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Household consumption patterns and the consumer price index, England, 1260–1869

Sara Horrell

Department of Economic History, London School of Economics and Political Science

Correspondence
Sara Horrell
Email: s.h.horrell@lse.ac.uk

Abstract

Existing long-run consumer price indices for England rely on a fixed consumption basket. Here we construct a methodologically improved, chained-Laspeyres price index for ordinary households based on their changing expenditure patterns between 1260 and 1869. Rather than offering a revisionist perspective on long-run costs, it confirms the broad accuracy of existing indices for the pre-industrial period. The dominant dependence of the key items of expenditure on agricultural, particularly arable, prices explains this finding. The industrial period introduced a new dynamic. The shift in household expenditure towards imported groceries and manufactured goods allowed for more substitution in response to relative price and income changes. Adding the current series to those chained-Laspeyres indices available for later periods provides a CPI for ordinary households in England over nearly eight centuries; from 1260 to the present day.

KEYWORDS
consumer price index, consumption, household expenditure, living standards, England, long run

Estimates of material living standards as well as assertions of high real wages in north-western Europe and their effect on technological innovation and economic growth all depend as much on what happened to the price level as they do on the money wages workers received.[1] Considerable attention has been paid to improving long-run wage series, much less to the underlying rate of

[1] Allen, 'Great Divergence'; Clark, 'Long march'; idem, 'Condition'.

consumer price inflation.[2] Accurate information on both aspects is required to be on firm ground when making comparisons of real wages over time and across space. Here we focus on evaluating the deflator. Existing long-run cost-of-living series indices are constructed around the consumption of an unchanging basket of goods. We present a new consumer price index (CPI) based on a chained-Laspeyres methodology that reflects changing household expenditure patterns over time. Detailed household expenditure accounts are derived at eight points through the years 1260–1869, allowing the quantity weights used in the cost-of-living index to vary both with the introduction of new goods and with changes in prices and income. This new CPI captures historical reality and is based on sound theoretical principles. However, for the pre-industrial period, it reveals no substantial difference in the long-run movement of families' living costs to that implied by existing indices. Allen's basket methodology prices fixed quantities of a limited range of commodities and has proved highly tractable in estimating real wages over time and across space. The results presented here confirm Allen's CPI as a reliable indicator of living costs for these years. The parallel trends in the indices reflect the heavy dependence of household consumption on agrarian products whose prices demonstrated similar co-movements. Divergence occurred as industrialization gathered pace. Trade opened possibilities for the consumption of goods whose production and price were determined by a new range of factors, and mechanized production moved consumption away from agrarian goods and towards metal products, pottery, and glassware, muting the dependence on agriculture. This diversification enabled choices exercised over consumption to impact the real living standards achieved.

Much of our current understanding of the root of modern economic growth rests on foundations constructed from long-run real wage series.[3] Increases in the return to labour, whether occurring post-Black Death, in the early modern period, or during industrialization, provide a cornerstone in explaining England's skill acquisition and adoption of labour-saving technology.[4] The ability of some north-west European economies to maintain this high-wage regime over the long term explains both the Little Divergence in this region's fortunes from those of southern Europe and the Great Divergence of Europe from Asia.[5] Debates continue over the timing of these divergences but the high-wage nature of early developers remains a consistent feature of the accounts.[6]

That England was a high-wage economy has not gone unchallenged. Some note the comparable pre-industrial living standards in many parts of Europe, Japan, and regions of China.[7] Others have questioned whether England itself exhibited the high wages that have been claimed. Concerns have been expressed about the rates of pay received by building labourers and craftsmen once contractors' markups have been deducted.[8] Scepticism surrounds the assumption that a day worker could secure the 250 days of work required to yield these high annual earnings, an

[2] See, for example, Humphries and Weisdorf, 'Unreal wages?'; Hatcher and Stephenson, *Seven Centuries*.

[3] Allen, 'Great divergence'; idem, *British Industrial Revolution*; Clark, 'Long march'; idem, 'Condition'.

[4] Ibid; van Zanden, *Long road*; van Zanden, Carmichael and de Moor, *Capital women*; Broadberry, Campbell, Overton and van Leuwen, *British economic growth*.

