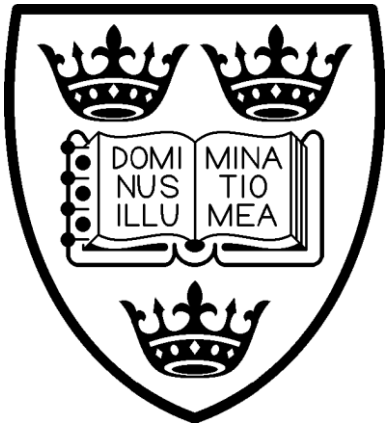


UNIVERSITY OF OXFORD

Oxford Economic and Social History Working Papers

Number 172, August 2019

Working for a Living? Women and Children's Labour Inputs in England, 1260-1850

Sara Horrell, Jane Humphries, and Jacob Weisdorf

Working for a Living?
Women and Children's Labour Inputs in England, 1260-1850[1]

Sara Horrell (Cambridge and LSE), Jane Humphries (Oxford and LSE), and
Jacob Weisdorf (University of Southern Denmark, CAGE, CEPR, Pisa Sant'Anna)

[This version: 17 August 2019]

Abstract

We use new estimates of men, women, and children's wages in combination with cost-of-living indices to explore *family* living standards across six centuries of English history. A family perspective enables us to quantify the labour inputs required from women and children in circumstances when men's earnings alone were insufficient to secure a decent standard of living, and so to register the historical relevance of the male breadwinner model. We employ a life-cycle approach where pre-marital savings help married couples manage increasing numbers of dependent children as well as other periods of economic pressure. We find that the male breadwinner model was generally insufficient for a 'respectable' standard of living; women and sometimes children were required to contribute and, even then, couples still faced poverty during old age. However, with the exception of the pre-Black Death period and the first half of the 17th-century, child labour was not essential and in the early modern era and old-age poverty was in retreat. We reconcile our findings with evidence of a surge in child-labour in the late 1700s and early 1800s, with reference to early modern economic growth, and its association with *industriousness* and *consumerism*, twin developments which served to stimulate the Industrial Revolution.

JEL: J22, N13, O10

Keywords: Living Standards; Prices, Wages.

[1] We thank the conference participants at the London School of Economics 'Working Time in the Past' Workshop, 'The New Malthusianism: A Symposium' conference in Cambridge, the XVIII World Economic History Congress in Boston, and the Economic History Society's Annual Conference in Belfast for their feedback. We are especially grateful for the comments and suggestions made by Bruce Campbell, Judy Stephenson, and Giovanni Federico. Jacob Weisdorf thanks the Carlsberg Foundation for financial support through a 'Semper Ardens' Grant (grant no CF18-0495).

1. Introduction

The secular evolution in human well-being, traditionally measured by workers' real wages, has been the subject of scholarly debate for decades if not centuries. Recent attention has focused on whether modern economic growth is a relatively recent phenomenon, prompted by the Industrial Revolution, or if improvements, even if on a more modest scale, happened much earlier. The timing is decisive for considering the role of the Industrial Revolution in economic development: did it initiate modern economic growth or was early-modern economic growth its impetus?

The broader debate has – from its beginning to the present day – suffered from two major shortcomings. These shortcomings need to be dealt with in order for scholars to better speak to the question above. First, earlier investigations into living standards have always identified family income with the *husband's* earnings (e.g. Allen 2009, Clark 2007), yet, the idea of a pre-modern male breadwinner sits awkwardly with evidence of women and children's participation in waged labour (e.g. Berg 1993, 1994; Tuttle 1999; Sharpe 1996; Burnette 1999, 2004; Honeyman 2007; Goose 2007; Humphries 2010; Humphries and Weisdorf 2015; Humphries and Horrell 2019). Worse still, the estimates of male earnings used previously to represent family incomes were drawn entirely from *casual* workers' wages despite the well-known problem of turning daily wage rates into annual incomes in the absence of knowledge about days worked per year (Allen and Weisdorf 2011; Hatcher 2011; Hatcher and Stephenson 2018; Humphries and Weisdorf 2019). Both issues are of paramount importance for a full understanding of family income-generating capacities and hence the chronology and causes of modern economic growth.

The second shortcoming has been an implicit but one-sided focus on the household's economic situation *when its size peaked*. Accounts of living standards during other stages of the family's life cycle have received very little attention (Schneider 2012; De Moor and

Zuijderduijn 2013). Not only does this focus fail to grasp the nature of pre-modern hardship, but it neglects the potentially important role played by pre-marital savings in mitigating later pressures. In particular, because labour and earning possibilities vary across the life cycle, standards of living need to be evaluated longitudinally so as to include those that prevailed during childhood, adolescence, adulthood, and old age. What is more, while a couple might face a crushing burden when their family size peaked, their earning potential might have been markedly better during other life-cycle stages, allowing them to accumulate in good times to survive the bad or to enjoy periods when their spending was not constrained to basic commodities. Returning to the overarching question about the root causes of the Industrial Revolution and modern economic growth, it is only by incorporating the *entire* life cycle of a family that it becomes possible to consider whether rising incomes during the pre-modern period served as an impetus to industrialisation and the wealth of nations, or whether living standards were stationary at close to subsistence until after the Industrial Revolution.

This article takes a fresh look at the standard of living debate, spurred in part by these shortcomings and in part by newly-available empirical evidence on wages which enables these shortcomings to be addressed. As a first step, we use newly-published wages of annually-employed male workers to consider the relevance of the male breadwinner model for pre-modern England. Thanks to recent archival work, we now have statistics regarding the wages of working-class males employed on long-term (stable) contracts, which solve many of the problems with the traditionally-used wage rates of casual workers (see Humphries and Weisdorf 2019). Adding to this, we also have information on the payments made to working-class women and children across 600 years of English history, both on stable and casual contracts, from before the Black Death through to the classic years of the Industrial Revolution (Humphries and Weisdorf 2015; Humphries and Horrell 2019). This

new empirical evidence means that we can escape from reliance on classic but sometimes flawed series occasionally tweaked by modern writers but whose substance goes back to the same overused original sources. We combine these recent estimates to provide a pioneer account of the waged-labour requirements of typical working-class families in the past.

Our approach is *needs-based*. We begin by asking how much a representative working-class family needed to consume in terms of basic consumption goods such as food, clothes, heating and housing to reach certain benchmark standards of living. This information enables us to deduce how much income was needed from the husband, as well as his wife and children when they were required to contribute, in order to achieve 'respectable' or 'bare bones' levels. We use standardised historical cost-of-living indices, provided by Allen (2009), in combination with the newly-collected wage-datasets for unskilled men, women, and children, to offer three new contributions to the classic standard-of-living debate.

The first contribution is methodological and concerns *how we measure* workers' family income. We make use of Humphries and Weisdorf's (2015, 2019) novel estimates of the earnings of women and men employed on stable rather than casual contracts. In contrast to previous estimates of annual incomes, which are based on day rates grossed up according to the ahistorical assumption that workers always and everywhere supplied and were demanded for 250 days per year (e.g. Allen 2009; Allen and Weisdorf 2011), our annual earnings estimates indicate that male workers earned significantly *less* per year than hitherto thought during most of the pre-modern period (see Figure A1 in the Appendix). This raises questions about the relevance of the male breadwinner model prior to the Industrial Revolution and thus the extent to which waged labour was required of women and children. Moreover, our earlier work suggested that though annual incomes grew steadily from c. 1650 this was at least in part the product of longer working time, as working

days appear to have climbed from as low as 100 in the period of the Black Death to close to 300 in the era of industrialisation (Humphries and Weisdorf 2019).

Our second contribution concerns our approach to the *size* of the inputs to household income required from women and children. Historical living standards are usually summarised according to the number of standardised family consumption baskets afforded by the earnings of the male head of household. Allen and Weisdorf (2011) turned this conventional story on its head, asking instead how many days of work were needed each year for a male worker to provide a certain level of family consumption. We revisit the Allen-Weisdorf approach but this time using the novel downscaled estimates of men's earnings, alongside the casual and annual wages of women and children. Finding that the male breadwinner model was *irrelevant* before the Industrial Revolution, we then proceed to ask how much first women then children had to contribute to household earnings in order for an average family to cope. To this end, we propose a *couple* breadwinner model in which the wife works part-time and all resident children of working age (5-14 years) work as much as is needed in order to cover the family's living expenses. For this, we use the historical wage rates of women and children, provided in Humphries and Weisdorf (2015) and Horrell and Humphries (2019), in combination with the cost of Allen's 'bare bones' and 'respectability' consumption baskets (Allen 2009, 2015), to infer the extent to which women and children had to engage in waged work in the past.

Our third contribution to the debate involves recognition that living standards do not just concern the stage in life when the family was under its maximum economic pressure, which was usually when family size peaked. Instead, we consider the balance between needs and potential earnings across the *entire* life-cycle, including childhood, adolescence, adulthood, and old age. Our life-cycle analyses suggest that the pre-modern labour market paid well enough to provide young adults (above the age of fifteen) with the chance to save

before marriage in anticipation of the situation when family needs peaked and women's ability to contribute to family income was restricted by child bearing and rearing. Methodologically, we deal with this via a life-cycle scheme which follows a representative working couple from when they leave their respective homes during adolescence and become independent, through their marriage and child-raising years, until their gradual withdrawal from the labour market and ultimate death. We consider the couple's joint income and accumulated wealth, and how these variables evolved over the life cycle, decade after decade, from before the Black Death through the classical years of the Industrial Revolution. This stylized account identifies periods of possible surplus earnings, which in turn clarifies whether pre-modern working-class families were able to participate in the 'consumer revolution' which helped to stimulate the Industrial Revolution (de Vries, 1994, 2008).

Our conceptual interventions revise the mainstream account of living standards in pre-modern England in a number of respects. Although pre-marital savings served to alleviate the economic stress that couples experienced in the childbearing and rearing years, women's labour was always needed to make ends meet while children's was often called upon. Both the pre-Black Death period and the long 17th century were particularly harsh in this regard, as all children of working age (5-14 years) living with their families of origin had to toil year-round in order for the family to maintain a 'respectable' living. Even then, couples still faced poverty in old age.

Couples' inability to cover their expenses after their children left home – something that was particularly grave during the 17th century – gradually became less severe and disappeared entirely after c. 1710. In fact, with the exception of the 17th century, with its harvest failures, civil war, and trade disruptions (Appleby 1978; Arnold 1988; Outhwaite 1991), slow but steady improvements in wage rates, particularly during the long 18th

century, meant that a typical unskilled working couple was eventually able to leave a staggering £300 to their descendants at their death or expend this surplus on leisure or discretionary consumption during their lifetimes. This was a long way from the £50 deficit that an elderly couple seeking to retain a 'respectable' living standard faced two centuries earlier.

The model also tracks the child labour that families needed to supply to make ends meet. During the so-called 'Golden Age of labour' in the centuries following the Black Death, and as long as women contributed with a few days of waged work each week, children did not need to work for wages for the family to achieve a 'respectable' living. The first half of the 17th century emerges as a time of stress. Falling adult wages and rising prices caused child-labour requirements to return to their early Medieval levels. However, by the early 18th century, necessary contributions from children fell back to the level of the 16th century, and with the turn of the 19th century, child labour was no longer needed for an average working family with to reach a 'respectable' standard of living.

Our prediction that children's work for wages disappeared early into the 18th century challenges the claim that child labour boomed during the classical years of the Industrial Revolution (Horrell and Humphries, 1995; Tuttle, 1999; Honeyman, 2007; Humphries, 2010, 2013). The discrepancies between predicted and observed child labour requires further investigation. To this end, we first perform a sensitivity check for the years 1560-1850 when we have access to demographic data from Wrigley et al (1997) to see if rising birth rates – by increasing the size of sib-sets – prompted the need for more child work than predicted in the benchmark analysis. Second, since the more accurate demography is not enough to explain early-19th century child labour, we enlarge our life-cycle model to show that the boom in the supply of child labour in the early 19th-century could have resulted from *industriousness* and *consumerism* (e.g. de Vries 2004, 2008). Of course, the families

whose experience we trace here were in many ways the lucky ones, best placed to protect their children from early work. Although they were headed by less skilled men, they were intact, with fathers who were able to work year-round and mothers also able to contribute. Life was more perilous for children growing up outside such unbroken family structures, with orphans and deserted children most at risk.

The reminder of the article provides the details. Section 2 summarises some central arguments of the long-standing debate. Section 3 describes the wages and prices used in our empirical exercise. Section 4 considers the relevance of the male breadwinner model along with other breadwinner models. Section 5 describes our family benchmark model and looks at how family wealth and labour inputs evolved across the stylized family life-cycle between 1260 and 1850. Section 6 explores amendments that help align the model's predictions with the predominant narratives. Finally, Section 7 discusses the findings in light of the enduring debate.

2. Background

The standard of living of the British population, both for particular sub-periods and over the long run, remains hotly debated not least for its powerful implications for our understanding of the chronology and causes of modern economic growth. Relying on the daily wage rates for male building craftsmen and labourers and agricultural workers, recent studies have built on the foundations laid by Phelps-Brown and Hopkins (1956) in their seven centuries of construction wages compared with the prices of consumer goods. By comparison with the price of a fixed basket of necessities over time and across countries, the remuneration of construction workers has identified a 'high wage' economy, which emerged after the ravages of the Black Death and, in Britain, persisted for several centuries thereafter (Allen 2009).

Moderate economic growth brought about by the development of London as a large commercial centre and the expansion of overseas trade, with concomitant demands fostering the commercialisation of agriculture, was evident from the mid-16th century. According to this account, high labour costs and relatively cheap coal promoted more capital-intensive methods of production with invention, innovation and mechanisation inaugurating the Industrial Revolution and modern economic growth. Key to this explanation is the high wages afforded to male workers, which enabled the early achievement of a respectable standard of living for their families, a view broadly endorsed by the account of British economic growth presented in Broadberry et al (2015).

This interpretation has not gone uncontested. One alterative theory prioritises the intellectual and scientific environment over factor prices (Mokyr 2009). Another questions the very existence of high wages once the idiosyncratic nature of contracting labour in the building trades is recognised (Hatcher and Stephenson 2018; Stephenson 2018; Gary 2018; Rota and Weisdorf 2019) and other sectors than construction are considered (Humphries and Schneider 2018). Yet another suggests that the desire to employ low-paid workers, such as women and children was more important than the wish to dispense with the labour of expensive male adults in promoting mechanization (Humphries 2013). Moreover, even if British workers received high wages, these were arguably offset by higher productivity which reduced the incentive for replacement with machinery (Kelly et al 2013).

The time path followed by wages has also been disputed. According to one much-cited series, agricultural labourers' wages recorded a marked rise in the post-plague 'Golden Age' but, by the 16th century, had declined precipitously. Not until the economic and technical developments of the 19th century were these halcyon living standards regained (Clark 2007). Indeed, according to the same author (Clark 2018) it is only in the last 200 years that

the average Briton has had access to the same amount of housing space and quality of nutrition enjoyed by his or her late 14th-century forebears.

