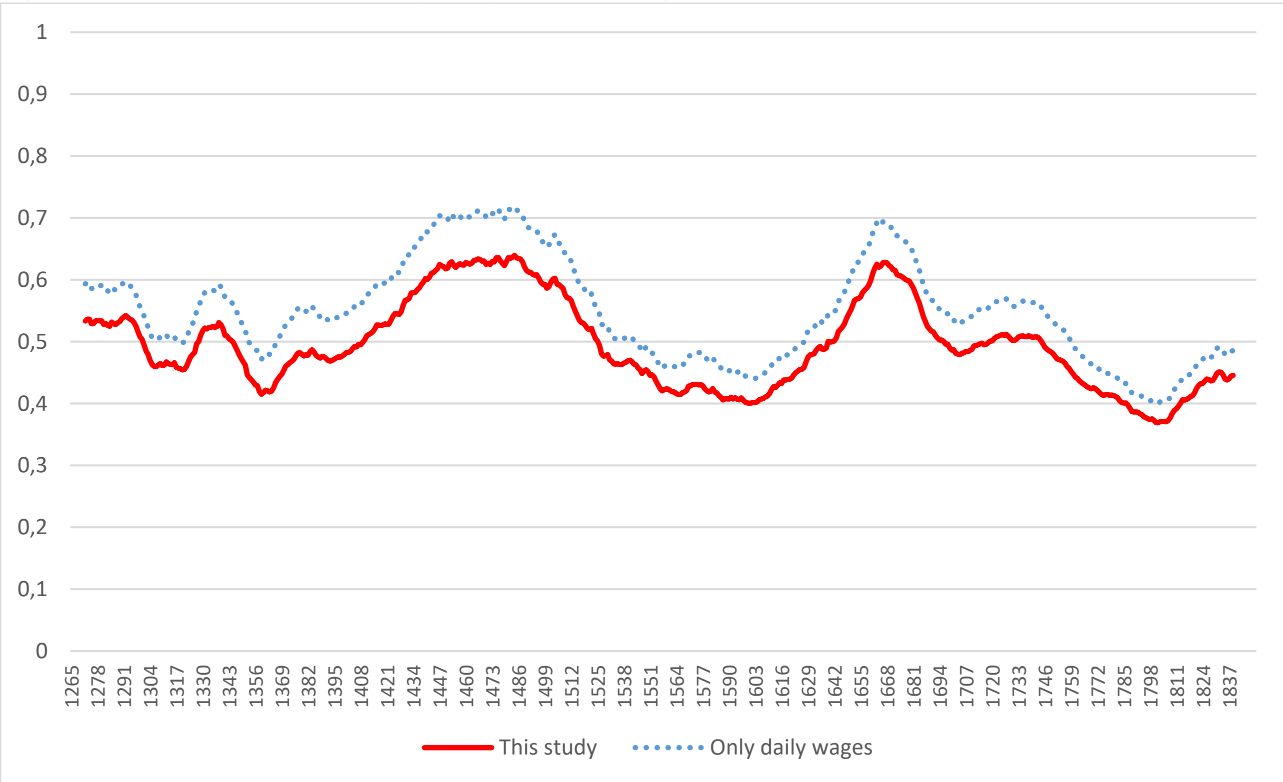
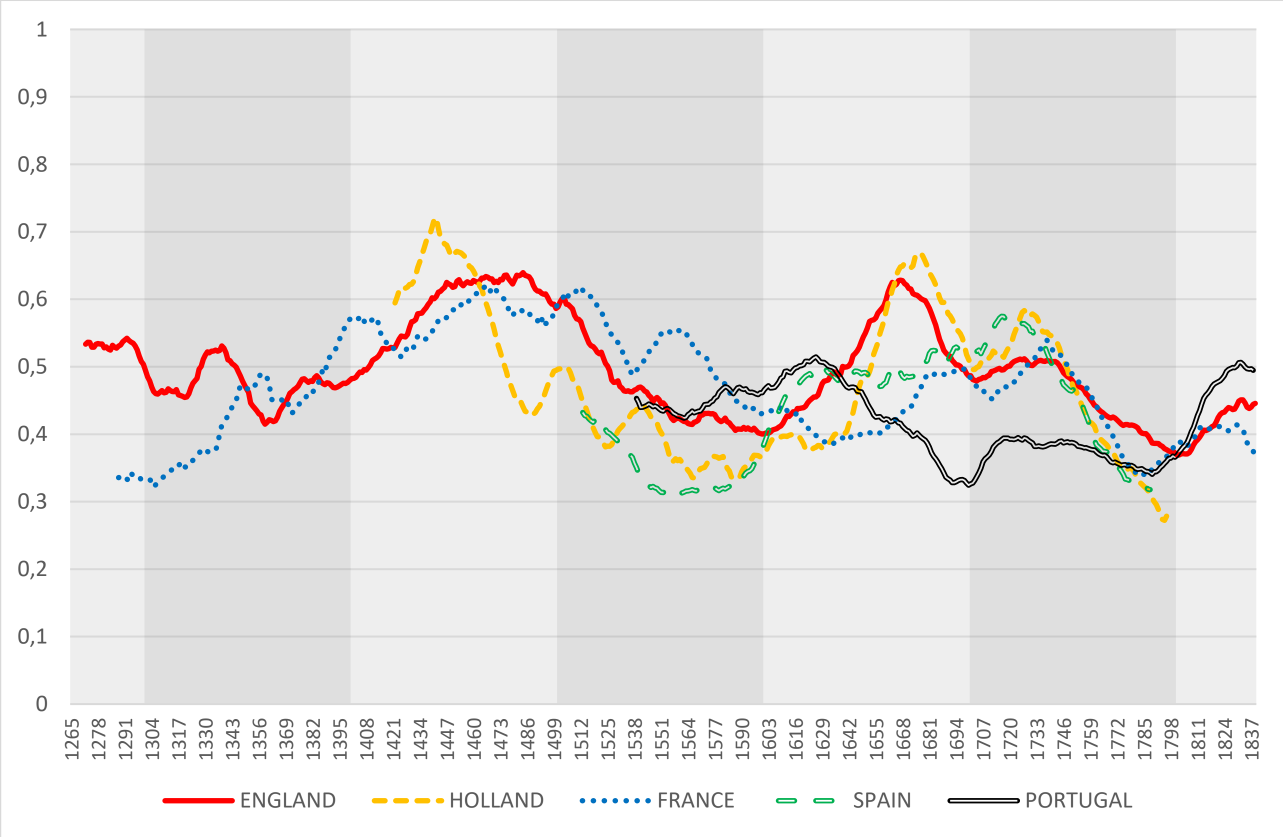
