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Abstract

We provide a framework for considering the living standards among intact and disrupted working-class families of various sizes in historical England. We estimate family incomes without resort to the usual male day wages and ahistorical assumptions about men's labour inputs, instead using approximations of their annual earnings. We incorporate women and children's wages and labour inputs and use a family life-cycle approach which accommodates consumption smoothing through saving. The analysis extends to families with often overlooked but historically common structures: widows with their children, deserted wives, and families which include husbands/fathers but ones unable or unwilling to work. Our framework suggests 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, broken, and disrupted families depended on child labour and poor relief up until 1830.

Introduction

The secular evolution in human well-being, traditionally measured by male workers' real wages, has been the subject of scholarly debate for decades if not centuries. However, from its beginning to the present day, the debate suffered from two major shortcomings. The first weakness is that investigations associated family income with the *husband's* earnings (for example, Allen 2009, Clark 2007).

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These were indexed according to *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). Worse still, family incomes were identified with these male earnings *alone* implicitly assuming away any contributions from other family members. 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, Horrell and Humphries 1990; Berg 1993, 1994; Tuttle 1999; Sharpe 1996; Burnette 1999, 2004; Honeyman 2007; Humphries 2010; Humphries and Weisdorf 2015; Horrell and Humphries 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 a representative and intact family's economic situation at one particular stage in its evolution over time, namely when its size peaked. Long-run accounts of living standards during other stages of the family's life cycle and among families of varying structures and sizes have received little attention (exceptions are Schneider 2012, De Moor and Zuijderduijn 2013, and Boter 2020). Not only does this focus fail to grasp the variegated nature of pre-modern hardship comparing intact with fractured families and smaller with larger ones, it also 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 charity or poor relief when the major provider of a family's income, normally the husband, ceased 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 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

considering a variety of family structures alongside the labour inputs of women and children that it becomes possible to assess family living standards in the past more accurately and to answer questions about the identities and circumstances among working families.

This article takes a fresh look at the standard of living debate, spurred in part by newly-available empirical evidence on wages which enables these core shortcomings to be addressed. Thanks to recent archival work, we now have a wage series for unskilled working-class males employed on long-term (stable) contracts, which as explained below solves many of the problems with the traditionally-used day wages of casual workers (see Humphries and Weisdorf 2019). We now also have information on the payments made to unskilled working-class women and children across 600 years of English history, both on stable and casual contracts, from before the Black Death through to the classic years of the Industrial Revolution (Humphries and Weisdorf 2015; Horrell and Humphries 2019). This new empirical evidence means we can escape from dependence on the standard but in certain aspects flawed wage series on which other authors rely, instead offering more complete, detailed, and fit-for-purpose evidence with which to ascertain family material welfare.

Our approach is needs-based. We combine the recent estimates of wages to provide a pioneer account of the amount of paid labour that working-class families in a variety of different circumstances needed to provide and obtain in order to rise above subsistence and attain 'respectable' living standards. We ask how much unskilled working-class families of various sizes and structures 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 the widely-used historical cost-of-living indices, provided by Allen (2009), enables us to deduce how much income was required and so needed to be earned by the members of the household in order to achieve a 'respectable' standard of living. On this basis, we follow the approach in Allen and Weisdorf (2011), which asked how many days of work were needed each year for a male worker to provide

a 'respectable' family level of consumption, though here comparing *family* earnings with these consumption requirements. We use historical evidence to determine how much women at different points in the life-cycle could contribute to household earnings, and then proceed to ask how much children had to work, in order for an average family to subsist at this level.

Our analysis suggests 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 and the time required to transform the commodities purchased with wages into the consumables that delivered living standards. Methodologically, we deal with this via a life-cycle scheme. Our baseline scenario follows a long-lived, average-sized 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 baseline 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 long-lived, average-sized pre-modern working-class families had to rely on child labour, alms, or poor relief.

Our conceptual interventions revise the mainstream account of living standards in pre-modern England in a number of ways. Our baseline model describing a stylized 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 wage 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 attain a 'respectable' living. On top of that, couples still faced poverty

at the end of their lives and without charity or poor relief would have suffered during old age.

With the turn of the 19th century, child labour appears no longer needed for this working family of average size to reach a 'respectable' standard of living. Couples' inability to cover their expenses after their children left home also gradually became less severe and faded among average-sized, intact families where both man and wife were able and willing to earn at the prescribed rates. However, this putative family is extremely fortunate. Its average size was limited and children's births all manageably spaced. The husband and wife both enjoyed good health and survived into old age. They remained capable of regular work and never suffered from under- or unemployment. This family led a charmed life.

In reality, such smooth sailing was unlikely. Individual and personal vulnerabilities were matched by existential threats. Macro-economic circumstances ebbed and flowed, with unlucky cohorts struggling to secure employment or earn a living. Technological change rendered hard won skills redundant (de Pleijt and Weisdorf 2016) and threatened whole occupations resulting in unemployment and loss of family income. Military campaigns pulled men from their families and disrupted support. The commonly-used assumptions protect the stylized family from these potential problems and more, making their living look excessively rosy. They certainly appear inconsistent with certain grim features of early modern historical experience, for example, the boom in child labour during the Industrial Revolution (Horrell and Humphries 1995; Tuttle 1999; Honeyman 2007; Humphries 2010, 2013) and the simultaneous skyrocketing expenditures on poor relief (Arkell 1987; King 2000; Lindert 1998; Newman-Brown 1984; Wales 1984; Williams 2005).

In attempting to accommodate the broader variation in the living conditions of historical working families, we perform a more advanced study for the years 1560-1850 when we have access to detailed family structure data from Wrigley et al (1997). We introduce historically accurate patterns of births to see if rising birth

rates and large families prompted the need for more child work and poor relief than predicted in the baseline analysis of the typified family. We 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 unwilling to work or unable to find any, eventualities with strong historical resonance. These variants emphasise the significance of moving beyond the traditional use of average-sized and intact families when exploring historical living standards.

With more realistic demography and a wider variety of family structures, our estimates show that 19th-century child labour was often necessary, even among healthy and long-lived couples when there were many mouths to feed. Poor relief was also 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 those families who were dependent on children's earnings better opportunities and might in this way have contributed to the significant internal migration of these decades (Shaw-Taylor and Wrigley 2014).

