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**WORKING FOR A LIVING? WOMEN AND
CHILDREN'S LABOUR INPUTS IN
ENGLAND, 1260-1850**

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ECONOMIC HISTORY



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Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
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We consider the living standards, supplies of child-labour, and poor-relief needs among intact and broken working-class families of various sizes in historical England. We estimate family incomes without resort to the usual day wages and ahistorical assumptions about male labour inputs. We also incorporate women and children's wages and labour alongside consumption smoothing using a life-cycle approach. Living standards varied considerably over time and by family structure and dependency ratio. Small and intact families enjoyed high and rising living standards after 1700. Large and broken families depended on child labour and poor relief up until 1830.

JEL Classification: J22, N13, O10

Keywords: Child labour, Consumption Smoothing, Costs-of-Living, Dependency Ratio, Life Cycle, living standards, Poor Relief, prices, wages

Sara Horrell - S.H.Horrell@lse.ac.uk
London School of Economics

Jane Humphries - jane.humphries@history.ox.ac.uk
Oxford University

Jacob Weisdorf - jacob.weisdorf@uniroma1.it
Sapienza University of Rome and CEPR

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Working for a Living? Women and Children's Labour Inputs in England, 1260-1850¹

Sara Horrell (Cambridge and LSE), Jane Humphries (Oxford and LSE),
and Jacob Weisdorf (Sapienza University of Rome, CAGE, CEPR)

Abstract

We consider the living standards, supplies of child-labour, and poor-relief needs among intact and broken working-class families of various sizes in historical England. We estimate family incomes without resort to the usual day wages and ahistorical assumptions about male labour inputs. We also incorporate women and children's wages and labour alongside consumption smoothing using a life-cycle approach. Living standards varied considerably over time and by family structure and dependency ratio. Small and intact families enjoyed high and rising living standards after 1700. Large and broken families depended on child labour and poor relief up until 1830.

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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. The broader debate has however – from its beginning to the present day – suffered from two major shortcomings. The first shortcoming is that earlier investigations identified family income with the *husband's* earnings (for example, Allen 2009, Clark 2007), yet, the idea of a pre-modern male breadwinner sits awkwardly with the evidence of women and children's extensive participation in waged labour (for example, Berg 1993, 1994; Tuttle 1999; Sharpe 1996; Burnette 1999, 2004; Honeyman 2007; Humphries 2010; Humphries and Weisdorf 2015; Humphries and Horrell 2019). Worse still, the male earnings used previously to represent family incomes were drawn entirely from *casual* male 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 2019; Humphries and Weisdorf 2019). Both issues are of paramount importance for a full understanding of family income-generating capacities and hence living standards in the past.

The second shortcoming has been an implicit but one-sided focus on the family's economic situation *when its size peaked*. Accounts of living standards during other stages of the family's life cycle have received little attention (exceptions are Schneider 2012 and 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 as well as the contribution of child labour during various family life-cycle stages and of poor relief when the major providers of family earnings, normally the husband, cease to deliver. 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. 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. It is only by incorporating the *entire* life cycle of a family alongside the labour inputs of women and children that it becomes possible to fully comprehend family living standards in the past and to answer questions like who were the recipients of poor relief and at what stage in their lives.

This article takes a fresh look at the standard of living debate, spurred in part by these limitations and in part by newly-available empirical evidence on wages which enables core shortcomings to be addressed. Thanks to recent archival work, we now have statistics regarding the wages of unskilled working-class males employed on long-term (stable) contracts, which as explained below solve many of the problems with the traditionally-used wage rates of casual workers (see Humphries and Weisdorf 2019). We now also have information on the payments made to unskilled working-class women and to 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; Horrell and Humphries 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.

Our approach is *needs-based*. We combine these recent estimates of wages to provide a pioneer account of the amount of paid labour that working-class families in a variety of different but typical circumstances needed to deliver to rise above subsistence to attain ‘respectable’ standards. We begin by asking how much a representative albeit unskilled 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 in combination with standardised historical cost-of-living indices, provided by Allen (2009), enables us to deduce how much income was needed from

the members of the household in order to achieve ‘respectable’ or ‘bare bones’ levels. The newly-collected wage-datasets for unskilled men, women, and children alongside realistic assumptions about how much labour and hence income the family breadwinner (usually the husband but sometimes the wife) could secure result in four new contributions to the classic standard-of-living debate.

The first contribution is methodological and concerns *how to measure* annual family income. Previous estimates of men’s yearly incomes are based on day rates grossed up according to the ahistorical assumption that casual workers always and everywhere found exactly 250 days of employment per year (for example, Allen 2009; Allen and Weisdorf 2011; Hatcher 2011; Hatcher and Stephenson 2019). Our annual incomes, by contrast, are estimated by those of men employed on long-term (annual) contracts. The use of annual rather than daily wages avoids speculations about the length of the working year. By assuming with Clark and van der Werf (1998) that casual and annual workers earned roughly the same annual income, we can approximate men’s annual earnings by the annual wages reported in Humphries and Weisdorf (2019) *regardless* of whether we consider men working for casual or annual wages. For women, moreover, we are careful to distinguish between single women who typically worked for annual wages and married women who usually worked only occasionally and for a daily wage (Humphries and Weisdorf 2015; Horrell, Humphries, and Weisdorf 2020).

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 now using the novel 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 and 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 casually (one or two days per week depending on her life-cycle stage) 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).

Our third contribution 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. Eric Schneider (2012) has conducted a similar, detailed exercise to compare the living standards of a range of families with children for the period 1650-1800. We develop this analysis for the long-run, 1270-1860, base it on the new estimates of male wages and explicitly incorporate women's and children's contributions, and moreover consider life-cycle phases beyond those where children are present: youth 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. Our baseline scenario follows a long-lived, average-sized (three children) 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 locates periods when earnings fell short of 'respectability' and so identifies when and to what extent pre-modern working-class families had to rely on child labour and public relief.

Our fourth and final contribution involves extending our focus beyond the standardised family described above that dominates demographic and economic history to include less typical but still common sorts of family. We introduce greater realism to the baseline scenario by considering families in the tails of the fertility distribution, that is those with significant more or fewer children than an average-sized family, this way investigating the living standards among the many different family sizes found in early-modern England (Wrigley et al 1997). We also combine the expanded fertility distribution with the welfare outcomes for broken families, that is those where husbands and fathers had died, disappeared or deserted and, additionally to the scenarios considered by Schneider, when the father is incapacitated. By looking across the panoply of families, we nuance our understanding of the living standards experienced by families in different circumstances.

Our conceptual interventions revise the mainstream account of living standards in pre-modern England in a number of important ways. Our baseline model describing the typical family shows that, although pre-marital savings served to alleviate the economic stress that couples experienced in the early childbearing and rearing years, women's labour was always needed to make ends meet while children's labour was often required. 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 at the end of their lives and would have had to resort to the Poor Law or private philanthropy for a decent 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 from our baseline model where both man and wife were capable of generating income. 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 men's and women's 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 baseline 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 a typical working family of average size to reach a 'respectable' standard of living.

The baseline model's prediction that children's work for wages among average-sized intact families 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 baseline framework also does not detect any need for poor relief after the 1720s – a contrast to the evidence on rising poor law expenditure and significant

proportions of families needing poor law payment during the 19th century (Arkell 1987; King 2000; Lindert 1998; Newman-Brown 1984; Wales 1984; Williams 2005). These discrepancies fade however when we introduce greater realism by widening our scope to encompass the experience of families that were either broken or larger than the norm.

To explore those experiences, we perform a more advanced analysis for the years 1560-1850 when we have access to detailed demographic data from Wrigley et al (1997). As a first step we introduce more realistic patterns of births to see if rising birth rates and large families prompted the need for more child work than predicted in the baseline analysis for a typical average-sized family. We then combine greater realism on the fertility front with a wider perspective on prevailing family types introducing the possibilities that husbands and fathers died or abandoned their families, or that they were simply unable or unwilling to work, possibilities with strong historical resonance. These adjustments dramatically improve the model's fit with the historical record. With more realistic demography, 19th-century child labour was often necessary, even among healthy and long-lived couples when these had many mouths to feed. Also, poor relief was always essential in families where the husband was absent or unable or unwilling to work. With the widespread need for child labour during the late 18th and early 19th centuries, regions where the factory system emerged offered families dependent on children's earnings better opportunities and might this way have contributed to the significant internal migration of these decades (Shaw-Taylor and Wrigley 2014).

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 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 associated with 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 the macro economy presented in Broadberry et al (2015).

This interpretation has not gone uncontested. One alternative 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 (Stephenson 2018; Hatcher and Stephenson 2019; Rota and Weisdorf 2020) and sectors other 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, Mokyr, and Ó Gráda 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 (Bailey 1996; 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).