Within sub-periods too, there is dissent. Most agree that the post-Black Death labour shortage put wage workers in a strong position (Dyer 1989), but gains are often mapped from day rates and assume plentiful work throughout the year. Worryingly, such calculations provide the casual worker with a living superior to the standard enjoyed by his employing landowner (Hatcher 2011). There is also strong evidence that single women missed out on the opportunity to exercise any new-found power, constrained instead to accept annual service contracts with much of their remuneration received in kind through the provision of board and lodging (Humphries and Weisdorf 2015). More generally, segregated work and low pay for women did little to advance their emancipation; their 'Golden Age' was more grey than gilded (Bennett 2010).

However, there is evidence of 16th-century Smithian growth. Markets developed, trade expanded, and commercialisation increased, with resulting shifts in the distribution of the labour force (Broadberry et al 2015; Palma and Silva 2018; Shaw Taylor and Wrigley 2014; Wallis, et al 2019). But destitution accompanied these developments, with ecclesiastical charity no longer able to cushion the slide into poverty for those at the bottom of the income distribution. The Tudor enclosures of land made rural dislocation the lot of many agricultural workers, and women's income earning opportunities were curtailed (Mate 1998). For many families economic growth did not translate into rising living standards.

Developments during the Industrial Revolution have probably been the most extensively debated. While some economic historians have argued that most people benefitted (Lindert and Williamson 1983), a comprehensive study of earnings across a wide selection of sectors, including women and juveniles, suggested that for the majority of the

population gains were insubstantial (Feinstein 1998). Even Allen's high-wage economy stalls during early industrialisation, his so-called 'Engels' Pause' (Allen 2009).

Much remains unresolved about the British standard of living over the long run. Key to a deeper understanding is to move beyond the earning power of a male sole-provider, casually employed yet supposedly always able to work 250 days in the year, to incorporate both the potential contributions made to household welfare by women and children and most families' life-cycle vulnerability. The new data put together from hitherto untapped original sources facilitate this revised perspective.

3. Data, family structure, and consumption

This section presents the newly-published wages and prices underlying our analysis of the requirements of an average unskilled working family across its life cycle. It also describes our assumptions about changing family composition, assumptions required to calculate *familial* consumption needs and thus the resources required to maintain a 'respectable' standard of living. The next section puts these components together to consider the wage labour needed to match the family's consumption needs.

Our wages for men, women, and children are those recently collected and published in Humphries and Weisdorf (2015, 2019) and Horrell and Humphries (2019). For men, we use the wages earned on long-term contracts. We refer to these employees as *stable* workers. Although arbitrage across the labour market suggests that stable and casual workers would earn approximately the same annual incomes (see Clark and van der Werf 1998), the advantage to using the yearly stipends of stable employees is that it avoids the well-known problem of estimating casual workers' annual incomes by grossing up daily wage rates according to some guesstimate of the number of days worked each year. For this reason, discussed at length in Humphries and Weisdorf (2019), we avoid the traditionally-used daily

wage rates for men altogether, and so break away from the standard series used and reused by economic historians hitherto.

For women, things are somewhat different. As described in Humphries and Weisdorf (2015), single women usually worked in stable jobs, but on marriage moved to more flexible casual work. To capture these marital-status dependent labour-market attachments, we use *annual* wage rates in the case of *single* and *daily* wage rates in the case of *married* women. Both series, covering 1260-1850, are provided in Humphries and Weisdorf (2015).

Children are also observed working on both annual and casual contracts (Horrell and Humphries 2019). Analysis of the children's wages dataset and observations of children's work from other sources, such as household budgets and local censuses, reveal no straightforward distinctions in the type of payment system used for children: age, occupation, sector, and family structure were all factors. However, in earlier work we controlled for heterogeneity through regression analysis and thus arrived at representative remuneration for a day's work (Horrell and Humphries 2019). We use that representative rate in determining children's contribution to the household economy.

Next, in order to calculate the total consumption expenditures of a typical family, we need to make assumptions about family size. Robert Allen's parallel study (Allen 2015), unlike our model, takes family income as equal to that of the husband, and assumes that an average working-class family in pre-modern England consisted of two adults and two children. In terms of consumption needs, Allen translated this family size into three male-adult equivalents.

Here, in our benchmark analysis, we also assume that a typical working-class family was made up of two adults and two children. However, there is a twist. Whereas Allen's analysis assumes a *snapshot* perspective of the family's economic situation, we instead employ a *life-cycle* approach. The family starts off comprising just the husband and wife,

then grows to its peak size as children are born, and then shrinks as adolescents leave home. To reflect this framework, we assume, again in our benchmark case, that an average family had three surviving children in total. But as Schneider (2012) has pointed out, given the spacing of births, infant mortality, and age at leaving home, all three children were not resident with their family of origin for their entire childhood. Thus our analysis effectively matches Allen's assumption of two adults and two children present at the same time.

Clearly, it is historically invalid to assume the *same* family size across several centuries and ignore the fact that many children did not live to reach adulthood. These assumptions merely serve to create a basic framework. In our later sensitivity analysis, the Cambridge Group's *family reconstitution* data provide a more realistic guide to the historical evolution of a representative family. For our baseline exercise, though, we retain the initial assumption of a constant family size of two adults and three surviving children.

Lastly, in order to assess the total consumption expenditures of an archetypal family, we use two standardised consumption baskets as proposed in Allen (2015): a 'bare bones' basket and a 'respectability' basket. Both baskets provide a set of basic consumption goods including calories, clothing, heating and housing. The respectability basket offers a decent (i.e. 'respectable') living standard in terms of the goods included and their volumes. However, there is no room for spending on luxuries or school fees or apprenticeships or midwifery or doctoring, something we come back to in the sensitivity section further below. The 'bare-bones' basket is worse, offering only basic necessities, as its name suggests. Both baskets are described in Table 1. Our baseline exercise relies on the 'respectability' basket, but the 'bare-bones' basket is retained in the background to check that the household's total income is always sufficient for survival. The prices of the relevant commodities, used to calculate the annual costs of the family's total consumption, are taken from Allen (2009, 2015).

Table 1: Allen's Consumption Baskets (for One Adult Person)

'Respectability'		'Bare bones'	
Good	Quantities per year	Good	Quantities per year
Bread	234 kg	Oatmeal	170 kg
Beans/peas	52 L	Beans/peas	34 kg
Meat	26 kg	Meat	5 kg
Butter	5.2 kg	Butter	3 kg
Cheese	5.2 kg	Cheese	
Eggs	52 each	Eggs	
Beer	182 L	Beer	
Soap	2.6 kg	Soap	1.3 kg
Linen	5 m	Linen	3 m
Candles	2.6 kg	Candles	1.3 kg
Lamp oil	2.6 L	Lamp oil	1.3 kg
Fuel	5.0 M BTU	Fuel	2.0 M BTU
Rent	5% allowance	Rent	5% allowance
Total	2,500 cal/day	Total	2,100 cal/day

Sources: Allen (2009, Table 2.1) and Allen (2015, Table 2).

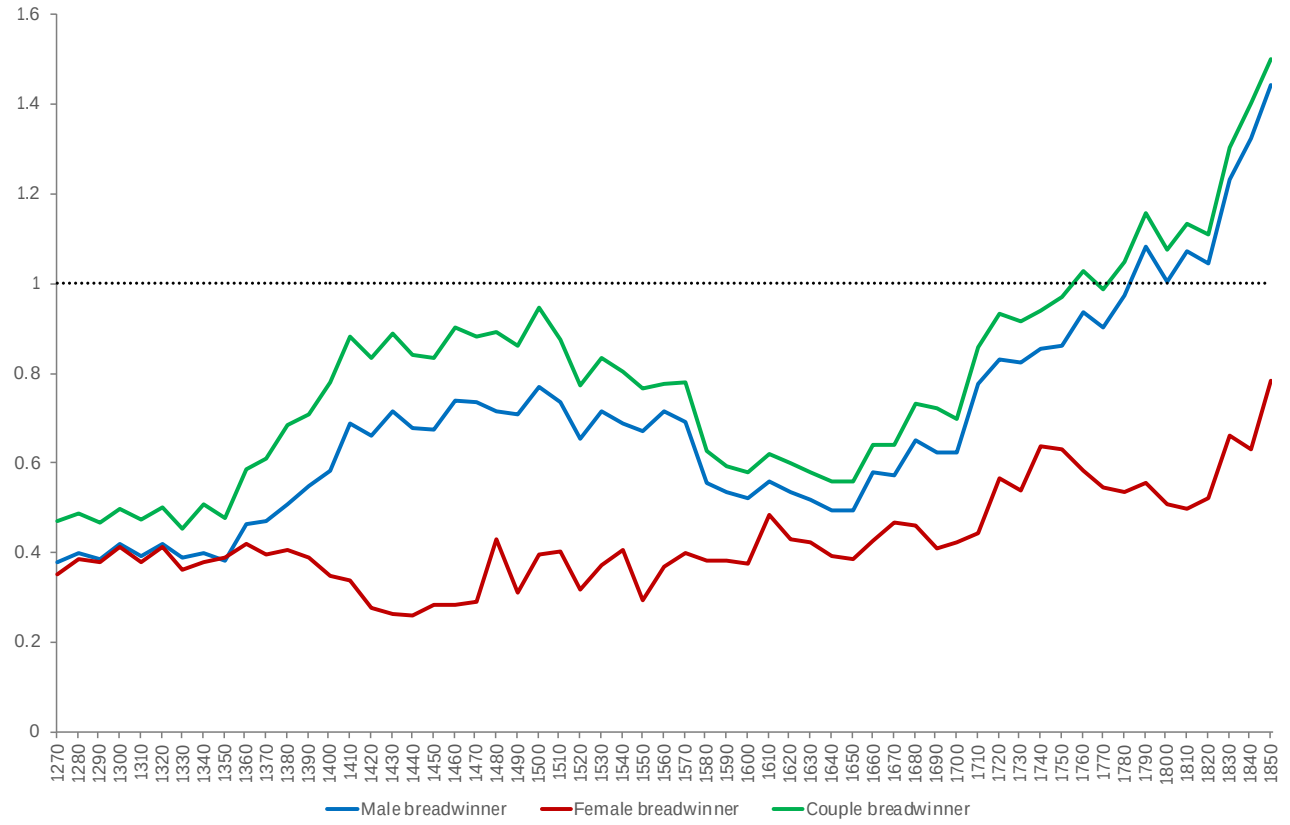
4. The Family's Income and Expenditure: A Snapshot View

We now move forward with two analytical exercises. The first calculates the living standard relative to the basket benchmarks that a representative family, comprising parents and children, could achieve under varying assumptions about the labour supplied by its members and their market wages. It provides a glimpse of a family's financial pressure at its maximum, decade by decade, across our period of observation, 1260-1850. The exercise is also used to consider the relevance of the so-called male *breadwinner model*, that is, the idea that the husband alone earned enough to keep family consumption at a respectable level without contributions from his wife and children even when dependence peaked.

Moving beyond the snapshot approach, the subsequent exercise – and one of this study's main contributions – is to consider *other* stages of a family's life cycle. In particular, our more advanced living-standard analysis considers the role played by the husband and wife's joint savings during their youth for their spending-patterns during later stages of their life cycle, when their consumption needs might exceed their earnings possibilities. The life-cycle analysis is described in detail in the next section.

Proceeding with the snapshot analysis, Figure 1 illustrates the evolution of various family so-called *welfare ratios* over time under different assumptions about labour supply. The welfare ratio represents the family's *real* earnings. It expresses how many times the family's total income was able to cover its total expenditures when, following Allen (2015), it included two adults and two children, equivalent in terms of need to three adults. If the welfare ratio in Figure 1 is one, then it means that the family's total earnings are just enough to buy a *family* respectability basket (equal to three single adult baskets) and live at a decent standard. Note, as in the relevant literature, the welfare ratio here ignores any utility that household members might derive from leisure.

Figure 1: Three breadwinner scenarios for a 'respectable' living, 1260-1850



Notes: Each year refers to a decade, so 1270 means the 1260s. The male/female breadwinner models assume that only the husband/wife works and full-time so for an annual salary. The couple breadwinner model assumes that the husband works full time for an annual salary and the wife one day a week for 50 weeks each year for a day rate. Nominal income in all three scenarios are divided by three times the cost of Allen's 'respectability' basket (see the text). *Sources*: Wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

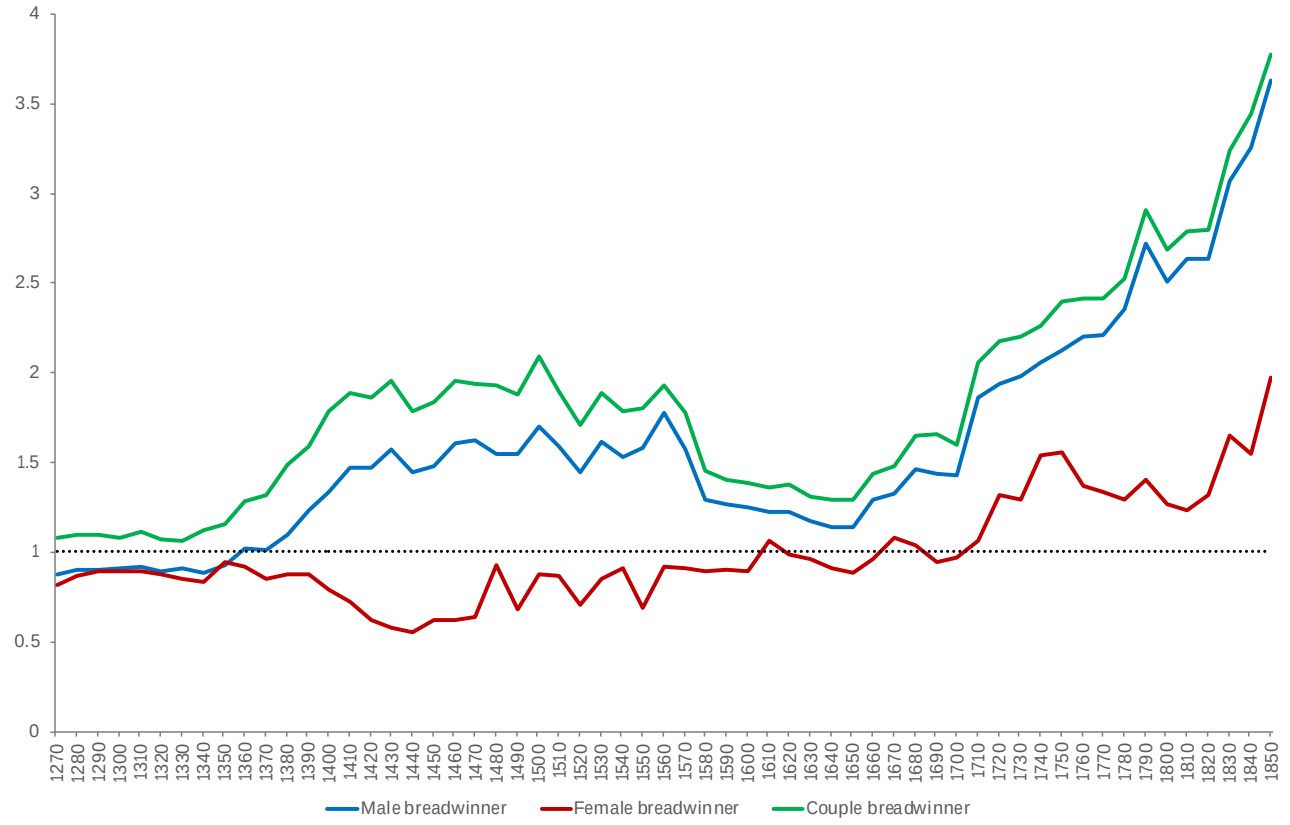
Figure 1 considers three different scenarios embodying alternative assumptions about the labour supplied by different family members and so the family as a whole: a *male* breadwinner model (blue), a *female* breadwinner model (red), and a *couple* breadwinner model (green). In the male breadwinner scenario, only the husband works but he works full-time. In the female breadwinner scenario, only the wife works also full-time. In the couple breadwinner scenario, both the husband and the wife work, the husband full-time and the wife part-time. Part-time here means one day each week for 50 weeks each year, so 50 working days in total, an assumption guided by the labour input observed among pre-

modern women in England (Horrell et al 2019, p. 30). Given the evidence that married women's labour input was unlikely to have been constant over time (Humphries and Sarasua 2012), this working assumption is revisited in our sensitivity analysis and conclusion below.