[5] For Europe see: Allen, 'Great divergence'; van Bavel and van Zanden, 'Jump start'; Broadberry et al., *British economic growth*; Lopez Losa and Piquero Zarauz, 'Spanish subsistence'; Malanima, *Pre-modern European economy*; idem, 'When did England?'; Palma and Reis, 'From convergence'; Rota and Weisdorf, 'Italy and the Little Divergence'; van Zanden, *Long road*; van Zanden et al., *Capital women*. For Asia see: Allen, Bassino, Ma, Moll-Murata and van Zanden, 'Wages'; Bassino et al., 'Japan'; Broadberry and Gupta, 'Early modern'; Broadberry et al., *British economic growth*, pp. 371–401; Saito, 'Growth'; van Zanden et al., *Capital women*.

[6] Angeles, 'GDP'; Clark, 'Long march'; idem, 'Condition'; Goldstone, 'Efflorescences'; Pomeranz, *Great divergence.*

[7] Saito 'Growth'; Pomeranz, *Great divergence*.

[8] Hatcher and Stephenson, *Seven centuries*; Stephenson, '"Real" wages?'.

amount of work that appears implausible when compared with medieval small holders' output and records of days worked in contractors' account books.[9] Indeed, an alternative approach that documents the payments received by the many workers on annual contracts has demonstrated muted improvement in earnings, reducing the glitter of the so-called medieval Golden Age and implying day labourers may have worked as few as 150 days in the year.[10] Similar challenges to the high-wage orthodoxy have been mounted for other times and places, leaving the timing and causes of modern economic growth contested.[11]

Determining real incomes has three elements: rates of pay and days worked are crucial to establishing nominal earnings, and an accurate cost-of-living deflator completes the computation. Long-run price series exist.[12] For England, Phelps Brown and Hopkins developed a series to accompany their seven centuries of builders' wages.[13] Clark utilized household expenditure information over industrialization and extended the categories for which price data were collected to construct series for English farm workers and working families for the period 1209–1869.[14] However, neither offers the simplicity and widespread applicability of Allen's measure: the welfare ratio. Having defined the basket of goods necessary to maintain an adult male at a 'respectable' standard that allows a modicum of variety in diet, along with adequate clothing, fuel, and light for basic comfort, this basket can be priced in every year for which relevant price data exist.[15] A family of five consumes three of these baskets. Comparison with male earnings yields a welfare ratio: the multiple of the household basket a worker can afford for their family in each year. Both the calorific adequacy of the content of the basket and the demographic reality of a five-person family have been scrutinized and criticized, resulting in an upgrading of the quantity of food consumed.[16] Changes in the consumption basket to reflect local diets and climatic conditions have allowed the same metric to be used in other regions facilitating cross-country real wage comparisons.[17]

The appeal is obvious, but the realism less so. How relevant does an unchanging basket of goods remain to actual consumption over the long run? Phelps Brown and Hopkins used unchanging

[9] Hatcher, 'Unreal wages'; Hatcher and Stephenson, *Seven centuries*; Stephenson, 'Working days'. For days worked in rural occupations see Humphries and Weisdorf, 'Unreal wages?'.

[10] Humphries and Weisdorf, 'Women's wages'; eisdem, 'Unreal wages?'.

[11] Allen et al., 'Wages'; Allen, Murphy and Schneider, 'Colonial origins'; Bassino and Ma, 'Japanese'; Federico, Nuvolari and Vasta, 'Origins'; Garcia-Zuniga and Lopez-Losa, 'Skills'; Gary, 'Work'; Gary and Olsson, 'Men at work'; Geloso, 'Were wages?'; Kumon, 'Labor intensive path'; Lopez-Losa and Piquero Zarauz, 'Spanish subsistence'; Liu, 'Wages'; Malanima, 'When did England?'; Mocarelli, 'What is wrong?'; Ozmuar and Pamuk, 'Real wages'; Ridolfi, 'Six centuries'; Rota and Weisdorf, 'Italy: new data'; eisdem, 'Italy: evidence'.

[12] The construction of these long-run price series is discussed in online app. S2.

[13] Phelps Brown and Hopkins, 'Seven centuries of the prices'; eisdem, 'Seven centuries of building wages'.

[14] Clark, 'Price history'; idem, 'Long march'; idem, 'Condition'. Clark, 'Macroeconomic aggregates', captures prices for the whole population.