There is also evidence of 16th-century Smithian growth that misaligns with trends in day wages. 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, Colson and Chilosi 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 to articulate the vulnerability most families faced at times through the life-cycle. The new data put together from hitherto untapped original sources facilitate this revised perspective.

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 consistently use the wages earned on long-term contracts. Workers on long-term contracts, which we refer to below as *stable* workers, made up between 16 and 46 per cent of the unskilled male workforce depending on the period of observation (Humphries and Weisdorf 2019, p. 2882). The remaining unskilled male labourers worked for casual wages. Since we do not know the length of the casual

working year – a problem highlighted in numerous studies (see Allen and Weisdorf 2011; Hatcher 2011, Hatcher and Stephenson 2019) – we assume with Clark and van der Werf (1998) that casual and stable workers earned roughly the same annual income, an assumption underpinned by arbitrage, that is the willingness and ability of both workers and employers to substitute between casual and stable contracts to obtain higher wages or lower costs per unit of labour. Regardless of whether a husband represented below was working for casual or stable wages, his annual earnings are therefore best approximated by the annual wages reported in Humphries and Weisdorf (2019).

For women, things are 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* wages in the case of *single* women and *daily* wages in the case of *married* women. Both series, covering 1260-1850, are provided in Humphries and Weisdorf (2015). For women's labour inputs we have amassed detailed evidence from a variety of commentators and documentation of individual women's work to estimate married working-class women's labour force participation and the number of days worked by these women in a year for the period 1280-1850 allowing a proportion to work less than full-time (see Horrell, Humphries and Weisdorf, 2020, Figure 9). From these data a reasonable estimate of the contribution of a typical married woman is between one and two days per week. We have used this estimate of one or two days, depending on life-cycle stage, throughout the period under study here, except when the family was without an income-generating husband and the wife therefore required to work full-time.

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. To capture a representative child, we use the average cash wage paid per day in each decade (see Horrell and Humphries, 2019, Appendix A3, Column 1).

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 as a starting point an average family had three surviving children in total reasonably consistent with research detailing the median number of children supported ranging from 2.01 to 2.29 and the mean number from 3.01 to 3.58 (Schneider 2012 p.106). But, as Schneider has pointed out, given the spacing of births, infant mortality, and age at leaving home, all three children were not likely resident simultaneously. Also, it is historically invalid to assume the same family size across several centuries plus ignore the fact that many children did not live to reach adulthood. When we broaden our perspective to include a range of family sizes and structures, the Cambridge Group's *family reconstitution* data is called on to 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. Note that we follow earlier work here and abstract from considering the earning possibilities and consumption requirements related to lodgers and adult siblings.

Lastly, in order to assess the total consumption expenditures of the archetypal family, we use the two now standardised consumption baskets as proposed in Allen (2015) and described above: a ‘bare bones’ basket and a ‘respectability’ basket. Both baskets provide basic consumption goods: food of a specific caloric value, clothing, heating and housing. The respectability basket is more generous but even here there is no room for spending on household durables or luxuries or school fees or apprenticeships or midwifery or doctoring. The ‘bare-bones’ basket offers only basic necessities, as its name suggests. Both baskets are described in Table A1 in the Online Appendix. 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 was 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).

The Family’s Income and Expenditure: A Snapshot View

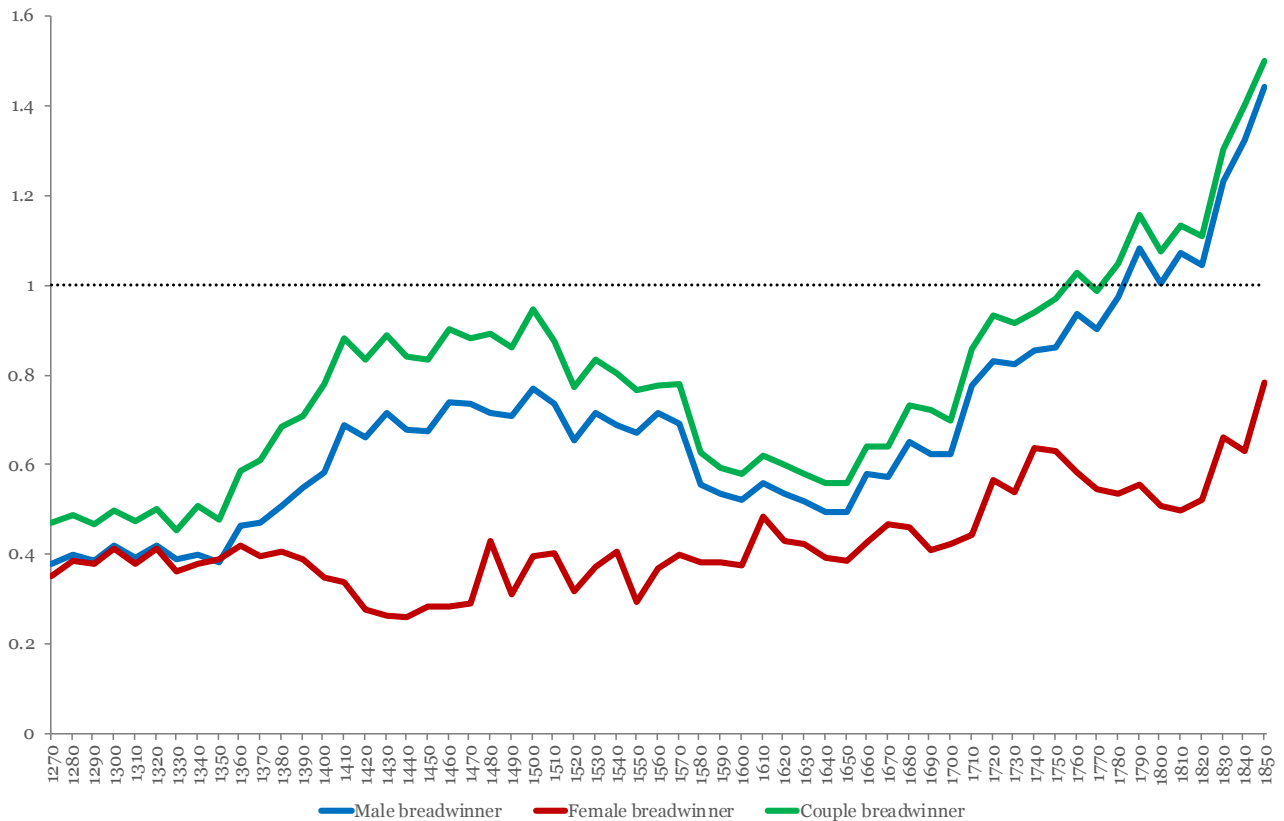
We now move forward with three analytical exercises. The first exercise calculates the living standard relative to the basket benchmarks that a representative family – comprising parents and children – could achieve under varying assumptions about the labour supplied by its members and their market wages. This exercise provides a glimpse of an averaged-sized family’s financial pressure at its maximum, decade by decade, across our period of observation, 1260-1850. The exercise also considers the relevance of the 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 – alongside other breadwinner scenarios.

Moving beyond the commonly-used snapshot approach, the two subsequent and more advanced exercises – comprising our study’s two main contributions – is to consider multiple stages of the family’s life cycle as well as different family structures. The life-cycle analysis is described in detail

in the next section. There, we consider the importance of cross life-cycle consumption smoothing, such as the role played by the husband and wife's joint pre-marital savings for their spending-patterns during later stages of their life cycle, when their consumption needs might exceed their earnings possibilities. After we explain the life-cycle approach using a representative average-sized family, we then move on to consider the living-standard implications of changing the family's size as well as its structure.

Proceeding here with the initial snapshot analysis, Figure 1 illustrates the evolution of the 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 needs 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 also mentioned in the related literature, that the welfare ratio here ignores any utility that household members might derive from leisure, which arguably depends on individual attitudes toward work – a topic outside the scope of this paper.

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 wage. The couple breadwinner model assumes that the husband works full time for an annual wage and the wife one day a week for 50 weeks each year for a daily wage. 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).