As is obvious from Figure 1, no model provides enough earnings to buy a family 'respectability' basket and ensure a decent living before the Industrial Revolution. In particular, the female breadwinner model shows that life for a family with a disabled or unemployed husband or no husband at all was one of severe poverty. Here, as we discuss later, children's labour would have been needed to make ends meet. Even if the male and couple breadwinner models look better, they also imply that children probably had to work for wages during most of the pre-modern period for a working-class family to reach a decent standard. We return to the question of *how much* children had to labour in the next section.

It should be emphasized that Figure 1 is based on the *new* male income data as reported in Humphries and Weisdorf (2019). These wages differ somewhat from the income estimates generated based on the traditional, but probably ahistorical, supposition that casual workers earned 250 times the daily wage rates. Figure A1 in the Appendix shows the traditional estimates of the male breadwinner model based on daily wage rates against the one reported in Figure 1, which builds on annual wage rates and, hence dispenses with *ad hoc* conjectures about days worked each year. Two striking differences emerge from using the wage rates of stable workers rather than casual ones. First, the gains that followed the Black Death were less dramatic than suggested by the questionable assumption that 'Golden Age' workers put in 250 days of casual work per year; whereas, second, the benefits of economic growth after 1700 were more noticeable than suggested by the equally questionable assumption that early modern workers limited their labour to the same number of days. Humphries and Weisdorf (2019, p. 15-16) offers a deeper reflection on these matters.

Figure 2: Three breadwinner scenarios for a 'bare-bones' living, 1260-1850



Notes: Each year refers to a decade, so 1270 means the 1260s. The male/female breadwinner models assume that only the husband/wife works and full-time so for an annual salary. The couple breadwinner model assumes that the husband works full time for an annual salary and the wife one day a week for 50 weeks each year for a day rate. Nominal income in all three scenarios are divided by three times the cost of Allen's 'bare-bones' basket (see the text). *Sources*: Wages: Humphries and Weisdorf (2015, 2019). Bare-bones cost of living: Allen (2009).

Are breadwinners able to sustain the family if consumption is reduced to the 'bare bones' level? Figure 2 provides the answer. Both the male and the couple breadwinner models were sufficient to maintain a 'bare-bones' living, at least after the Black Death, and throughout the following centuries. The female breadwinner model, however, falls short of even this miserable standard before 1700.

'Bare-bones' living was conducive neither to productive work nor an enjoyable life. Living on the verge of starvation, family members would have found it difficult to provide a

full day's work, let alone labour day in and day out as required of a main breadwinner. Add to this the monotony of an uninterrupted diet of oatmeal and dried legumes. We therefore turn our attention back to the 'respectability' basket, while acknowledging that families could reduce their consumption below respectability, at least periodically, and still survive. Such occasional retrenchment was requisite in a world where working families could normally not borrow to cover temporary shortfalls in earnings.

Having established that the couple's labour input was insufficient to make ends meet at the 'respectable' level, the next section turns to the question of *how much* waged labour the family's children would have had to contribute in order to maintain respectability. Importantly, the next section adds realism by including the possibility that the couple might have been able to save prior to marriage in anticipation of the burden of dependent children and the dwindling availability of labour not just because of the wife/mother's child-raising and domestic responsibilities, but also because of increased morbidity as both husband and wife aged. Our life-cycle framework can address these longitudinal features of family life.

5. The Family's Income and Expenditure: A Life Cycle Approach

This section looks at the life cycle of an archetypical working-class family. To this end, we introduce six life-cycle stages based on the following three phases of a couple's live: (i) youth and independence (from age 15 to age 25); (ii) marriage and child-raising (from age 25 to 55); and (iii) post child-raising including old-age (from age 55 to age 75, the age of death). The full six life cycles are detailed further below.

Our assumption that people lived to age 75 may seem optimistic when early-modern life-expectancy at birth ranged between 30 and 45 years (Wrigley et al 1997, p. 295, Table 6.12) and may have been lower still in earlier periods. Two considerations support our supposition. First, life expectancy was heavily influenced by high infant and child mortality

rates, with almost 40 per cent of all new-borns not living beyond childhood (*ibid*, p.215, Table 6.1). But having survived these dangerous ages (as our stylized individuals did) people could expect to live much longer. Indeed, at age 25, life expectancy was close to 60 (*ibid*, p. 282). Second, since we wish to follow couples beyond their child-raising years and into their old age, and since life expectancy at age 50 (the assumed age of menopause) was 22 and at 60 it was 15 (Ediev 2011), our assumption that people lived to be 75 fits the purpose at hand.

Before describing the three main phases and six life-cycle stages in full, we also need to make assumptions about the time-span between births. This is necessary to demarcate the length of the parenting period and to identify when children were able to participate in waged labour. We assume five-year birth intervals, roughly twice as long as the average spacing observed among early-modern English couples (Cinnirella et al 2017). However, since we only consider the influences on the family's budget of *surviving* children, at least in our benchmark exercise, we implicitly assume that every other new-born did not outlive infancy and so never became a burden on the family. In reality, even babies who died imposed costs (lying in and midwife's costs, opportunity costs of mother's time, etc.), and as they never grew old enough to compensate, in a way, they were a double burden. We relax this assumption later in the paper.

The six stages of the life-cycle

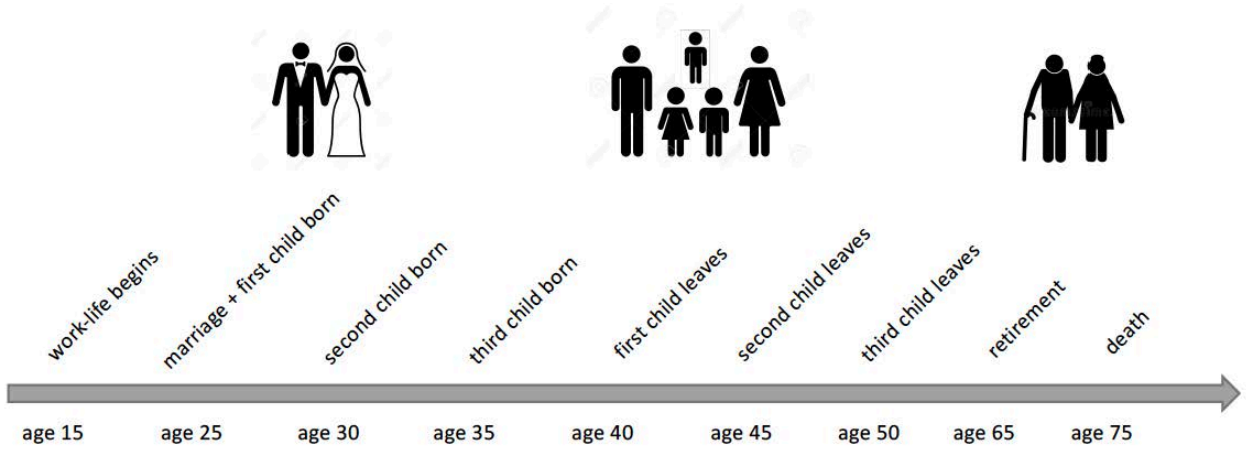
Returning to the six life-cycle stages, the first begins with independence at the age of fifteen. It ends when a marriage is contracted which we assume happens for both men and women at twenty-five, slightly younger than the norm for working-class couples, as we show later on. We refer to this stage as *youth*. During *youth* we assume that the man and woman are both employed full-time in stable jobs. After marriage, the wife works part-time in order to accommodate child care and domestic labour. As in our snapshot analysis, we assume that

married women work one day each week on average for 50 weeks each year during the first two decades of the couple's parenting years, that is, between the ages of 25 and 45. These ages see the family transition from its *young-family* stage (age 25 to 35) into the *family-peak* stage (age 35 to 45).

Next, the couple enters the fourth stage of their life cycle, which we refer to as the *old-family* stage (ages 45 to 55). During this stage, family size has begun to shrink again. Since there are no new-born children during this last decade of parenting, we assume the wife is able to increase her casual labour input from one to two days weekly, a labour input that she also maintains during the subsequent (and fifth) *post-family* stage (age 55 to 65), when all children have left home. The husband, meanwhile, continues to work full-time and still in stable employment.

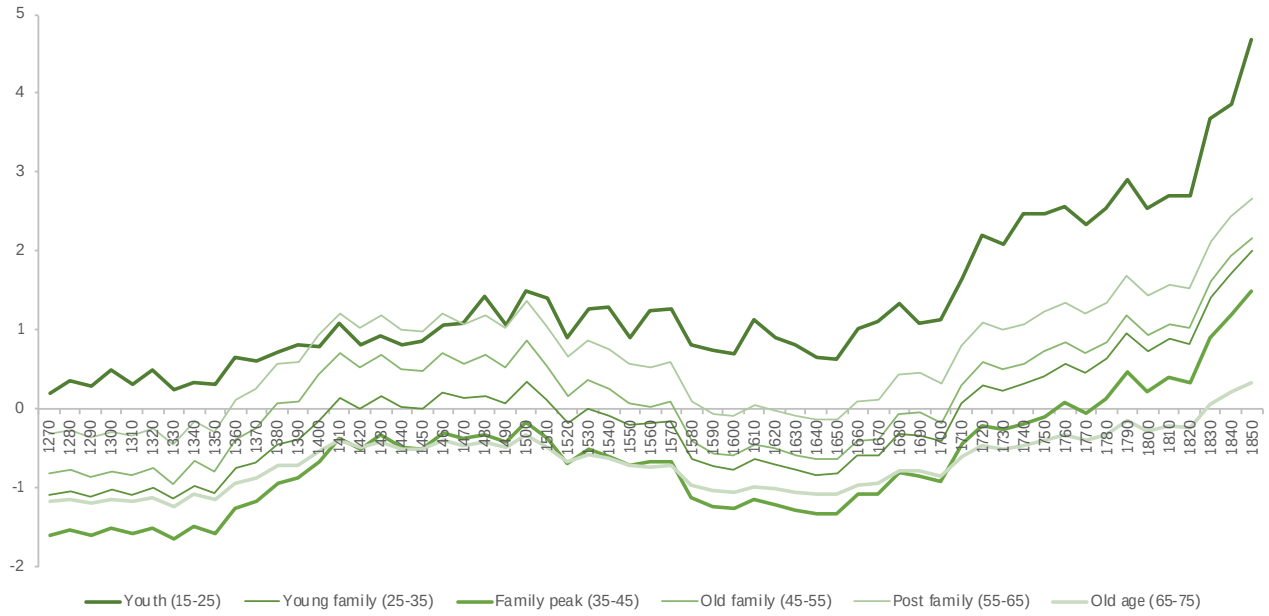
Finally, in the sixth stage (*old-age*), the couple (now aged 65 to 75) gradually reduce their labour input, so that it reaches zero when their lives end aged 75. In terms of the model, we assume that the husband simply works fifty per cent of full time and the wife again one day per week for 50 weeks during their final life-cycle decade. Figure 3 illustrates the family life-cycle stages including the timing of the different demographic events, that is, when the children are born and when they leave home.

Figure 3: The family life cycle



Having defined the different life-cycle stages, we now return to our interest in how much labour children had to supply to make ends meet. We assume that children did not enter the labour market until they were aged six and moreover that they became independent at age fifteen (see Figure 3). Thus, only children between the ages of five and fifteen were able contribute to family incomes. In order to avoid unnecessary complications, we further assume that no intergenerational transfers take place, that is, children over fifteen do not remit earnings back to their families of origin. Nor do they receive any support from their parents after turning fifteen, including any bequests on their parents' deaths. Finally, savings, when there are any, are considered to be accumulated credit with an employer and do not yield interest. Similarly, we assume no borrowing. Although, these assumptions capture the historic realities for many families, we consider their relaxation in our discussion section below.

Figure 4: The couple's real annual net surplus in each life-cycle stage, 1260-1850



Notes: Each year refers to a decade, so 1270 means the 1260s. The *net* surpluses (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

The instantaneous budget situation

We now look at the family's welfare ratio during each of their six life-cycle stages, decade by decade, across our nearly six centuries of observation, 1260-1850. We first explore the couples' net surplus in each life-cycle stage and decade (Figure 4). Then, we allow couples to carry a potential surplus over to the next life-cycle stage, which enables us to track accumulated family wealth decade by decade (Figure 5). If earnings are insufficient to cover 'respectability' consumption, since no borrowing is allowed, families must cut consumption retreating to a 'bare bones' standard or raise the contributions from members persuading them to work longer and harder, as discussed below.

Figure 4 shows the couple's net surplus in each of the six life-cycle stages under investigation, from when they become independent at the age of fifteen and up until their

death at the age of 75. Recall that women work for an annual wage during their *youth*, the first life-cycle stage, but move into casual employment thereafter, when they work for a day rate either for 50 or 100 days per year depending on the life cycle, as specified above.

The bold, dark-green line reports the number of 'respectability' baskets that their joint *net* income i.e. after their own consumption needs have been met (hence, *net* surplus) was able to buy during *youth* (ages 15-25). The dark-green line is always positive, which means that mutual pre-marital income was more than enough to cover a 'respectable' living for both of them and leave a surplus at all times. However, this surplus differs from one end of our time scale to the other. The accumulated real value of a young couple's net surplus before the Black Death was roughly one-third of one 'respectability' basket each year. The comparable number for a young couple at the other end of the period, around 1850, was almost five respectability baskets each year, some 15-times more than that of their 13th-century counterpart. Improved net earnings came in two waves: one set in motion by the Black Death and lasting, with interruptions, for one and a half centuries (the so-called 'Golden Age of Labour'), and one beginning around 1650 and lasting for two centuries (Humphries and Weisdorf's so-called 'Early-Modern Economic Growth'). The latter was by far the most important in terms of improvement.