[15] Allen, 'Great divergence'; idem, *British Industrial Revolution*, ch.4; idem, 'High wage economy'. The respectability basket broadly based on the account of a household in the 1790s is initially discussed in Allen, 'Great divergence' where the quantities are 'suggested by examining many budgets and weighting schemes', ibid, p.422. This variant yields just 1941 kcal per day. The basket is later upgraded to ensure 2500 kcal per day, Allen, *British Industrial Revolution*, pp. 35–6, t.2.1. Recognizing the more straightened circumstances of those in other countries, Allen also creates a 'bare bones' subsistence basket composed of local grains and yielding a little over 1900 kcal per day, ibid, p.37. This basket is upgraded to allow 2100 kcal per day in response to criticism by Humphries, 'Lure of aggregates', Allen, 'High wage economy', t.2.

[16] Schneider, 'Real wages'; Humphries, 'Lure of aggregates'; Horrell, Humphries and Weisdorf, 'Beyond the male breadwinner'; Allen, 'High wage economy'. For the Netherlands , see Boter, 'Living standards'.

[17] See n.11.

weights for seven main heads of expenditure, but they were keen to alert the reader to its limitations and noted that the resultant series was the cost of a composite unit of consumables. Only in this broad sense could it be considered to reflect changes in cost of living.[18] Allen also declares the deficiencies of his index. He notes that the basket is premodern in content, it does not include new commodities such as tea, sugar, coffee, tobacco, and potatoes, and he is careful to term the resultant 'real wage' a welfare ratio in the recognition that his methodology is not that used in other widely-accepted cost-of-living indices. Allen's constant consumption basket conforms to a Laspeyres cost-of-living index, a format which reflects the price changes felt by consumers but allows them no agency to change the quantities they purchase in response.[19] This matters. History, theory, and consequence concur.

The consumption of the ordinary Briton did not stay static. They eschewed the medieval diet of oatmeal gruel and coarse bread eaten off a wooden platter washed down with a cup of ale in favour of using a knife and fork to eat meat and potatoes off a ceramic plate and sipping sweetened tea from a china cup. They ditched the straw pallet to sleep on a feather bed with sheets and coverlets, and chose to wear colourful cotton gowns rather than a rough woollen tunic. Economic growth was reflected in observable changes in consumption.[20]

A Laspeyres fixed-quantity index does not match the theoretical tenets of consumer theory. Consumers maximize utility by choosing a consumption bundle given existing prices and an income constraint. As prices change the consumption of normal goods shifts away from those that have become relatively expensive towards those that are now relatively cheaper. A consumer price index must capture these changes to accurately measure consumer welfare.[21] Fixed quantities move the index ever further away from consumer welfare as understood in economic theory. This has practical implications too. The Laspeyres index fails to observe consumption changes to minimize the impact of price rises, so it will be upwardly biased in its measure of living costs in times of price inflation.[22] Commodity items and the quantities consumed become outdated, leading to erroneous conclusions about the standard of living achieved. Phelps Brown considered the sensitivity of the original Phelps Brown and Hopkins' price index to a different set of expenditure weights constructed from Gregory King's notebook of 1688. Amongst other changes, he noted considerably slower growth in prices after the fifteenth century than indicated by the initial index.[23] Living standards in the British industrial revolution have also been downgraded from the significant material benefits enjoyed by the majority, optimistically concluded by Lindert and Williamson.[24] Their cost-of-living index based on the consumption of a basket of goods purchased by labouring families in the 1780s and 1790s was challenged by Feinstein.[25] By allowing consumption patterns to alter from this period of eighteenth-century hardship to the somewhat better times of the 1830s, and again to later mid-century industrial prosperity, his reconstructed

[18] Phelps Brown and Hopkins, 'Seven centuries of the prices', p. 303.

[19] Laspeyres price index, $L_P = \Sigma\, p_i\, q_0 / \Sigma\, p_0\, q_0$, where p_i represents price of the item in each year, p_0 the price in the base year 0, and q_0 represents the quantities of each item purchased in the base year. Equivalently $L_P = \Sigma\, ((p_i/p_0) * p_0\, q_0) / \Sigma\, p_0\, q_0$.

[20] De Vries, *Industrious revolution*; idem, 'Industrious revolution'.

[21] Imai, Diewert, and Shimizu, 'Consumer price index biases'; Armknecht, 'Fixed basket', p.97; Feinstein and Thomas, *Making history*, pp. 515–16.

[22] Ibid.

[23] Phelps Brown, 'Gregory King's notebook', p. 103.

[24] Lindert and Williamson, 'English workers' living standards'.

[25] Feinstein, 'Pessimism perpetuated'.

CPI revealed a considerably more pessimistic view of the real gains to workers occasioned by the momentous shift in mode of production.

