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Forgotten family: the influence of women and children in the economic-demographic nexus

Sara Horrell, Jane Humphries and Jacob Weisdorf

London School of Economics; University of Oxford; Sapienza University of Rome

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Abstract

In a classic contribution that combined reconstructed demographic data with the best wage evidence then available, E.A. Wrigley demonstrated that English early modern nuptiality and fertility varied with economic conditions consistent with Malthus's preventive check. Subsequently, late marriage and frequent celibacy acquired new significance. Summarized within Hajnal's north-west European Marriage Pattern (EMP), they were assigned a causal role in the 'Little divergence', whereby England and the Low Countries enjoyed accelerated growth and began to escape Malthusian shackles. While these demographic-economic relationships have been much theorized their empirical foundations were flimsy. This was particularly true of the central role assigned to women. Thus, although women's economic opportunities after the Black Death and in the early-modern labour market allegedly dampened their enthusiasm for marriage, wage data, the crucial evidence, only existed for men. Even updated annual series, used in these analyses, although inviting revision of the conventional wisdom, remained exclusively male. Here we use our newly-constructed wage series for married and single women to evaluate their effects on marriage and fertility. We argue that women were key in the functioning of early-modern preventive checks. Demographic evidence also suggests that economic circumstances contributed to the timing of medieval marriage, but poverty

more often than prosperity prompted celibacy. We confirm the importance of women's responses in maintaining population-resources balance, but are sceptical about the early emergence of the EMP. Turning to children, again, there has been no shortage of theorization. Both protoindustrial theory and ideas about proletarianization have focussed on the earnings capacity of whole families, including children, as influencing marriage decisions. But, once more, empirical evidence was lacking. Our new juvenile wage data indicate that, at the aggregate level, children's labour and its relation to family formation seems neither to fit a proletarianization nor a proto-industrial imperative.

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Introduction

Wrigley and Schofield's Population History, published in 1981, by providing the demographic data for England, 1581 – 1871, allowed economic historians to explore the relationship between economic development and population growth.[1] Malthus's Theory of Population has held a prominent place in these analyses.[2] Research on the early-modern period suggested that in the English case the preventive check, whereby marriage at young ages was encouraged by buoyant labour markets but restrained when circumstances were less favourable, supplanted the positive check, whereby population growth occasioned by periods of prosperity was brought to a brutal end by the resulting pressure on resources and associated high mortality. Data for crude first marriage rates and real wages convincingly demonstrated that nuptiality and economic prosperity moved in tandem.[3] Later, industrialisation enabled economic growth and population expansion to occur simultaneously, ending the need for a preventive check.[4] Proto-industrialisation, household production of goods sold by merchants in distance markets found across much of Europe throughout the early modern period, and proletarianization, the almost-complete dependency of families on wage earning activities typified by industrialisation, altered the pre-existing internally constrained relationship between land availability, agricultural resources and household formation.

They also added the prospect of children's wage-earning to the mix.

John Hajnal had earlier identified late marriage and widespread celibacy as demographic controls that were characteristic of north-west Europe.[5] This 'European Marriage Pattern' has recently gained greater traction. It has been conceptualized not only as the mechanism by which some countries overcame resource constraints and achieved economic growth in the early modern period, but, arguably, as a product of the labour crisis that followed the devastating mortality of the Black Death and so a key development in this watershed with profound implications.[6] In particular, the transition from pre-plague factor proportions when population had pressed on limited land to a new environment of scarce labour and many vacant land-holdings encouraged the expansion of pastoral agriculture, and so, allegedly, the employment of young women to milk, shear, herd and attend to the animals. The constant care that livestock required was provided most economically by live-in servants. These servants tended to be young people; they gained skills and saved their annual pay to found their own households in due course, but their youthful posts were conditional on remaining single and celibate. Lacking the strength to compete effectively with men in arable work, women were deemed to have a comparative advantage in pastoral activities. Young women seized the opportunities afforded by

expanded pastoral production and deferred, or in some cases eschewed, marriage. While such propitious circumstances lasted no more than a century following the Black Death, the advantages to women of late marriage, the enhanced authority they acquired within their own households and their youthful acquisition of human capital, had become entrenched. The European Marriage Pattern persisted, outlasting the conditions that had brought it into being, but having profound and ongoing effects.[7] Indeed, explanations of England's precocious economic growth now take this chain of events as established orthodoxy.[8]

Medieval historians too have observed the widening opportunities for young women and their ability to exercise greater control over their own destinies after the Black Death, including delaying or forgoing marriage. However, no element in this account of the causes, consequences and meaning of the European Marriage Pattern (EMP) has gone uncontested.[9] The geographical uniqueness of the EMP has been challenged, as has the claim that unmarried women's labour was the mainstay of medieval pastoral activities.[10] Medievalists have identified youthful marriage among some groups, and shown that late marriage and lifetime celibacy characterized pre-plague as well as the post-plague experience for others, calling into question the role of the pandemic shock.[11] However, the delayed nuptiality of the earlier medieval era

appears occasioned by poverty, rather than plenty, thus undermining any claims for precocious changes in female agency and empowerment.[12] Even if the characteristics of the EMP existed this early in time, the underlying demographic mechanisms remain doubtful. Crucially, women move to centre stage as the economic actors responsible for kick-starting growth, but empirical evidence on the wage-marriage nexus has focussed entirely on men's work opportunities and remuneration.

This remains true for demographic analysis beyond the medieval period. Evidence on women's incentives in and responsiveness to the changed environment is missing. Wrigley himself laments the lack of evidence:

"A caveat, however, is needed. The real wage index is based on male wages only … it covers only a fraction of the whole workforce. Ideally, household rather than individual earnings would be a better guide …"[13]

Here we address this lacuna. Recently constructed wages series for young women on annual contracts and married women on casual wage rates in England from 1260 to 1850, along with other newly-constructed series first for men on annual contracts, and second for children provide the quantitative evidence on rewards to labour that are necessary to put women

and the family firmly back into these accounts of demographic transition.[14]

We start by describing the collation of the wage series. We then use these series to explore wage change and population change in the context of Malthusian relationships from 1260 to 1850. Next, we turn our attention to the nexus of family wage earning and demographic response in the early modern era. We pay particular attention to the role of women's remuneration in determining aggregate demographic outcomes and consider how children's earnings opportunities may have affected these choices. Our data allow extension back to the medieval period, although lacking fully-validated demographic metrics, our findings for this period remain tentative.

We find three distinct epochs in the relationship between remuneration and marriage. The early modern period was characterised by the co-relationship between male earnings and family formation, as attested elsewhere. As their wages increased, men were more inclined to marry and to marry at an earlier age, with a consequent boost to population. Women too viewed improvements in men's earnings opportunities as a positive incentive to marry. However, improvements in women's own earnings placed a brake on this exuberance, increases acted to reduce nuptiality and to increase the age of marriage for both men and women. Our key finding is the importance of

women's economic agency in determining observed demographic outcomes and the crucial role that women's choices and opportunities may have played in keeping the economy-population nexus in balance – a hitherto unrecognised mechanism. We also observe that the potential for children to earn, maybe in the expanding protoindustrial activities, was only a weak influence in encouraging fertility. Our data for the industrial period extends only to 1840, but here we see the unchecked expansion of population alongside growth in real wages and attribute this to the loosening of agrarian constraints as the economy diversified into imported goods and mineral-based energy sources. In this environment high fertility increased the proportion of child labourers in the working population, but this did not result in proletarian immiserization. An overstocked, unskilled labour market had an adverse impact on the pay of women and children, but placed a premium on the skills and strength of adult men. For the medieval period lack of reliable data precludes anything more than tentative conclusions. Here we observe characteristics of the European Marriage Pattern but cannot find evidence of the preventive mechanism for controlling population postulated by some authors. Instead female earning opportunities are unrelated to our constructed measure of aggregate fertility and, while male pay and this measure are correlated, further analysis suggests that expansion of population put pressure on

men's pay, rather than increased pay enabling population growth.