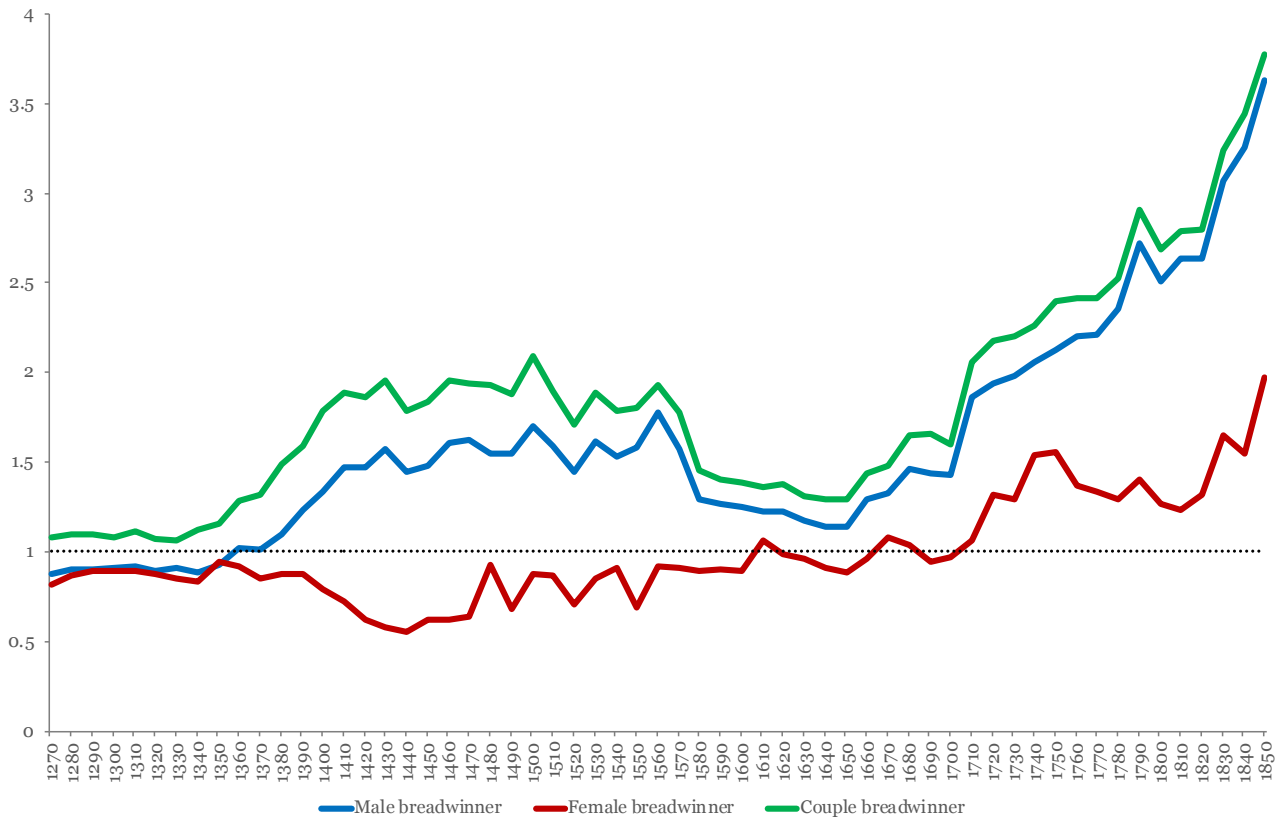
Figure 1 considers three different scenarios embodying alternative assumptions about the labour supplied by different family members and so the family as a whole: a *male* breadwinner model (blue), a *female* breadwinner model (red), and a *couple* breadwinner model (green). In the male breadwinner scenario, the husband works full-time. In the female breadwinner scenario, only the wife works. In the couple breadwinner scenario, both the husband and the wife work, the husband full-time and the wife intermittently. Intermittently here means one day each week on average 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, Humphries, and Weisdorf 2020, Figure 9). Given the evidence that married women's labour input was unlikely to have been constant over time (for example, Humphries and Sarasua 2012; Horrell, Humphries, and Weisdorf 2020), this working assumption is amended further below.

As is obvious from Figure 1, none of the three models provide 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 was one of severe poverty. Here, as we discuss later, children's labour or poor relief 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 emphasised that Figure 1 is based on the *new* male income data as reported in Humphries and Weisdorf (2019). These differ from the income estimates based on the traditional, but probably ahistorical, supposition that casual workers earned 250 times the daily wage rates. Figure A1 in the Online Appendix shows the traditional estimates of the male breadwinner model based on daily wage rates multiplied by 250 against the ones reported in Figure 1, which builds on annual wage rates and, hence, dispenses with *ad hoc* conjectures about days worked each year. Indeed, throughout our analyses below we use annual wages rather than daily wages to proxy male annual income regardless of whether males were working for annual or daily wages, as we explained above.

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 wage. The couple breadwinner model assumes that the husband works full time for an annual wage and the wife one day a week for 50 weeks each year for a daily wage. 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). Respectable 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, thus having to recourse to the Poor Law or child labour for survival. ‘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 required in a world where working families could not borrow or access poor relief to cover temporary shortfalls.

Having established that even the couple’s joint labour input was normally insufficient for a standardised family to make ends meet at the ‘respectable’ level, the next section turns to the question of *how much* waged labour the standardised family’s children would have had to contribute in order to secure ‘respectability’. Using a life-cycle approach, we add 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 because of the wife/mother’s child-raising and domestic responsibilities.

The Family’s Income and Expenditure: A Life Cycle Approach

This section explains our life-cycle approach. To simplify matters, we introduce the life-cycle setup using the archetypical working-class family described above. The next section then expands the modelled family in terms of size and structure. In the following, we consider six life-cycle stages based on the following three phases of a couple’s life: (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). These categories are consistent with the stages identified by Seebohm Rowntree in his studies on late 19th- and early 20th-century poverty (Seebohm Rowntree 1901). The waged-labour activities of the six life cycles are detailed further below. For the moment, in order to explore what happens beyond the child-raising years, we consider a long-lived couple where both

adults are capable of working and survive until the age of 75. This merely serves as a reference point. Later on, we expand our analysis to cover threats to the integrity of the family structure, for example, where the main breadwinner was unable or unwilling to provide support or died during the child-raising years.

Before describing the three main phases and six life-cycle stages in full, we also 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 relax this assumption in the next section where we introduce evidence on developments in family sizes. For now, in order to keep the model tractable, we assume five-year birth intervals, roughly twice as long as the average spacing observed among early-modern English couples (Cinnirella, Klemp, and Weisdorf 2017). Since we only consider the influences on the family's budget of surviving children, we implicitly assume that every other new-born did not survive infancy and so never became a significant burden on the family.

The six stages of the life-cycle

The first life cycle begins with independence at the age of fifteen. It ends when a marriage is contracted, which we assume happens at twenty-five (Boberg-Fazlic, Sharp, and Weisdorf 2011, Figure 5). We refer to this stage as *youth*. During *youth* we assume that the man and woman are both employed full-time in stable jobs, that is, both are working for annual wage rates. Even if they were employed on casual terms, we would still proxy their annual earnings by the annual wages, as we explained above.

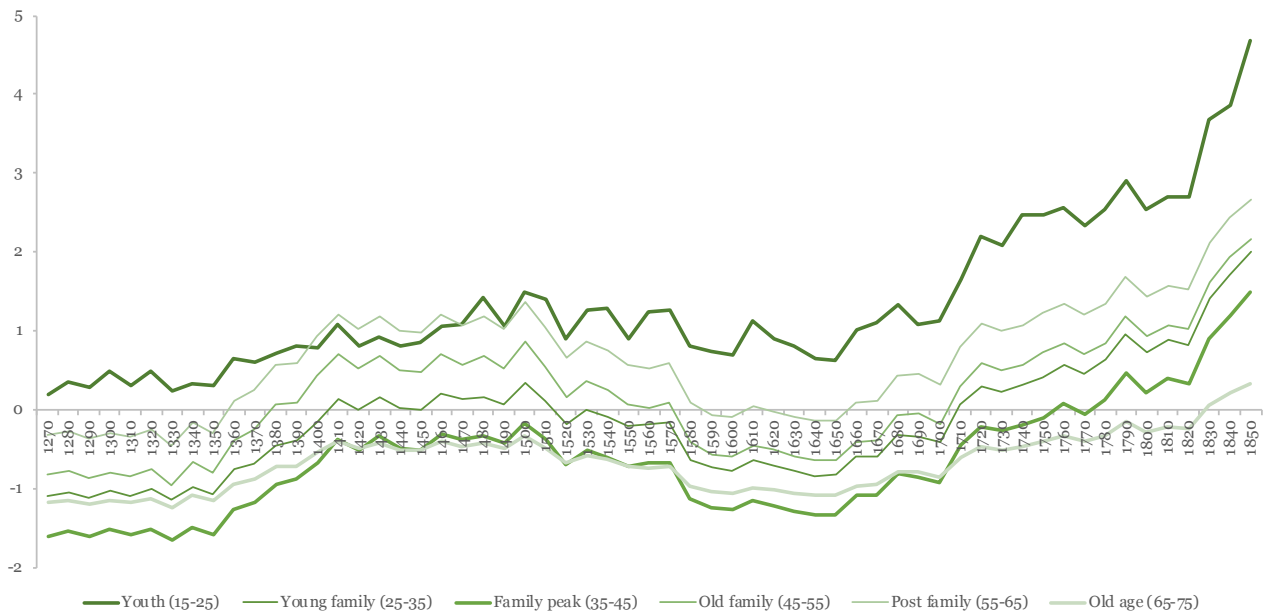
After marriage, the wife works part-time in order to accommodate child care and domestic labour (see Humphries and Weisdorf 2015). As in our snapshot analysis and for the reasons given above, we assume that married women work one day each week on average for 50 weeks each year

during the first two decades of the couple's parenting years, that is, between the ages of 25 and 45. This is in line with married women working 53 days in the year at Chalvington, Essex in 1441 (Mate 1999 p.30-1) and observations of early modern women working just over 100 days per year in agriculture (Burnette 1999). 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 further births 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. 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 this final phase, we assume that the husband works fifty per cent of full time while the wife reverts to one day per week for 50 weeks.