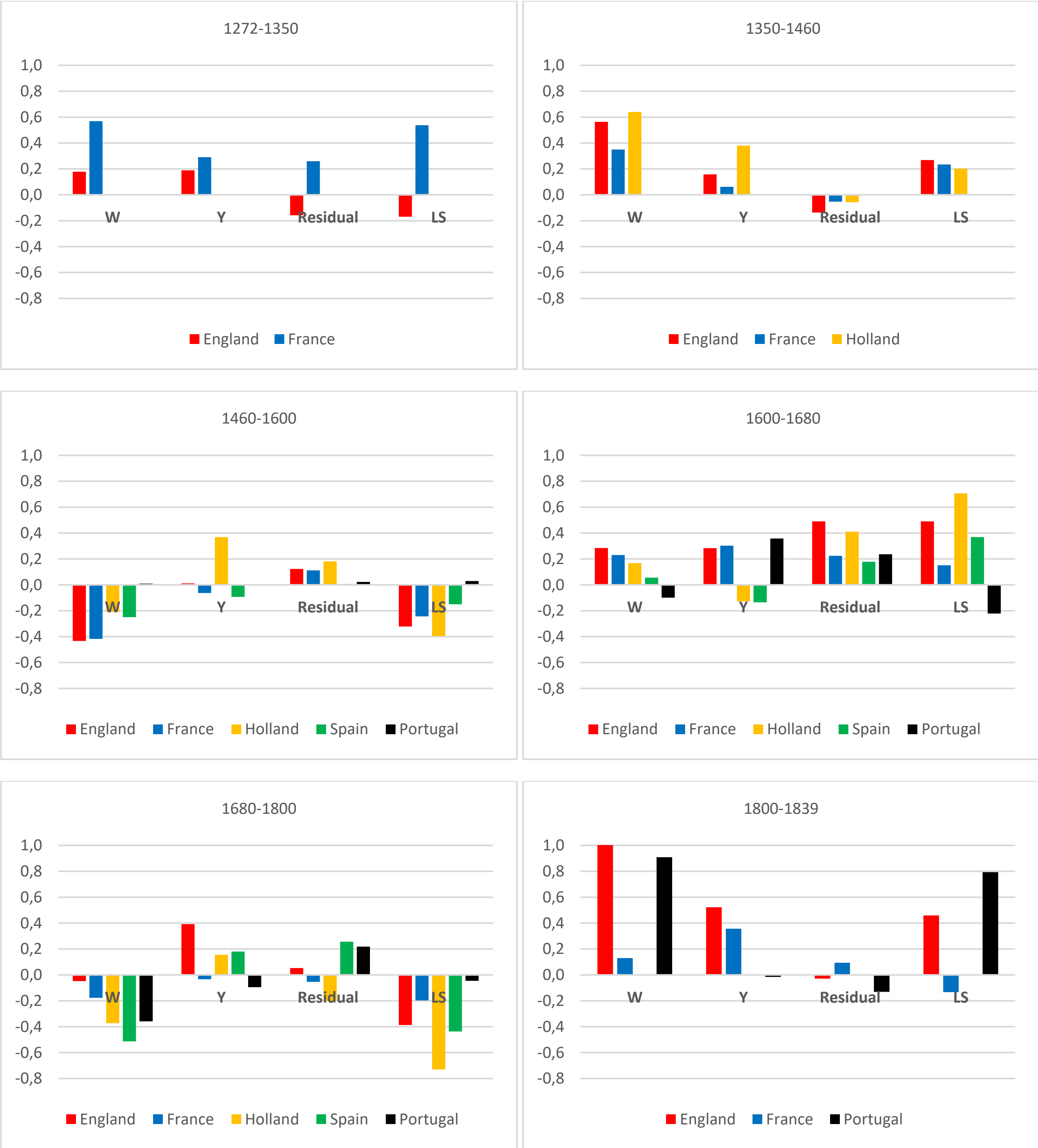