The data

In a series of related projects, we have compiled long-run series of men, women, and children's wages in England from 1260-1850. These data have been collected from a wide variety of sources, ranging from manuscript accounts of medieval manors to farm records to factory paybooks and churchwardens' and Poor Law accounts. Throughout the data have been collected for individuals, often named. In total we have 16,700 individual observations. We focus on workers in unskilled and semi-skilled jobs, mainly in agriculture and often located in the south of England. The appendix provides additional detail on the data used in this paper. Alongside monetary pay, the length of time the payment covered and any additional payments have been recorded. These last are crucial. Workers on annual contracts, almost always lived in and were fed by their employers as well as receiving a monetary payment. We have attributed a value to this board and lodging using the cost of the 'respectability' basket per day in each year devised by Robert Allen.[15] The respectability basket affords an individual the quantities of standard foodstuffs needed for physical maintenance and work effort; it allows a modicum of variety in

diet – bread, beer, and beef are included – and it also covers other necessities, such as housing, fuel, clothing, light, and soap. Annual workers received this maintenance every day in the year, so we added its imputed value (times 365) to the annual monetary wage reported in the various sources to yield total remuneration. For day labourers the money wage paid is usually recorded as a daily rate. In line with previous research, because this enables comparability with annual pay, we assume they worked 250 days in the year.[16]

We need to address whether paid labour can be taken as representative of the many families who farmed their own land and exhibited, at least partial, self-sufficency, particularly in the early years under study. We argue that it can. The existence of a labour market, however nascent, meant that alternative options were available, so allowing the assumption of a degree of arbitrage between the two situations that would ensure rough comparability. More specifically, in other work we have explicitly compared the wage earnings of representative medieval households to the estimates of the incomes generated from land holdings of different sizes by Christopher Dyer, John Hatcher and Harry Kitsikopoulos and found family earnings to represent the living standards of those dependent on small-scale agriculture.[17]

These nominal earnings reveal little about material welfare. To capture living standards, we need to ask what money earnings could buy. We need to deflate nominal pay by a measure of the cost of living. We use Allen's long-run series of the daily cost of the respectability basket multiplied by 365 to scale up to an annual cost. Dividing nominal remuneration by the cost of respectable subsistence results in a 'welfare ratio', the number or fractions of the standard basket that a worker's pay could purchase on any representative day in the year.[18]

The heterogeneity of the data for children by gender, age, occupation, and location of work requires attention if compositional shifts within the sample are not to suggest misleading changes over time. Following established practice, we use regression analysis to identify the effects of these factors on wages and use the estimated coefficients to predict a typical experience: here a 12-year-old boy working on day rates in agriculture in the south-east of England.[19] The resultant data series for men and women on different kinds of contract and our representative child are illustrated in figure 1. For comparison, we include Gregory Clark's series of the day wages earned by adult male agricultural workers.[20]

FIGURE 1 HERE

The figure illustrates important findings. The labour scarcity that followed the Black Death has long been held a Golden Age for the English peasantry, raising the wages of male day workers to a level that remained unmatched until later industrialisation, as depicted in the series for men on daily pay. Meta-narratives of English economic history hinge on this account. However, the earnings achieved by women and children disrupt this standard story. Women, and, with a small delay, children, did share in the initial gains, but the subsequent downturn in their pay came earlier than for men and their welfare ratios drifted ever further from those of male day labourers as the economy underwent industrial transformation. Moreover, workers on annual contracts, whether male or female, did not share in the golden gains to the same extent as daily labourers, although their remuneration improved relatively from the early-modern period. The new annual wage series query the standard account of men's day wages, grossed up to yearly income assuming 250 days paid work in every year, and so the grand narrative built on this base. The assumption that day workers always and everywhere were either willing or able to find work for 250 days throughout this six-hundred-year period has been disputed and other work has demonstrated that days worked were fewer post-plague and through the early modern period, but rose to over 300 once industrialisation was

underway and the imperatives of capitalist production imposed greater regularity and discipline.[21] Our series of workers' remuneration when working by the year responds to this problem. These series capture labour's annual returns without requiring knowledge of days worked, and, on a variety of measures, have been shown to be more accurate than day rates scaled up assuming a standard work year.[22] We use the annual remuneration for male and female workers in the subsequent analysis, but we make comparison with day wage estimates where appropriate.

The Malthusian world

We set the scene by following E. A. Wrigley in comparing the direction and magnitude of change in population and real wages to seek out variants of a Malthusian world.[23] We focus initially on the change in male annual workers' remuneration, but develop the analysis by drawing on our other series.

We start with a summary visualisation. Percentage changes in the welfare ratio over each decade based on the male annual wages are compared with analogous changes in population. A scatter diagram of these changes placed in quadrants can identify a Malthusian dynamic where population and wages move inversely, that is wages improve as population pressure moderates and decline as it increases, since these lie in the

north-west south-east quadrants. We contrast these dynamics with those we describe as 'Boserupian' where small growth in population is able to jump-start small growth in the economy, while small declines in economy and population occur together. Such Boserupian dynamics rest on the idea that thin markets are antithetical to economic development so declining population is associated with economic stagnation while modest population growth can, by expanding markets, stimulate new techniques in agriculture that increase productivity, wages, and output. In this case observations will lie in the north-east south-west quadrants. We divide our observations into two diagrams, 1260-1550 covering the medieval period and 1560-1840 covering the early modern era and, from around 1750, the early industrial years (Figure 2).

FIGURE 2 HERE

The medieval dynamic, 1260-1550, contrasts with those of the early-modern and industrial eras, 1560-1840. In the former, changes by decade reflect Malthusian constraints: decreases in population were accompanied by wage increases and *vice versa*. For a few decades in the 13th and 16th centuries, there was Boserupian growth, with small same-direction changes in population and wages. In the years 1560-1750, Boserupian

growth was again evident and later, in 1760-1840, increased in scale and became more persistent with a transition into modern economic growth. While small population declines continued to co-exist with reasonable wage improvement and increases in population with wage retrenchment in the 17th century, such combinations were less frequent than in previous centuries. Instead, a strong positive relationship between wages and population emerged from the mid-18th century onwards. The exception is 1780-89 when wartime inflation eroded wages.

These observations chime with the empirical analysis of the Malthusian relationship for 1541-1861 by the Cambridge Group. They identify two stages in early-modern economic-demographic interaction. The economy was capable of absorbing small increases in population of up to 0.5% per annum from 1541. Although limits existed and setbacks occurred from 1541-1750, moderate rises in population generally had only a minimal adverse impact on pay, in sharp contrast to the inverse relationship observed for these variables in earlier centuries. However, to travel further into the quadrant mapping continued wage growth accompanying substantial population growth, a new dynamic in economic expansion was required to release the constraint of finite land. From 1750 economic growth, male remuneration and population increase all occurred together. Key to this change was the increased use of coal, it replaced timber as a source of heat energy, and,

through the steam engine, human and animal muscle, as a source of mechanical energy.[24] Limited land no longer limited growth.

We combine our various wage series to capture family earnings and incomes to further investigate the timing of the escape from the Malthusian world. The evolution of this composite measure more accurately captures the situation of ordinary people as it includes the work opportunities that an expanding economy afforded women and children. Thus we move beyond the conventional exclusive focus on men's wages and their relation to population growth, to consider the combined influence of men, women and children's earnings on demography.[25] The resulting index reflects the direction and magnitude of the co-movements in population and family wage growth. An inverse move in both population and wage will give a negative value, a co-movement a positive one. We visualise the evolution of this composite measure over time. The series shows a pattern of broadly negative followed by more consistently positive movements.

FIGURE 3 HERE

Note that a positive result occurs whether the combined change is a decline in both population and wages, the Boserupian 'thin' markets case, or an increase in both, the Boserupian

widening markets case. To avoid the identification of 'false positives' we register periods of Boserupian economic decline in figure 3. The overall pattern is clear. Throughout the medieval period, England was in the grip of Malthus. Rarely was the composite indicator of all workers' remuneration and population in positive territory. Where the indicator did breech the dividing line with a positive value, this typically represented a period of recession where both population and wages had declined. Indeed, mortality events occurred with fateful regularity.[26] From the 16th century onwards, the index exhibited considerable and growing volatility, but positive movements became more frequent and of greater magnitude. There also ceased to be the 'false' positives caused by thin markets. Initial escape from the grim Malthusian world of the positive check, where resource limits prevented the co-existence of sustained population and economic growth, occurred around the early 17th century, consistent with known changes in economic activity. Politically and socially, the late-16th century was challenging, but economically England established her presence in the North American colonies, benefitted from the Atlantic trade and developed her exports of lighter woollen cloths, the so-called 'New Draperies'.[27] In the centuries that followed, markets became more integrated, transport improved and internal trade, particularly centred on London, boomed.[28] Agriculture too showed decisive improvements

in productivity.[29] The English economy diversified towards manufacturing and services. The proportion of men working in industry grew from 1600 and real GDP per capita from the mid-17th century.[30] The institutional and political changes of the Glorious Revolution in 1668 may also have helped these developments. Escape from Malthusian stagnation saw a move from tentative Boserupian gains into self-sustaining Smithian growth, with responsive nuptiality enabling moderate population growth, but continued expansion was always threatened by the limits of the organic economy. As Wrigley argued, the increasing use of fossil fuel was a paradigm shift and we observe increased possibilities for substantial population growth to co-exist with economic growth as industrialisation progressed. We identify these phases as associated with the positive check 1280 to c.1600, the preventive check c.1600 to c. 1780, and release from constraint and modern economic growth from around 1780.

Incorporating women's and children's remuneration into an overview picture of demography and wage change confirms understandings of the epochs of population dynamics. Subsequent sections of the paper investigate the roles of changing nuptiality and fertility and spikes in mortality in driving the demographic-economic relationship.

Women as agents in the early modern demography-economy nexus, 1541-1841

The marriage decision and fertility

We now focus on the mechanisms that restrained population growth in the early modern period, beginning with nuptiality's response to economic circumstances through the preventive check. In Malthusian accounts, when men's wages grew, they married earlier, marital fertility rose, but, eventually, a larger population put pressure on resources, real wages fell and marriage was deferred. This self-regulation avoided collision with finite resources and the more brutal positive check whereby food shortages, hunger and disease brought population back in balance. The European Marriage Pattern provided a social and cultural context for the preventive check. Marriage took place at relatively late ages, and celibacy was relatively common, which reduced demographic pressure while enabling responsiveness to economic conditions.[31] But how did women's agency and sensitivity to their own economic opportunities impact nuptiality? Women were pivotal in theories of the decision to marry and create new households but lack of evidence on their earning meant that they were completely absent in empirical studies.