The move from a constant expenditure basket to one reflecting changing consumption patterns over time uses a chained-Laspeyres methodology in which the consumption weights are regularly updated.[26] Many statistical agencies use some form of this index to monitor prices and establish rates of inflation, such as the Consumer Price Index used in the UK. However, it is not perfect. Even with annual surveys of expenditure, a lag in collecting and collating the data remains which, in times of high inflation, can lead to a significant overstatement of the actual price rise. An 0.8 per cent overstatement in 1978 cost the UK Treasury some £400 million, in 1986 prices, in overpayment of index-linked government expenditure.[27]

The authors of historical long-run CPI series all recognize the hazards of relying on an unchanging consumption bundle, but to quote Allen:

> Introducing new items into a consumer price index raises difficult problems that are usually solved by chain linkage. This requires extremely detailed budget information that is not available for the early modern period.[28]

Here we attempt to overcome this lack of information. We construct detailed household expenditure accounts at eight points through the years 1260–1869, so allowing the quantity weights used in our cost-of-living computation to vary both with the introduction of new goods and with changes in prices and income. We rely on the existing, detailed price data collected by Allen and Clark in the construction of our index, so the key difference is one of method.[29]

I | THE PRINCIPLES ON WHICH THE HOUSEHOLD BUDGETS ARE CONSTRUCTED

We need to assess expenditure on a comparable basis through time. Today it is obvious. For most people money is earned and either spent on goods for household consumption or saved. Weights for a consumer price index take the share of average household expenditure on various categories of goods purchased by the representative family. Lumpy expenditures, such as a car, are amortized. Things were more complex in the past. The pre-market-economy household had a mixed economy where self-provisioning, sale of output, and market work co-existed. Medievalists have criticized reliance on measuring living standards through wages alone when the produce of gardens and small holdings formed such a large element of family consumption.[30] For the medieval landholding household, productive activities had their outcomes as payment of dues and tithes

[26] See Feinstein and Thomas, *Making history*, p. 518.

$$\frac{P_{t+1}}{P_t} \times \frac{P_{t+2}}{P_{t+1}} = \frac{P_{t+2}}{P_t}$$

Where $\frac{P_{t+1}}{P_t}$ is computed as $L_P = \Sigma\left((p_{t+1}/p_t) * p_t\, q_t\right)/\Sigma\, p_t\, q_t$.

[27] Marsh, *Exploring data*, p. 71.

[28] Allen, 'Great divergence', p. 420.

[29] The CPI developed here will not capture short-term fluctuations in quantities purchased due to the intermittent nature of the consumption basket observations, but it will reflect the structural shifts in consumption over time.

[30] Bailey, *After the Black Death*, p. 141.

to the lord of the manor or the church and inputs of raw materials that, with further processing, yielded products for consumption by the family or for sale to the market. This provided cash for the purchase of necessary tools and implements or essential commodities that the family could not produce for itself. Thus the medieval family's activities involved a complex web of goods as inputs and for direct consumption, labour power necessary to turn some inputs into consumable commodities, output as payment, investment in equipment and inputs, and, in a good year, the promise of a small profit to then reinvest or consume.

Some of these categories are relatively simple to disentangle. As today we are concerned with consumption from income after tax and with the addition of transfers, so dues and tithes can be omitted from our considerations. The use-value derived from land and equipment will be incorporated into the market price used to value crops. For instance, if we know the volume of wheat the family consumed and value it at its market price, this 'expenditure' will incorporate depreciation, replacement, and maintenance of equipment, rental of land, labour costs, and a modicum of profit to the auctioneer and the farmer. Harder is the valuation of the conversion of wheat to bread that is then required for the family to eat this food. Tithes to the miller may be separately documented, and firewood to heat the oven will come into our fuel estimation, but the labour of the wife in kneading the dough and baking the bread will be omitted. This remains true today. Expenditure measures monetary purchases. The price of a ready meal will capture the labour, transport, and distribution costs along the way, but a chicken, potatoes, and carrots will require considerable additional labour to be turned into a meal. Becker formally recognized the role of the household as both producer and consumer and neatly valued domestic labour time as the wage foregone in the market.[31] This provides one answer, but in an era when wage earning was intermittent and many payments non-pecuniary, it is hard to ascribe a monetary value to a woman's time.[32] Furthermore, the amount of time needed to complete any domestic task can only be a matter for conjecture. Of course, there are some items where the market price can be used to infer labour time as well as raw material inputs: the household might keep bees and the output of wax and honey valued using the price paid in the market, and spun wool and woven flax made into chemises and tunics can be priced at the cost of a similar item found in accounts elsewhere. For these items the domestic time input is recognized and there will be consistency in the valuation over time. For others, such as the move to baker-baked bread, butchered meat, sliced bacon, churned butter, matured cheese, and brewed ale, household expenditure accounts based on the price of the underlying commodity, such as wheat, will understate the true value of these items to the household in earlier eras. This will reduce their expenditure share relative to 'purchased' commodities, but their dominance in household 'expenditure' means the effect of their understatement in the price index calculation will be relatively small. Overall, our principle is that where possible, home-produced goods are priced at their market rates to assure consistency in the method of valuation employed over the 600-year period under study.