Figure 6. Labour share in five countries (1260-1850)



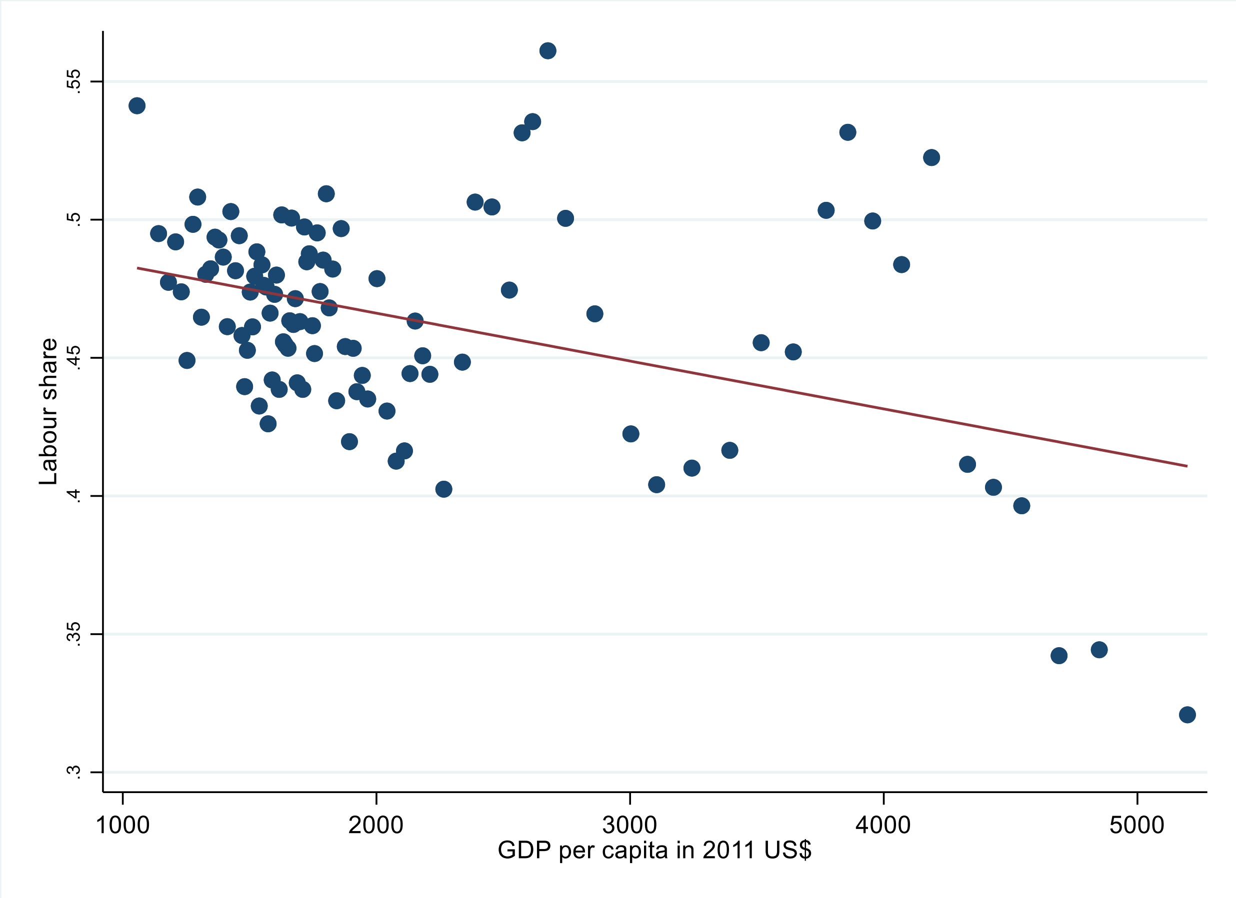
Note: our own elaborations based on the sources of Table 2.