The remaining lines trace the surplus after deducting the consumption needs of the whole family in each of the ensuing stages over the whole timespan. They follow roughly similar trends to the one relating to *youth*, but the *levels* differ substantially. In particular, pre-Black Death couples all fell short of income *immediately* into their married life and, despite their joint efforts, were unable thereafter in any life cycle stage to produce a surplus or, indeed, reach a 'respectable' living in the absence of savings or child labour. The situation improved, however, during the post-Black Death Golden Age. For example, 15th-century families were able to create a net surplus during all life-cycle stages, except for the *family*

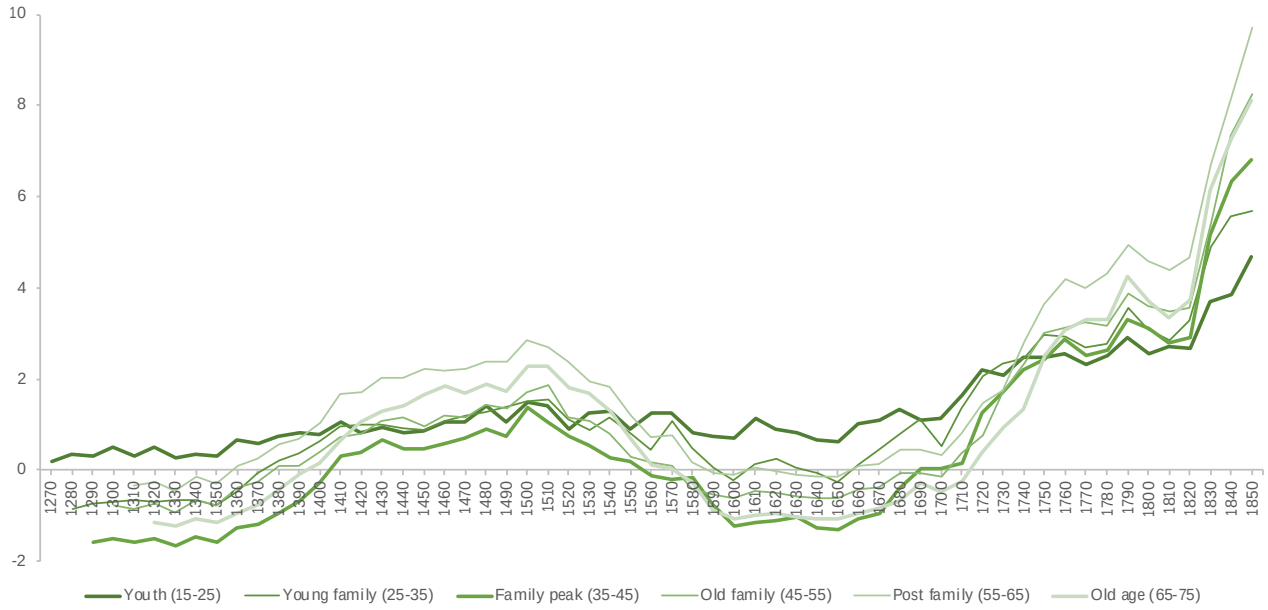
peak (age 35-45) and *old-age* (age 65-75) when the welfare ratio fell just short of zero and a decent living could not be assured without the help of past savings or current child labour. The 17th century was marked by setbacks, with all life-cycle stages except *youth* facing net deficits. But, with the turn of the 18th century, each life-cycle stage began to see net surpluses again, even if old-age poverty persisted until the 1830s. However, we have not yet allowed for life-cycle savings, which change the picture.

Introducing savings

The numbers in Figure 4 represent the *instantaneous* surpluses and deficits of our stylized family during its different life-cycle stages. So, what would happen to the family's standard, especially episodes of poverty, if we allow previous periods' surpluses to be carried over to the next life-cycle stage? And, if there were still deficits despite the possibility of savings, would waged child labour help the family stay afloat? Figures 5 and 6 offer answers to both questions, showing the couple's real accumulated wealth at the end of each of life-cycle stage, expressed in terms of the number of 'respectability' baskets that the wealth could purchase.

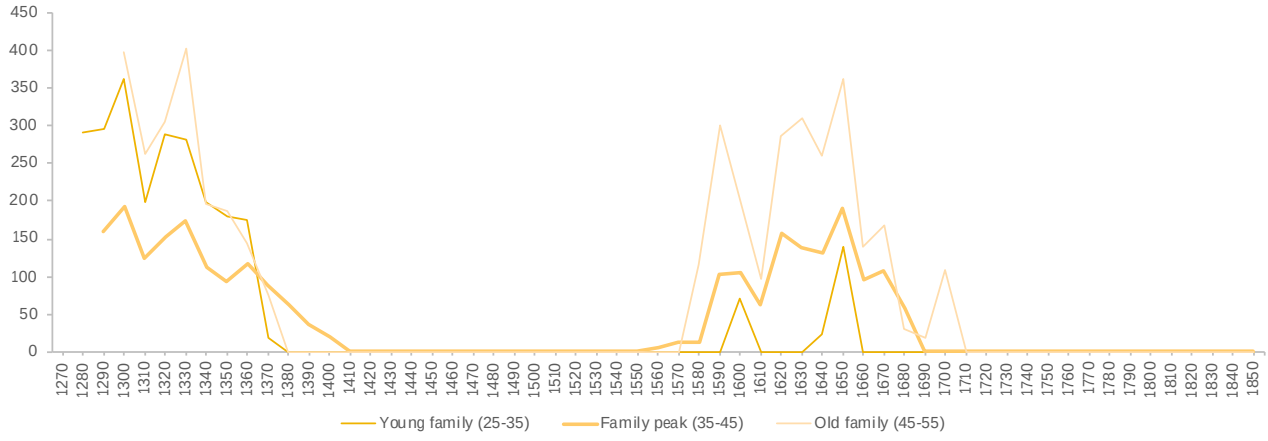
Figure 5 makes clear what Figure 4 insinuated, namely that the pre-Black Death period and the 17th century were hard times when child labour was needed. The introduction of savings does improve the picture, especially when times were comparatively good. For example, savings mean that *all* stages of the life cycle now see surpluses in the centuries that followed the Black Death, that is, between c. 1400 and 1550, and again after c. 1700 (compare Figures 4 and 5). For these long periods, *and as long as the husband worked full-time and the wife part-time as specified above*, no child labour was required in order for all family members to enjoy a 'respectable' living. However, before c. 1400 and between circa 1560 and 1670, either consumption fell short of what was necessary for decency, or child labour was required.

Figure 5: Real yearly accumulated wealth in each life-cycle stage, by decade, 1260-1850



Notes: Each year refers to a decade, so 1270 means the 1260s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

Figure 6: The implied number of days of labour of each working-age child, 1260-1800



Notes: Each year refers to a decade, so 1270 means the 1260s. The implied number of days are computed by dividing the life-cycle deficit of Figure 5 for each decade by the daily wage rates multiplied by number of resident children at working age. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Children's wages: Horrell and Humphries (2019). Respectable cost of living: Allen (2009).

Was savings feasible?

Before turning to how much child labour was involved, we consider the feasibility of our savings scenarios. Shortages of coin throughout much of the period meant that savings took the form of accumulated credit or were turned into tangible assets, such as land, animals and work tools, or household goods (Muldrew 2018). Multilateral systems of credit between employers, labourers, landlords, shopkeepers, and traders were essential to facilitate exchange in an economy with insufficient liquidity (Muldrew and King 2018). For the early modern period, farm service thus enabled young people to accumulate their wages.

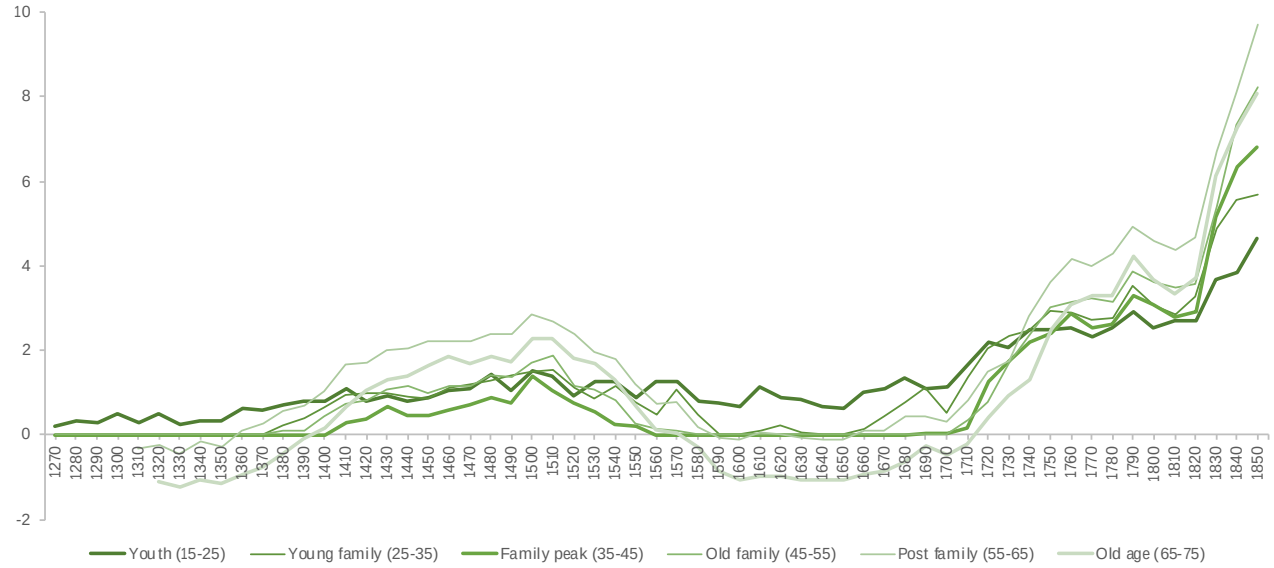
The cash component of wages was usually due annually, but many employers retained it as a credit to the servant often accumulated over many years (Kussmaul 1981, pp. 38-9). These credits might be commuted into keep for livestock and final settlements offset against the rental of a farm cottage. On leaving a post, servants also took their accumulated wages to purchase tools or a new wardrobe with which to follow an industrial occupation or compete in the market for domestic servants. Most commonly, savings were used to form an independent household with all its associated expenses (Kussmaul 1990, p.17). Tools, household goods, even clothing could be used later as the basis for exchange and as security against debt (Shepard 2015).

In the 1560s, our representative couples were able to jointly amass some £7 over a decade. This was certainly consistent with (though towards the low end of) the net worth in goods stated in witness depositions in Church courts, some £9-£35 for a male and a female servant taken together as reported in Shepard and Spicksley (2011, Table 9, p. 517). The total saved by a couple in service for a decade in the 1780s was some £20 according to our calculations, so below the £27-£60 reported by Ann Kussmaul for two young servants after ten years of service and certainly not enough according to Arthur Young to enable them to rent and stock a pastoral farm (Kussmaul 1981, Table 5.3, p.82; Wrigley et al 1997, p.124).

Servants' probate inventories also show the extent to which employers owed back-pay. According to Craig Muldrew, arrears of pay in the period 1550-1800 ranged between £20 and £41 (Muldrew 2011, p.407). Note that our savings estimates are based on *unskilled* workers, whereas Muldrew, Kussmaul, and Shepard and Spicksley include skilled employees, who were paid more and so able to save more.

At the other end of the life cycle, had older people accumulated sufficient to tide them through reduced productivity and possible incapacity? Mechanisms were in place from earliest times to finance old age. In medieval times, some parents passed farms and equipment onto their children on the understanding that the children would then provide adequate maintenance for the remainder of their parents' lives (Clark 1982; Dyer 1989 pp.151-2). Such personalized strategies for maintenance were recorded in the Lord's court and provide fascinating detail on the composition of respectable living and contract enforcement. Thus in 1408 one widow surrendered her customary land to her son in exchange for 1 quarter of faggots valued at 12d yearly for life plus 8s paid quarterly, 2 rooms fully repaired, and the same food and drink enjoyed by her heir (SRO HA 12/C2/22 9HIV cited in Clark 1982). If the fare was not to her liking she was to be compensated with a further 12d to cushion her displeasure! Such contracts did not cease in the early modern era when men and women even in humble circumstances continued to cede property to heirs prior to death in exchange for maintenance (Humphries, 2019). Analysis of labourers' probate inventories reveals total values of wealth at death of £15 in 1550-99, rising to £54 by 1700-1800 (Muldrew 2011, p.401), consistent with our estimates of between £5 in c. 1700 to £56 in 1800.

Figure 7: Real yearly accumulated wealth, by decade and child-labour adjusted, 1260-1850



Notes: Each year refers to a decade, so 1270 means the 1260s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

Child labour

Given that other sources suggest that families under pressure more commonly pursued an 'added worker' strategy in which children were central (Horrell et al 2019), we now estimate how much child labour would have been needed to maintain consumption at the 'respectable' level. To this end, we use the daily wage rates reported in Horrell and Humphries (2019) for the relevant decades, to ask how many days each resident child of working age (5-14 years) needed to work to avoid the family running into a deficit.

Figure 6 above gives an answer. The graph shows that all resident children between the ages of five and fifteen needed sometimes to work over 300 days each year before c. 1400 and again between c. 1550 and 1700. Fewer days were needed outside these periods of pressure. Interestingly, during the *peak family* stage (the thick line) individual children were not required to work for so many days as during the earlier or later stages of the family

life cycle (the thin lines) since more children were resident at home during the family peak and could share the work required. Further, as long as savings was a possibility (Figure 5) and parents were present and able to find work in the amounts prescribed above, waged child-labour was *not* required for a 'respectable' living during the most of the 15th-16th or 18th-19th centuries.

The couple's accumulated wealth *after* adjusting for the children-labour contributions given in Figure 6 are illustrated in Figure 7. The graph suggests that, now, only one life-cycle stage remains subject to poverty: *old-age* (ages 65 to 75). Old-age poverty was also only the case before 1390 and during the 17th century. Indeed, as old-age poverty disappeared, with the turn of the 18th century, couples were eventually able to amass a considerable surplus, well over £60 on average in each year of their last decade in the 1840s, equivalent to a total of eight 'respectability' baskets.

In hard times, on the other hand, old-age poverty was severe. During the worst of times, that is, between 1600 and 1650, elderly couples were some £6 short of reaching a 'respectable' living: in effect this meant they could only afford to buy and share one respectability basket between the two of them. Thus, without the support of others, if they were unable to work harder than we have assumed (half time for the husband and one day per week for the wife), consumption had to be axed. Also, though barely visible from the graph, during the 17th century the *post-family* years (aged 55 to 65) could also be ones of hardship, but here it required little extra work from the wife (we have assumed two days per week on average for 50 weeks for this life-cycle stage) to earn enough to bridge the gap back to a 'respectable' living. So, after adjusting for savings and child labour, old age was effectively the only time when the family was severely tested.

In sum, pre-marital savings and child labour meant that even families towards the bottom of the working-class ladder were generally able to avoid poverty and achieve a

'respectable' standard of living across all of their life-cycle stages and during the six centuries of observation. In fact, as Figure 7 clearly shows, several life-cycle stages during most of the pre-modern period offered these families a decent surplus. This surplus could translate either into reduced labour input, perhaps particularly for women and children, or into *enhanced consumption* especially after 1650, topics we discuss further in Section 7.

Still, these relatively optimistic findings hinge on two important and possibly ahistorical assumptions: that families remained intact and that they could find the employment assumed above. Parents needed not only to survive through all stages of the family life-cycle but also to be able to work at the rates suggested, avoiding under- and unemployment at all times. There is no room in the analysis for parental morbidity or mortality. Nor is there room for alcoholism, idleness, disability, or mere bad luck. Nor is there much leeway for fecundity; family sizes had to remain modest with every other child dying before it became a burden. Nor is there space for children to be ill, disabled or unwilling to work. Any student of medieval and early modern Britain knows how common the violations of these assumptions must have been. The wolf was seldom far from working-class doors. The next section takes some first steps towards greater realism.