Other aspects of the expenditure calculation also require mention. The purchase of clothing, shoes, household furnishings, and equipment would, in today's expenditure surveys, enter as the total expenditure in any year. Even if bought infrequently, sufficient families are surveyed to capture a representative average. The same does not hold for our historic households, where many purchases were made infrequently, sometimes just once in a lifetime. We instead estimate the value of the contents of the home and the households' wardrobe, relying on a variety of evidence, such as probate inventories and insurance claims, and use information on replacement intervals

[31] Becker, 'Theory'.

[32] However, see Humphries 'In search', for an innovative and informative way of achieving this.

to then estimate the value of the flow of services provided by these items in a year. This essentially equates to the purchase cost spread across the number of years over which the item is used.

Housing costs are a major item of expenditure throughout, but for our predominantly rural households, they can be difficult to estimate in the earlier years under study. While a medieval landholder might pay a rent, it incorporates not just their house, but also their land and outbuildings, and the house itself will, in part, be a site of productive activity, not just a home.[33] For consistency with later periods, we need to extract the amount paid for accommodation alone. We have the occasional estimate of the cost of building a peasant's house and some description of the maintenance required. Until monetary rents are recorded, we assume a house yields 5 per cent of its initial building costs in accommodation services each year. We benchmark this against actual observations of rents paid where available.

Most of the expenditure we record relates to consumption of physical goods consumed with limited evidence on expenditure on services and leisure. Expenditures on schooling, insurance through, say, a Friendly Society, and church or charity donations, along with the occasional leisure activity, feature in later household accounts and are incorporated into our representative family's expenditure pattern. Earlier there might be a tiny amount of schooling purchased, attendance at a performance by a roving troupe of actors, and celebration at an annual fair. Donations and dues at church too formed part of every family's outgoings.[34] These expenditures are rarely observed so, by necessity, are omitted from the constructed budgets, but the omission will result in a small inaccuracy in our price index estimate.

A greater oversight is the neglect of purchased labour services used within the home. Engaging a charwoman to clean, sending out laundry, or putting a baby with a childminder were activities that could involve monetary payment and were not beyond the reach of the respectable household. Recent findings of significant amounts of domestic work undertaken for others outside the household in the early modern period demonstrate the ubiquity of this type of exchange and its highly commercialized nature.[35] In principle, information from time-use studies on frequency of activity combined with payments for the services would enable these activities to be given a monetary value and so be included in family expenditure. This would be insightful and capture any change over time but, unfortunately, it lies beyond the scope of this study as well as outside the usual realms of cost-of-living index construction.[36]

II | FAMILY EXPENDITURE COMPUTATION, 1299–1850

II.I | Family 'Expenditure' in the Medieval Household

Our aim is to devise household budgets for an ordinary family at various intervals from 1260 through to 1860 so that we can construct a price index against which to evaluate family incomes.[37]

[33] See Dyer, 'Living'; Rees Jones, 'Property'.

[34] See Sapoznik, 'Bees.' The obligatory nature of these contributions makes them akin to a tax and so outside the expenditure computation here.

[35] A total of 54% of housework tasks and 84% of care work tasks were performed for someone deemed to be outside the household. (Whittle, 'Critique', pp. 60, 64; Whittle and Hailwood, 'Gender division', t.10).

[36] For an important project valuing 'domestic' work and detailing the consequence of its inclusion for costs-of-living and living standards, see Humphries, 'In search'.

[37] The construction of these accounts is detailed in online app. S1.