Figure 7. Decomposition of the movements of the labour share, yearly growth rates (1272-1839)



Note: France: 1288-1838; Holland: 1422-1796; Spain: 1513-1788; Portugal: 1539-1838.

Figure 8. Labour Share vs GDP per capita in pre-industrial Europe (England, France, Holland, Spain and Portugal)



Note: Binscatter plot constructed using 100 equally sized bins.

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Appendix

This Appendix contains a detailed description of the sources used and of the procedures adopted for constructing the variables used in the paper.

ENGLAND

Nominal daily wages for male unskilled workers: the data used are the series of building workers, farm workers and craftsmen reconstructed by Clark and are retrieved from the *Global Price and Income History Group* website (https://gpih.ucdavis.edu/). More specifically, the series are those contained in the spreadsheet ("England_1209-1914_(Clark).xls") retrieved as "England prices and wages since 13th (Clark)" in the main file list. The average wage in pence per day is computed by weighting farm workers with the share of employment in agriculture and building workers with the share of industrial employment, both on the sum of agriculture and industry (employment data are from Broadberry et al. (2015, p. 344). We assume thus that the labour force in services changed between rural and urban occupation as much as the rest.

Costs of the bare-bone basket: the bare-bone basket is computed using the quantities in Allen et al. (2011) and the prices from the same spreadsheet of nominal wages. Missing observations were interpolated using the aggregate indexes constructed by Clark: beef with the 'meat' price index; butter with 'dairy'; firewood, soap, tallow, lamp oil with the aggregate 'farm' index. The resulting series is very similar to the one computed using the prices collected by Allen (spreadsheet 'London' from https://www.nuffield.ox.ac.uk/people/sites/allen-research-pages/). The two series are very similar and are plotted in Figure A.1.

<Figure A.1 about here>

GDP per capita: this is the series reconstructed by Broadberry et al. (2015) and retrieved in 2011 US$ from the 2018 version of the Maddison Project website (Bolt et al. 2018).

Working days:

- **casual workers**: Blanchard (1994: 24) suggests a range of variation between 200 and 264 working days per year, corresponding to regimes of 'high earnings and low rents and prices' (as in the 15th century) and 'high population pressure and weak labour markets' (as in the 13th century). Note that there is perhaps a different conceptualization of working days between Blanchard, who considers as a 'working day' a day in which the worker was formally employed even for a brief spell of time, while the other estimates of working days (e.g. Humphries and Weisdorf 2019) are based on implicit full working days and they take into account a standard number of hours. We construct a 'compromise' estimate with 220 working days to the Black Death (disregarding the possible effects of short term variations of population such as the demographic crisis of the 1326). Afterwards, we assume a sharp reduction to 180 days until 1549. Subsequently, we assume an increase to 200 working days in the second half of the 16th century because of the change in the number of festivities after the Reformation (Aston 2015). Then, we assume 220 days in the first half of the 17th century, 250 days from 1650 to 1700, 275 days from 1700 to 1749, 290 from 1750-1799 and 310 in the period 1800-1850 (Voth 2001).

- **annual workers**: following Humphries and Weisdorf (2019), we assume a standard of 260 working days per year for this type of workers along the period.

Share of working-age cohorts in total population: this is computed as the share of workers between 15-64 years old from Wrigley et al. (1997: 615). We assume that the population in each cohort comprises 50% of males and 50% of females.

Activity rate for males: we adopt a constant activity rate of 90% based on Allen (2019), assuming that the only categories not working were paupers and the landed aristocracy (see, Social tables for 1688, 1759 and 1798).

Activity rate for females: we assume an activity rate of 40% until 1500. This increases to 50% in the period 1500-1600. From 1600, we assume a further steady increase to 70% in 1688 and to 82% in 1759, to be consistent with the data from social tables (Allen 2019). Afterwards, we link to the series by Horrell and Humphries (1995: 98) - who estimate a rate of to 65.7% in the period 1787-1815 and a further drop to 45.3% per cent in 1846-1865.

Gender gap (female wages/male wages): we use the estimate by de Pleijt and van Zanden (2018) for consistency with other countries. The English series is very close to the estimate by Humphries and Weisdorf (2015).

Share of male skilled workers in the total workforce: we assume that farm workers were unskilled because none of them had any specific skill, which could get a premium over the basic wages and because all agricultural skills had no market value in other sectors. Thus, we consider only the share of skilled workers on the workforce in manufacturing and services from Broadberry et al. (2015: 195 and 344). We assume a share of 75% unskilled workers in 1250, which is consistent with the extremely low literacy rate of the time (de Pleijt 2018). This is projected forward to 1550 assuming a steady rate of increase up to 1550. From 1550 onwards, we consider the share of skilled workers as the sum of medium and high skilled workers from de Pleijt and Weisdorf (2017).