Having defined the different life-cycle stages, we now return to our interest in how much labour resident children had to supply to make ends meet. We assume that children did not enter the labour market until they were aged six and that they became independent at age fifteen. Thus, only children between the ages of five and fifteen were able to contribute to family incomes. In order to avoid unnecessary complications, we rule out intergenerational transfers. Children over fifteen neither remit earnings to their families of origin, nor receive support from their parents after turning fifteen, including bequests on their parents' death. Finally, savings, when there are any, are considered to be accumulated credit with an employer and do not yield interest. We assume there is no borrowing.

Figure 3: 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 costs of living: Allen (2009).

The instantaneous budget situation

We now track the welfare ratio of the representative family during each of its 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 3). Then, we allow couples to smooth their consumption, that is, to carry a potential surplus over to the next life-cycle stage, which enables us to track accumulated family wealth decade by decade (Figure 4). If earnings are insufficient to cover ‘respectability’ consumption, since no borrowing is allowed, families must retreat to a ‘bare bones’ standard or raise the contributions from members persuading them to work longer and harder, as discussed below or to recourse to poor relief.

Figure 3 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 full-time (that is, 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, that is, income 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.

This surplus differs, however, 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 real 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, that is, Humphries and Weisdorf’s so-called *early-modern economic growth*. The latter was by far the most important in terms of improvement.

The remaining trajectories 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. 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, absent savings or child labour, reach a ‘respectable’ living. The situation improved 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

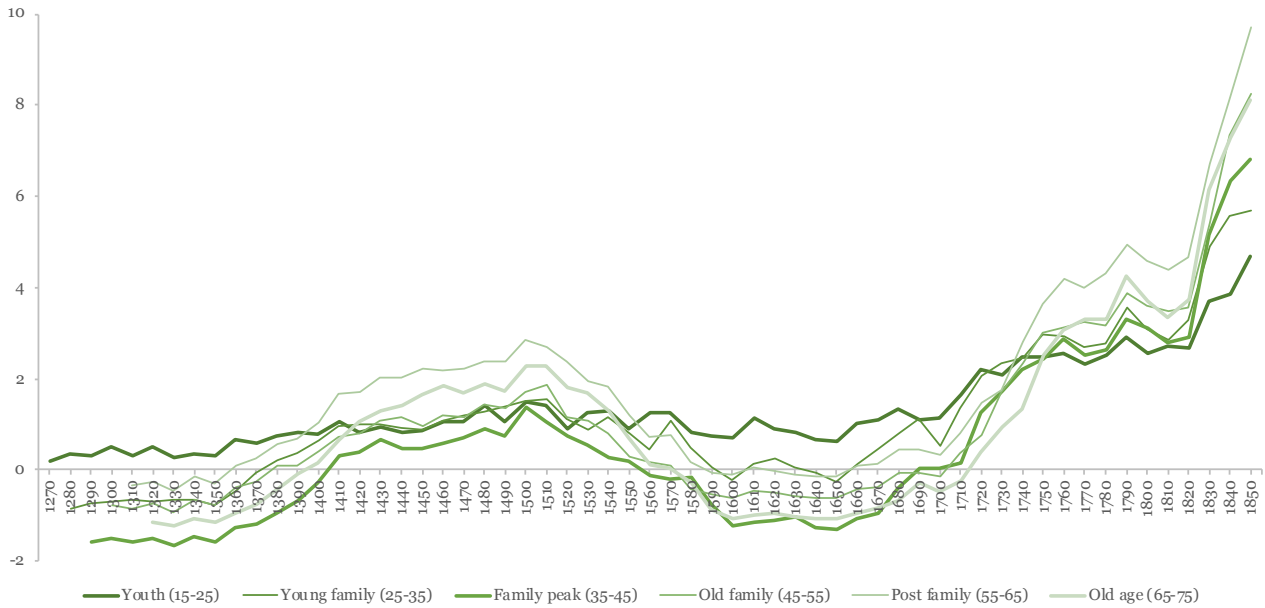
decent living could not be assured without the help of past savings, poor relief, or current child labour. The 17th century was marked by setbacks, with all life-cycle stages except *youth* facing net deficits. But, with the turn of the 18th century, each life-cycle stage began to see net surpluses again, 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 3 above represent the *instantaneous* surpluses and deficits of our stylised 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 child labour help the family stay afloat? Figures 4 and 5 offer answers to both questions, showing the couple's real accumulated wealth at the end of each life-cycle stage, expressed in terms of the number of 'respectability' baskets that the wealth could purchase.

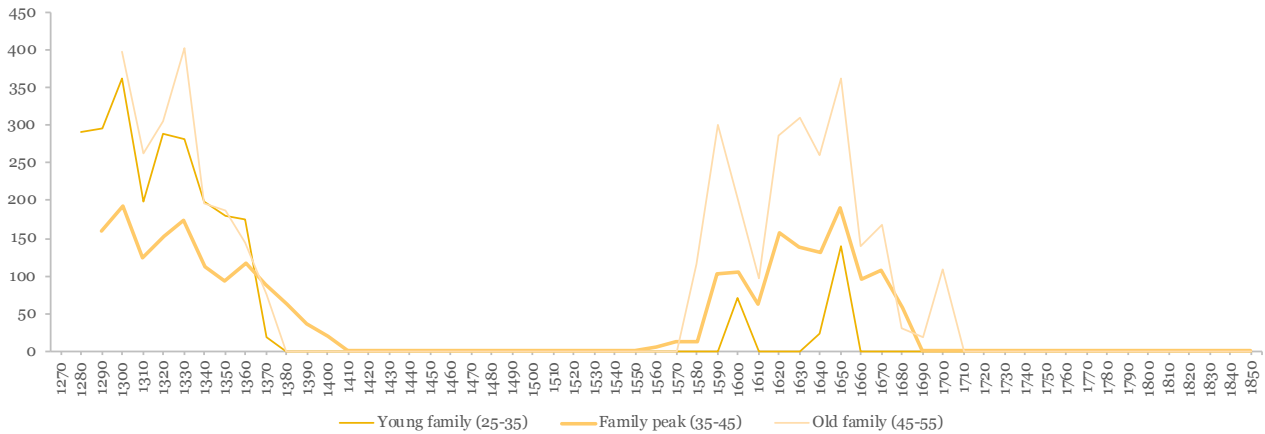
Figure 4 makes clear what Figure 3 suggested, namely that the pre-Black Death period and the 17th century were hard times when child labour was needed. The introduction of savings improves the picture, especially when times were comparatively good. For example, savings mean that *all* stages of the life 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 3 and 4). 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 families 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 4: 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 5: 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 4 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 2019). 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 2019). For the early modern period, farm service thus enabled young people to accumulate their wages.