Wages, life-cycles, family structures, and 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, throughout, we use the wages earned on long-term contracts. Workers on long-term contracts, which we denote *stable* workers, made up a substantial fraction of the unskilled male workforce depending on the period of observation (Humphries and Weisdorf 2019). 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 incomes, an assumption underpinned by arbitrage, that is the willingness

and ability of both workers and employers to substitute between types of employment 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 et al 2020). 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 as a result the wife was 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). Children's labour inputs are endogenized in our later analyses, as we explain further below.

The Life Cycle Model

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 late 19th- and early 20th-century investigations of the extent and incidence of family poverty (Rowntree 1901). The waged-labour activities of the six life cycles are detailed further below. To begin with, 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.

For our baseline analysis, and before we draw on fertility data to model the pattern of births, we require assumptions about family size and the spacing of births. The latter is necessary to demarcate the length of the parenting period and to identify when children were able to participate in waged labour. To this end, we follow Allen (2015) and assume the family consists of two adults and three children spaced five years apart or roughly twice as long as the average spacing observed among early-modern English couples (Cinnirella et al 2017). Since here 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 financial burden. We relax both these assumptions later on, where we introduce evidence of actual family sizes from Wrigley et al 1997.

The six life cycles look as follows. The first cycle begins with independence at the age of fifteen. It ends when a marriage is contracted, which was usually around age twenty-five (Boberg-Fazlic et al 2011, Figure 5). We refer to this stage as *youth*. During *youth,* we assume that the man and woman are both employed full-time and reckon their yearly earnings according to the prevailing annual wage to

avoid distorting assumptions about the length of the working year as explained above. After marriage, the wife reduces her wage labour to accommodate childcare and domestic work (see Humphries and Weisdorf 2015). We assume that married women work for wages 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 the evidence that married women worked 53 days in the year at Chalvington, Essex in 1441 (Mate 1999, p. 30-31) 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 begins to shrink. Since there were normally no further births during this last decade of parenting, we assume the wife can increase her casual labour input from one to two days weekly, participation that she maintains during the subsequent (and fifth) *post-family* stage (age 55 to 65), when all children are assumed to 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 and their alleged adult labour inputs, 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. To simplify further, 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 also assume there is no borrowing.

Consumption needs

The last piece of the model concerns the family's consumption needs. For now, in order to appreciate how the life-cycle model functions, the baseline family containing two adults and three children is employed. This family starts off comprising just the husband and wife, then grows to its peak size as children are born, and finally shrinks as adolescents leave home. 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 families of different types.

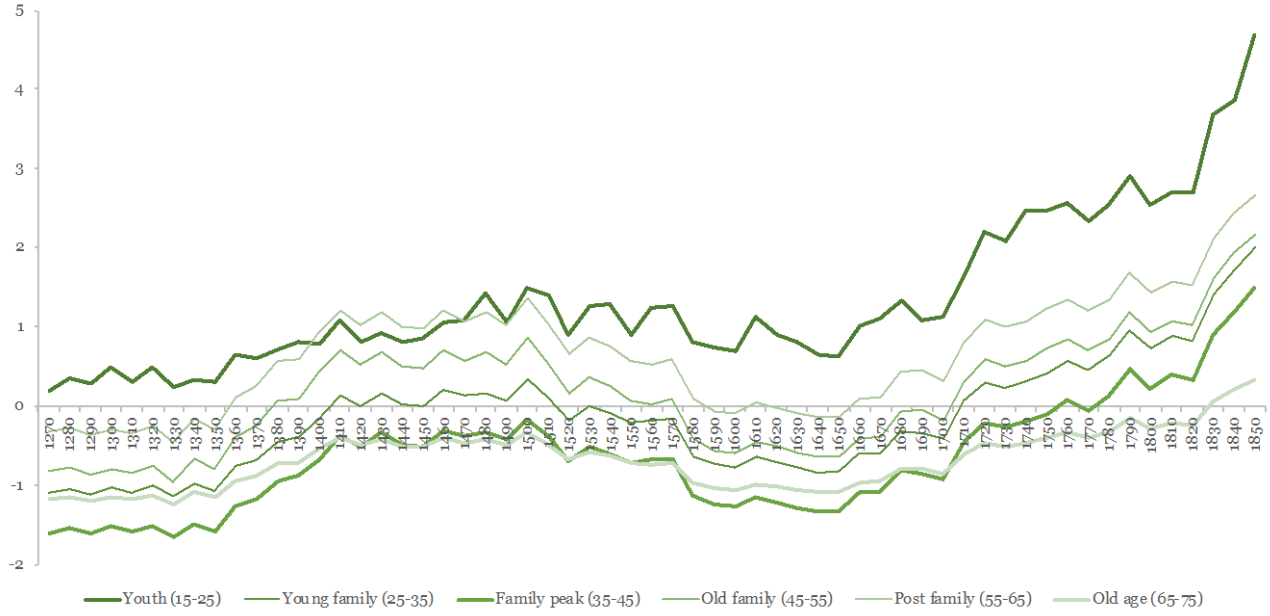
In order to assess a family's total consumption expenditures, we use the now standardised 'respectability' consumption basket as proposed in Allen (2015). Allen's alternative standard – the 'bare-bones' basket is designed for mere survival and could not sustain the physically-demanding work undertaken by our household members, nor would it allow any surplus to cope with the exigencies occurring intermittently in a typical lifetime. The 'respectability' basket provides basic consumption goods: food of a specific caloric value, clothing, heating and housing, all described in Table A1 in the Online Appendix alongside the quantities purchased. The commodity's prices, used to calculate the annual costs of the family's total consumption, are taken from Allen (2009, 2015). Adults are each assumed to consume a whole consumption basket, children just one half, totalling 3.5 baskets for the whole family at its peak.

The baseline analysis

We now track the welfare ratio of our baseline family during each of its six life-cycle stages, decade by decade, across our nearly six centuries of observation, 1260-1850, remembering its persistent good fortune all the while. We first explore the couples' *net surplus*, that is the consumption potential of their earnings after

their own needs have been met, in each life-cycle stage and decade. 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. If earnings are insufficient to cover 'respectability' consumption, since no borrowing is allowed, families must retreat towards a 'bare bones' standard, or raise the contributions from members persuading them to work longer and harder as discussed below, or have recourse to alms or poor relief.

Figure 1: 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).

Figure 1 shows the couple's *net surplus* in each of the six life-cycle stages under investigation, from when they became independent at the age of fifteen up until their death at the age of 75. Recall that the woman works full-time (that is, for an annual wage) during her *youth*, the first life-cycle stage, but moves into casual employment thereafter, when she works 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 can be purchased by the net surplus 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 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 counterparts. 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 more important in terms of improvement.