Skill premium (wages of skilled workers/wages of unskilled workers): this is the ratio of craftsmen and building labourers' wages in the Clark dataset used for the nominal wages.

Share of annual workers in the total workforce: for male workers, we assume that a share of 20% was employed with annual contracts (Humphries and Weisdorf 2019); for female workers we assume that women of age 15-25 were employed on annual contracts, while women of age 25-64 on daily contracts (Horrell, Humphries and Weisdorf 2020).

Wage gap annual workers (wage annual workers/wage daily workers): the series is constructed from the yearly wages of annual workers assuming 260 working days (Humphries and Weisdorf 2019).

Children's labour share (1780-1850): the series is constructed using the population aged 5-14 (Wrigley et al. 1997: 615); the wage gap for children and the activity rates for children from Horrell, Humphries and Weisdorf (2020) and assuming that their working days amount to 2/3 of that of male workers. Figure A.2 displays the series.

<Figure A.2 about here>

Nominal wage share (1270-1850): the series is constructed using the cost of the bare-bone basket with Clark prices and the deflator of the GDP by Broadberry et al. (2015: 227-244). Figure A.3 compares the real and the nominal labour shares.

<Figure A.3 about here>

FRANCE

Nominal daily wages for male unskilled workers: the data are from Ridolfi (2019).

Costs of the bare-bone basket: the data are from the calculation of the bare-bone basket with oats in Ridolfi (2019: supplementary material).

GDP per capita: this is the series by Ridolfi and Nuvolari (2020). The series is US$ 1990 and it is transformed in US$ 2011 (Maddison project version 2018) using the 1850 benchmark.

Working days: the series is retrieved from Ridolfi (2019: Online Appendix S1). We use the of series workers employed for at least 130 days.

Share of working-age cohorts in total population: as in England.

Activity rate for males and females: as in England.

Gender gap (female wages/male wages): the source is de Pleijt and van Zanden (2018).

Share of male skilled workers in the total workforce: we consider the share of non-agricultural workers estimated as in Ridolfi and Nuvolari (2020). The series of skilled workers inside the non-rural sector is the English series.

Skill premium (wages of skilled workers/wages of unskilled workers): this is the ratio of craftsmen and building labourers' wages in the Ridolfi (2019) data-set.

HOLLAND

Welfare Ratio (nominal wages/costs of bare-bone basket of 1,940 calories): the data refers to building labourers in Amsterdam (Allen, personal communication).

GDP per capita: this is the series of van Zanden and van Leeuwen (2012) in 2011 US$ from the 2018 version of the Maddison project (Bolt et al. 2018).

Working days: de Vries and van de Woude (1997: 616-617) argue that 'frequent interruptions by Christian holidays' reduced the number of available days to 260-265 days, and remind the decision of the Synod of Dordrecht to abolish most festivities, increasing the potential number of workdays to a maximum of 307. However, de Vries (2008: 89) points out that not all these days were effectively used. He suggests that the effective hours work (excluding pauses) increased from 2,600 before 1574 to about 3,100 after 1650 and remained constant thereafter. van Zanden and van Leeuwen (2012: supplementary material and 50) translate these information in 250 days before 1574, growing linearly to 300 in 1650 and then remaining constant (de Vries 2019). We prefer a slightly lower number (230 days) before 1574, in line with England.

Share of working-age cohorts in total population: as in England.

Activity rate for males and females: as in England.

Gender gap (female wages/male wages): the source is de Pleijt and van Zanden (2018), data for Antwerp.

Share of male skilled workers in the total workforce: we consider the share of non-agricultural workers by de Vries and van der Woude (1997: 61). The series of skilled workers inside the non-rural sector is the English series.

Skill premium (wages of skilled workers/wages of unskilled workers): this is the ratio of craftsmen and building labourers' wages for Amsterdam in the Allen wages and prices dataset: (https://www.nuffield.ox.ac.uk/people/sites/allen-research-pages/).

SPAIN

Nominal daily wages for male unskilled workers: this series is by Lopez Losa and Piquero Zarauz (2020, personal communication).

Costs of the bare-bone basket: Lopez Losa and Piquero Zarauz (2020, personal communication).

GDP per capita: Prados de la Escosura (personal communication). The series is US$ 1990 and it is transformed in $ 2011 (Maddison project version 2018) using the 1850 benchmark.

Working days: the series is the same as in Portugal (Palma and Reis 2019).

Share of working-age cohorts in total population: Prados de la Escosura (personal communication).

Activity rate for males and females: Prados de la Escosura (personal communication).

Gender gap (female wages/male wages): the source is de Pleijt and van Zanden (2018), the series is that for Southern Europe.

Share of male skilled workers in the total workforce: we consider the share of non-agricultural workers is Prados de la Escosura (personal communication). The series of skilled workers inside the non-rural sector is the English series.