6. Towards Greater Realism

Our baseline model holds family size constant, clearly an unrealistic assumption in the era of population growth that preceded the Industrial Revolution. This section introduces more credible demographics into the life-cycle model based on the Cambridge Group's *family reconstitution* data (Wrigley et al 1977). Below, we look at how the numbers of dependent and working-age children evolved. The sensitivity check not only tests the resilience of our findings to greater demographic realism, it also discloses a mismatch between the model's predictions and the claims of both contemporaries and historians about the extent of child

labour. On the one hand, the model predicts that child labour was not necessary for a 'respectable' living standard after the 1720s when men's annual incomes in particular rose considerably. On the other hand, contemporary accounts and some historical analyses have suggested that the late 18th and early 19th centuries witnessed marked growth in child labour (Gaskell 1833; Horrell and Humphries 1995; Galbi 1997; Tuttle 1999; Honeyman 2007; Humphries 2010; Humphries 2013). Several factors could potentially serve to reconcile this disparity, as we discuss below, but first we introduce more realistic family demographics.

Improved demography

Little is known about demographics at the household-level before 1541. After 1541, thanks to work by the *Cambridge Group for the History of Population and Social Structure* in reconstructing historical families in England, 1541-1871, we have some idea how key demographic variables changed over the course of the early-modern period and the classical years of the Industrial Revolution. The CAMPOP dataset, documented in detail in Wrigley et al (1997), forms the basis of our more authentic life-cycle analysis below.

We reconstituted the original dataset to reflect our interest in working-class families headed by unskilled men. First, we selected a subset of data containing only 'completed' marriages – that is, where the wife survived until the age of 50 and the husband remained alive until she reached that age. This classic constraint in historical demography ensures that fertility was not interrupted by the death of either parent. Of course, it also ensures that the families selected remained intact, with fathers and mothers able to support their children with year-round work as assumed above. It turns a blind eye to the mortality, morbidity, desertion, illegitimacy and abandonment of the past, circumstances in which

perhaps a third of children grew up and which we return to below (Humphries 2010, pp. 63-68; Schneider 2012).

Next, we restricted this subsample with regards to socio-economic class. We selected families where the father's occupation was known, and, using the standardised occupational classification system, HISCO/HISCLASS, documented in Van Leeuwen and Maas (2011), further selected fathers whose occupational titles involved unskilled work (HISCLASS 11 and 12). We excluded the first decade, 1550-59, because it contained only one family of this kind. The remaining decades had information about at least 10 families, aggregating to 1,204 sampled families (see Table A1).

We use the dataset's detailed family-level information to quantify the more realistic demographic scenario. Table A2 in the Appendix gives an example based on a marriage between Hannah (maiden name Simes) and John North. The family example is used to illustrate the variables available from the CAMPOP dataset and to explain how we exploited them in the analysis below. The example marriage (FRF No 2005) took place in Odiham, an ancient market town in Hampshire, in 1804. Hannah North gave birth to a total of seven children, the average of the sampled families at the time: Elizabeth in 1805, Jane in 1807, Anne in 1808, Martha in 1810, George in 1813, Louisa in 1816, and finally John in 1821. The records show that daughter Jane died within a year of birth, daughter Martha died aged 18, and daughter Anne aged 30. The remaining children have no reported date of burial, either because they moved after leaving home to a parish beyond the CAMPOP catchment area or, more probably, because they died outside the period of observation (that is, after 1871). For our purposes, therefore, only Jane did not survive beyond age 15.

Information of this kind enables us to predict the numbers of resident and working-aged children during the three life-cycles of the family described in the previous sections. In turn, that ultimately allows us to compute the family's total calorie requirements and thus

the income needed to purchase nutritional 'respectability'. In the North family's first stage (the *young family* cycle), the number of resident children grew from zero to four, but only one of the four children reached working age within that stage (Table A2). During the second family stage (the *family peak*) the number of North children grew to five out of which up to four reached working age. Finally, during the third family phase (the *old family*), the number of resident children fell to one, as did the number of children of working age.

With this knowledge, we can compute the caloric requirements of each resident family member and aggregate to the total caloric needs during each of the three family phases. To this end, we used the caloric requirements specified by FAO (2001) and reported in Table A3 in the Appendix. According to FAO, a one-year old child needs 30 per cent of the calories of an adult. Since we provide adults with 2,500 calories per day, this means a one-year old should get 750 calories per day; a two-year old 900 calories per day; a three-year old 975 calories per day; and so forth until the child turns 15 whereupon she reaches the adult equivalent 2,500 calories per day. An infant is assumed to require 323 calories per day. This number comes about by considering the mother's total caloric needs during pregnancy and breastfeeding.[2]

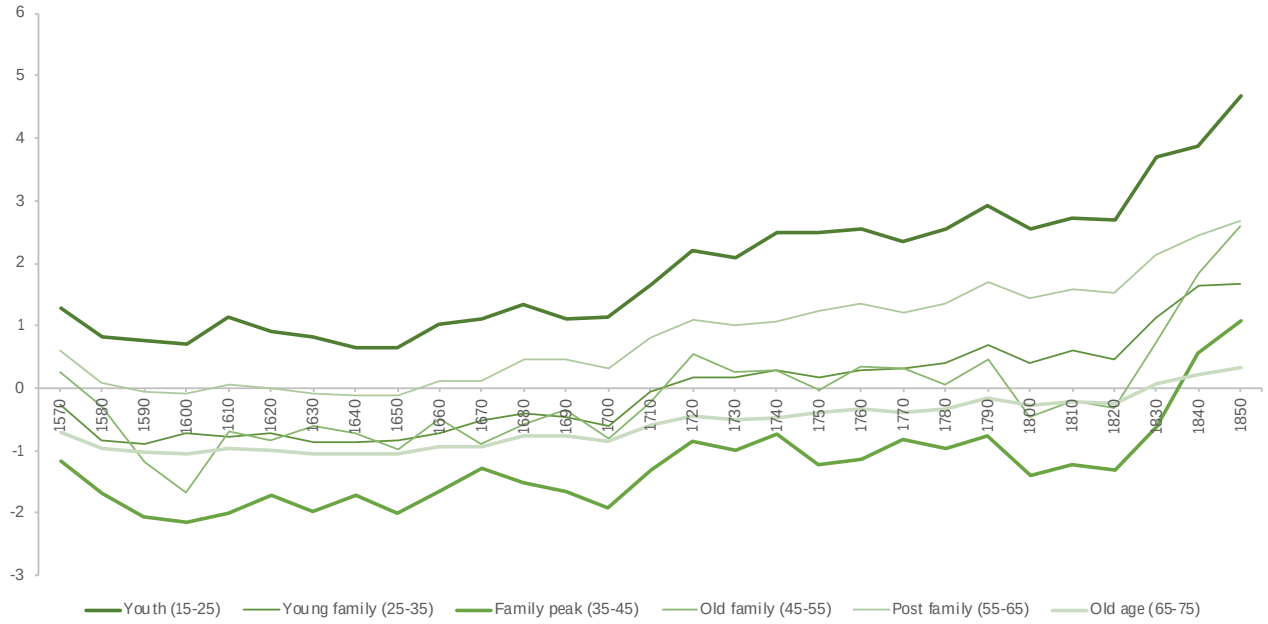
Table A2 shows how the caloric needs of the North family grew, from 5,000 calories per day for the husband and wife to nearly twice as much – 9,375 calories – at the end of the *young family* life-cycle phase. Dividing 9,375 by 2,500, this means that during the first ten years of marriage the family's consumption-basket requirement increased from 2 to 3.8

[2] Energy costs of pregnancy in women, according to FAO, is 69 calories per day in the first trimester; 266 calories in the second; and 496 calories in third. The first trimester is assumed to be 79 days long, and second and third 93 days long each, so the total additional caloric need of a pregnant women is 73,527 calories. As for breastfeeding, a normal woman should increase her food intake by 121 calories per day, totalling 44,165 calories for a whole year if we assume she continues to breastfeed for 12 months. If we spread those 73,806+44,165=117,692 calories out on the first year of birth, then this corresponds to 323 extra calories per day, which thus accounts both for the pregnancy and the breastfeeding period.

baskets. That number increased further during the *family peak*, when up to 13,600 calories were needed each day to keep the North family at a 'respectable' living standard, corresponding to 5.4 consumption baskets. The caloric needs and number of baskets then gradually declined as the family moved towards the final phase as an *old family*, ending at 2.8 baskets 30 years after the marriage.

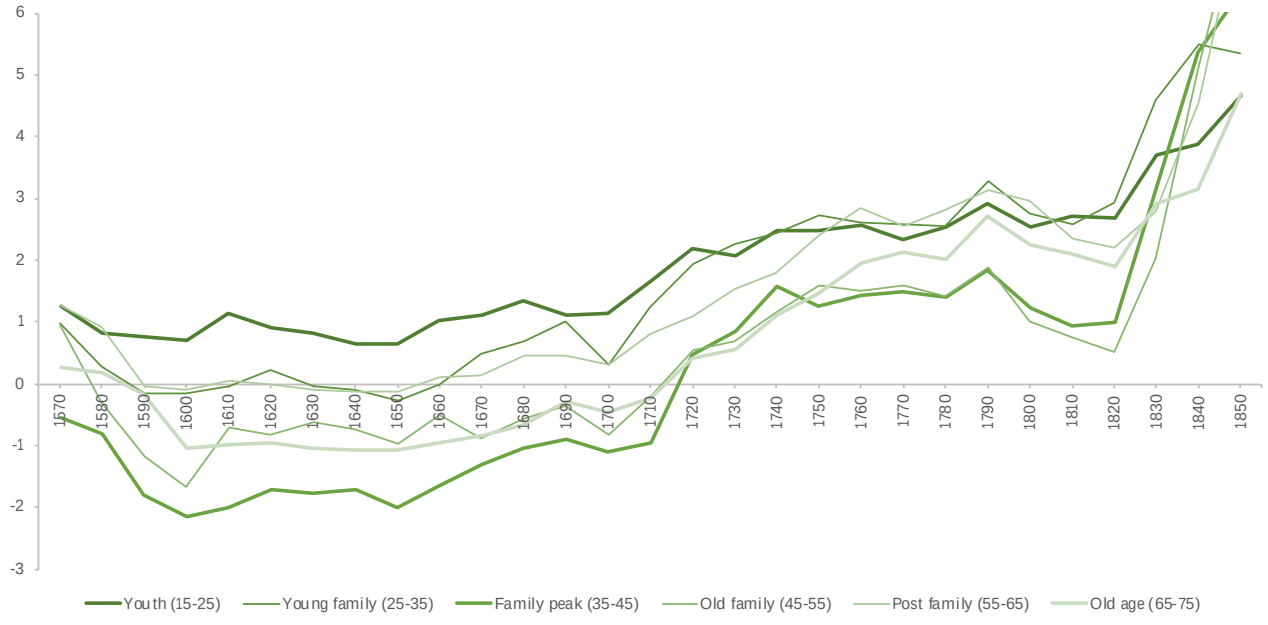
We can now compute the annual incomes needed to buy the average number of baskets. Not just for the North family in the example above, but for all the subsampled families in the CAMPOP dataset and throughout the truncated period for which we have the detailed demographic data, 1570-1850 (see Table A1). Figure 8 (comparable to Figure 4 above) shows the resulting real annual surpluses left from parental income earning, by life cycle and decade, after 'respectable' consumption needs have been covered. Compared to the demographic scenario of the benchmark case above, since the actual number of births now exceeds the initial assumption of three children throughout (Table A1), wellbeing in the peak family stage has deteriorated, and the average family remains in poverty until the 184os. Further, when we adjust for family savings being carried forward from one life-cycle stage to the next, Figure 9 (analogous to Figure 5) shows a dip in real accumulated wealth during the late 18th and early 19th centuries, caused by the period's relatively large number of births and thus dependent children (see Table A1). However, poverty at the *family-peak* still ends by the beginning of the 18th century.

Figure 8: The couple's real annual net surplus in each life-cycle stage, 1560-1850



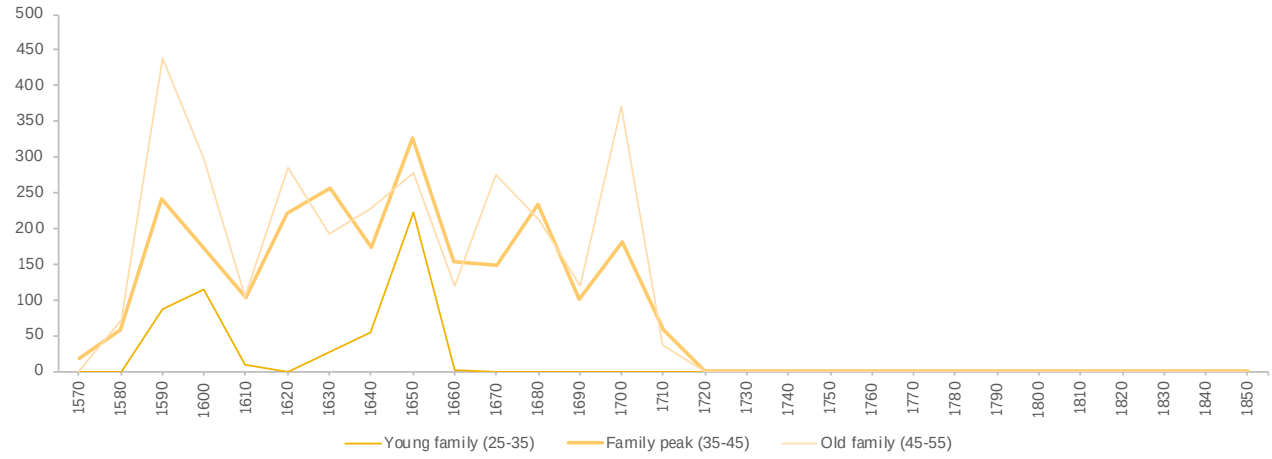
Notes: Each year refers to a decade, so 1570 means the 1560s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

Figure 9: Real yearly accumulated wealth in each life-cycle stage, by decade, 1570-1850



Notes: Each year refers to a decade, so 1570 means the 1560s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

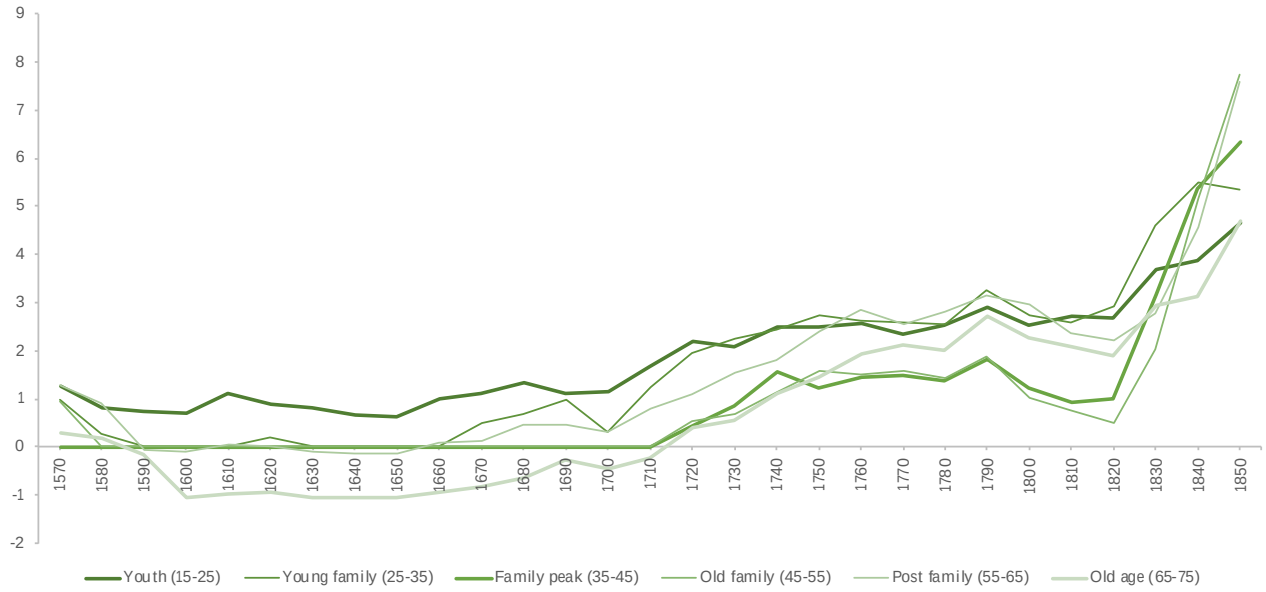
Figure 10: The implied number of days of labour of each working-age child, 1560-1800



Notes: Each year refers to a decade, so 1570 means the 1560s. The implied number of days are computed by dividing the life-cycle deficit of Figure 9 for each decade by the daily wage rates multiplied by number of resident children at working age. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Children's wages: Horrell and Humphries (2019). Respectable cost of living: Allen (2009).