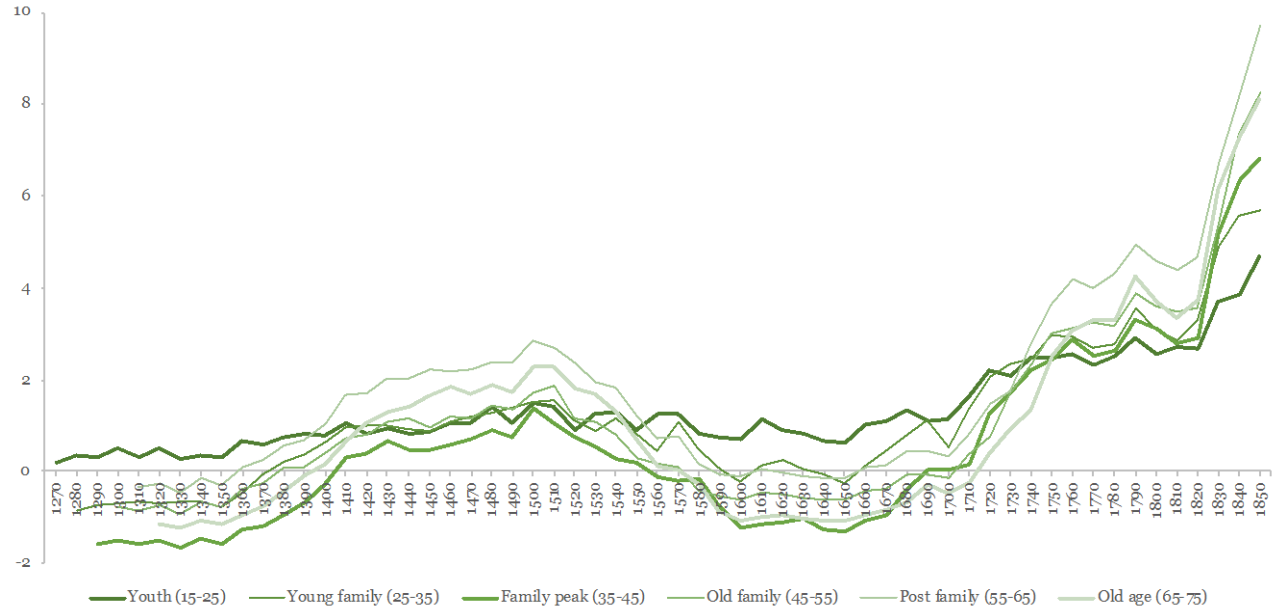
The remaining trajectories trace the surplus after deducting the consumption needs of the whole family in each of the ensuing stages over the whole timespan. They follow roughly similar trends to the one relating to *youth*, but the levels differ substantially. Pre-Black Death couples all fell short 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), a 'respectable' living could not be assured without the help of past savings, charity, 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 alters the picture.

Introducing savings

The numbers in Figure 1 above represent the *instantaneous* surpluses and deficits of our stylised family during its different life-cycle stages. 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? Borrowing is not countenanced so deficits in any period can only be met with additional labour inputs. Figures 2 and 3 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.

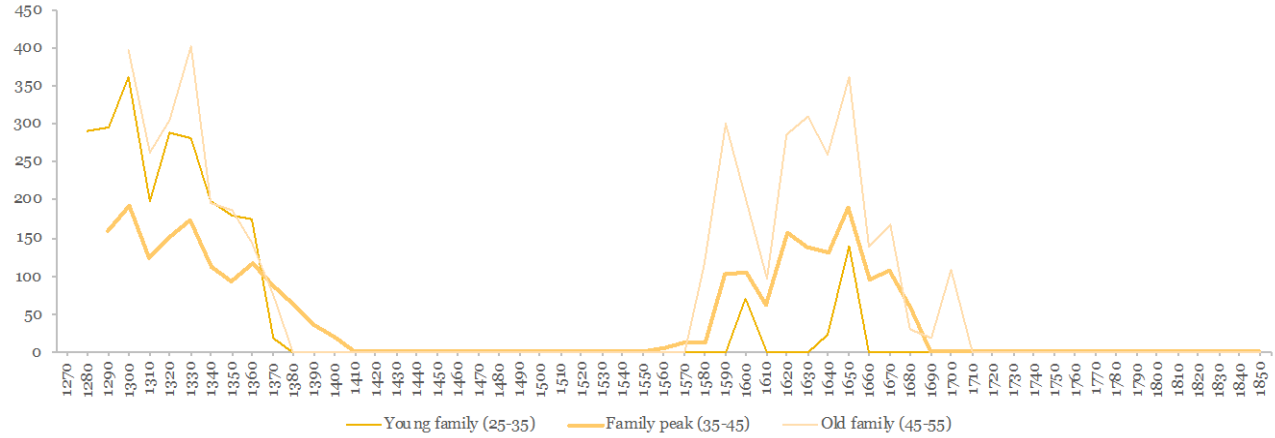
Figure 2 makes clear what Figure 1 suggested, namely that the pre-Black Death period and the 17th century were hard times when child labour, charity or, for the later period, poor relief was needed. The introduction of savings improves the picture, especially when times were comparatively good. For example, 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 1 and 2). 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 or charity was required.

Figure 2: 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 3: 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 2 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).

Were 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.