Our data afford new insight. The constructed long-run wage series for women distinguish between single and married

women.[32] It was predominantly unmarried women who were available to work on an annual basis. Celibacy was often a condition of service. Pregnancy was an accepted reason for the termination of an annual contract,[33] and while married women had access to the casual labour market, often as a helper or adjunct of a working husband, day labour for single women was frowned upon. [34] Figure 1 reminds us of the different time-paths followed by married and single women's remuneration. We also have information on the remuneration of men on annual contracts and in day labouring positions. However, we contend that the male labour market was not segmented by marital status. Men, young and old, could move between different forms of employment, so ensuring arbitrage between day and annual wages. As we demonstrate below, the demographic responses to men's remuneration, whether earned by the day or through annual service, was no different.

The demographic data is sourced from E. A. Wrigley et al. We extract quinquennial Crude Marriage and Birth Rates for 1541-1860 and convert these into decadal averages to match the periodicity of our wage data. We also use some of the family reconstitution data for lower-skilled and unskilled males from English parish registers to look more closely at the determinants of age at marriage.[35] We use regression analysis to determine the effects of changes in male and female

remuneration on these demographic outcomes. Here we report the key findings.[36]

Visually the Crude Marriage Rate shows limited covariance with the remuneration of either men or women (figure 4). The regression results are more illuminating (columns 1 and 2, table 1). We present two regressions for the relationship with the Crude Marriage Rate because collinearity, parallel changes in male and female annual remuneration, prevents a direct test of the relationship between young men and women's pay and proportions marrying.

FIGURE 4 HERE

The results in column 1 suggest that neither the real wages of men on annual contracts, nor those of women working casually had any significant implications for marriage decisions.[37] This highlights that females who worked on casual terms typically were already married, so wage changes would not delay or encourage the decision to start a family. In column 2, day pay for men is positively and significantly associated with the CMR, the positive relationship identified by Malthus in his preventive check. However, for young, annually employed,and therefore typically unmarried, women real wages are negatively associated with marriage rates. While

propitious economic circumstances would encourage men to contemplate marriage, the same circumstances would cause young women to defer nuptiality. Women chose economic independence rather than marital subservience when the labour market provided robust opportunities. These countervailing forces operated on marriage decisions to mute the exuberance tight labour markets conveyed to nuptiality and must have been important in keeping England's population increase at sufficiently low levels to avoid overwhelming any economic growth.

TABLE 1 HERE

The same relationships are identified when we consider the age of marriage of men and women from the family reconstitutions (table 1, columns 3 and 4). Improved pay for men, both in day and annual work, reduced the age at which they married, and had a parallel effect on the ages of brides. Marriage would occur earlier if economic circumstances allowed and if men's pay alone determined timing. However, improved pay for young annually-employed women caused both women and men to postpone marriage until they were older. Women's day rates had no effect on any of these outcomes, married women's casual earnings apparently having no impact on family formation

decisions. Perhaps couples could not foresee the contributions that wives might make to family earnings and so discounted them when decision-making. The Crude Birth Rate similarly reflects the Malthusian preventive check operating with men's wages, but the boost to births provided by male wage gains was subdued by the countervailing effects of women's response to improvements in annual pay (table 1, column 5).[38] Women's caution moderated men's confidence when economic conditions were favourable. Such moderating factors helped to keep population growth in line with economic resources and may have been crucial in enabling England to escape Malthusian constraints. The converse also occurred. When men's pay came under pressure, men were more reluctant to take on the responsibility of a new household. Yet young women, maybe suffering over-supplied labour markets and lower wages to a greater degree than young men, would take refuge in marriage and do so at an earlier age. Again, these countervailing reactions by men and women to economic fortunes demonstrate the importance of women's decisions in maintaining demographic stability. While the analysis implies that men and women had different incentives to marry is implied, it also highlights gender differences in situation. Women faced considerably greater variability in level of income and ability to earn enough to maintain their person compared with men in these volatile early modern labour markets, this constrained their

choices and left them vulnerable to opting for marriage to secure subsistence.

Children's opportunities to earn and the demographic context

The European Marriage Pattern operated through the decisions of both young women and young men to reduce demographic pressure. At the same time, the sixteenth- and seventeenth-century economy was not stagnant.[39] The impetus given by a slowly growing population to the adoption of new techniques in agriculture, a Boserupian mechanism, provided one stimulus, but this was overlaid by the spread and deepening of Smithian growth. Productivity improvements driven by technological change, specialisation and the division of labour, developments in transport and trade, and the thickening of markets both home and abroad, spread expansion from agriculture to industry and services. Implicitly, the viability of households and the raising of children has been subsumed into the economics of the marriage decision and reduced to levels and trends in men's wages. We have widened the lens to include women's active role and the factors that influenced their deliberations about marriage. But the basis of the decision to marry and form a new household shifted as the economy grew and livelihoods were less directly based on the land. Importantly, another set of potential contributors

to family subsistence entered the reckoning: children. Over the course of the 'long eighteenth century' the population had become dramatically younger, peaking in 1826, with children under 15 years of age constituting nearly two-fifths of the population.[40] This changed the equation as we demonstrate below.

Children worked from young ages in the early-modern and industrial economies. Indeed, economic growth coincided with increased demand for child labour. Proto industry presented new work opportunities for both women and children. Some historians have argued that wage-earning opportunities in domestic manufacturing ended children's dependence on parents, and promoted earlier marriage, providing one route to early modern population growth.[41] Another route is through proletarianization which reversed the imperatives. Wage dependency removed the ties to agricultural land that maintained a regime of celibacy and mature marriage. In the traditional agrarian society, young people had to work to save enough to buy land and stock a small farm before they could establish a new household, and in the meantime were subject to community scrutiny that imposed abstinence and abhorred illegitimacy. As a result their marriage prospects were circumscribed. Wage labour and migration to towns lessened these constraints. Marriages and households could be founded on the earnings of all family members and were perhaps better

established at younger ages when earnings peaked. However, if the resulting population growth intensified competition in an over-supplied labour market and eroded living standards, parents may have been encouraged to have more children to shore up the family's resources.[42] In this account proletarianization and immiserization go hand-in-hand.[43]

In both the protoindustrial and proletarianization scenarios, the opportunities for child labour shifted England to a higher fertility regime and introduced a dynamic beyond the earnings potential of the marriage partners alone. Local studies have been unable to link these new ways of working to demographic discontinuities, instead reaffirming the persistence of traditional marriage patterns albeit within looser economic constraints. Nonetheless, these theorizations suggest the need to probe the role that family labour may play in demographic outcomes.[44]

We use our children's wage series to investigate. We start by determining whether an increased supply of children available for work adversely affected adult pay, as well as their own earnings, the immizerising version of proletarianization. After controlling for other influences on our observations of individual children's pay; gender, age, occupation, region, and time period; we can determine how the proportion of children aged 5-14 in the population, capturing the relative

supply of child labour, affected children's own pay. As would be predicted in standard analyses of labour markets, an increase in the population of young people adversely affected children's own wages (table 2, column 1).

TABLE 2 HERE

We can use the same demographic variable, the share of juveniles in the population, to consider the effect of an increased child labour supply on adult pay. Here we face the potential problem of endogeneity; adult pay, through fertility decisions, will determine the number of children, as well as the number of children impacting on adult pay. However, this problem is obviated as the juvenile population aged over five at a point in time is the result of behaviour 5-14 years earlier, so is not itself determined by current wage rates. More child workers had a depressing effect on married women's pay; they were likely in competition for the same, lower skilled jobs (table 2, column 3). But a high proportion of child workers enhanced male pay (table 2, column 2). Children could not substitute for the strength and skills of adult men, instead they were complimentary workers, used to supplement and enhance men's efforts, improve their productivity and so raise their wages.

How does this speak to the proletarianization argument? Higher fertility increased the supply of child workers. This adversely affected their own and their mothers' pay, but the countervailing tendency to improve adult male pay could offset this effect. Indeed, where adult men contributed more than half their families' income, the net effect would be positive.[45] High fertility could co-exist with economic growth and improvements in family income, thus the mechanism that identifies the high fertility regime as occasioned by family poverty, proletarian immiserization, was not evident at the economy-wide level.

Our data can also illuminate aggregate aspects of the relationship between marital fertility and protoindustrial expansion. We consider the relationship of children's wages to parental earning ability and to demographic variables. Protoindustrial expansion in woollen cloth, metal goods industries, pottery, glass, papermaking and lace spinning, among others, offered extensive employment to men, women and children increasing the demand for child workers.[46] Demand exceeding the supply of children willing to work would be reflected in an increase in children's wage. If this demand was also relatively higher than the demand for adult male or adult female labour an increase in children's relative pay would also be expected. The pay data (figures 5a and 5b) show no indication of an excess demand for child workers throughout

the early modern period. The wage ratio indicates that children were in demand relative to men after 1750, but this is coincident with early industrialisation rather than the expansion of cottage industries.