We begin with Dyer's detailed work on living standards in the Middle Ages supplemented with additional material to develop a medieval household budget.[38] We start with the family of Robert le Kyng, a yardlander holding about 30 acres of land, recorded in the survey made for the Bishop of Worcester on his manor of Bishop's Cleeve, Gloucestershire in 1299.[39] The position of the yardlander was very different than the average working family; probably just one-quarter of tenants held a yardland or more according to the Hundred Rolls of 1279–80, and half farmed less than a half-yardland.[40] These were tenants; the many *famuli* (annual workers) and landless wage earners would have been in an even less fortunate position. We commence with le Kyng's household because the considerable detail on his situation helps to benchmark the expenditure of the families of Henry Benet, a half-yardlander, and John le Gavisare, a customary tenant with just 3 acres of land.

Robert le Kyng is assumed to be in the prime of life, fit and healthy, with a wife and three children aged between 5 and 12 years old. Dyer provides estimates of grain, cheese, and pork eaten by the family. He notes the quantities produced of beef, mutton, wool, poultry, eggs, flax, hemp, vegetables, and honey, the collection of firewood, the rent paid by le Kyng for his buildings and land, and the cash surplus he would have made. Other sources help price these items and allow for the estimation of the proportion consumed directly by le Kyng's family.[41]

Other aspects of le Kyng's expenditure can also be ascertained. Dyer provides detailed accounts of peasant housing, the contents of a typical home from surviving inventories, a description of the clothing worn by ordinary medieval people, and examples of maintenance agreements detail the nutrition, accommodation, and clothing to be granted to a retiring property owner on the relinquishing of their land and home to a descendent.[42] The typical peasant house was timber framed, walled with wattle and daub, and thatched. It contained two rooms: a hall and a chamber. Le Kyng's house would have been little different, although there may have been an outside kitchen and buildings for grain and livestock. Clothing was basic – a linen chemise, a woollen tunic, and leather shoes – and replaced infrequently. Furniture is detailed in inventories.[43] We have itemized the basic contents of a home, allowing no luxury, and priced them using the inventory information. We record the value of the services provided by these goods per year in our expenditure account.

Le Kyng and his family had a total annual expenditure of £4 1s 2d. How does this compare with the cost of basic maintenance and wages? The nominal wage for a farm worker was 1.35d per day *c*. 1300. If he worked for 250 days per year, he would earn £1 8s 1.5 d, covering nearly 35 per cent of le Kyng's family expenditure.[44] An annual worker would have had a total remuneration including board and lodging of £1 1s 8d.[45] A rough adjustment to also include the contributions made by these farm workers' wives and children suggests that yardlander le Kyng's household

[38] Dyer, *Standards.*

[39] Ibid, pp. 110–7.

[40] Ibid, t.8, p. 119.

[41] The calorie content of the diet is assumed to meet modern standards of 11 000 for the family per day and is provided mainly by grains, ibid, pp. 134–5. This accords with the amounts eaten by medieval *famuli* paid in grain wages, Claridge and Langdon, 'Composition' app. B, pp. 214–8.

[42] Dyer, *Standards*, ch.6, pp. 151–87; Dyer, 'Living'.

[43] Dyer, *Standards*, pp. 169–75; Goldberg, 'Fashioning'.

[44] Clark, 'Long march', t.A.2, pp. 130–4.

[45] Humphries and Weisdorf, 'Unreal wages?', t.app. 2.

enjoyed consumption some one-half greater than a medieval labouring family could afford. This reassures us that we have enumerated le Kyng's expenditure fairly accurately.

Having ascertained the position of the relatively affluent le Kyng, we use similar computations to determine the expenditure of Henry Benet, a half yardlander, and John le Gavisare, a cottager. Dyer tells us that Henry Benet's family consumed the same amount of grain in bread and pottage as le Kyng's household, but Benet had half as much stock, leaving the contribution from the garden and poultry commensurately more important to the household.[46] Less than 3 quarters of barley was malted for brewing in Benet's home. His house was of slightly poorer quality than le Kyng's, Benet used less fuel in heating it, and his family wore cheaper clothes. We have been frugal with le Kyng's furniture, so assume the same standard of comfort for the Benet family. There is no cash surplus after shoes and other sundries have been purchased. Despite these economies, Benet's family could still attain a standard of comfort twice that of a single, landless labourer.