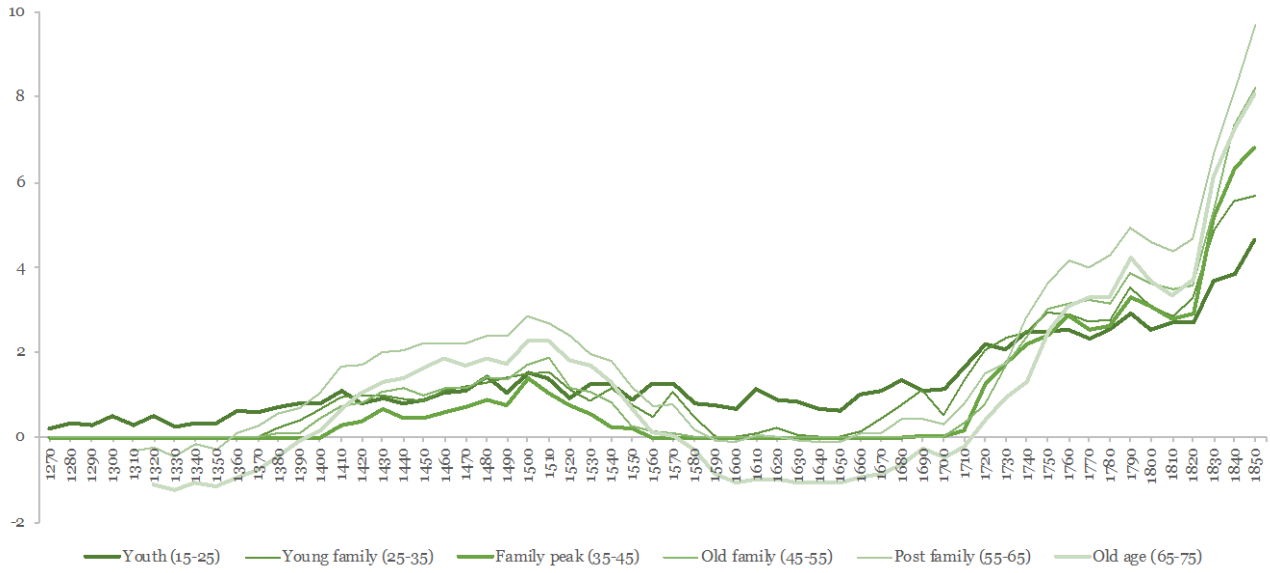
The cash component of wages was usually due annually, but many employers retained it as a credit to the servant often accumulated over many years (Kussmaul 1981, pp. 38-9; Muldrew and King, 2018). These credits might be commuted into keep for livestock and final settlements offset against the rental 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 also 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 the earliest times to finance old age. In medieval England, some parents passed land, farms, and equipment onto their children on the understanding that they 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 beneficiary (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 4: 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 also commonly pursued an 'added worker' strategy in which children were central (Horrell et al 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 3 above gives an answer. The graph shows that all resident children between the ages of five and fifteen sometimes needed 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). The

explanation for this seeming anomaly is that more children were resident at home during the family peak and could share the work required. Further, as long as savings were possible (Figure 2) and parents were present and working and earning as prescribed above, child labour was *not* required for a 'respectable' living during the most of the 15th-16th or 18th-19th centuries. Remember however that our focus thus far is on a family of average size and where both parents were willing and able to provide the support assumed. As will become apparent, the findings just described are conditional on this family structure.

Conditionality also applies to our conclusion concerning the couple's accumulated wealth *after* adjusting for the child-labour contributions given in Figure 3. Figure 4 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. However, we reiterate that this was a fortunate and long-lived couple. In reality, a very high proportion of people suffered widowhood, often repeatedly if remarriage occurred, during their lifetime (Erickson 1993; Moring and Wall 2017). We turn to this commonplace occurrence of family disruption below.

Even for this healthy, long-lived couple, in hard times old-age poverty was acute. During the punitive 50 years from 1600 to 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 (Rowntree 1901; Thompson 1991; Lees 1998; Thane 2002). Even after a lifetime of prudence and economy, and several centuries of economic growth and development, the elderly could not hope to live respectably. Though barely visible from the graph, during the 17th century the *post-family* years (aged 55 to 65) could also be times 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 this family, blessed as it was in terms of size and structure, 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 that adult members behaved as assumed. Parents needed not only to survive through all stages of the family life-cycle but also to be able and willing to work at the rates suggested. There is no room in this analysis for parental morbidity or mortality. Nor for absence, alcoholism, idleness, disability, un- or underemployment, or mere bad luck. Such an untroubled family life would have been extremely unusual in medieval and early modern England. Death frequently robbed children of a father's support. But mortality was merely one source of failing support for, even if yet living, fathers were sometimes unable or unwilling to shoulder the role of breadwinning: they fell ill or became injured, they enlisted in the army or were pressed into the Navy, they were idle or drunken, or simply unable to find jobs. In extreme cases they absconded (Snell 1985; Kent 1990; Humphries 1998; Bailey 2003; Humphries 2010). The next section captures the blight that these common crises cast on family wellbeing.

Towards Greater Realism

Contemporary accounts and numerous historical analyses demonstrate 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). These developments do not chime with our relatively optimistic findings. The reasons are obvious. They lie in the

protection from the harsh realities of early modern life that our assumptions afford. Greater demographic realism and a broader perspective on family types is needed to capture the experiences of large, stressed and even broken families and the effects of these common circumstances on the evolution of family living standards.

Our baseline model held family size constant at two adults and three children throughout time, clearly an unrealistic assumption in the era of rising rates of population growth that preceded the Industrial Revolution. Indeed, family size not only increased, but 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 in family-specific dependency ratios created large disparities in family standards of living. Our baseline model also assumed that mothers and particularly fathers, who provided the lion's share of family income, were present and able and willing to work and earn throughout the family life cycle. In historical reality, families did not remain intact, both mothers and fathers died or disappeared and even if they remained resident were not always competent or willing contributors to family income. In short, family structure and functioning varied around the robust performance of the baseline case also creating large disparities in living standards.

More realistic demographics are introduced into the life-cycle model using the Cambridge Group's *family-reconstitution* data (Wrigley et al 1997). This data is available from 1541, enabling a detailed assessment of the variety of household experience to be explored. We consider how family size and numbers of dependent and working-age children evolved, exploring these empirically-based demographic trends in combination with less idealised and more realistically fragile family structures. Specifically, we explore three possible historical scenarios, in each case combining the more grounded demographics with a distinct and historically common family type. The first tracks a family that like our fortunate baseline case remained intact with the wife and husband able to earn as assumed but with dependency rates following those observed historically. The second considers a less

fortunate family in which the husband/father does not contribute to family income either because he could not find employment or because he was unable or unwilling to work. The third focusses on a family where the husband/father is missing either because he has died or because he has abandoned his children and their mother before or after marriage. These scenarios capture the varied and often dismal experiences of labouring families in early modern England.

The pioneering work of the *Cambridge Group for the History of Population and Social Structure* has reconstructed historical families in England, 1541-1871. We use the *family-reconstitution* dataset, documented in detail in Wrigley et al (1997), as the basis for our 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.