FIGURES 5a, 5b and 5c HERE

The relationship of boys' pay to the Crude Marriage Rate and the Crude Birth Rate also fails to support the argument that increased demand for child workers fuelled fertility. While more work for women and juveniles in protoindustry might increase marriage rates and reduce age at marriage, thereby increasing the supply of children, there is no evidence of high demand for children, as measured by their real wage, being correlated with either of these demographic variables in the years associated with burgeoning protoindustry, 1680-1750 (figure 5b and table 3). There is a significant correlation between pay and demographic measures earlier, between 1540 and 1670, but here fertility and pay are both declining. By industrialisation 1750-1840, the sign of the correlation, while remaining insignificant, became negative. As observed elsewhere, the mid-eighteenth century marked a watershed after which young people were responding to a different set of conditions in making their decisions about family formation.

TABLE 3 HERE

The failure of our evidence to support the idea of a beneficial expansion of protoindustrial opportunities, 1540-1670, is reinforced by consideration of the living standards afforded by a small family of a representative couple at this time. Combining the annual pay for a father and casual day pay for part time work for a mother and comparing it with the respectability basket required for a family of four shows whether parents were able to afford a respectable standard of living for their household (figure 5c).[47] The figure indicates periods of surplus and deficit for the family.

Until the latter part of the eighteenth century the earnings of a man and wife were insufficient to support their growing family. Surpluses carried over from their youthful saving could help, but, from 1540 to 1690, their children also needed to contribute to household income by working if the family was to maintain a respectable standard. In this same period, children's wage levels tended to be depressed (figure 5a) and fertility rates on a downward trend (figure 5b). It seems unlikely that couples started families with the expectation

that their children would soon become net-contributors able to cover the cost of their own subsistence.

We suggest that proto-industrialisation was only a weak influence in encouraging fertility, the acceleration observed required the more decisive change in circumstances provided by modern economic growth.

Medieval demographic choices

The existence of the European Marriage Pattern

Discussions of the European Marriage Pattern and the influence of economic opportunity on women's family formation decisions have centred on developments after the Black Death. Specifically, labour shortages allowed young women to gain skills, take jobs that had previously been exclusively male, and so earn hitherto undreamed-of sums of money. In this favourable environment, they allegedly deferred or eschewed marriage, reducing population pressure and encouraging the tap roots of economic growth. As already noted, this account of 'girl powered' economic growth has been contested. Medievalists point out that the extreme mortality and decimated population must have reduced competition for land and so enabled many to marry at an earlier age than previously.[48] Indeed, to maintain population in a high mortality environment requires counterbalancing high fertility

rates, and so young and universal marriage. Our new wage data can contribute to these debates.

'Girl-power' originated in female farm servants sharing the windfall wages of the Golden Age. Our women's wage series call this account into question (see Figure 1).[49] Female workers on annual contracts, those we have identified as single and therefore making choices about marriage, saw only a glimmer of gold in their remuneration. Statute and custom combined to suppress and control the work and pay of young women.[50] Conversely, women on day rates, those we have identified as married, did benefit from the chronic labour scarcity. At the peak, if they worked 250 days in the year, these women could earn over three times their annual subsistence. But wives' golden age was short lived. By the fifteenth century, their pay began to plummet. Women were excluded from a range of economic activities and their ability to conduct business was curtailed.[51] Women typically could not sign contracts, obtain loans or credit, utilise land as security, or use courts to pursue debtors. Any taste of independence soon faded. In any event, for many women their work had only been as an adjunct to their husband. From our wage evidence, it is hard to sustain the notion that economic advancement and enhanced agency caused a fundamental shift in the role women played in family formation decisions after the plague.

We can pursue these themes further. In previous work, we used Pamela Nightingale's series of the mortality rates of London merchant creditors 1305 - 1529 alongside population figures to construct a series for the possible fertility rate in each decade.[52] We used this demographic variable to investigate the relationship with men's and women's wage series, as we did in the previous section for the early modern period. Uncertainty over the constructed fertility rate means the results are tentative.

We found no relationship with women's earnings. There was an inverse relationship between men's annual pay and the fertility rate which could testify to attempts to accumulate prior to marriage. But there is also the possibility of reverse causation, the nutritional needs occasioned by high fertility levels putting pressure on agricultural resources that then depressed men's wages. We used econometric techniques to separate these two possibilities and determined that population growth acted to depress men's pay, while fertility itself was unresponsive to men's remuneration. The lack of evidence for a mechanism linking fertility to couples' economic circumstances suggests that mortality was likely the main driver of medieval population trends.

We also tabulated some of the documented age of marriage estimates from medieval studies and plotted these against

men's and women's annual remuneration.[53] There were no obvious shifts in the age of marriage, and so little space to see variation with our wage series. We also noted the late age of childbearing implied by archaeological skeletal remains.[54]

Further, features of the European Marriage Pattern have been observed early in the medieval period, long before the Black Death. Non-elite men and women married at relatively late ages. Many were destined for a lifetime of celibacy. On marriage, couples set up nuclear households, and earlier worked as life-cycle servants. But these familiar characteristics do not necessarily imply the same economic mechanisms underlay marriage decisions as those we have identified for the early modern period.[55] These outcomes were features of a land-poor, labour-surplus society. Where agricultural resources were needed for family formation, pressure on these resources required communities to restrict future claims. Poverty, not opportunity, structured the marital landscape; household formation, age of marriage and the nuptiality of the propertyless were socially controlled but in an environment where dearth and death threatened noncompliance. On the new evidence presented here, we suggest that the medieval world was not only Malthusian, with population pressure determining living standards, but one where any preventive mechanism operated through restriction of marriage by both men and women in response to this pressure

rather than through an optimistic responsiveness to economic opportunity.[56]