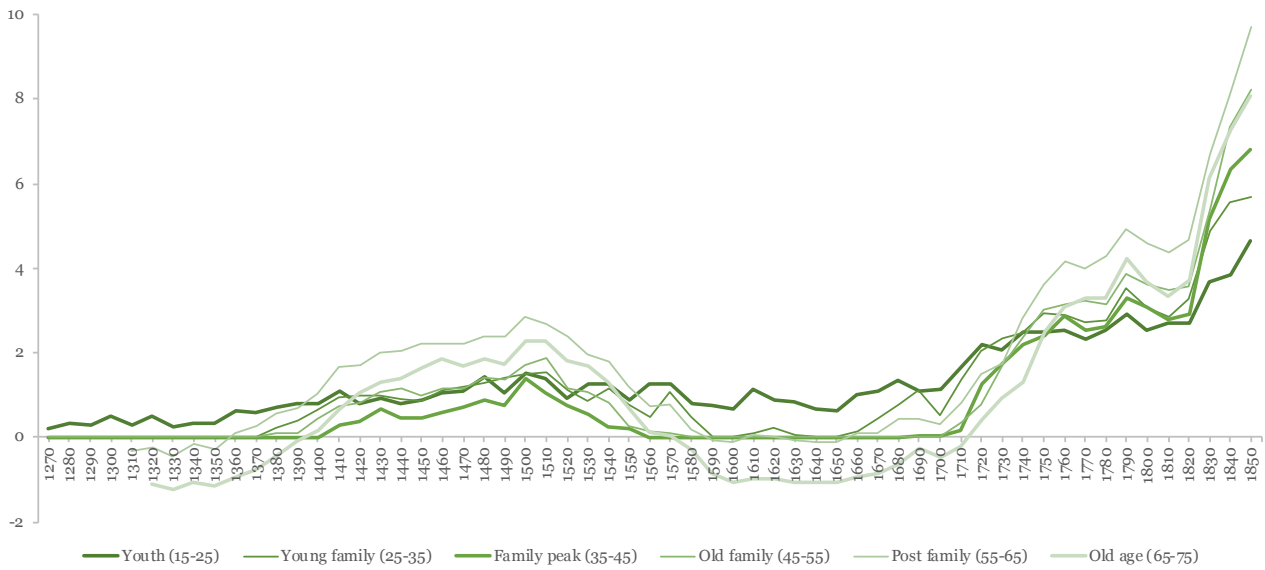
The cash component of wages was usually due annually, but many employers retained it as a credit to the servant often accumulated over many years (Kussmaul 1981, pp. 38-9). These credits might be commuted into keep for livestock and final settlements offset against the rental of a farm cottage. On leaving 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 the wages of *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. Such collections of household goods accumulated over a lifetime were even used as collateral when the elderly sought poor relief, with the authorities sequestering pauper inventories as payment against support (King 1997).

Figure 6: 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, Humphries, and Weisdorf 2020), 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 wages 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 5 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 4) 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. It should be kept in mind however that our focus thus far is on an archetypal family of average size and where both parents were willing and able to generate income. As will become apparent below, the findings just described are conditional on this family structure.

This sensitivity issue also applies to our conclusion concerning the archetypal couple’s accumulated wealth *after* adjusting for the child-labour contributions given in Figure 5. Figure 6 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, the typical couple was 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, late in life 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. 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 (Seebohm Rowntree 1901; 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. 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 standard average-sized family was severely tested.

The overall relatively optimistic findings – for the period after c. 1700 especially – hinge on two important and ahistorical assumptions: that families remained intact and could and would supply the labour 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. There was no room in the analysis so far for parental morbidity or mortality. Nor was there room for absence, alcoholism, idleness, disability, or mere bad luck. Any student of medieval and early modern Britain knows how common the violations of these assumptions must have been. Records show for example that death frequently robbed children of a father’s support, others lacked a father who was willing and able to shoulder the task of breadwinning. Fathers also sometimes deserted their families, they enlisted in the army or were pressed into the Navy, they were idle or drunken, or simply unable to find jobs (Humphries 2010). The wolf was seldom far from working-class doors. The next section captures the blight that these common crises cast on family wellbeing.

Towards Greater Realism

The baseline model above, considering a normal average-sized family, predicts that child labour was not necessary for a ‘respectable’ living standard after the 1720s and is curiously silent about need for poor relief after the end of the 17th century. In contrast, 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). Similarly, Poor Law payments in the late 18th and early 19th centuries made up a considerable share of national income going to working people (Broadberry et al 2015 p. 327; Mitchell 1962 p. 410; King 2000; Lindert 1998; Goose 2014). However, we have yet to take the steps towards greater demographic realism and a broader perspective on family types promised above.

Our baseline model held family size constant at three adult equivalents, clearly an unrealistic assumption in the era of rising rates of population growth that preceded the Industrial Revolution. Worse still, family size varied widely at any given point in time – from no children at all to families of more than ten children (Wrigley et al 1997). These differences created large disparities in family standards of living depending on the family-specific dependency ratios. The baseline model also abstracted from the family issues registered above concerning the husband’s willingness and capacity to support the family. These matters, if properly accounted for, can help correct the mismatch between our preliminary predictions and the claims of both contemporaries and historians about the extent of child labour and the need for poor relief.

This section introduces more credible demographics into the life-cycle model based on the Cambridge Group’s *family-reconstitution* data (Wrigley et al 1997). We look at how the numbers of dependent and working-age children actually evolved, exploring these in combination with three distinct family types. The first scenario considers families that (equal to the one above) remained intact with the wife and husband able to bring home the earnings assumed in the previous section. The second scenario considers a less fortunate family in which the husband was unable to work either because he could not find employment or because he was unable or unwilling to work. The third and final scenario considers the possibility that the husband went missing either because he suffered an early death or because he abandoned the family. As will become clear below, the introduction of

greater realism in terms of varying family sizes and types improves the model's ability considerably with regards to matching observed 19th-century needs for child labour and poor relief.

Improved demography

Little is known about demographics at the household-level before 1541. However, 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 so-called *family-reconstitution* dataset, documented in detail in Wrigley et al (1997), forms the basis of our more authentic analysis of family demography below.

We reconstructed the original dataset to reflect our interest in working-class families headed by unskilled men. First, 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 selecting fathers whose occupational titles involved unskilled work (HISCLASS 11 and 12). We excluded the first two decades, 1540-59, because they contained only one and five families of this kind, respectively. The remaining decades had information about well over 200 families on average, aggregating to 6,172 sampled families for which the following restrictions were imposed:

For our three family-type scenarios, we first selected a subset of data containing only 'completed marriages', meaning that the wife and husband both survived until the end of the family life-cycles ensuring that fertility was not interrupted by the death of either parent. In this first scenario, both parents were able to generate the incomes assumed above. We use the same subset of data in our second scenario, but here we assume that the husband was unable to generate income after the marriage, decimating family earnings and forcing the wife to work full time. Finally, the data indicate

that some 40 per cent of all husbands died before completing the family life-cycles; that is, before the husband reached 55 years of age (see Figure A2 in the Online Appendix). In order to represent these less fortunate families, our third scenario assumes that the husband died at the age of 35 in the midst of raising a family. This leaves his wife, as well as the children born during the *young-family* life-cycle, to support themselves from the *family-peak* cycle onwards. As with the previous scenario, the father's absence slashes family earnings and forces the wife to work full time. However, as the husband is no longer present in the family he can neither eat nor procreate, which limits the damage imposed on the family budget compared to the second scenario. The third scenario has identical economic implications to one where the husband abandons the family.

To bring even greater realism into the model, we computed and used the standard deviations in the size of the sampled families. An average 'completed' family in the sub-sampled data gave birth to somewhere between two and four children, which is not far from the archetypical family portrayed above. However, Figure A3 in the Online Appendix shows that very large families in the data (the mean plus 1.96 times the standard deviation) ranged between five and eleven births during the three life-cycles covered by the model. The smallest families during the period of observation had no children at all. The standard deviation in family size enable us to calculate and graph the 95 per-cent confidence intervals for the various measures of family living standards originally displayed in Figures 3 to 6 above.

How many actual English families do the three scenarios described above cover? While this question is difficult to answer exactly, we can get a crude idea on the basis of a combination of the overall composition of English families by social rank and the information about family types contained in the *family-reconstitution* dataset. Sources for the general population collected and reported in Boberg-Fazlic, Sharp and Weisdorf (2011, Figure 9) show that working-class families represented some 40-50 per cent of all English families during the period of observation. The *family-*

reconstitution data moreover suggests that women lived beyond 55 years of age in 50.2 per cent of the sampled working-class families. Taken together, since roughly half of the English population belonged to the working classes and half of these included wives surviving beyond the age of 55, this implies that our conclusions apply to about one in four English families.

Table A2 in the Online 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 *family-reconstitution* 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 *family-reconstitution* catchment area or, more probably, because they died outside the period of observation. 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, this 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 (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 Online 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 (see Table A3). 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 many – 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 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 Hannah and John's marriage.

We can now compute the annual incomes needed to buy the baskets required by the families found within the 95 per-cent confidence interval of family fertility (Figure A3) and then compare this with the household income that the couple was able to obtain under the assumptions described above.

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 the 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 during the child's first year of life.

Figure 7, Panels A1-A3, shows the resulting real annual surpluses left at the end of the *family-peak* cycle after the family's 'respectable' consumption needs have been covered, decade by decade between the 1560s and the 1840s. The bold line in Panel A1 is comparable to the bold, light-green line in Figure 3 above, with the only difference being that Panel A1 uses actual fertility numbers. Because the actual fertility rates for an average family size is not far from that assumed above – three children – the resulting family surpluses are not far from those reported in Figure 3.