John le Gavisare, however, was in a more parlous position.[47] He only produced 3 quarters of grain so had to purchase the rest of the grain required to feed his family and pay his rent of 4s, of which maybe 2s 6d was paid for his cottage, by labouring for wages on the land of others. There was no surplus barley for ale, he kept a cow which provided the household with cheese, but they ate no meat beyond a few culled hens. We assume he burned the cottagers' allocation of firewood, wore clothes of a meaner sort which by necessity were required to last longer, and, although his household goods were similar to those of le Kyng's, they were of a more shabby and basic type. Le Gavisare and his family would have had a standard of comfort just a little above that of a waged labourer whose wife and children could also find plentiful work.

We take the intermediate position between Benet and le Gavisare to represent the expenditure of an ordinary household in 1299. This position represents maybe 55 per cent of the population of England that were smallholders (half yardlanders), cottagers, labourers, and rural craftsmen.[48] The family expenditure of 53s 6.5d per annum is remarkably close to the 56s that was needed for respectable living for a family of five in 1290 estimated elsewhere.[49]

After the ravages of the 1315–8 famine and the 1348–9 plague, the position of survivors was more fortunate than their predecessors. Land was plentiful, enabling families to increase their farm size and the land-holding distribution to shift upwards, and pastoral agriculture was profitable. Crop yields were improved by new techniques, changed rotations, and increased manuring. Rents, particularly the tax and dues elements, fell.[50] Furthermore, population stasis suggests co-resident family size may have fallen to just two children. Families of all social standings were better off. How then did this impact on expenditure?

The situation of some men of similar status to those already described are recorded for a later date, 1475, in a rental at Cleeve.[51] We construct expenditure accounts for the households of William Newman, a yardlander, and Robert Smyth, a half-yardlander. Robert Smyth's consumption is used to represent typical expenditure for an ordinary household to reflect the improved prosperity of the late medieval period.[52]

[46] Dyer, *Standards*, p. 117.

[47] Ibid, p. 117.

[48] Campbell, *Great transition*, app. 3.1, t.3.4.

[49] Ibid, p. 166, also app. 3.1 t.3.4.

[50] Ibid, pp. 353–83; Bailey, *After the Black Death*, pp. 135–85, 251–4.

[51] Dyer, *Standards*, pp. 148–50.

[52] A total of 40% of households were unable to afford the respectability basket in 1290; this had fallen to under 20% by 1381. (Campbell, *Great transition*, p. 373).

William Newman planted less of his land than le Kyng, but by using improved techniques, he reaped a total yield one-fifth higher. He fed and 'watered' his family to a similar per capita level, using 8 quarters of grain in total, but there was a shift towards consuming wheat bread and the increased quantity of ale drunk was stronger.[53] He could keep more cows and sheep, but still had land for his pigs, chickens, vegetables, and bees. More meat was consumed in 1475 than in 1299. There was also a transformation in consumer spending.[54] Newman's house was more solidly constructed, so of improved quality despite the reduction in rent.[55] Changes in clothing fashion could be observed even among the peasantry. Men wore short, lined tunics, cloaks with hoods, hose, and doublets. Women too wore hose, cloaks, and hoods.[56] Peasant households contained more metal cookware and pots, and tableware improved; wood trenchers and bowls were replaced with ceramic ones, and wealthy peasants might possess one or two pieces of pewter.[57] We know less about Smyth, the half-yardlander, except that he raised a larger number of animals than Benet had previously.[58]

With a total expenditure of £4 4s 6.5d, William Newman's household was only able to spend 11 per cent more than a day labourer working 250 days in 1475, despite significant contributions from Newman's wife and children.[59] Smyth's family was worse off. However, as noted elsewhere, the wages assumed to be earned by fifteenth-century day labourers seem high and the implied availability of work too generous.[60] The remuneration of annual workers requires no assumptions to be made about the number of days worked and captures in-kind as well as monetary payments.[61] This comparison finds Newman's family able to afford some 2.1 times more than a man on annual wages, and Smyth's family 1.6 times more. Our constructed expenditures again seem plausible once we account for the additional income contributions the wife and children would have made to the annual worker's household.

II.II | Family Expenditure in the Elizabethan Household

For the Elizabethan era, that is, 1558–1603, we use accounts and inventories to gauge ordinary households' consumption. In many respects there was only limited change from the previous centuries despite significant shifts in the commercial activities of the economy, the development of colonial interests, and the expansion of London as an urban centre. The population remained predominantly rural, with just 8 per cent of people living in moderately-sized towns.[62] In the countryside, the vast majority were husbandmen with smallholdings, cottagers with just a few acres, or agricultural labourers.[63] The houses they lived in were still two-room, single storey dwellings

[53] Dyer, *Standards*, p. 148; Kowaleski, 'Consumer', pp. 242–3; Bennett, *Ale*, pp. 10, 44; Bailey, *After the Black Death*, p. 140.