To trace our three types of family through their historical scenarios, we first selected a subset of data containing only 'completed marriages', that is where the wife and husband both survive until the end of the family life-cycles ensuring that fertility was not interrupted by mortality. 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 our family type is defined by a husband who while remaining resident within the family was unable to generate income after the marriage, decimating family earnings and forcing the wife to work full time. Our final scenario introduces a third family type, one headed by a woman, whether a widow with orphaned children or a family abandoned by the husband/father. In this case, we assume that the husband died or disappeared 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 featuring the still present but failed breadwinner, the lack of adult male support dramatically reduces family earnings and forces the mother to work full time. However, in this final case as the husband is no longer present, he neither eats nor procreates, which limits the damage imposed on the family budget compared to the second scenario.

To capture demographic realism, we computed the standard deviations of family size from the sampled reconstitutions and used these to predict the range of experience. An average 'completed' family in the sub-sampled data gave birth to somewhere between two and four children, so close to the baseline family of three children assumed in Allen (2015) and portrayed above. However, as Figure A3 in the Online Appendix shows, large families (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 contained no children. The standard deviation in family size enables us to calculate and graph the 95 per-cent confidence intervals for the various measures of family living standards originally displayed in Figures 1 to 4 above.

How many actual English families are covered by our analysis, that is, were working-class and one of the types defined above? While this question is difficult to answer exactly, we can get a rough idea on the basis of a combination of the overall composition of English families by social rank and information about family types contained in the *family-reconstitution* dataset and other sources. Sources for the general population collected and reported in Boberg-Fazlic et al (2011, Figure 9) found that labouring families represented almost half of all English families during the period of observation. Meanwhile, Allen's recent reworking of the social tables of King, Massie and Colquhoun suggest that this is an underestimate (Allen 2016). Families in his consistently coded 'Workers' category (conservatively excluding both cottagers and paupers below and lower

middle class above) make up 56 per cent of all families in 1688, 56.4 per cent in 1759 and 61.1 per cent in 1798.

It is even more difficult to identify the proportions within this total represented by the different family types, but again we can offer some orders of magnitude. The CAMPOP data indicate that some 40 per cent of all husbands died before completing the family life-cycle, that is, before the husband reached 55 years of age (see Figure A2 in the Online Appendix).[2] Many of these men died after their children were grown but simulations of orphanage using CAMSIM (Smith and Oeppen 1993) suggest that some 16 per cent of working-class children lost their fathers before they reached age 14, and around the same proportion of working men and women who provided autobiographical evidence reported fathers' dying during their childhoods (Humphries 2010; Humphries 2021). Moreover, as explained above, families were deprived of adult male support for reasons other than death. The autobiographical evidence suggests that in a similar proportion of working families, fathers while yet living had disappeared or were resident but inadequate breadwinners (Humphries 2010; Humphries, 2021). Altogether, then, about a third of working families and almost 20 per cent of all families were of type 2 or 3 and fell short of the robust structure of our baseline case.

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

[2] Mothers died too at a slightly higher rates again presumably spread over the family life cycles. We have not considered motherless families as a distinct type on the grounds that they were more likely to be absorbed into other households or to be reinvented via remarriage and so represented by a modified version of the baseline.

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 because they died outside the period of observation. For our purposes, however, it is important only that 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 refine the analysis by computing the family's total calorie requirements and thus the income needed to purchase a sharper nutritional measure of '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 by age 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 following Allen (2015), 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.[3]

[3] 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

Table A2 shows how the total 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 full 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.

Following this example, 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 previously. Figure 5, 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 1 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 1.

A key difference to Figure 1 however is that we can now consider families that deviated from the archetypical one used above and by other authors 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

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.

surpluses or smaller deficits 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 (lower bound line in Panel A1). Larger families, unsurprisingly, often were in deficit to the tune of three to four respectability baskets if there was reliance on the parents' earnings only.

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 died or 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 no or fewer than average children, meeting the 'respectable' target was impossible without savings or contributions from children.

Figure 5: Welfare surplus and child labour during the *family-peak*, *post-family*, and *old-age* life cycles, 1560s-1840s