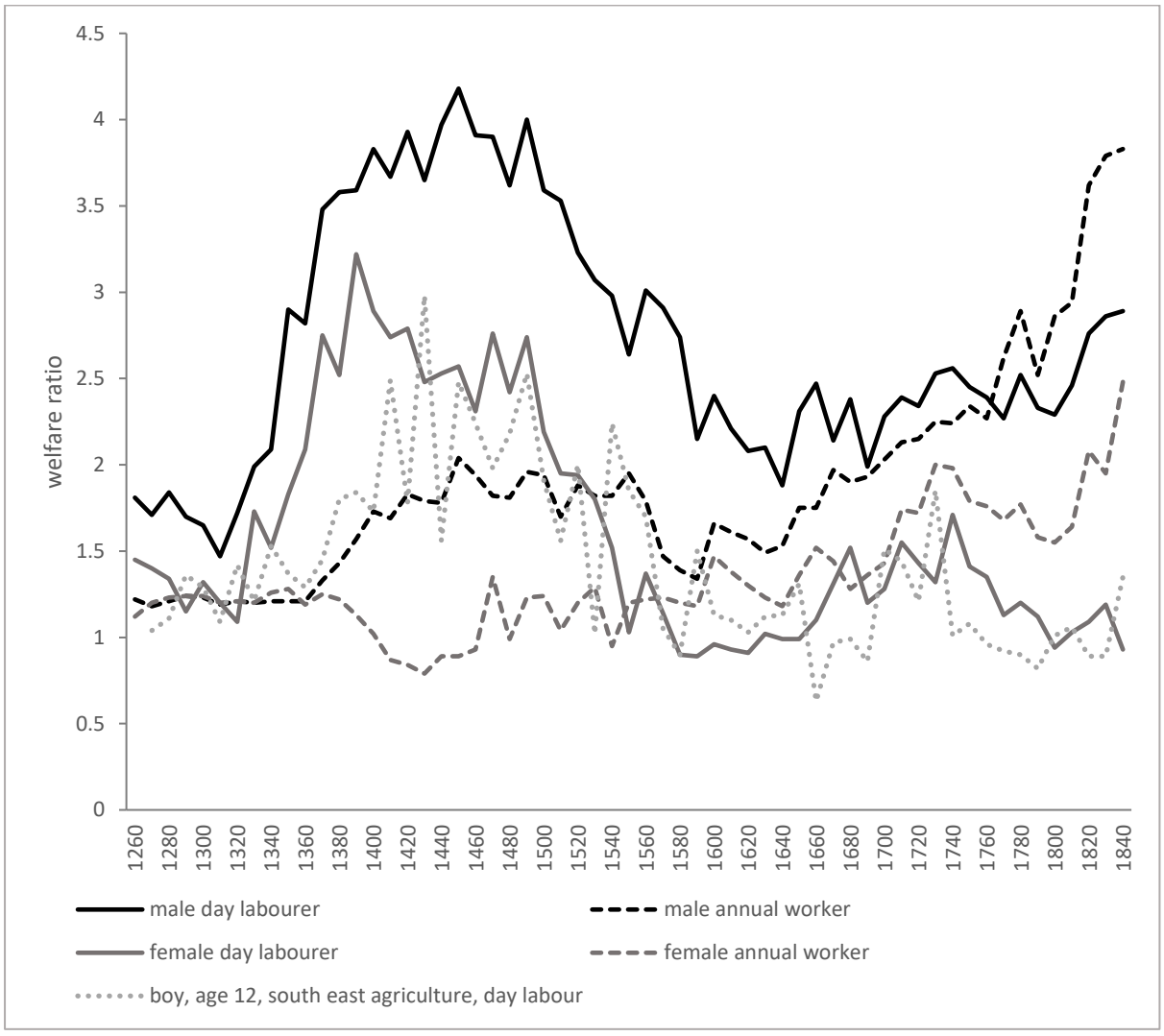
Conclusion

Our work on long-run wage series for different family members allows us to apply a household lens to the relationship between economy and population. We observe distinct phases in English population history: medieval statis dominated by mortality events with any small growth rapidly crashing against the Malthusian constraint of finite land; occasional decades of hesitant Boserupian growth when agricultural productivity was sufficiently responsive to accommodate small growth in population, but despite generally late marriage and widespread celibacy unable to sustain achievements; early-modern Smithian growth when the preventive check enabled control over fertility and ensured that economic gains were not outpaced by population; and, modern economic growth where industrialisation and the use of primary inputs from home and abroad meant that the economy and population could surge together unimpeded. We observe the operation of the European Marriage Pattern at its apogee in the early modern period and bring women to centre stage. Not only were women actors in demographic decisions, but their choices tempered responses to increasing male wages. When women's wages rose alongside

those of their sweethearts, giving them a decent life as spinsters, they opted to defer marriage. Their decisions curbed the potential for demographic overreaction to increases in male wages, lessened the danger that population growth would outrun economic growth, and added an extra dimension to the preventive check. While children's wage- earning opportunities in proto-industry and early manufacturing may have decreased their cost to the family and so encouraged their parents to marry younger, we find little to suggest that this played out as a major factor in the aggregate picture. In the medieval era, the persistent manifestations of the European Marriage Pattern suggest continuity but this hides a more binding resource constraint. While we have no doubt that women participated in behaviour that helped to balance people and provisions, alone a preventive check was not strong enough to enable sustained growth. In the 14th and 15th centuries, more brutal forces policed the demographic landscape. Throughout we emphasise the importance of considering the family as a unit and highlight the reinterpretation of standard narratives and increased understanding of underlying mechanisms when women's choices and actions are incorporated.

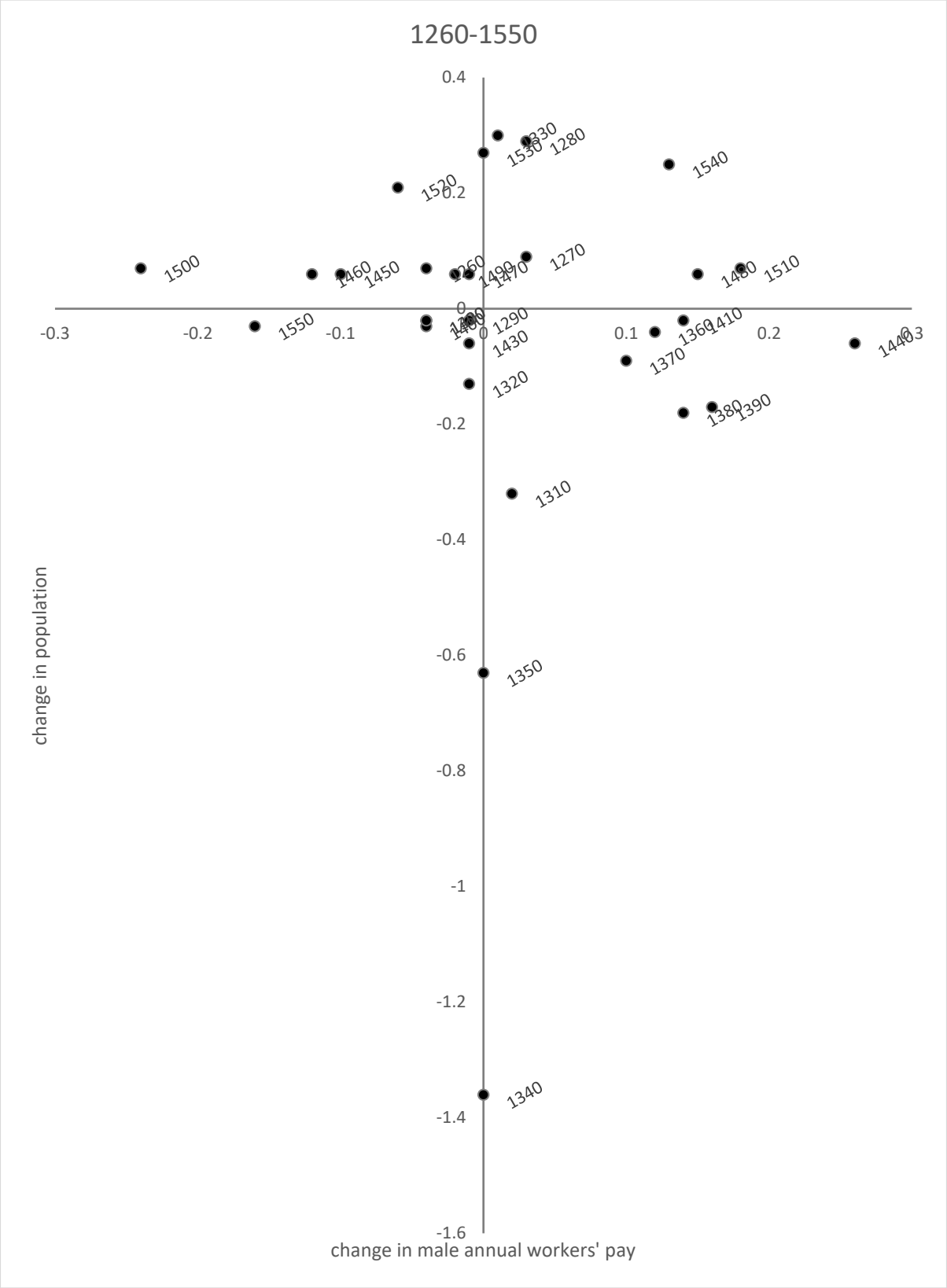
FIGURES AND TABLES

Figure 1. The wage series, expressed as welfare ratio (nominal wage / cost of subsistence basket)



Sources: male day labourer, Clark, 'Long march'; male annual worker, Humphries and Weisdorf, 'Unreal wages'; female day labourer, female annual worker, Humpries and Weisdorf, 'Wages'; boy, Horrell and Humphries, 'Children's wages'; cost of subsistence basket per day from Allen, 'Data' spreadsheet as used in Humphries and Weisdorf, 'Wages'