Skill premium (wages of skilled workers/wage of unskilled workers): Lopez Losa and Piquero Zarauz (2016).

PORTUGAL

Nominal daily wages for male unskilled workers: Palma and Reis (2019).

Costs of the bare bone basket: Palma and Reis (2019).

GDP per capita: Palma and Reis (2019). The series is US$ 1990 and it is transformed in US$ 2011 (Maddison project version 2018) using the benchmark of 1850.

Working days: Palma and Reis (2019).

Share of working-age cohorts in total population: as in Spain.

Activity rate for males and females: as in Spain.

Gender gap (female wages/male wages): the source is de Pleijt and van Zanden (2018), the series is that for Southern Europe.

Share of male skilled workers in the total workforce: Palma and Reis (2019).

Skill premium (wages of skilled workers/wages of unskilled workers): Palma and Reis (2019).

Figure A.1 Cost of bare-bone baskets in England in d. (1250-1850)

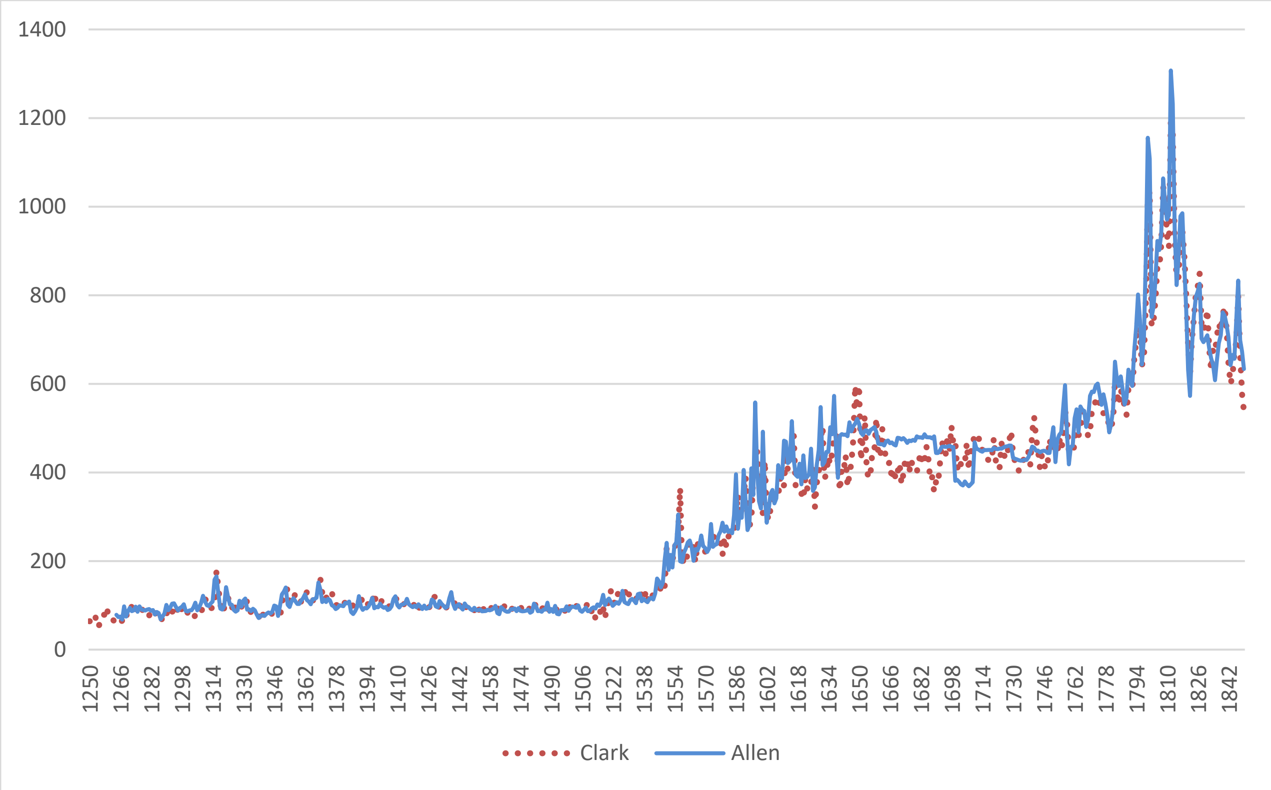


Figure A.2 Children Labour Share (1780-1850)