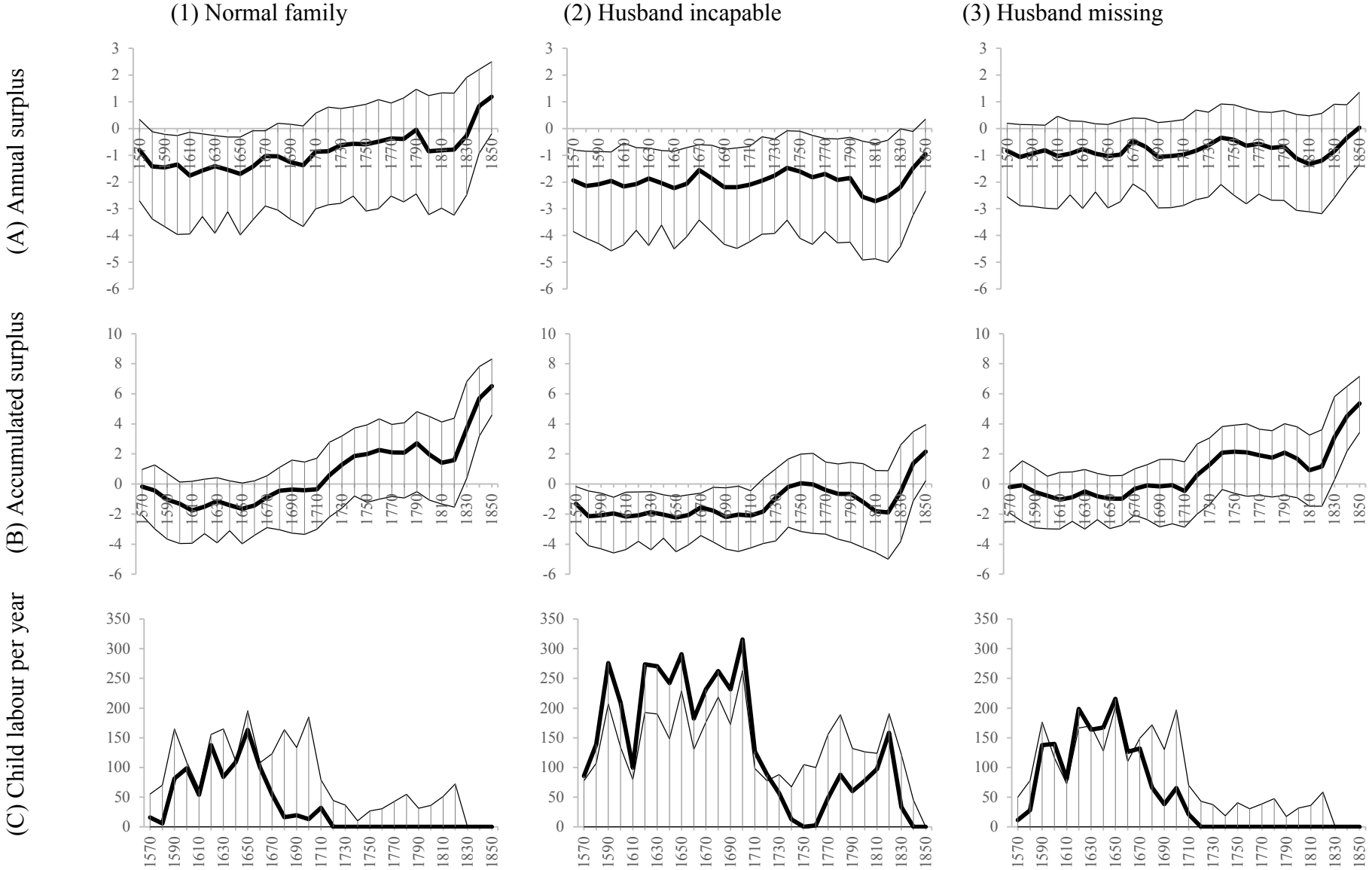
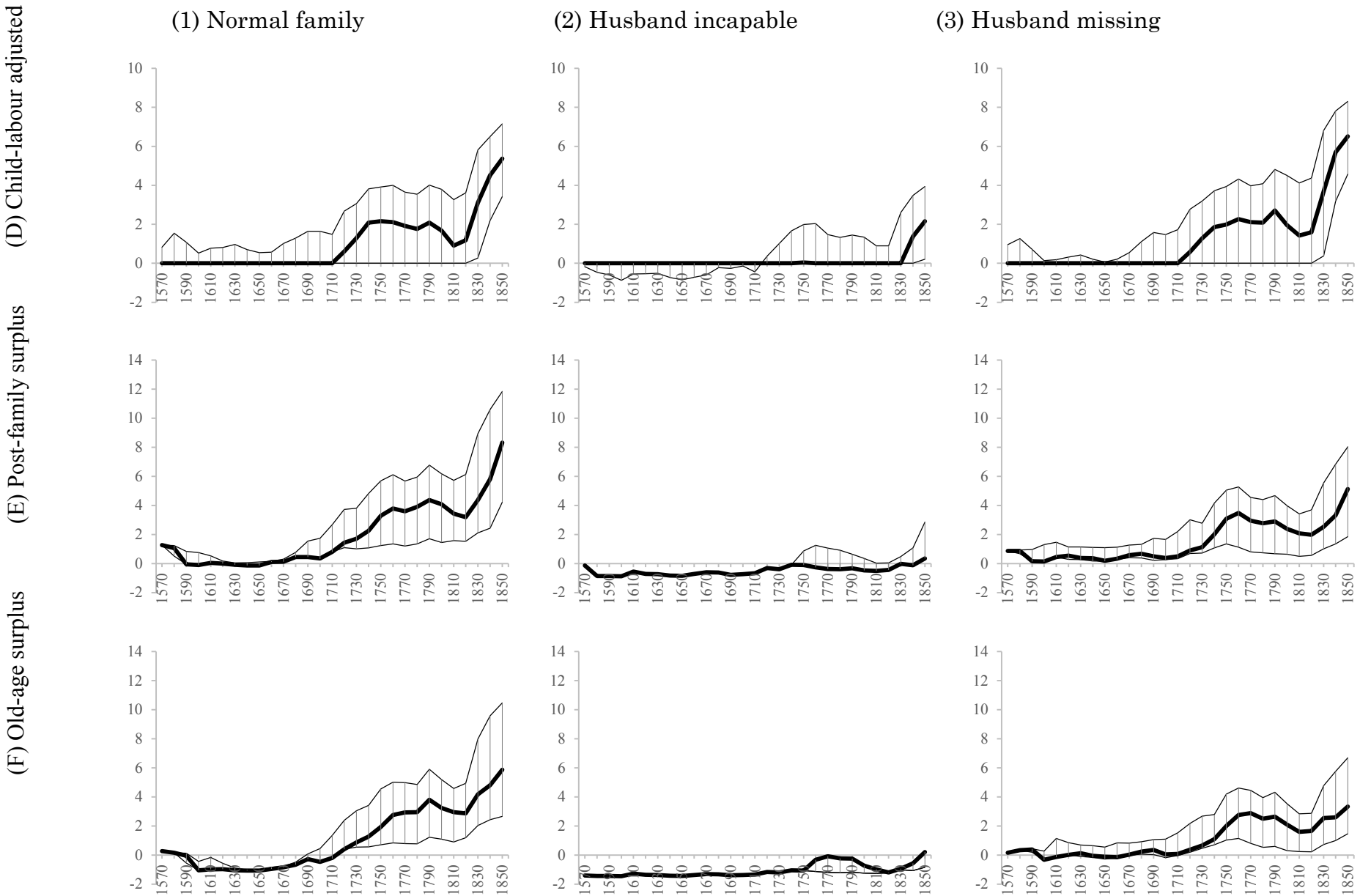


Figure 5, *cont'd*: Welfare surplus and child labour during the *family-peak*, *post-family*, and *old-age* life cycles, 1560s-1840s



Saving did matter. For intact families headed by competent men (B1) and for families where the husband had died or disappeared (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 or unwilling to work full-time year- round faced severe difficulties in reaching a decent standard of living even into the 19th century. Families in more favourable circumstances reached these standards about 1700.

The desperation of the struggling families reappears in the form of their reliance on child-labour (Panels C1-C3). As in the comparable Figure 3 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 intact families even with competent male heads (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 thus partly rooted in swelling family sizes, especially at the top end of the distribution. 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 that, that is, by almost two and a half children, during the same period. These enlarged sibsets illustrate in stark terms the need to expand family earnings compared to families with smaller numbers of children.

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, our analysis suggests that the child work force also included children from seemingly adequately-resourced two-parent families when family size was large. Indeed, many children laboured alongside relatively well-remunerated mothers and fathers, for instance in coal mines and cotton factories, tempted in these cases by high wages and rationalised by social norms (Horrell and Humphries 1998).

The child-labour adjusted surpluses, reported during the *family-peak* life-cycles in Panels D1-D3, show that intact 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, it is important to recognise 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 with missing husbands/fathers are roughly on a par with or even sometimes better off than standard families (compare D1 to D3), a situation that arises because a lost father neither procreated nor consumed. Families of incapable husbands (D2) fared significantly worse than the other two family-types. Paradoxically, in this group childless couples and very small families were worse off than their larger counterparts where older children could help mothers support both fathers and younger siblings.