Figure 2. Malthusian relationships



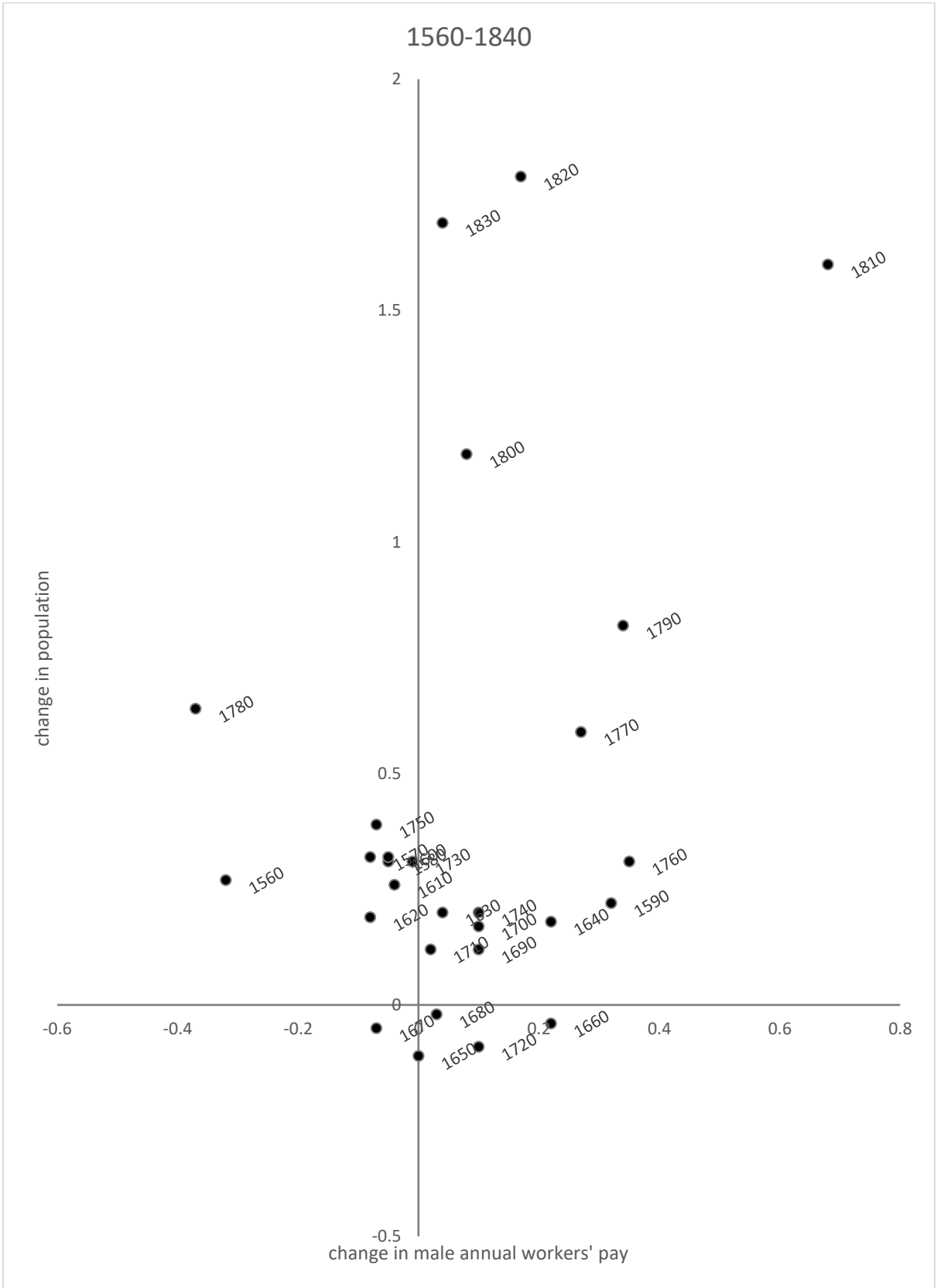
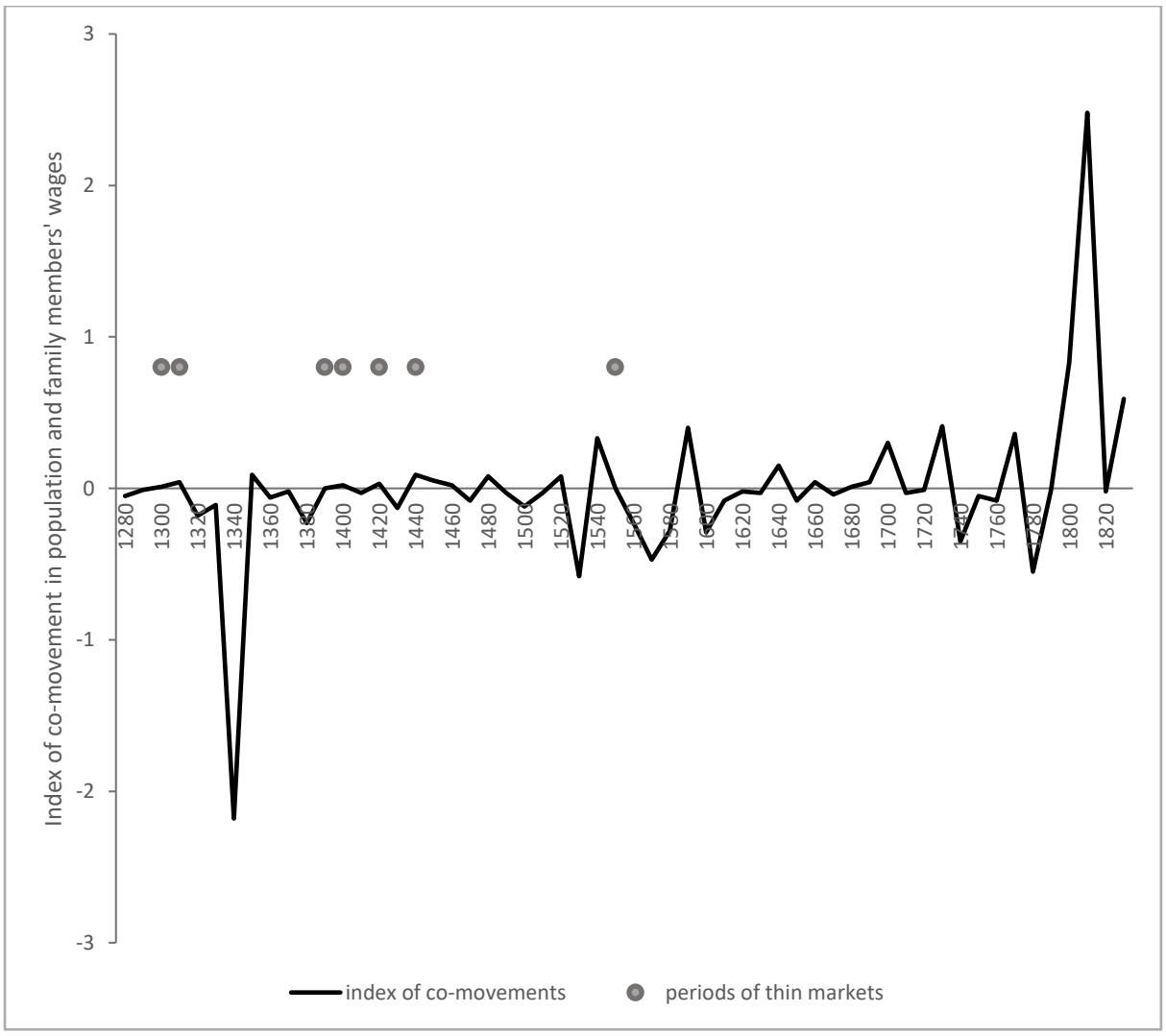

1560-1840
change in population
change in male annual workers' pay
2
1.5
1
0.5
0
-0.5
-0.6
-0.4
-0.2
0.2
0.4
0.6
0.8
1820
1830
1810
1800
1790
1780
1770
1750
1760
1560
1730
1610
1620
1590
1640
1700
1690
1680
1660
1650
1720

Figure 3. Time path of co-movements in population and family earnings.



Note: periods of economic growth (population and wages grow together) and of recession (population and wages fall together) both appear as positive values above the horizontal axis, those generated by declines in both are indicated by 'thin markets'.

Figure 4. Crude Marriage Rate and real remuneration (expressed as welfare ratio), 1540-1840

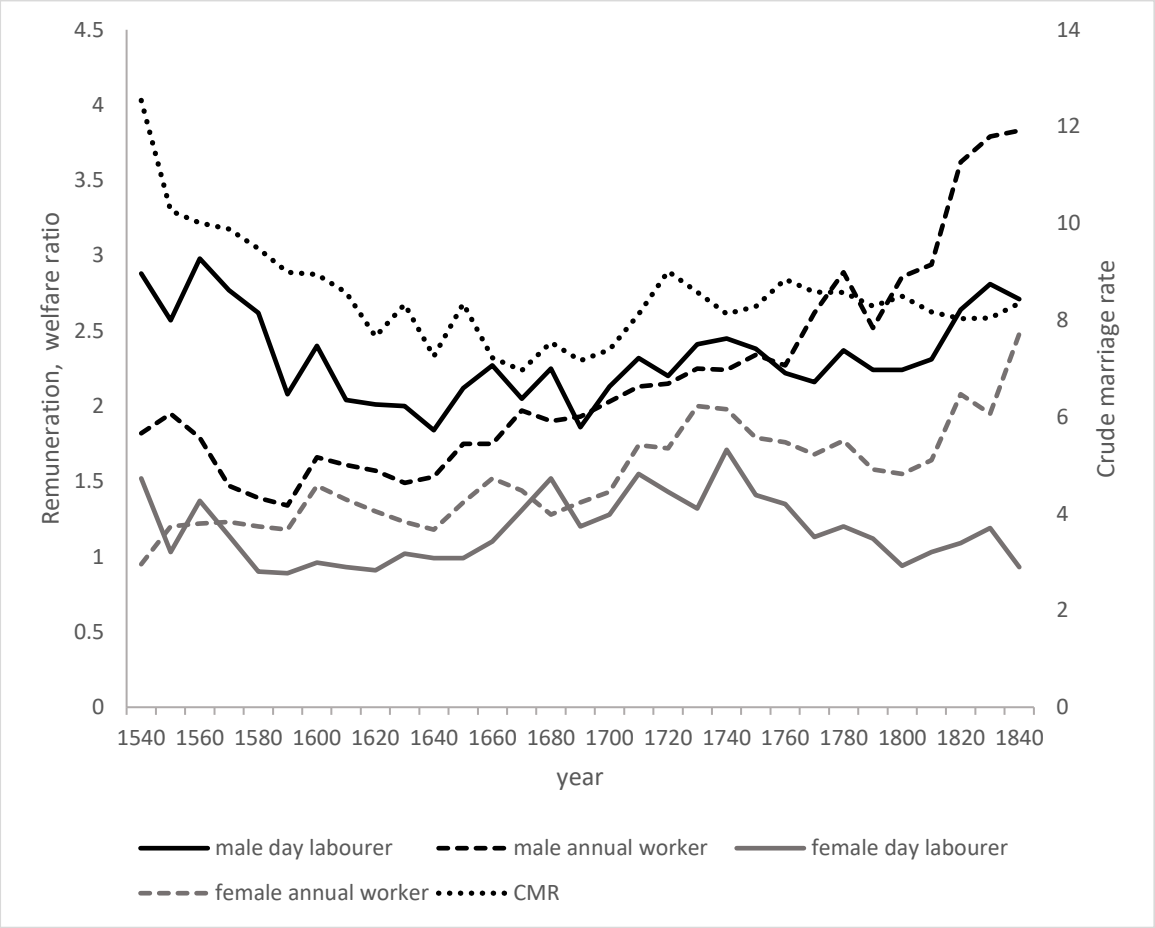
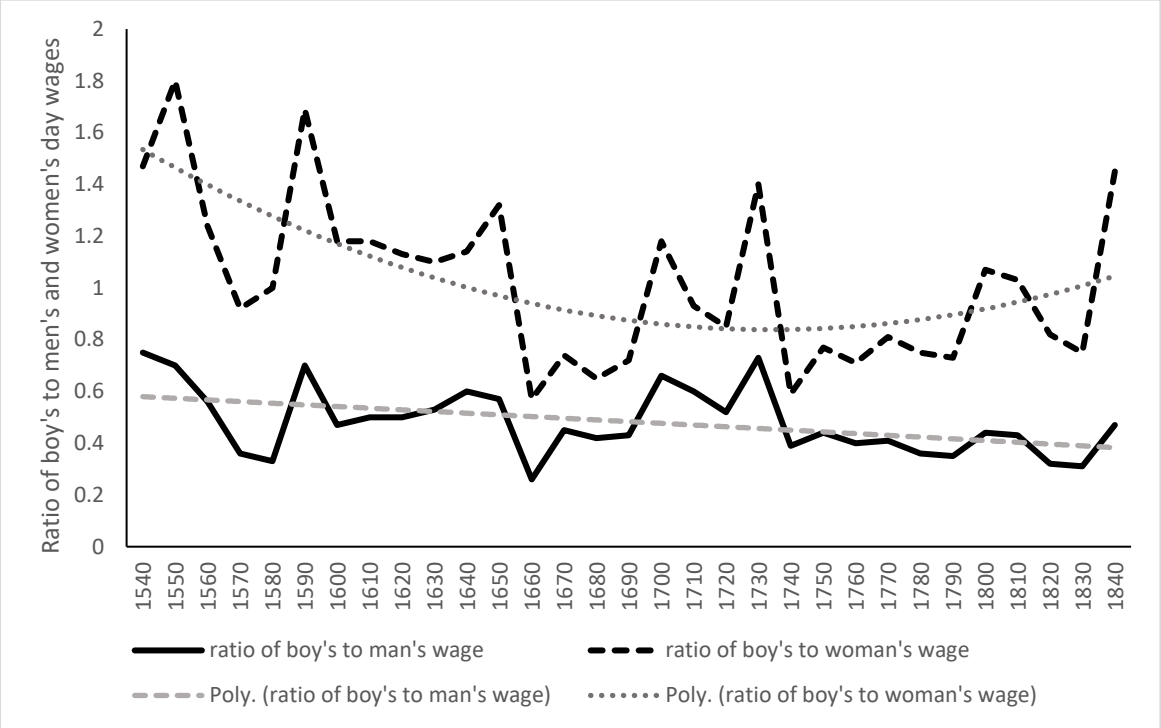