Continuing to replicate our benchmark exercise, we now ask how much child labour was needed at market wage rates in order to maintain a 'respectable' living. Figure 10 (corresponding to Figure 6) shows that the annual number of days required by each working-age child is now higher during the *old-family* life-cycle stage compared to our original yardstick. The intensities of child labour requirements each year – often full-time during the long 17th century – are not dramatically different from the earlier exercise, mainly because more offspring also eventually mean more working-age children (see Table A1). The model thus predicts that child labour falls to zero after c. 1720, something that contrasts markedly with observations of growing rates of child labour during the late 18th and early 19th centuries, a point explored further below.

Figure 11: Real yearly accumulated wealth, child-labour adjusted, 1560-1850



Notes: Each year refers to a decade, so 1570 means the 1560s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

Lastly, when turning to the child-labour-adjusted accumulated wealth, displayed in Figure 11, the situation is more or less identical to the comparable Figure 7 above. The lines representing the family life-cycle stages of course shift down as a result of the increased *peak-family* requirements associated with more offspring compared to the benchmark (see Table A1). But the trends and above-poverty living-standards still remain, except, as before, for the *old-age* stage until c. 1710. In sum, it appears that the qualitative conclusions drawn for the benchmark case – that working-class families were able to secure a 'respectable' consumption level from the 18th century on without the use of child labour – are robust to using empirically-based and thus more accurate demography.

Consumerism and child labour

The disappearance of the need for children to work by the early 18th century is, however, hard to reconcile with contemporary accounts and subsequent research identifying a rise in child labour, possibly initiated by proto-industrialisation, but certainly in full swing with mechanisation and factory industry (Levine 1987; Hammond and Hammond 1917; Pinchbeck and Hewitt 1973; Nardinelli 1990; Horrell and Humphries 1995; Lavalette 1999; Humphries 2010; Humphries 2013).

Several factors potentially serve to reconcile the disparity between predicted and observed child labour. First, here our focus is on 'complete' marriages, that is, families which retained breadwinner fathers and contributing mothers. Many families were not in this fortunate category. Death robbed some 18 per cent of children of a father's support, and a similar-sized group lacked a father who was willing and able to shoulder the task of breadwinning. Fathers were ill and disabled, they deserted before or after marriage, they enlisted in the army or were pressed into the Navy, they were idle or drunken, and they were under- and unemployed (Humphries 2010). Records suggest that it was orphaned, fatherless or *de facto* fatherless children who were in the vanguard of the child labour force (Honeyman 2007; Humphries 2013). However, although the child work force contained many unfortunate children who were pushed into intensive toil by the loss or incapacity of one or both parents, it also included children from seemingly adequately-resourced two-parent families. Indeed, many children laboured alongside relatively well-remunerated mothers and fathers, for instance in coal mines and cotton factories (Horrell and Humphries 1998). Such groupings resemble those traced through our life-cycles to expose a fading need for child labour.

Why was there an apparent upsurge in children's employment when the necessity for it was fading away? The answer could well lie in the metric used to measure the 'respectable'

standard of living: the current cost of an unchanging basket of consumables. While the 'respectability' basket is sufficient to maintain life at a tolerable level, it does not capture shifts in contemporary views of what constituted a decent living and an acceptable standard of comfort over time. Poverty, and its avoidance, are relative concepts, measured against what is available and what others achieve. It is hard to imagine that our 18th- and early-19th century family would have been any happier to only match the standards of the early medieval period than we would be to have the comfort of our Tudor forebears.

In order to reconcile the predicted and the observed child labour inputs, and explain the upsurge in child labour in an era when it was no longer strictly needed to remain at the historic level of 'respectability', we cite Jan de Vries' argument that an 'industrious revolution' paved the way for a 'consumer revolution' whereby working people broke away from historic standards and sought to share in the new world of goods. Economic growth from the mid-17th century introduced novel goods and new standards – tea, sugar, coffee, tobacco, china, cotton clothing and domestic comforts, such as feather mattresses, quilts, curtains, mirrors and lamps – the 'consumer revolution' (de Vries 2008; Lemire 1992; Muldrew 2011). These goods became the necessities of the day and few would have felt that they had attained a satisfactory and well-thought-of status if they could merely afford the 'respectability' basket. Changes in the length of men's working year is already built into our baseline model as it explains some of the ebb and flow of stable annual earnings (Humphries and Weisdorf 2019, p. 18). Legal changes, new technologies, and changes in the organisation of production, may have required children as well as adults to work regularly and for longer periods of time. But alternatively, juvenile industriousness might have been motivated by family aspirations for better food and clothing and for new things like travel, trips, and entertainment (de Vries 2004, 2008). Child labour enabled families to access the rising standards of the time.

To this end, we propose a simple addition to the model described above, whereby we increase the money spent on consumption goods between 1700 and 1850. Specifically, in 1700, each family member is assumed to consume the value of Allen's 'respectability' basket, whereas by 1850, each member consumes the basket's value *plus* 30 per cent. Children's consumption, of course, is age-adjusted. Growth in consumption is assumed to be gradual, meaning that consumption increases by two percentage points on average each decade.[3]

The resulting trends are illustrated below. Compared to the four graphs reported above (Figures 8, 9, 10, and 11), the key differences are that the family now runs a deficit in the late 18th and early 19th centuries during the *young*- and *peak-family* life-cycle phases (Figure 13) requiring child labour to surge during this period (Figure 14). In the end, the child-labour-adjusted accumulated wealth (Figure 15) is identical to the previous one (Figure 11), where *old-age* poverty vanishes after c. 1720.

The result is plausible. Indeed, our data themselves provide some additional evidence that changing relative standards motivated family labour supply. Throughout the period 1570-1850, the income of the *young* couple followed an upward trend relative to the cost of the required basket, but the pair then suffered significant hardship when burdened with children in the *family-peak* stage (see Figure 9). The size of the decline in material well-being with the arrival of children is not surprising and is actually well-documented in other sources. Autobiographies by both working men and women describe the reality check – or *matrimonial downturn* – that marriage and the arrival of children brought to their material circumstances. James Bowd, for example, a farm worker in early-19th century Cambridgeshire, recounted how his rising wages and harvest pay made him feel like 'I had

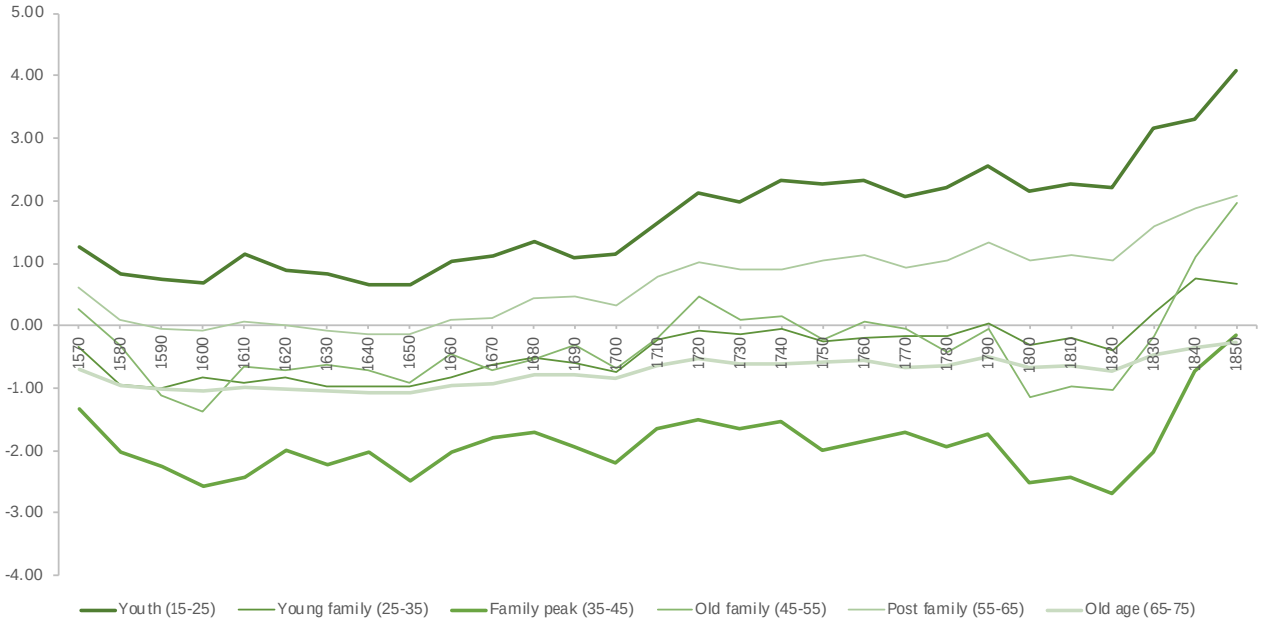
[3] Our assumption of 30 per cent total growth in consumption among the lower working classes is fairly modest compared to the growth of per-capita GDP which was 72 per cent in total between 1700 and 1850 or 4.8 percentage points per decade (Broadberry et al 2015).

become a man at once' encouraging his marriage despite meagre savings. But the matrimonial downturn came soon thereafter when children started to arrive. Then, in the transition to the *family-peak* stage, the Bowds merely 'trudged along', the young couple's earlier prosperity left far behind (Bowd 1955, 295-7). The fall in livings standards associated with the matrimonial downturn is particularly evident over the long-17th century, a period noted for its poor harvests, rising prices, food scarcities, and political disruption (Arnold 1988; Appleby 1978; Outhwaite 1991).

The 18th century offered substantial improvement with a mitigation of the erosion of living standards caused by childbearing and rearing and the wealth position remaining in surplus. However, by the 1790s the high cost of family maintenance was again evident, reaching a localised peak around 1820 (Figure 9). Early-19th century young marrieds not only suffered a particularly substantial fall in material wellbeing as their family expanded, but the decline occasioned by life-cycle progression was also much greater than that experienced by the couple's parents and grandparents. Relative income at different stages of marriage and family life provided an additional spur to utilise children's time to help shore up the family's reduced circumstances. When a modest improvement in the composition and extent of the 'respectability' basket is built into the life-cycle balance of family earnings and living costs, the matrimonial downturn from the young couple stage in the 1800s is even more pronounced, and possibly the largest experienced from 1570 to 1850 (Figure 13).

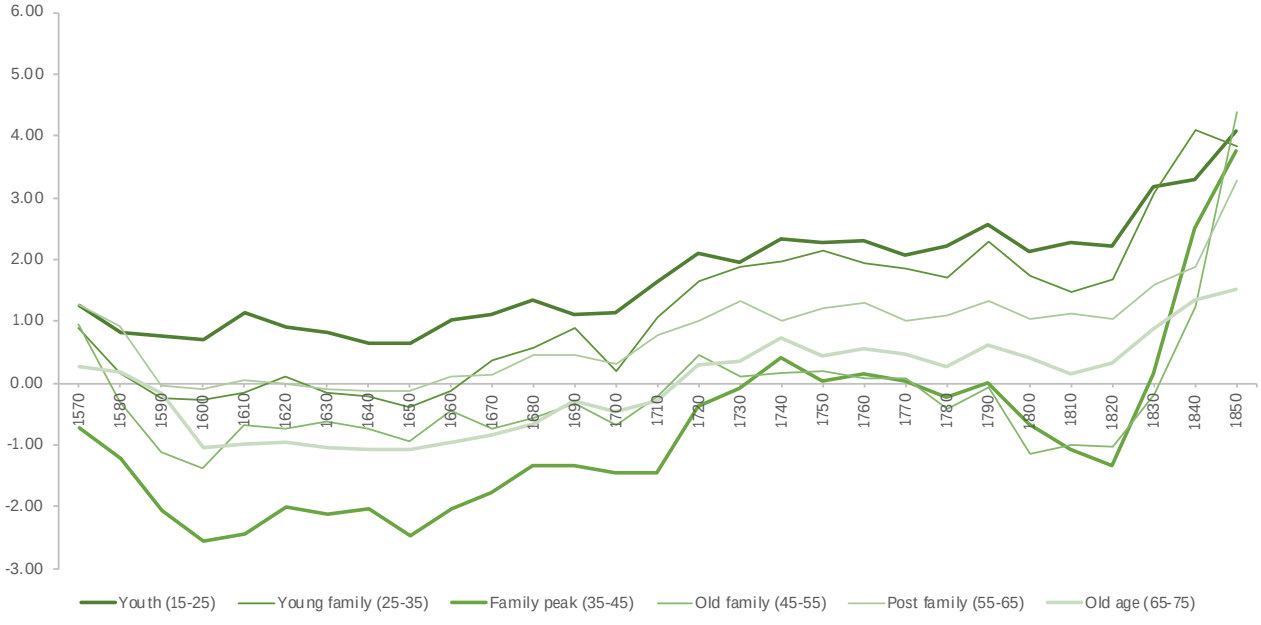
Despite the optimistic indication of the baseline model that the necessity for child labour had long passed, shifting demography, evolving consumption standards, and – especially – the issue of relative poverty across the stages of the life cycle combined to ensure that child labour re-emerged and hit a new peak in the early 19th century.