A key difference to Figure 3 however is that we can now consider families that deviated from the archetypical one used above and in earlier studies. For example, it is clear that the smallest families – those with no children as captured by the upper-bound line in Panel A1 – enjoyed significantly larger surpluses than both an average-sized family (the bold line) and certainly than the very large families (the lower-bound line). The smallest families were between two and four accumulated 'respectability' baskets better off compared to the largest families.

Roughly similar differences during the *family-peak* cycle also applied to the less fortunate families (Panels A2 and A3). However, these families differed in other important regards. Panel A2 shows the real annual surpluses when the husband was present but unable to generate income (our second family type). While large families were much worse off than smaller ones, none of the families short of the husband's contribution were capable of meeting a 'respectable' standard (except those with no children at the very end of the period). For families where the husband went missing after the *young-family* cycle (Panel A3 capturing our third family type), the *family-peak* cycle was slightly more comfortable than when the husband was present but inactive. Still, with the exception of families with little or no children, meeting the 'respectable' target was impossible without savings or contributions from children.

Figure 7: Welfare surplus and child labour during the *family-peak*, *post-family*, and *old-age* life cycles, 1560s-1840s

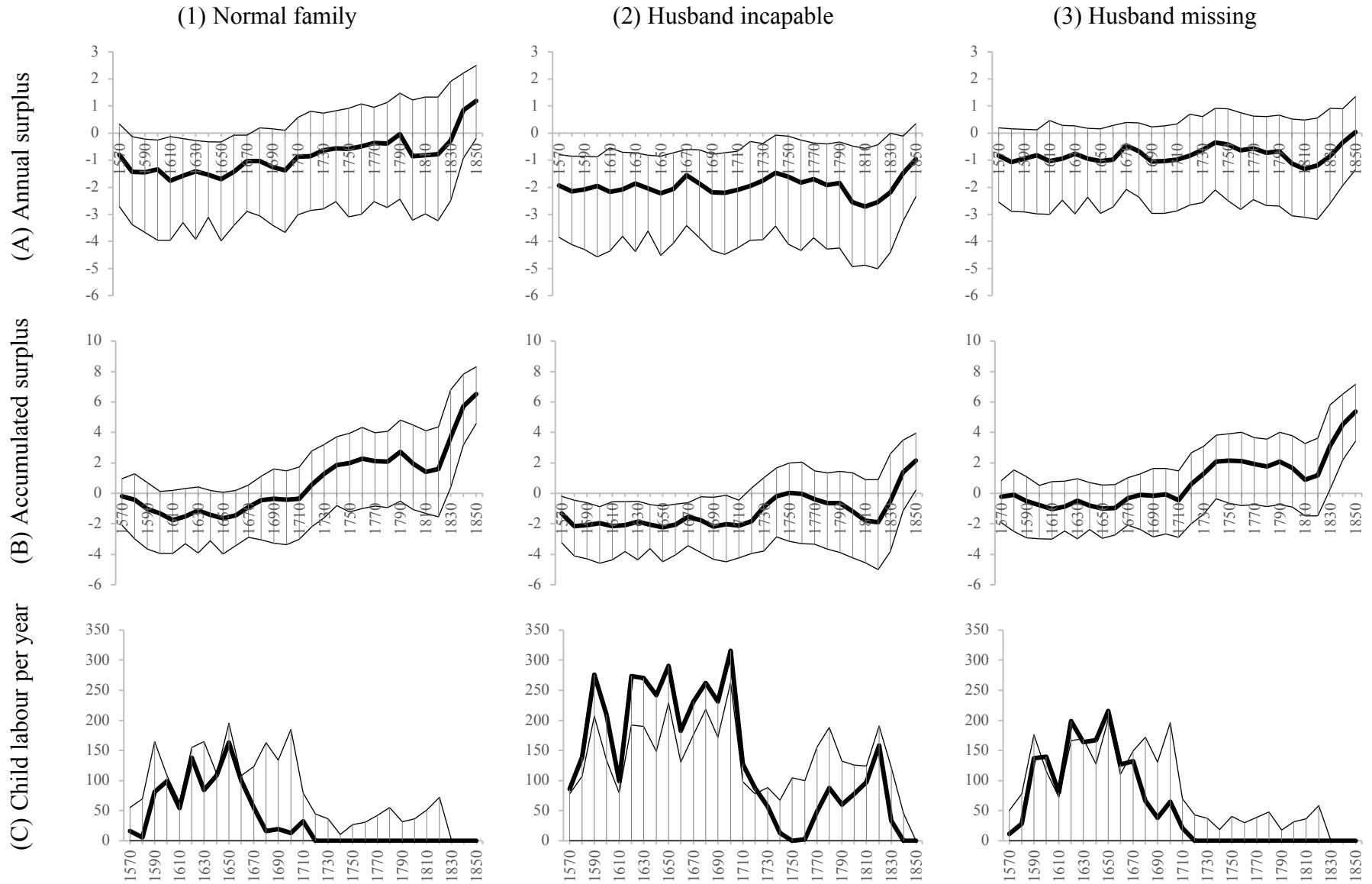
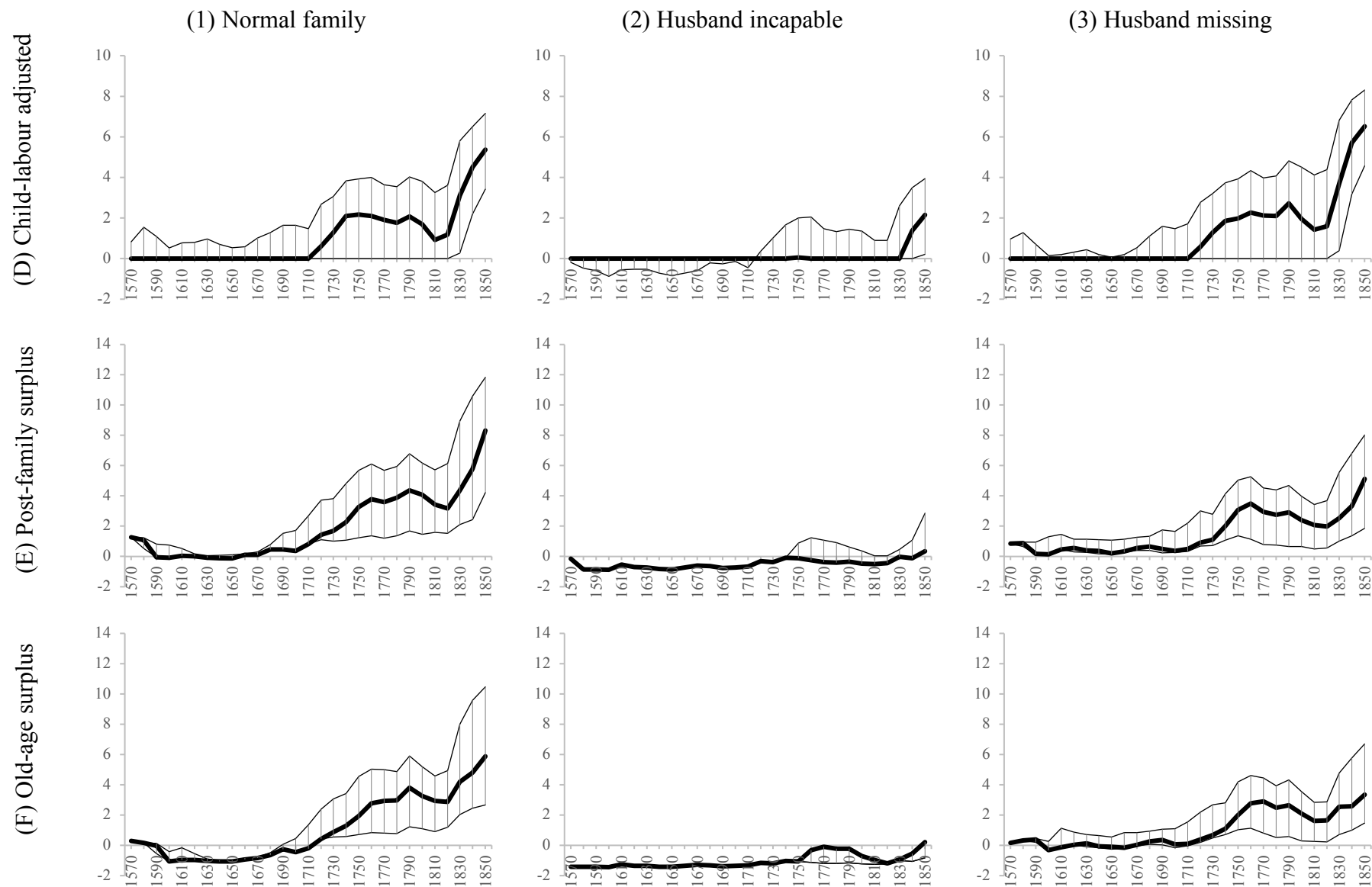


Figure 7, *cont'd*: Welfare surplus and child labour during the *family-peak*, *post-family*, and *old-age* life cycles, 1560s-1840s



Saving did change matters somewhat. For normal families (B1) and for families where the husband went missing (B3), saving alone meant that the average-sized family (bold line) was almost able to reach ‘respectability’ before 1700 and certainly thereafter. Only the largest families struggled to meet the ‘respectable’ goal all the way up until 1830. Families of incapable husbands (B2), with the exception of the smallest ones after 1710, could not obtain ‘respectability’ even after adjusting for pre-marital savings. A clear picture is emerging from these graphs to suggest that very large families alongside families with husbands unable to work endured severe difficulties in reaching a decent standard of living as late as a few decades into the 19th century. The remaining working-class families on the other hand did well in this regard after 1700.