Figure 5a. Ratio of boys' to men's and to women's day pay



Note: polynomial trend lines shown in grey.

Figure 5b. Boys' pay and demographic variables, 1540-1850

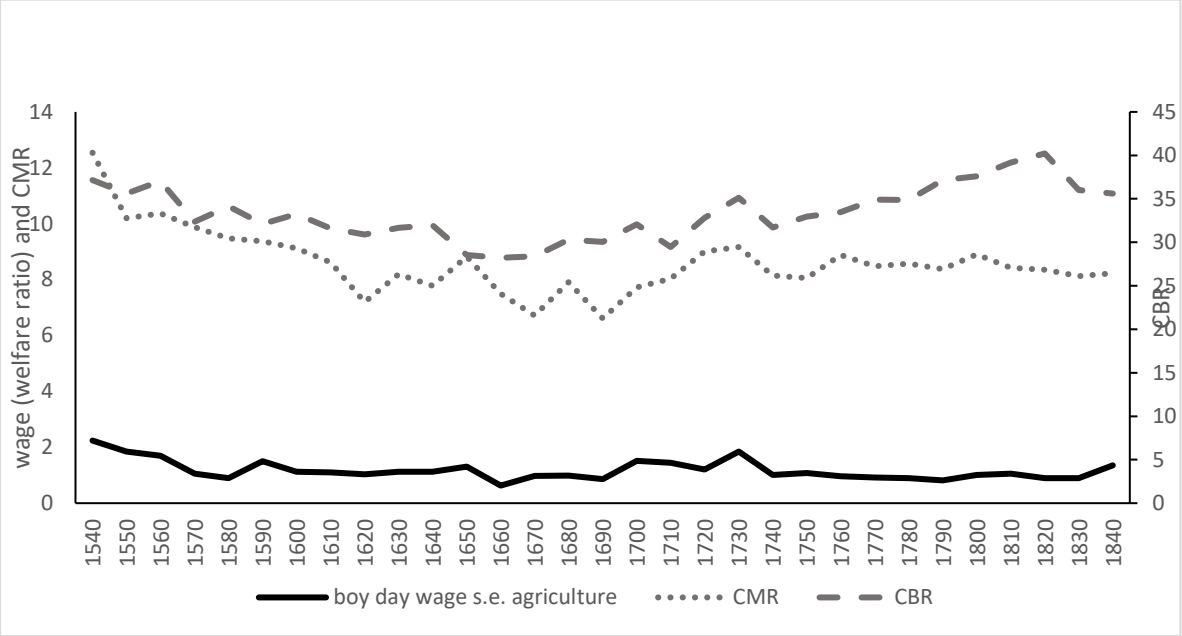


Figure 5c. Deficit/ surplus in family subsistence with only parents working and the days of work needed from each child to meet 'respectable' subsistence

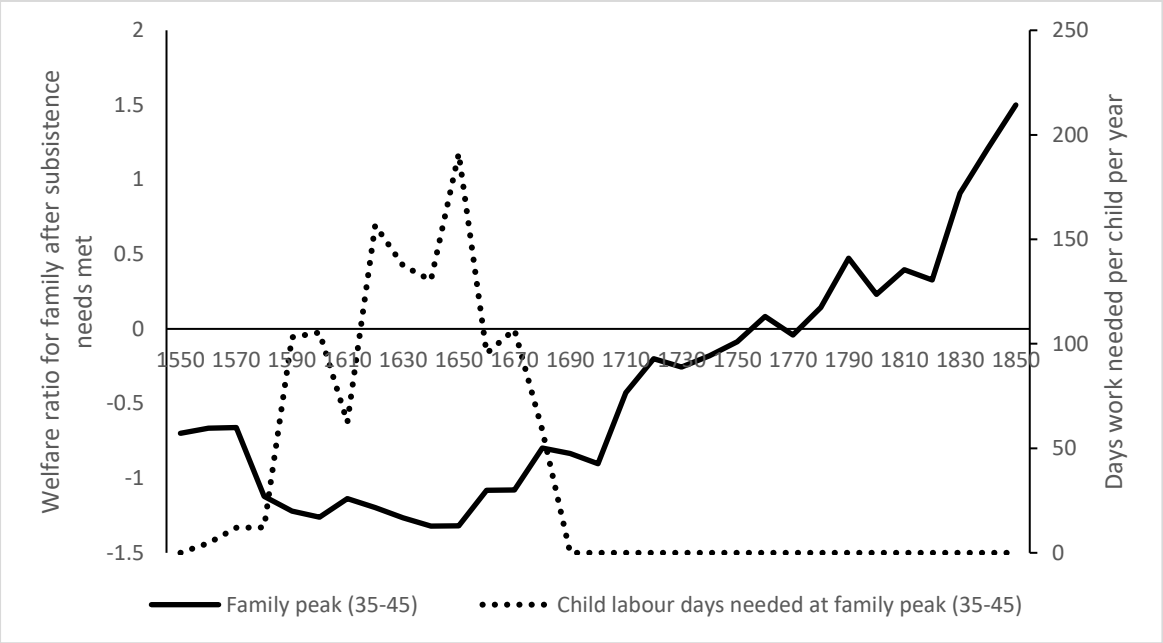


Table 1. Regression results: crude birth and marriage rate, ages at marriage, and remuneration

Outcome variables:	Crude marriage rate		Ages at marriage: Men	Women	Crude birth rate
Welfare ratio:	(1)	(2)	(3)	(4)	(5)
Annual income men	-0.27		-1.237**		3.896***
	(0.21)		(0.51)		(1.19)
Day rate women	0.512				
	(1.11)				
Day rate men		2.723***	-3.283***	-7.019***	3.473***
		(0.62)	(0.47)	(2.02)	(1.16)
Annual income women		-1.533***	3.562***	2.769***	-4.323**
		(0.51)	(0.96)	(1.38)	(2.05)
Constant	8.501***	4.52**	31.54***	36.03***	23.034***
	(1.17)	(1.12)	(1.29)	(2.77)	(3.46)
Adjusted R^2	-0.032	0.589	0.550	0.599	0.541
F	0.537	22.474***			12.803***
N (periods)	30	30	28	28	30

Reprinted from European Economic Review, vol.129, Sara Horrell, Jane Humphries and Jacob Weisdorf, "Malthus's missing women and children: demography and wages in historical perspective, England 1280-1850", 103534, t.1 cols. 2 & 3, t.2 cols. 2 & 4, t.3 col. 2.