Figure 12: The couple's real annual net surplus in each life-cycle stage, 1560-1850



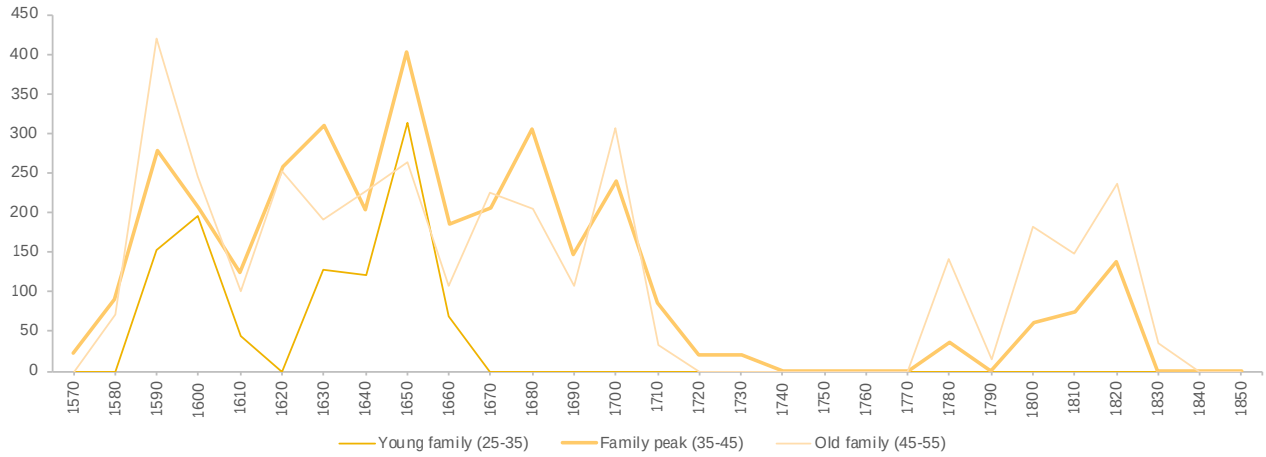
Notes: Each year refers to a decade, so 1570 means the 1560s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

Figure 13: Real yearly accumulated wealth in each life-cycle stage, by decade, 1570-1850



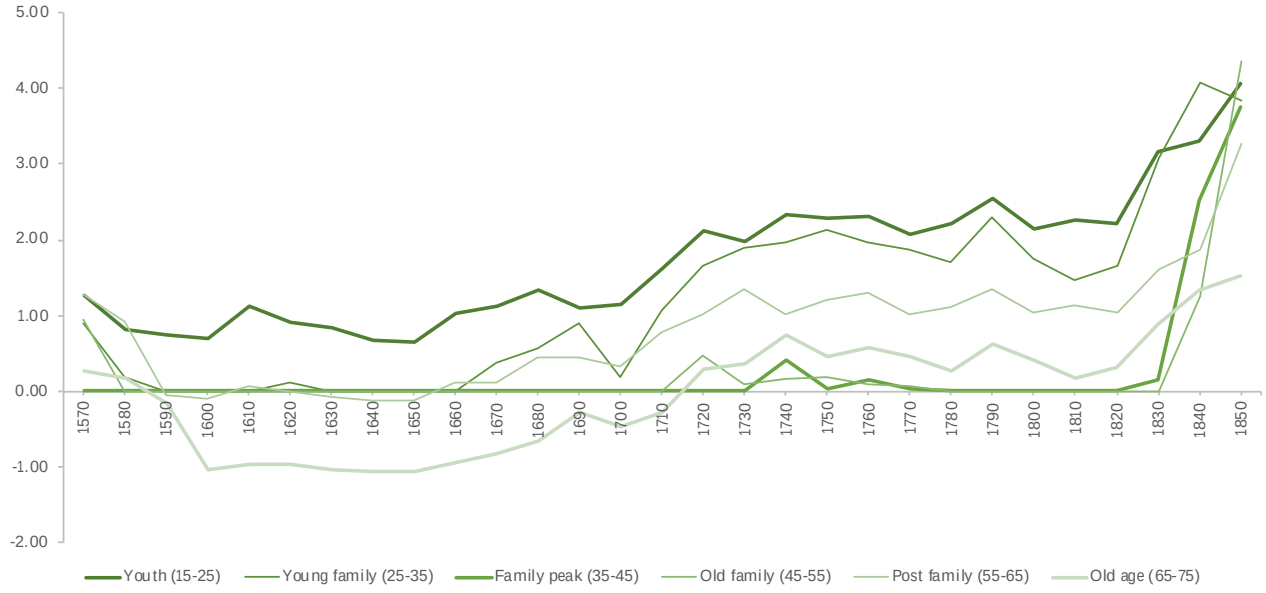
Notes: Each year refers to a decade, so 1570 means the 1560s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

Figure 14: The implied number of days of labour of each able-bodied child, 1560-1800



Notes: Each year refers to a decade, so 1570 means the 1560s. The implied number of days are computed by dividing the life-cycle deficit of Figure 13 for each decade by the daily wage rates multiplied by number of resident children at working age. *Sources*: Male and female wages: Humphries and Weisdorf (2015, 2019). Children's wages: Horrell and Humphries (2019). Respectable cost of living: Allen (2009).

Figure 15: Real yearly accumulated wealth, child-labour adjusted, 1560-1850



Notes: Each year refers to a decade, so 1570 means the 1560s. The accumulated wealth (or deficits) are expressed in terms of the number of 'respectability' baskets that the couple could afford *in addition* to their own consumption in *each* year of the relevant decade. *Sources*: Wages: Humphries and Weisdorf (2015, 2019). Respectable cost of living: Allen (2009).

7. Conclusion and Discussion

Our empirical investigation of family living standards across the life cycle – the first of its kind for pre-modern England – casts new light 0n the labour inputs of women and children that were required to maintain a 'respectable' material existence. Our findings, along with the questions they raise, are discussed below.

Previous work has – implicitly or explicitly – ignored or treated as marginal the contributions of women and children to household incomes and the living standards that they could purchase. It has also invariably assumed a male breadwinner model with the husband/father as the main earner employed 'full time' (e.g. for 250 days per year) at all ages and over the complete family life-cycle. Abandoning these patently unrealistic assumptions, we have turned the standard of living debate on its head and asked not what an imaginary family was able to achieve on the basis of the male (casual) wage, but whether with representative wages and working time, a male breadwinner could earn enough to support his family at different points in English history and at different stages in the family life cycle. The equally important corollary is what contributions his wife and children needed to make if the family was to achieve an (exogenously determined) decent standard.

In essence, we endogenized the labour supply of children and then observed how labour inputs varied over time and across the family life-cycle. We concluded that some stages saw family surpluses, which could be used either to increase leisure or improve living standards. Other periods were more testing and demanded full-time work from all resident children of working age. Our identification of the period before the Black Death and the late 1500s and early 1600s as times of severe pressure is consistent with other studies of poverty and hardship (Dyer 2012; Appleby 1978). Our original investigation of the varying pressures on families over the life cycle also identified key phases of particular stress: the peak family stage and old age. The miseries faced by the elderly emerge as a historical constant,

consistent with their centrality among the clientele in historical studies of charity and poor relief (Thompson 1991; Lees 1998).

By placing the family, with its various members at the centre of the story, we have shone new light on family strategies and circumstances. But our research demands a new focus on several further questions. First, our approach is *supply side*. We trace the labour that family members needed to supply at the going wage rates to achieve a collective target, the cost of a family 'respectability' basket of goods, almost entirely leaving to one side the question of whether this labour would find a buyer. Yet the unreliability of demand, and the miseries created by under- and unemployment have always been key elements in the standard of living debate, challenging any account of incomes based on grossed up day rates. Our new stable (annual) series of men's wages provides a partial defence since it builds into the earnings estimates evidence on the working year. But our account stops short before providing clear evidence that married women and young children could always find the days of paid work assumed. Insufficient demand was an important factor affecting the waged labour available to married women in particular at different points in time (Boyer 1990; Burnette 1999, 2004). Agricultural work was seasonal while the mechanization of domestic manufacturing, particularly hand spinning was a major blow (Muldrew 2012; Humphries and Schneider 2018). On the other hand, the use of machinery and the factory system increased demand for child labour, a demand side contribution to the boom in children's work that our baseline model of household needs failed to predict. More generally, further research is needed to be able to answer whether under- and unemployment prevented families from reaching the material standards that we have shown were otherwise possible, and, more subtly, whether changes in the composition of labour demand shifted the structure of contributions to family income away from the patterns assumed, playing up or

down breadwinning roles, pushing married women into domesticity, and requiring children to become back-up earners.

The reverse of under- and unemployment is an expanding labour market and heightened *industriousness*. Was it possible that fathers and mothers at certain times and in certain phases of the life cycle, worked longer than we have assumed or that children worked even when it was not necessary for a decent living? Variation in the working time of husbands and fathers is already built into our account as it underpins some of the trends in annual income used for the computations. Crucial here is the increase in men's working year from c. 1660 perhaps motivated by the desire to access newly available market goods. De Vries, the originator of the theory that the Industrial Revolution was preceded and in indeed precipitated by an *Industrious Revolution* (de Vries 1994, 2008), placed other family members, particularly women, at the centre of this more intensive engagement with the market both as sellers of labour and buyers of commodities. Our family-based approach enables this insight to be pursued.

One of our key findings is that child labour was rarely needed after c. 1700 in order to meet a 'respectable' standard of living, but other evidence suggests that child labour was common during the early modern period and boomed particularly in the classical years of the Industrial Revolution (Tuttle 1999; Horrell and Humphries 1997; Honeyman 2007; Humphries 2010). This discrepancy raises the question of whether child labour represented the dark side of the consumer revolution, children proletarianized so that parents could consume novelties beyond the respectability basket. Undoubtedly some parents did sacrifice their children's leisure to their own avarice, drunkenness and sloth. More commonly, child labour was part of a family betterment strategy in an era when cultural norms frowned on playtime and returns to education were uncertain. Families that lacked a competent male earner, or where mothers were unable to contribute at the levels suggested or where family

size was above the norm assumed here probably contributed disproportionately to the supply of child workers. But these sources were undoubtedly supplemented by families like those we have traced, but perhaps where fathers and mothers faced cyclical or structural unemployment or where buoyant labour markets for children proved too tempting to families hungry for better food and clothing, tropical groceries and perhaps even less grind for grown-ups (Humphries 2010). Whether children shared fairly in the incomes they augmented remains another question.

Our third main finding concerned the prevalence of old-age poverty. It was clear from our exercise that couples, aged from 65 to 75, and arguably unable to deliver the same labour inputs as during their previous life cycles, struggled at the beginning of our history, the late 13th century, and then again during the turbulent 17th century, even after we allowed for savings and child labour. So, how did elderly couples cope with this poverty? Without help from children or charity, elderly couples probably fell back to the drudgery of a 'bare bones' existence, a suggestion that is consistent with the frequency with which, despite its stigma and meanness, the aged, even those hitherto 'respectable', were forced to resort to poor relief even when this only became available within the dreaded workhouse (Thompson 1991; Lees 1998; Thane 2002). Even after a lifetime of prudence and economy, and even after several centuries of growth and development, the elderly could not hope to live respectably, and their fate should be more than a mere footnote in the standard of living debate.

References

Allen, R.C. (2009a), *The British Industrial Revolution in a Global Perspective*, Cambridge: Cambridge University Press. Data retrieved from: https://www.nuffield.ox.ac.uk/people/sites/allen-research-pages/.

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

Allen, R.C. (2015), 'The high wage economy and the industrial revolution: a restatement,' *Economic History Review* 68, pp. 1-22.

Allen, R.C., and J. Weisdorf (2011), 'Was there an 'Industrious Revolution' before the Industrial Revolution?', *Economic History Review* 64:3, pp. 715–729.

Appleby, A.B. (1978), *Famine in Tudor and Stuart England*, Liverpool: Liverpool University Press.

Arnold, D. (1988), *Famine, Social Crisis and Historical Change*, Oxford: Basil Blackwell.

Berg, M. (1993), 'What Difference did Women's Work Make to the Industrial Revolution?' *History Workshop Journal*, 35: 22-44.

Boberg-Fazlic, N.; P. Sharp; and J. Weisdorf (2011), 'Survival of the Richest? Patterns of Fertility and Social Mobility in England,' *European Review of Economic History* 15:3, pp. 365-392.

Boyer, G. (1990), *An Economic History f the English Poor Laws, 1750-1850*, Cambridge: Cambridge University Press.

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

Burnette, J. (1999), 'Laborers at the Oakes: Changes in Demand for Female Day-Labourers at a Farm near Sheffield during the Agricultural Revolution,' *Journal of Economic History* 59, pp. 41-67.

Burnette, J. (2004), 'The Wages and Employment of Female Day-Labourers in English Agriculture, 1740-1850,' *Economic History Review* 57, pp. 664-90.

Cinnirella, F.; M. Klemp; and J. Weisdorf (2017), 'Malthus in the Bedroom: Birth Spacing as Birth Control in Pre-Transition England', *Demography* 54, pp. 413-436.

Cinnirella, F.; M. Klemp; and J. Weisdorf (2019), 'Further Evidence of Within-Marriage Fertility Control in Pre-Industrial England', *Demography* (forthcoming).

Clark, E. (1982), 'Some Aspects of Social Security in Medieval England', *Journal of Family History* 7, pp. 307-321.

Clark, G. (2007), *A farewell to alms: a brief economic history of the world*, Princeton, NJ: Princeton University Press.

Clark, G. (2018), 'Before the Dawn: English Medieval Living Standards and Malthusian Doctrine', paper presented at the 'The New Malthusianism: A Symposium' at Cambridge University, 11-13 December 2018.

De La Croix, D.; E. Schneider; and J. Weisdorf (2019), 'Childlessness, Celibacy, and Net Fertility in Pre-Industrial England: The Middle-Class Evolutionary Advantage', *Journal of Economic Growth* (forthcoming).

De Moor, T., and J. Zuijderduijn (2013), 'Preferences of the poor: market participation and asset management of poor households in sixteenth-century Holland', *European Review of Economic History* 17, pp. 233–249.

Dyer, C. (2012) 'Poverty and its Relief in Late medieval England', *Past and Present*, 216: 41-78.

Dyer, C. (1989) *Standards of living in the later Middle Ages. Social change in England c.1200-1520*, Cambridge University Press.

Feinstein, C.H. (1998), 'Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution', *Journal of Economic History*, 58: 625-58.

Froide, A.M. (1999), 'Marital Status as a Category of Difference: Singlewomen and Widows in Early Modern England', in Singlewomen in the European Past 1250-1800, edited by Judith M. Bennett and Amy M. Froide, Philadelphia: University of Pennsylvania Press, pp. 236-69.

Ediev, D.M. (2011), 'Life Expectancy in Developed Countries is Higher Than Conventionally Estimated. Implications from Improved Measurement of Human Longevity', *Journal of Population Ageing*, 4:5: https://doi.org/10.1007/s12062-011-9040-x.

Gary, K.E. (2018), 'The distinct seasonality of early modern casual labor and the short durations of individual working years: Sweden 1500-1800, in *Work, Wages and Income: Remuneration and Labor Patterns in Southern Sweden 1500-1850*, by K.E. Gary, Lund University Doctoral Dissertation.

Hatcher, J. (2011). 'Unreal Wages: Long-Run Living Standards and the 'Golden Age' of the Fifteenth Century', in (B. Dodds and C.D. Liddy, eds.), *Commercial Activity, Markets and Entrepreneurs in the Middle Ages*, pp. 1-24, Woodbridge: Boydell Press.

Horrell, S., and J. Humphries (2019) 'Children's work and wages in Britain, 1280-1860', *Explorations in Economic History* (forthcoming).

Horrell, S., J. Humphries, and J. Weisdorf (2019), 'Family standards of living over the long run, England 1280-1850', *Centre for Competitive Advantage in the Global Economy* Working Paper No 419.