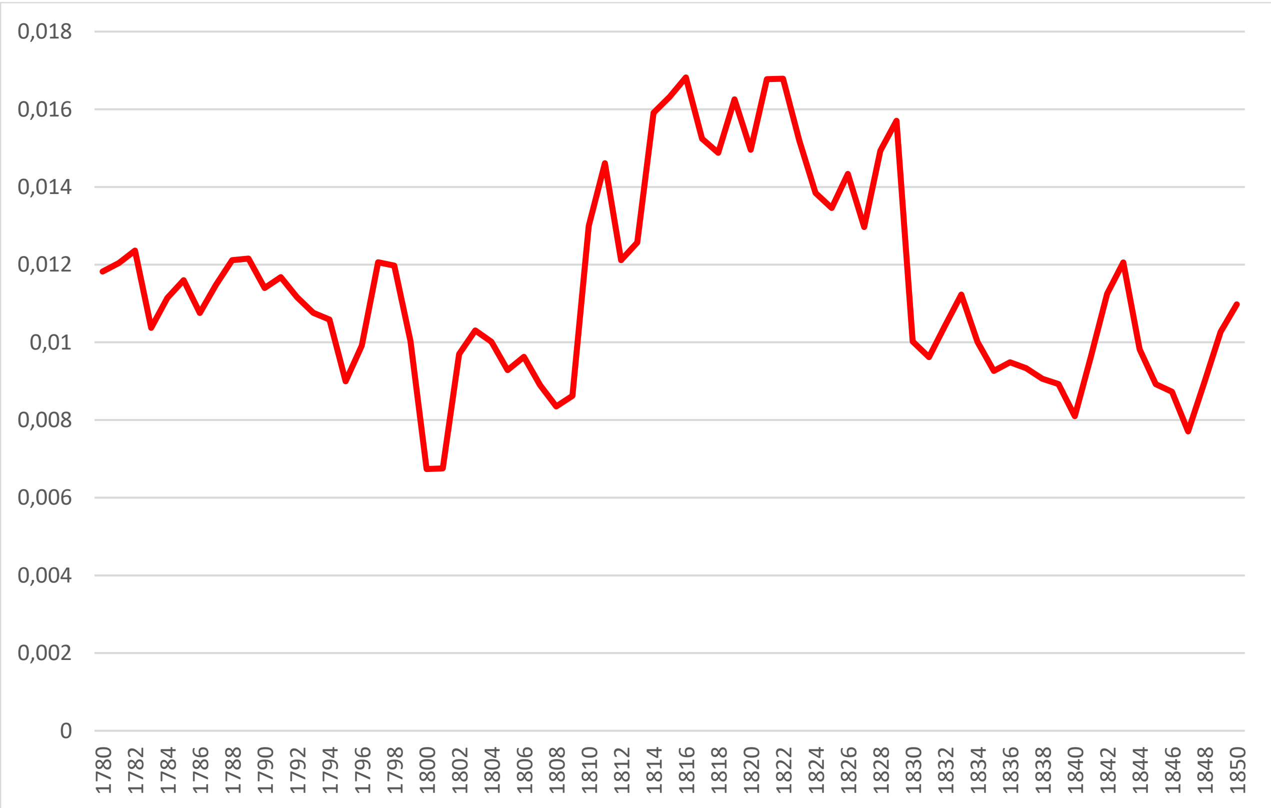


Figure A.3 Real and nominal Labour Share, England (1270-1850)