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. Intact 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 indicate the relevance of the Poor Law 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 families, both during the *post-family* cycle and even more so during *old age,* would have struggled 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 5 bears witness 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 grown children in order to avoid old-age poverty, something hitherto undiscussed. In principle, this would have 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 then fared better in terms of surpluses across their life-cycles (and certainly during old age) the fewer their offspring. At the same time, men and women who had grown up in large families, where they had experienced competition for resources and pressure to work at younger ages, perhaps came to favour fewer children (Humphries 2007). These experiences maybe helped to motivate the transition towards lower fertility 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. But men and women who were unlucky, imprudent or particularly fertile ran the risk of heading big or fractured families with much less benign outcomes. Our framework shows that their circumstances help understand the expansion of child labour and recourse to Poor Law support during industrialisation.

Conclusion

Our proposed analytical framework and empirical investigation presents the first study of family living standards across the life cycle for pre-modern England. This casts new light on the roles played by the labour inputs of women and children required to maintain or even surpass a 'respectable' material existence.

Previous work has, either implicitly or explicitly, assumed a male breadwinner model with the husband/father as the single contributor reckoned to earn according to casual wage-rates but assuming 'full time' (that is, for 250 days per year) employment at all ages and over the complete family life-cycle and at the same time ignored or treated as marginal the contributions of women and children to household incomes and the living standards that they could purchase. 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 day wage, but whether with representative wages and more realistic labour inputs of women and sometimes children, families could attain respectable standards at different stages in the family life cycle and different points in English history. Shortfalls are then associated with the need for families to reach beyond their adult members and call on children to contribute.

In essence, our framework 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 model's 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 (Rowntree 1901; Thompson 1991; Lees 1998).

While much can be learned from our baseline case, we emphasized that it traces a rarefied experience, protected from the hazards of parental frailty, demographic remorselessness, macroeconomic volatility, international political turbulence and mere bad luck. We identified three historically common family types representing less providential experiences: families with many children; families whose husband/father was unable or unwilling to work at the intensity assumed; and, families whose husband/father had died or disappeared. Following such families through their life cycles and over time, explains much about the persistence of poverty, indeed its intensification in particular circumstances.

By placing the family with its various members rather than just the husband 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 exemplar of the 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 observed in our analysis. 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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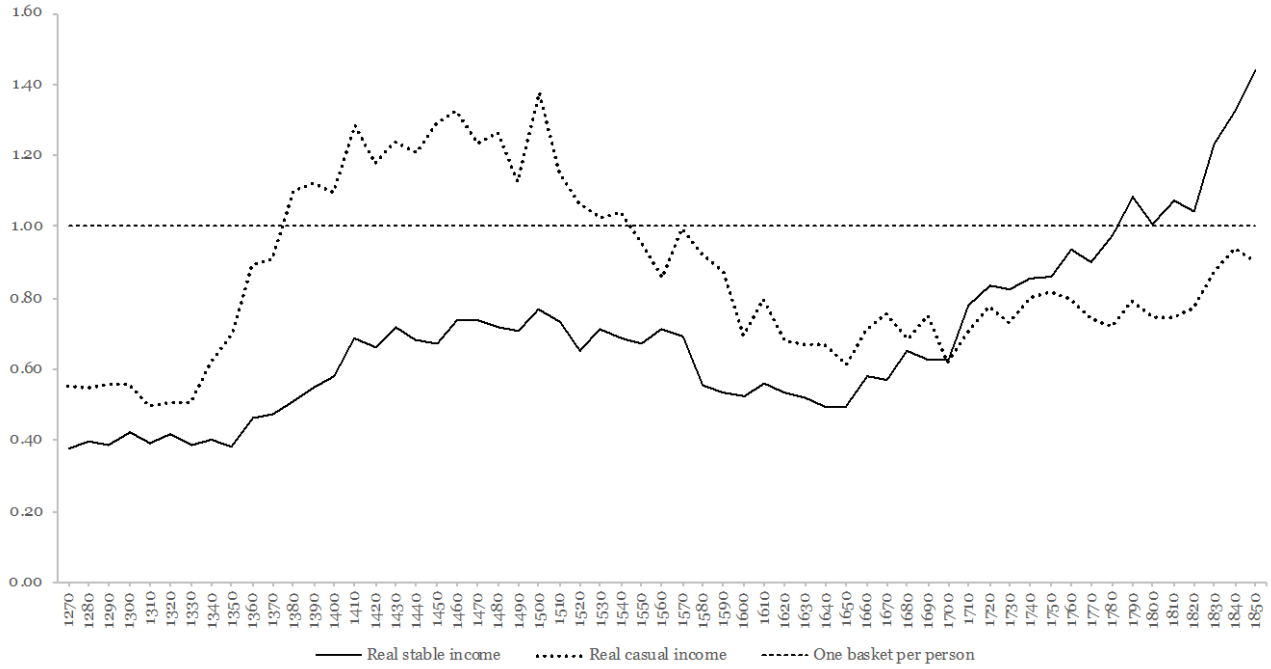
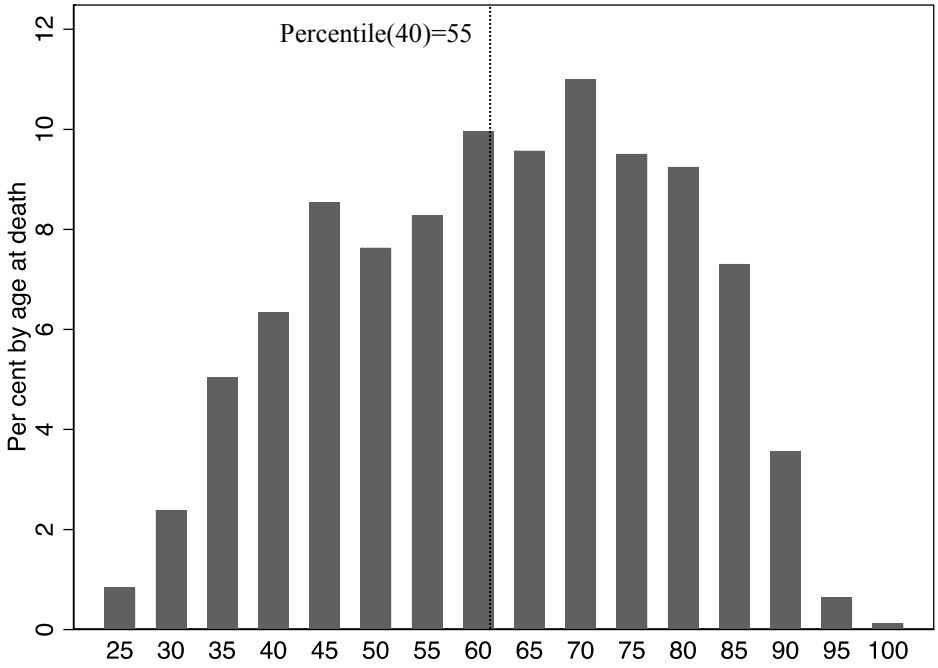
Online Appendix