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

Humphries, J. (2013), Child Labour and the British Industrial Revolution', *Economic History Review*, 66: 395-418.

Humphries, J. (2013), 'The lure of aggregates and the pitfalls of the patriarchal perspective: a critique of the high wage economy interpretation of the British industrial revolution', *Economic History Review* 66, pp. 693-714.

Humphries, J. (2019), 'In Search of the Real Cost of Living', Presentation, Sound Workshop, Trondheim, May, 2019.

Humphries, J. and Sarasua, C. (2012) 'Off the Record: Female Labour Force Participation in the European Past', *Feminist Economics* 18:4, pp. 39-67.

Humphries, J., and Weisdorf, J. (2015) 'The Wages of Women in England, 1260-1850', *Journal of Economic History*, 75, pp. 405-445.

Humphries, J. and Schneider, B. (1919), 'Spinning the Industrial Revolution', *Economic History Review*, 72, 126-155.

Humphries, J., and J. Weisdorf (2019), 'Unreal Wages? A New Empirical Foundation for the Study of Living Standards and Economic Growth in England, 1260-1850', *Economic Journal* (early view).

Kussmaul, A. (1981), *Servants in husbandry in early modern England*, Cambridge University Press.

Kussmaul, A. (1990), *A general view of the rural economy of England, 1538-1840*, Cambridge University Press.

Kelly, M.; J. Mokyr, and C. Ó Gráda (2013), 'Precocious Albion: a new interpretation of the British industrial revolution', School of Economics, University College Dublin, Working Papers No 201311.

Lees, L.H. (1998), *The Solidarities of Strangers. The English Poor Laws and the People, 1700-1948*, Cambridge: Cambridge University Press.

Lindert, P., and J.G. Williamson (1983), 'English Workers Living Standards during the Industrial Revolution: A New Look', *Economic History Review* 36, pp.1-25.

Mate, M. (1998), *Daughters, Wives and Widows after the Black Death. Women in Sussex, 1350-1535,* Woodbridge: Boydell.

Mate, M (1999) *Women in medieval English society*, Cambridge University Press.

Mokyr, J. (2009), *The Enlightened Economy: An Economic History of Britain 1700-1850*, New Haven: Yale University Press.

Muldrew, C. (2011) *Food, energy and the creation of industriousness*, Cambridge University Press

Muldrew, C. (2011), 'From credit to savings? An examination of debt and credit in relation to increasing consumption in England (c.1650 to 1770)', *Quaderni Storici*, 46, pp.391-409.

Muldrew, C. (2012), '"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, pp. 498-526.

Muldrew, C. (2018), 'What is a money wage? Measuring the earnings of agricultural labourers in early modern England', in John Hatcher and Judy Z. Stephenson (eds.) *Seven centuries of unreal wages*, Palgrave Macmillan, pp. 165-93.

Muldrew, C., and S. King (2018), 'Cash, wages and the economy of makeshifts in England, 1650-1800', in John Hatcher and Judy Z. Stephenson (eds.) *Seven centuries of unreal wages*, Palgrave Macmillan, pp. 267-306.

Outhwaite, R.B. (1991), *Dearth, Public Policy and Social Disturbances in England 1550-1800*, Basingstoke, Macmillan.

Palma, N., and Silva, A.C. (2016), 'Spending a windfall: American precious metals and Euro-Asian trade 1531-1810', GGDC Research Memorandum No 165.

Phelps Brown, E.H., and S.V. Hopkins (1956), 'Seven Centuries of the Prices of Consumables, Compared with Builders' Wage-Rates', *Economica* 23, pp. 296-314.

Rota, M., and J. Weisdorf (2019,) 'Why was the First Industrial Revolution English? Roman Real Wages and the *Little Divergence* within Europe Revisited', *Centre for Competitive Advantage in the Global Economy* Working Paper No 400.

Schneider, E (2013) 'Real wages and the family: adjusting real wages to changing demography in pre-modern England', *Explorations in Economic History* 50, pp.99-115.

Sharpe, P. (1996), *Adapting to Capitalism. Working Women in the English Economy, 1700-1850*, Houndsmill, Basingstoke: Macmillan.

Shaw Taylor, L. and A.E. Wrigley (2014) 'Occupational structure and population change', in Roderick Floud, Jane Humphries and Paul Johnson (eds) *The Cambridge Economic History of Modern Britain, vol. I, 1700-1870*, Cambridge University Press, pp.53-88.

Shepard, A. (2015), 'Crediting women in the early modern English economy', *History Workshop Journal*, 79, pp.1-19 (online early version)

Shepard, A., and J Spicksley (2011), 'Worth, age, and social status in early modern England', *Economic History Review,* 64, pp.493-530.

Stephenson, J. (2018), "'Real' wages? Contractors, workers, and pay in London building trades, 1650–1800," *Economic History Review* 71, pp. 106–132.

Hatcher, J. (2019), 'Seven Centuries of Unreal Wages', in John Hatcher and Judy Z. Stephenson (eds.) *Seven centuries of unreal wages*, Palgrave Macmillan, pp. 15-69.

Thane, P. (2002), *Old Age in English History: Past Experiences, Present Issues*, Oxford,

Thomson, D. (1991), 'The Welfare of the Elderly in the Past: A Family or Community Responsibility?' in Pelling, M. and Smith, R.M. (eds), *Life, Death and the Elderly: Historical Perspectives*, London:

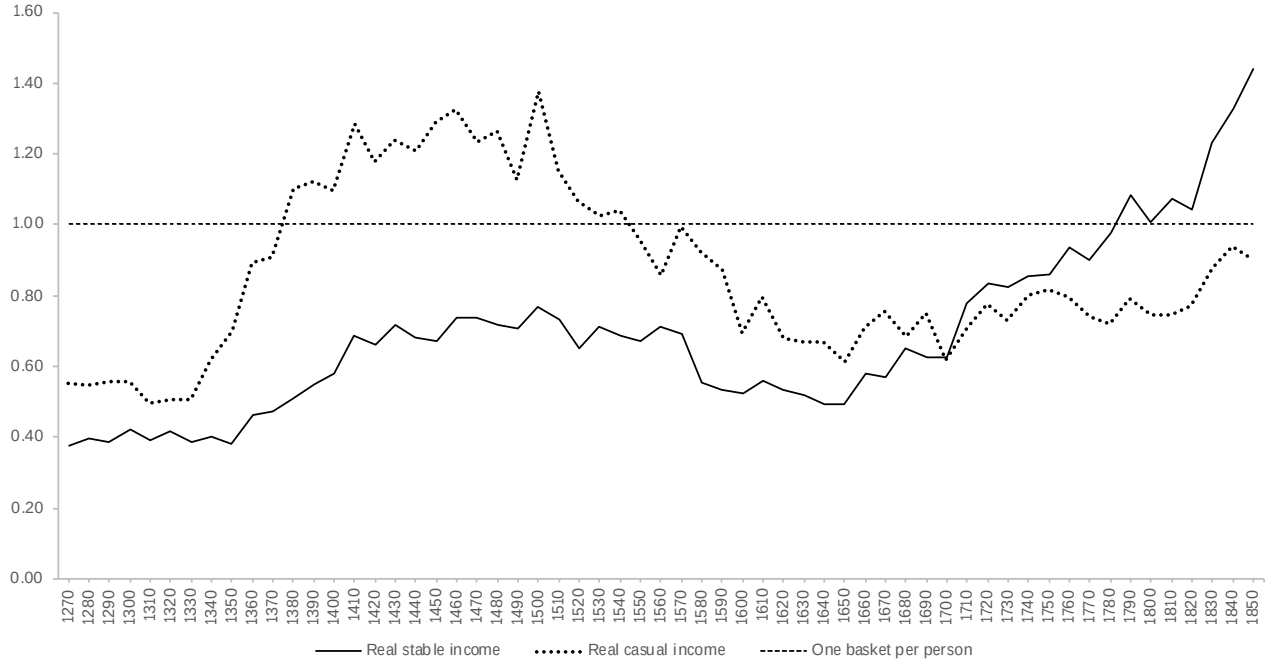
Van Leeuwen, M.H.D., and I. Maas (2011), *HISCLASS: a historical international social class scheme*, Louvain.

Wallis, P.; J. Colson; and D. Chilosi (2018) 'Structural change and economic growth in the British economy before the Industrial revolution 1500-1800', *Journal of Economic History* 78, pp.862-903

Wrigley, E.A.; R.S. Davies; J. Oeppen, and R. Schofield (1997), *English Population History from Family Reconstitution: 1580-1837*. Cambridge: Cambridge University Press.

Appendix

Figure A1: Casual and stable annual incomes in the male breadwinner model, 1260-1850



Notes: Each year refers to a decade, so 1270 means the 1260s. Casual income is computed (as conventionally) by multiplying the daily wage rates by 250 days per year. Stable income is simply the annual wage rate. Nominal income in both scenarios are divided by three times the cost of Allen's 'respectability' basket (see the text). *Sources*: Daily wages: Clark (2007). Annual wages: Humphries and Weisdorf (2019). 'Respectable' cost of living: Allen (2009).

Table A1: Resident and working children and the family's consumption needs, 1560-1850

Decade	Family Births	Resident children			Children of working age			Family baskets needed			Obs
		Young family	Family peak	Old family	Young family	Family peak	Old family	Young family	Family peak	Old family	
1560s	3.58	2.39	2.71	1.00	0.37	1.94	0.40	2.68	3.68	2.35	12
1570s	4.06	2.69	3.22	1.33	0.49	2.04	0.59	2.82	3.89	2.39	18
1580s	5.34	2.86	4.38	2.51	0.45	2.14	0.73	2.79	4.02	3.07	29
1590s	5.61	2.29	4.08	3.34	0.23	2.14	0.96	2.56	4.30	3.28	20
1600s	5.25	3.03	3.80	2.03	0.40	2.23	0.73	2.78	4.29	2.72	41
1610s	4.77	2.61	3.19	1.84	0.32	1.82	0.82	2.63	3.81	2.72	30
1620s	4.56	2.89	3.40	1.35	0.31	2.05	0.85	2.72	3.97	2.53	18
1630s	4.30	2.47	2.98	1.75	0.34	1.78	0.66	2.64	3.70	2.60	20
1640s	5.16	2.35	3.58	2.13	0.35	1.92	1.02	2.64	4.16	2.80	23
1650s	4.73	3.12	3.19	1.49	0.34	1.93	0.75	2.76	3.94	2.56	18
1660s	4.95	2.05	2.84	2.24	0.30	1.38	0.72	2.55	3.70	2.85	14
1670s	5.14	2.96	3.95	2.47	0.37	2.05	0.84	2.72	3.92	3.00	33
1680s	5.35	2.85	3.90	2.16	0.38	2.18	0.67	2.75	4.11	2.77	48
1690s	5.93	3.16	4.45	2.51	0.44	2.35	0.79	2.83	4.29	2.99	55
1700s	5.43	3.07	4.18	2.42	0.36	2.22	0.81	2.75	4.15	2.95	47
1710s	5.53	3.09	3.73	1.56	0.40	2.01	0.65	2.77	4.14	2.53	43
1720s	5.40	2.84	3.95	1.92	0.33	2.02	0.72	2.71	4.14	2.75	86
1730s	5.09	2.41	3.31	1.84	0.32	1.87	0.65	2.65	4.03	2.70	56
1740s	6.80	3.57	4.76	3.10	0.43	2.49	1.18	2.87	4.45	3.15	53
1750s	5.83	3.45	4.66	2.43	0.51	2.65	0.93	2.92	4.41	2.95	79
1760s	5.50	3.03	3.85	2.26	0.37	2.15	0.89	2.75	4.09	2.87	94
1770s	6.57	3.45	4.84	3.04	0.46	2.42	0.99	2.86	4.38	3.27	110
1780s	6.14	3.62	4.92	3.00	0.48	2.61	0.99	2.91	4.41	3.19	70
1790s	7.22	3.56	6.01	4.38	0.51	2.99	1.51	2.96	4.78	3.83	45
1800s	7.07	3.68	6.05	4.14	0.49	2.97	1.41	2.94	4.76	3.74	56
1810s	7.50	3.91	6.13	3.98	0.54	3.00	1.33	3.00	4.84	3.67	37
1820s	6.28	3.64	5.45	3.34	0.47	2.92	1.24	2.93	4.70	3.41	18
1830s	4.82	3.32	3.57	1.68	0.29	1.96	0.74	2.69	3.85	2.61	20
1840s	3.14	2.76	2.62	0.38	0.65	1.92	0.05	2.94	3.57	2.08	11

Table A2: Family Example, John and Hannah North, Odiham (FRF No 2005)

	FRF No: 2005	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833	
	Marriage in Odiham, 1804					Young-family cycle										Peak-family cycle										Old-family cycle							
Members and ages	Parents																															Age at death
	Hannah North, age	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	77
	John North, age	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	88
	Children (7 births in total)																															
	Elizabeth, age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15														>15
	Jane, age				0																											0
	Anne, age					0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15											30
	Martha, age							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15									18
	George, age										0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15						>15
	Louisa, age													0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			>15
	John, age																		0	1	2	3	4	5	6	7	8	9	10	11	12	>15
																																Max
	Home-living children	0	1	1	2	2	2	3	3	3	4	4	4	5	5	5	5	5	5	5	5	4	4	3	3	3	2	2	2	1	1	5
Labour input	Parents																															
	Hannah North, days per year	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	100	100	100	100	100	100	100	100	100	100	
	John North, annual	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	
	Children																															
	Elizabeth, able (0/1)		0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1														
	Jane, able (0/1)					0																										
	Anne, able (0/1)					0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1											
	Martha, able (0/1)							0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1									
	George, able (0/1)										0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1						
	Louisa, able (0/1)													0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1			
	John, able (0/1)																		0	0	0	0	0	0	1	1	1	1	1	1	1	
																																Max
	Work-able children	0	0	0	0	0	0	0	1	1	1	2	2	3	3	3	4	4	3	4	4	3	3	2	3	3	2	2	2	1	1	4
Calorie needs	Parents																															
	Hannah North, calories	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	
	John North, calories	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	
	Children																															
	Elizabeth		800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500														
	Jane				800																											
	Anne					800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500											
	Martha							800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500									
	George										800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500						
	Louisa													800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500			
	John																		800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	
																																Max
	Total calories	5000	5800	5750	6700	6775	6825	7850	7950	8300	9375	9600	10075	11300	11700	12375	12950	13600	12425	12875	13600	11625	12125	10025	10425	10825	8625	8900	9200	6850	7000	13600
	Basket equivalents	2.0	2.3	2.3	2.7	2.7	2.7	3.1	3.2	3.3	3.8	3.8	4.0	4.5	4.7	5.0	5.2	5.4	5.0	5.2	5.4	4.7	4.9	4.0	4.2	4.3	3.5	3.6	3.7	2.7	2.8	5.4

Table A3: FAO Caloric Requirement of Children, by Age

Age	Calories	Share
0	323	13%
1	750	30%
2	900	36%
3	975	39%
4	1075	43%
5	1150	46%
6	1225	49%
7	1325	43%
8	1450	58%
9	1550	62%
10	1700	68%
11	1850	74%
12	2000	80%
13	2175	87%
14	2350	94%
15	2500	100%