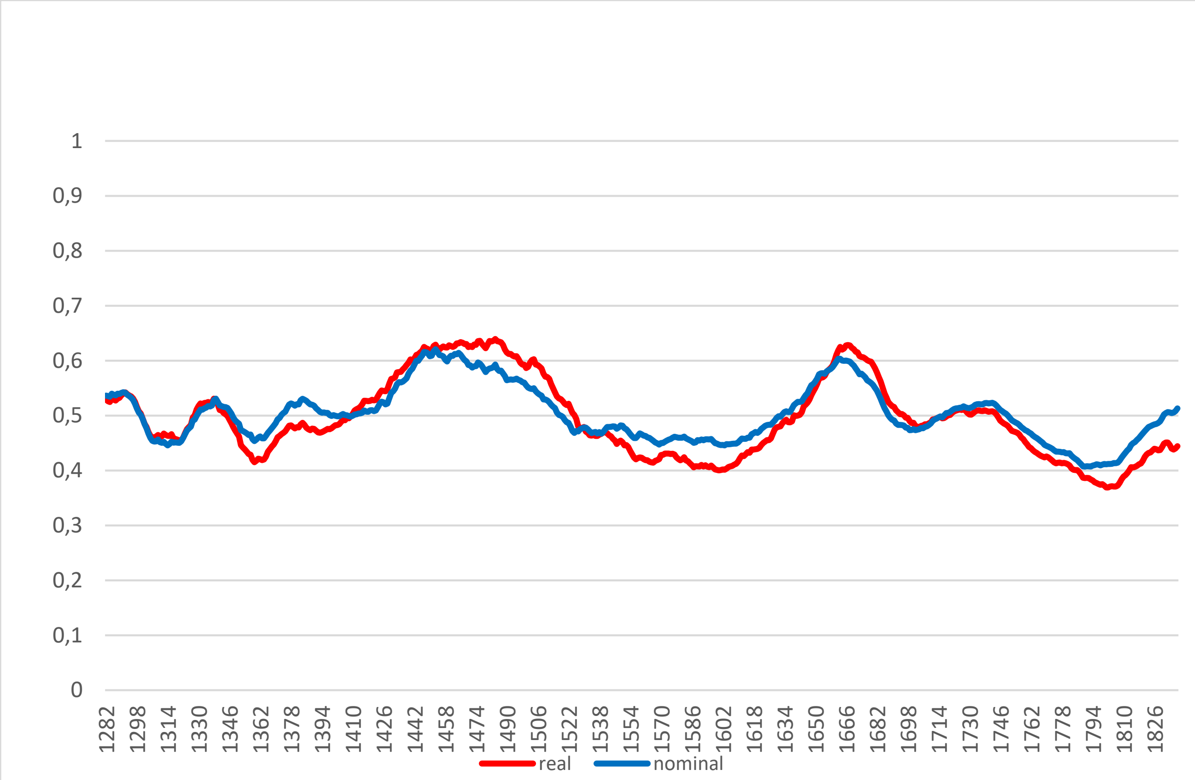
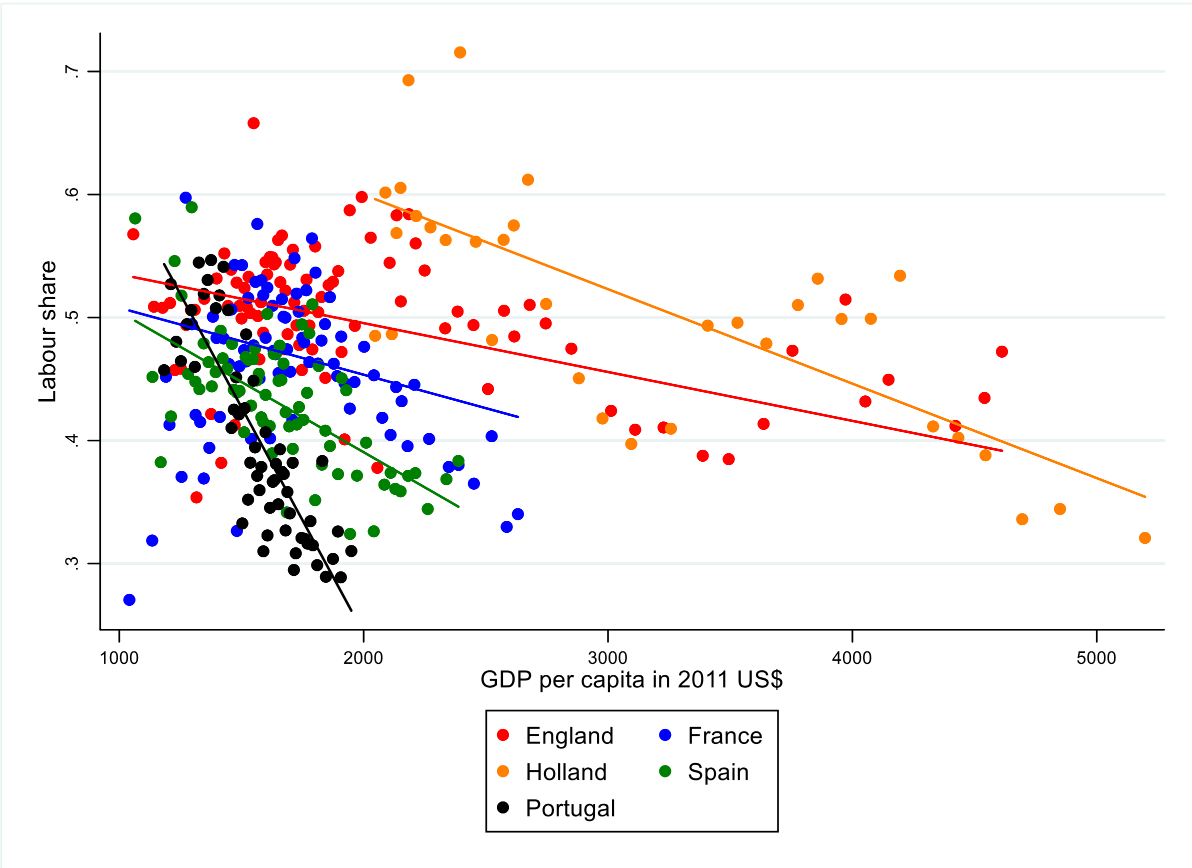


Figure A.4 Labour Share vs GDP per capita in pre-industrial Europe (England, France, Holland, Spain and Portugal)



Note: Binscatter plot constructed using 100 equally sized bins for each country.

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