The difficulties of the struggling families reappear in the form of child-labour needs (Panels C1-C3). As in the comparable Figure 5 above, child labour inputs declined across the board as the 17th turned into the 18th century. Yet, Panel C2 shows that the pre-1700 child-labour needs were massively larger among families of incapable husbands, often twice as large as those in normal families (C1) and families where the husband was missing (C3). The post-1700 patterns of child labour requirements are equally interesting. Families of incapable husbands saw a strong recurrence of child-labour needs in the latter half of the 18th and early parts of the 19th centuries, contributing to the spikes in child labour observed in the numerous historical analyses cited above.

It was not just among the less fortunate families that 19th-century children had to labour. The larger range of the normal families (the upper-bound line in Panel C1) also had to send all able-bodied children to work for up to 50-60 days each year to earn enough for a ‘respectable’ living. The growing use of child labour during the latter half of the 18th and early part of the 19th centuries is rooted in swelling family size in this period, especially among the largest families. For example, the average-sized family increased its number of births by one child on average between 1760 and 1820 (Figure A3). But families whose size was the average plus 1.96 times the standard deviation grew more than

twice of that, that is, by almost two and a half children, during the same period. This explains their increased need to expand family earnings compared to an average-sized family.

The historical record suggests – consistent with our model’s predictions – 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 when these were sufficiently large, as the model shows. Indeed, many children laboured alongside relatively well-remunerated mothers and fathers, for instance in coal mines and cotton factories (Horrell and Humphries 1998).

The child-labour adjusted surpluses, reported during the *family-peak* life-cycles in Panels D1-D3, show that normal families alongside families with missing husbands were able, when assisted by their children’s labour inputs, to reach a ‘respectable’ standard of living regardless of their family size. Here, an important note is that large families have larger supplies of child labour, explaining why they are not additionally set back compared to their smaller counterparts. Equally, it is worth noting that families of missing husbands are roughly on a par with or even sometimes performing slightly better than standard families (compare D1 to D3), a situation that arises because a missing father neither procreates nor consumes. Families of incapable husbands (D2) fared significantly worse than the two other family types, with childless couples and very small families actually being worse off than their larger counterparts, circumstances caused by the fact that children were not there to help their mother support their father.

We close by considering living standards beyond the three child-rearing cycles checking to see if and when poor relief was needed later in life among the three family types. Normal families alongside families where the husband went missing, leaving only the wife, enjoyed considerable

improvement in their living standards after the turn of the 18th century. This is captured by Panels E1 and E3 showing the *post-family* life-cycle, as well as Panels F1 and F3 showing *old age*. These gains were enjoyed by small, average, and large families alike, all of which witnessed substantial growth in their surplus in their last two life-cycles. However, family size left indelible footprints on the post-family living standard. Small families (the upper-bound lines) were able to amass greater surpluses later in life compared to their larger counterparts (the lower-bound lines) helped by larger carry-over surpluses from previous life cycles. The graphs also clearly suggest that the Poor Law was certainly relevant for the families of incapable husbands (Panels E2 and F2). Very small families of this type with few or no children (the upper-bound line in Panel E2) could barely attain ‘respectability’ during the latter half of the 18th and first half of the 19th centuries. Larger such families, both during the *post-family* cycle and even more so during *old age*, would have struggled significantly to make ends meet, especially in the first parts of the 19th century.

On a final note, the evolution in standards of living shown in Figure 7 witnesses to a changing society with potential implications for family planning decisions. Before 1700 and in the absence of poor relief, couples would have had to rely on transfers from their children in order to avoid old-age poverty. In principle, this required children not only to work at young ages to help support the family but also to help sustain their parents later in life. In practice, the Poor Law and negotiated transfers may have muted this effect (van Zanden, Carmichael, and de Moor 2019). But the necessity for dependence on inter-family transfers clearly changed around 1700, when parents were able to support themselves and could even transfer money to their children. As the model shows, parents fared better in terms of surpluses across their life-cycles (and certainly during old age) the fewer their offspring. This could be seen as a factor motivating the transition towards lower fertility starting later in the 19th century as well as potentially freeing resources for investment in the next generation’s human capital.

In sum, the qualitative conclusions drawn for the baseline case – that an intact working-class family of average size was able to secure a ‘respectable’ living from the 18th century on without the use of child labour and poor relief – are robust to using more empirically-based demography. Broken or very large families were however not as fortunate, and their circumstances help understand the expansion of child labour and recourse to Poor Law support during industrialisation.

Conclusion and Discussion

Our empirical investigation presents the first study of family living standards across the life cycle for pre-modern England and casts new light on the labour inputs of women and children that were required to maintain a ‘respectable’ material existence.

Previous work has, either 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 single earner employed ‘full time’ (that is, for 250 days per year) at all ages and over the complete family life-cycle using long-run series of casual wage-rates. Abandoning these doubtful 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 more realistic and representative wages, 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 these 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 (Seebohm Rowntree 1901; 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, largely 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 example of a less fortunate family in which the husband was unable or unwilling to support his family at the level assumed vividly illustrates the misery and hardship faced by families with men who fell short of breadwinner standards.

Insufficient demand was also 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 equivalent to the 19th-century boom in children’s work that our advanced model predicted was

needed to make ends meet. Indeed, regional differences in the demand for child labour may have encouraged the vast growth of population from in-migration experienced in England's industrial regions. Further research is needed on whether under- and unemployment prevented families from reaching the material standards that we have shown were otherwise possible and whether geographical mobility was a response to labour market conditions.

The reverse of under- and unemployment is a booming labour market and heightened *industriousness*. 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 satisfied with the diet and comforts offered by the goods contained in Table A1. Acceptable standards drifted further and further away from the contents of the ‘respectability’ basket. The chronology of this divergence and its role in family labour supply and the evolution of living standards emerges as the next topic for economic historians’ attention.