Notes: The coefficients indicate by how much a one unit change in real income, as measured by the welfare ratio, will affect the demographic variable of interest. Robust standard errors are presented below the coefficients in parentheses, these report the standard deviation around the coefficient value, with larger deviations relative to the value indicating lower confidence that the coefficient differs from zero. Asterisks denote significance at 10%*, 5% **, and 1% *** levels, indicating the confidence with which the conclusion that the stated coefficient differs from zero can be held, 1% represents the highest level.

Table 2. Regression results for increasing juvenile population, aged 5-14, on own and adult wages, 1541-1860

Outcome variables:	Real wage, expressed as welfare ratio		
		Employed in day labour	
	Children	Men	Women
Independent variables:	(1)	(2)	(3)
% population aged 5-14	-0.019 (0.008)***	0.088 (0.02)***	-0.066 (0.02)***
Time trend	-0.014 (0.002)***		
Constant	1.121 (0.185)**	0.498 (0.48)	2.550 (0.44)***
Adjusted R^2	0.420	0.174	0.169
F	66.281***	7.326***	7.109***
N (observations and periods)	3243	30	30

Reprinted from European Economic Review, vol.129, Sara Horrell, Jane Humphries and Jacob Weisdorf, "Malthus's missing women and children: demography and wages in historical perspective, England 1280-1850", 103534, t.4. t-ratio converted to standard errors for children's wage regression in this version.

Notes: Robust standard errors in parentheses. Significance at 10%*, 5% **, and 1% ***
The children's wage effect is derived from a regression on the full sample of individual children, see Horrell, Humphries and Weisdorf, app. A.2. The effect on men's and women's wages is conducted at decadal level.

Table 3. Correlation coefficients between children's pay and key demographic variables

	Boy's wage and CMR	Boy's wage and CBR	Ratio of boy's to man's wage and CMR	Ratio of boy's to man's wage and CBR
1540-1670	0.816**	0.749**	0.495*	0.485*
1680-1750	0.607	0.572	0.452	0.470
1760-1840	-0.199	-0.071	0.353	-0.176

Note: ** denotes significance at 5% level, * at 10% level

Data appendix

Our series cover 3879 observations of children's work and wages, 3942 observations of women working on annual pay, 2076 women on day rates, and 6805 observations of men employed on annual contracts.

	Children	**Women, annual pay**	**Women, day pay**		**Men, annual pay**
Half century	%	%	%		%
1250-1299	2.0	0.9	2.6		9.6
1300-1349	6.5	1.9	4.4		18.8
1350-1399	2.3	1.0	3.7		8.2
1400-1449	2.6	4.8	2.3		3.4
1450-1499	0.9	6.7	1.9		6.2
1500-1549	2.5	6.5	6.1		4.4
1550-1599	4.4	3.3	11.5		4.0
1600-1649	10.2	8.7	15.1		12.7
1650-1699	5.3	4.7	13.9		7.3
1700-1749	12.3	17.5	12.6		13.2
1750-1799	19.9	25.8	16.2		91
1800-1849	29.7	18.1	9.8		3.3
1850-69	1.6	-	-		-
Occupation:	%	unskilled	unskilled	Unskilled agricultural:	%
Agriculture	38.0	agriculture	agriculture	man/helper	40
Cottage industry	25.3			servant	13
Manufacturing	9.0			labourer	8
Service	11.5	service	service	unknown	39
Construction	6.7	construction	construction		
Other / unknown	9.5				
Region:	%				%
South East	58.2			South	34
South West	17.5			Midlands	52
North East	9.4			North	14
North West	13.5				
Other	1.4				
Sources:					
Number	204	174			
% female	32%				

Note: The series relate predominantly to unskilled and semi-skilled workers in agriculture. Although the children's dataset contains a variety of occupations we use the regression coefficients to extract the wage series for a 12 year old boy, working in agriculture in the south east of England for our analysis.

Endnotes

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[12] See, for example, Mark Bailey, "Demographic decline"; Judith M. Bennett, "Wretched girls".

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[20] Gregory Clark, "Long march".

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[24] E. A. Wrigley, Energy, ch. 6.

[25] We multiply the decadal change in population by the decadal change in wages for each type of worker: male annual worker, male day labourer, female annual worker, female day labourer, and child labourer. We sum these values so that each wage series is given equal weight in the index. In justification we note that men and women may well have comprised equal proportions of the adult labour force, annual contracts were both prevalent and persistent in early modern England, and

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[33] See Ann Kussmaul, Servants in husbandry in early modern England (Cambridge, 1981) for a detailed analysis of the EMP in operation amongst farm servants. Richard M. Smith, "Fertility, economy and household formation in England over three centuries", Population and Development Review, 7, no.4 (1981): 595-622, discusses young women's engagement in agrarian service. He emphasises that this engagement may have been more attuned to economic conditions than men's thus giving women's employment a key role in determining fertility.

[34] Charmian Mansell's recent research suggests more varied experience for female servants, while confirming these underlying characteristics, see Female servants in early modern England (Oxford, 2023 in press).

[35] E. A. Wrigley et al, English population history, app. 9, at 164-15 and family reconstitution data, available at http://reshare.ukdataservice.ac.uk/853082.

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[37] The standard errors of the estimated coefficients are relatively large suggesting that the direction of change is indeterminate.

[38] These opposing effects occurred frequently, in nearly 2/3 of the decades in our sample period annual pay for men and for women rose or fell together. Pearson correlation coefficient 0.346** significant at 1% level.

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[42] Kaushik Basu, "Child labor: cause, consequence and cure, with remarks on labor standards", Journal of Economic Literature, 37, no.3 (1999): 1083-119.

[43] See discussions in Richard M. Smith, "Fertility" and E.A. Wrigley, "British population".

[44] For example, Richard M. Smith, "Fertility", at 611-15 concludes that the EMP survived the assault of dramatic change in the mode of production.

[45] Sara Horrell and Jane Humphries, "The origins and expansion of the male-breadwinner family: the case of nineteenth-century Britain", International Review of Social History, 42, supp. 5 (1997): 25-64, table 1 find that fathers' contributed between two-thirds and four-fifths of their families' incomes from 1787-1850.

[46] Celia Fiennes, The Journeys of Celia Fiennes, introduction John Hillaby (Maryland: Heritage, 1983); Daniel Defoe, A tour through the whole island of Great Britain, 1724-26, 4 vols. (London, 1738). Craig Muldrew, "'th' ancient distaff'and whirling spindle': measuring the contribution of spinning to household earnings and the national economy in England 1550-1770", Economic History Review, 65, no.2 (2012): 498-526 shows a dramatic increase in the employment offered by wool spinning in the late C17th, reaching a peak of over one million women and children employed in this way by the mid-C18th. Benjamin Schneider's inclusion of flax, hemp and cotton spinning suggests even higher employment totals, "Technological unemployment in the British Industrial Revolution: the destruction of hand spinning", Working Paper, Centre for

Welfare and Labor Research, Oslo Metropolitan University, 2023.

[47] This measure is extracted from Sara Horrell, Jane Humphries and Jacob Weisdorf , "Beyond the male breadwinner".

[48] John Hatcher, Plague, population and the English economy; John Hatcher, "Understanding the population history of England, 1450-1750", Past and Present, 180, August (2003): 83-130; Mark Bailey, After the Black Death: economy, society and the law in fourteenth-century England (Oxford, 2012).

[49] Jane Humphries and Jacob Weisdorf, "Women's wages".

[50] Judith M. Bennett, "Compulsory service in late medieval England", Past and Present, 209, no. 1 (2010): 7-51; Mavis E. Mate, Women in medieval English society (Cambridge, 1999); Jordan Claridge and Spike Gibbs, "Waifs and strays: property rights in late medieval England", Journal of British Studies, 61, no.1 (2022): 50-82.

[51] Jeremy Goldberg, Women, work.

[52]Sara Horrell, Jane Humphries and Jacob Weisdorf, "Malthus's missing women and children"; Pamela Nightingale, "Some new evidence of crises and trends of mortality in late medieval England", Past and Present, 187, no.1 (2005): 33-68; Population from Stephen Broadberry et al, British Economic Growth,at 226-44, app. 5.3

[53] Sara Horrell, Jane Humphries and Jacob Weisdorf, "Malthus's missing women and children", t.6 and fig.5.

[54] Fiona Shapland, Mary Lewis, and Rebecca Watts, "The lives and deaths of young medieval women: the osteological evidence", Journal of Medical Archaeology, 15, no.1 (2016): 272-89

[55] Judith M. Bennett, "Wretched girls"; Morgan Kelly and Cormac O'Grada, "The preventive check".

[56] For a detailed discussion of the evidence supporting preventive and positive checks in this era see Mark Bailey, "Demographic decline".