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



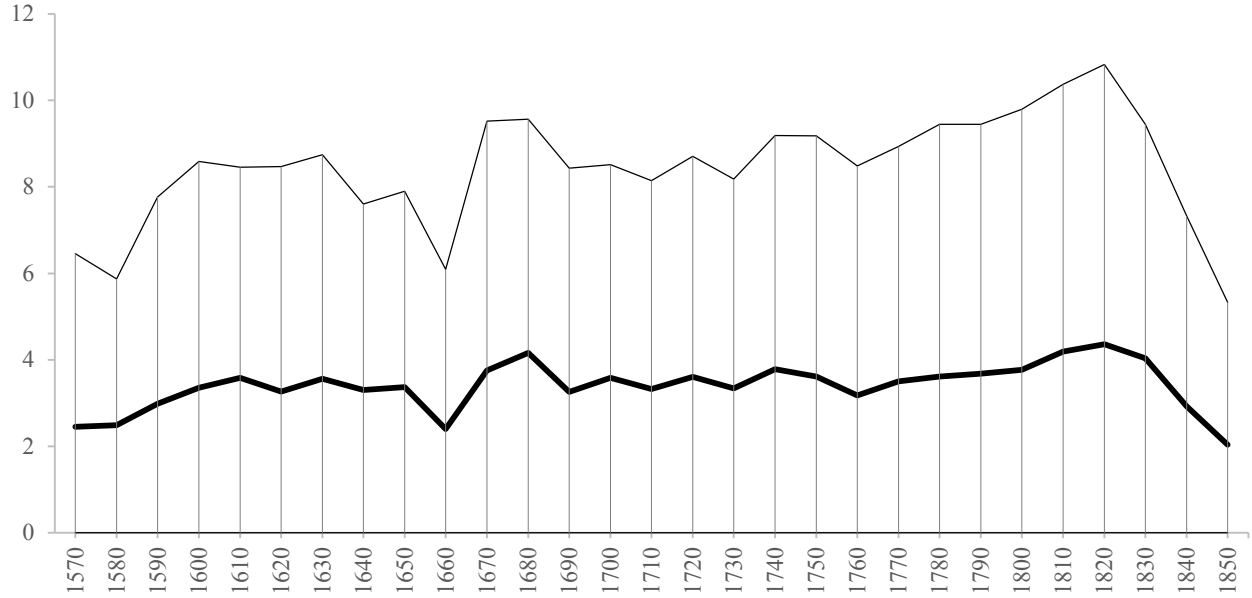
Notes: Each year refers to a decade, so 1270 means the 1260s. Casual income is computed (as conventionally) by multiplying the daily wage rates by 250 days per year. Stable income is simply the annual wage rate. Nominal income in both scenarios are divided by three times the cost of Allen's 'respectability' 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 years 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 'Respectability' Consumption Basket (for One Adult Person)

Goods	Quantities per year
Bread	234 kg
Beans/peas	52 L
Meat	26 kg
Butter	5.2 kg
Cheese	5.2 kg
Eggs	52 each
Beer	182 L
Soap	2.6 kg
Linen	5 m
Candles	2.6 kg
Lamp oil	2.6 L
Fuel	5.0 M BTU
Rent	5% allowance
Total	2,500 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																															Age at death
	Hannah North, age	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	77
	John North, age	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	88
	Children (7 births in total)																															
	Elizabeth, age		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15														> 15
	Jane, age				0																											0
	Anne, age					0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15											30
	Martha, age							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15									18
	George, age										0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15						> 15
	Louisa, age													0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			> 15
	John, age																		0	1	2	3	4	5	6	7	8	9	10	11	12	> 15
																																Max
	Home-living children	0	1	1	2	2	2	3	3	3	4	4	4	5	5	5	5	5	5	5	5	4	4	3	3	3	2	2	2	1	1	5
Labour input	Parents																															
	Hannah North, days per year	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	100	100	100	100	100	100	100	100	100	100	
	John North, annual	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	
	Children																															
	Elizabeth, able (0/1)		0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1														
	Jane, able (0/1)					0																										
	Anne, able (0/1)					0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1											
	Martha, able (0/1)							0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1									
	George, able (0/1)										0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1						
	Louisa, able (0/1)													0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1			
	John, able (0/1)																		0	0	0	0	0	0	1	1	1	1	1	1	1	
																																Max
	Work-able children	0	0	0	0	0	0	0	1	1	1	2	2	3	3	3	4	4	3	4	4	3	3	2	3	3	2	2	2	1	1	4
Calorie needs	Parents																															
	Hannah North, calories	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	
	John North, calories	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	
	Children																															
	Elizabeth		800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500														
	Jane				800																											
	Anne					800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500											
	Martha							800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500									
	George										800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500						
	Louisa													800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	2175	2350	2500			
	John																		800	750	900	975	1075	1150	1225	1325	1450	1550	1700	1850	2000	
																																Max
	Total calories	5000	5800	5750	6700	6775	6825	7850	7950	8300	9375	9600	10075	11300	11700	12375	12950	13600	12425	12875	13600	11625	12125	10025	10425	10825	8625	8900	9200	6850	7000	13600
	Basket equivalents	2.0	2.3	2.3	2.7	2.7	2.7	3.1	3.2	3.3	3.8	3.8	4.0	4.5	4.7	5.0	5.2	5.4	5.0	5.2	5.4	4.7	4.9	4.0	4.2	4.3	3.5	3.6	3.7	2.7	2.8	5.4

Table A3: FAO Caloric Requirement of Children, by Age

Age	Calories	Share
0	323	13%
1	750	30%
2	900	36%
3	975	39%
4	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%