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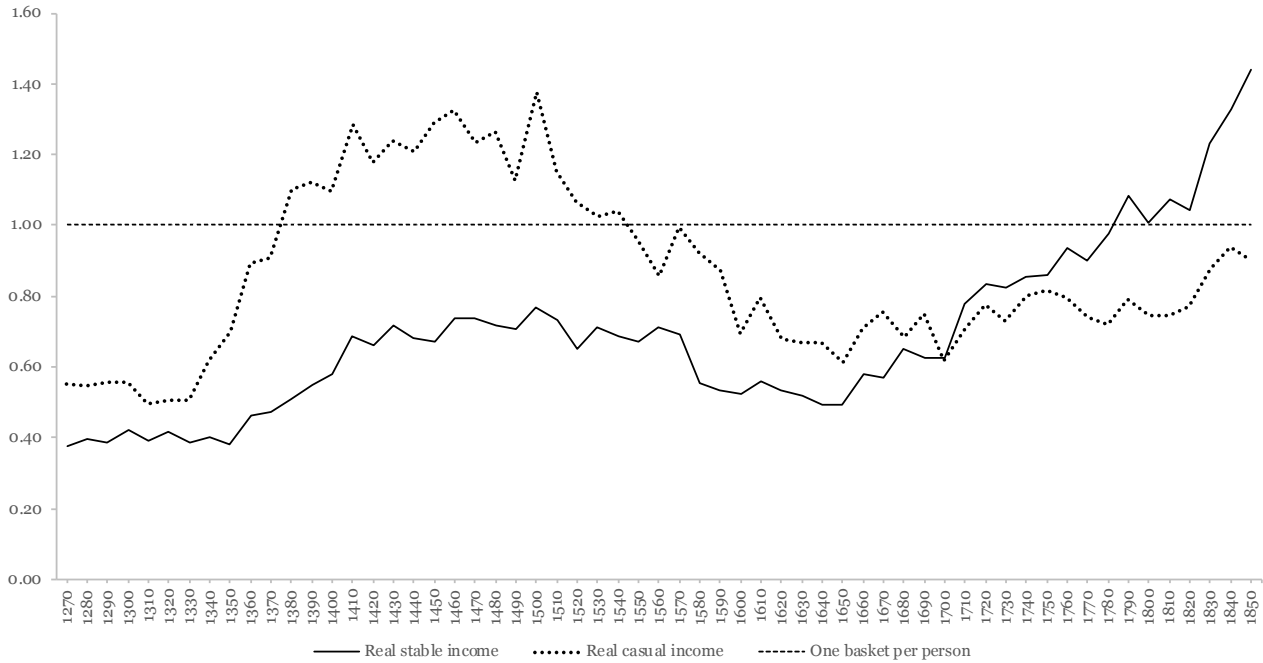
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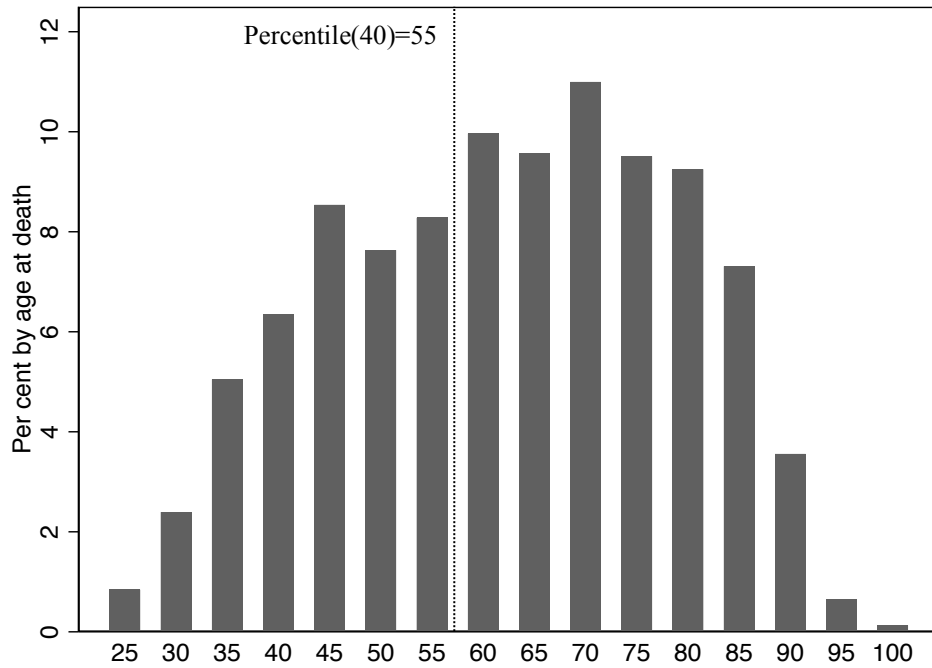
Online Appendix

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



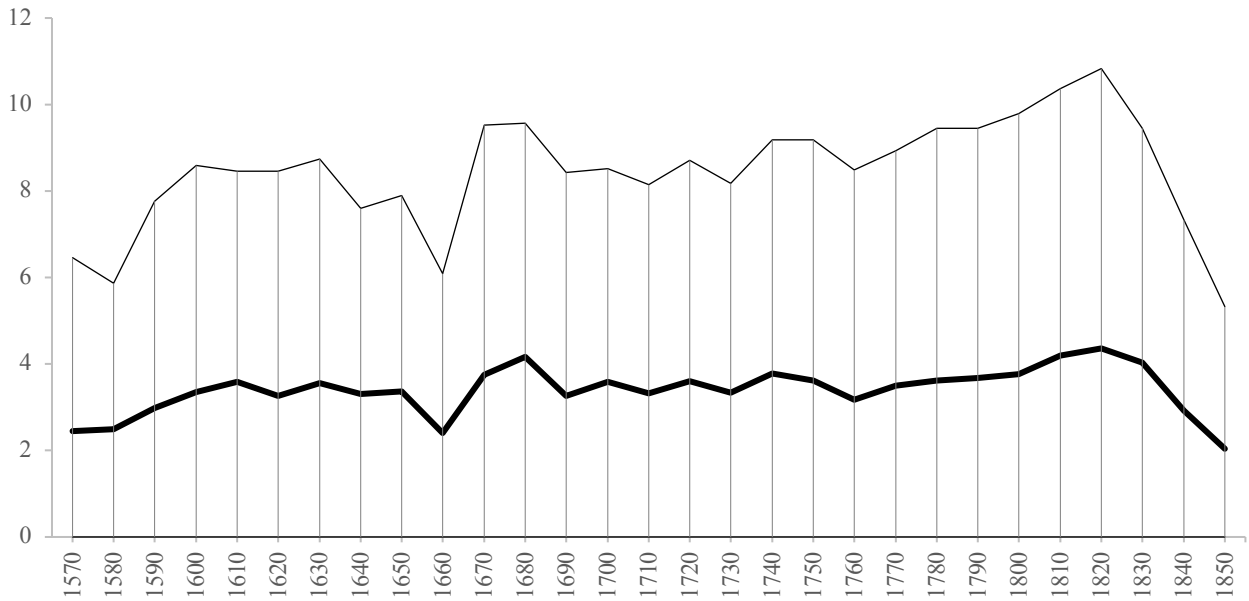
Notes: Each year refers to a decade, so 1270 means the 1260s. Casual income is computed (as conventionally) by multiplying the daily wage rates by 250 days per year. Stable income is simply the annual wage rate. Nominal income in both scenarios are divided by three times the cost of Allen's 'respectability'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

Figure A2: Frequency of husband's age at death



Notes: The graph shows the frequencies of age at death in five-year bins. Age at death of the husband is conditional on the wife surviving beyond the age of 55, so surviving until all children have reached 15 year of age. Forty per cent of the sampled husbands did not live beyond 55 years of age. *Source:* Cambridge Group's Family Reconstitution Data (Wrigley et al 1997).

Figure A3: Number of births on average and in very large families, 1560-1850



Note: Each year refers to a decade, so 1570 means the 1560s. The numbers of birth are computed for families in which the wife and husband both survives until the age of 55, thus completing the *old-family* life-cycle. *Source:* Cambridge Group's Family Reconstitution Data (Wrigley et al 1997).

Table A1: 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).

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 Hannah North, age John North, age									Parents Hannah North, age John North, age									Parents Hannah North, age John North, age									Age at death			
	24 29	25 30	26 31	27 32	28 33	29 34	30 35	31 36	32 37	33 38	34 39	35 40	36 41	37 42	38 43	39 44	40 45	41 46	42 47	43 48	44 49	45 50	46 51	47 52	48 53	49 54	50 55	51 56	52 57	53 58	77 88
	Children (7 births in total) Elizabeth, age Jane, age Anne, age Martha, age George, age Louisa, age John, age									Children (7 births in total) Elizabeth, age Jane, age Anne, age Martha, age George, age Louisa, age John, age									Children (7 births in total) Elizabeth, age Jane, age Anne, age Martha, age George, age Louisa, age John, age									>15 0 30 18 >15 >15 Max 5			
	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	
	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	
Labour input	Parents Hannah North, days per year John North, annual									Parents Hannah North, days per year John North, annual									Parents Hannah North, days per year John North, annual												
	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	50 All	100 All	100 All	100 All	100 All	100 All	100 All	100 All	100 All	100 All	100 All	Max 4
	Children Elizabeth, able (o/1) Jane, able (o/1) Anne, able (o/1) Martha, able (o/1) George, able (o/1) Louisa, able (o/1) John, able (o/1)									Children Elizabeth, able (o/1) Jane, able (o/1) Anne, able (o/1) Martha, able (o/1) George, able (o/1) Louisa, able (o/1) John, able (o/1)									Children Elizabeth, able (o/1) Jane, able (o/1) Anne, able (o/1) Martha, able (o/1) George, able (o/1) Louisa, able (o/1) John, able (o/1)												
	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
	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		
Caloric needs	Parents Hannah North, calories John North, calories									Parents Hannah North, calories John North, calories									Parents Hannah North, calories 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	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 Jane Anne Martha George Louisa John									Children Elizabeth Jane Anne Martha George Louisa John									Children Elizabeth Jane Anne Martha George Louisa John									Max 13600 5.4			
	800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500	2350	2500	2350	2500	2350	2500	2350	2500	2350	2500	2350	2500	2350	2500	
	5000	5800	5750	6700	6775	6825	7850	7950	8300	9375	9600	10975	11300	11700	12375	12950	13600	12425	12875	13600	11625	12125	10025	10425	10825	8625	8900	9200	6850	7000	
	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	

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	1,075	43%
5	1,150	46%
6	1,225	49%
7	1,325	53%
8	1,450	58%
9	1,550	62%
10	1,700	68%
11	1,850	74%
12	2,000	80%
13	2,175	87%
14	2,350	94%
15	2,500	100%