[54] Kowaleski, 'Consumer', p. 239.

[55] Campbell, *Great transition*, pp. 382–3.

[56] Dyer, *Standards*, p. 176; Kowaleski, 'Consumer', p. 246.

[57] Dyer, 'Living', p. 25; Kowaleski, 'Consumer', p. 254.

[58] The assumptions employed to estimate Smyth's consumption are detailed in online app. S1, t.2.

[59] 3.65d per day in 1472–9 (Clark, 'Long march', pp. 130–4). 250 days gives annual income of 911.7d.

[60] Hatcher, 'Unreal wages'.

[61] An annual worker received 484d in remuneration. (Humphries and Weisdorf, 'Unreal wages' t.app.2.).

[62] Singman, *Daily life*, p. 85.

[63] Ibid, pp. 14–5.

with earth floors.[64] The Great Rebuild of 1570–1640 started to bring some improvement, with timber super-structures attached to brick plinths and brick chimneys, enabling the roof space to be converted to a storage loft or an additional sleeping area, but relatively few lived in such accommodation.[65] Furniture and household goods saw meagre improvements in materials, but clothing fashions had changed towards greater styling and warmth of outer garments.[66] We use secondary sources on probate inventories, maintenance agreements, institutional diets, and living histories to reconstruct the expenditure of a typical working family. Population grew during Elizabeth's reign, so we assume household size had risen to five people: a man, his wife, and three children.

Total food expenditure for our family is estimated at 2812d per annum, 54d per week. The cost of subsistence was 28d to 42d per week for families in poverty according to the authorities of Ipswich in the 1590s and Salisbury in the 1630s.[67] Our family's food consumption does not appear excessive. The total household expenditure of our Elizabethan household was some three times the pay of an annual worker and twice the pay of a wage labourer able to work 250 days in the year.[68] Again this seems plausible once the labourer's wife and children's contributions to the household's well-being are included.

II.III | Family Expenditure in the Stuart (1603–1714) and Early Georgian Household

Estimates of household expenditure on food for the Stuart period are notoriously difficult to construct. While a number of account books survive, they pertain to households who were wealthier and better resourced than the average family. Even Craig Muldrew's detailed study of food and diet in the early modern period finds very few relevant examples.[69] We predominantly rely on his work to construct food expenditure in this period but err on the side of caution by avoiding his reliance on Vanderlint's 1734 budget and Sir Frederic Morton Eden's family of nine living in Streatley, Berkshire, in 1795.[70] We also refer to eighteenth-century workhouse and charity dietaries for 1713–25.[71]

What account is taken of changing tastes and diet through this period? By 1758 pottage was less commonly eaten and wheaten bread was preferred.[72] Beer was brewed with hops so that it lasted longer than ale and weaker strengths were drunk by women and children. Meat eating was

[64] Wrightson and Levine, *Poverty*, p. 37.

[65] Emmison, *Elizabethan life*, p. 2.

[66] Singman, *Daily life*, pp. 93–129.

[67] Slack, *Poverty*, pp. 80–2. It also sits closely with other budgets. (Archer, *Pursuit of stability*, pp. 190–5, app. 1, t.3.)

[68] Humphries and Weisdorf, 'Unreal wages?', app. 2. annual worker's remuneration 1170d. Clark 'Long march', pp. 130–4, 7.19 d per day, 1798.6 d per annum.

[69] Muldrew, *Food*, ch.3.

[70] Jacob Vanderlint (pamphlet 1734), 'Money', estimates a London labourer's expenses for a family of six, but he notes that most men had only half the work assumed. (Muldrew, *Food*, p. 36, pp. 128–36.) The constructed expenditure far exceeded the earnings of even well-paid building craftsmen in the capital. (Allen, 'Pessimism preserved', pp. 4–5; Clark, 'Shelter'.) Despite having continual well-paid employment, Eden's Berkshire labourer could not afford meat or beer. This deficiency is compensated by adding the amount spent by Vanderlint's labourer to Eden's budget. (Muldrew, *Food*, pp. 136–8.).

[71] Ibid, p. 128, t.3.7, p. 134, t.3.9, p. 138, t.3.11, p. 213, t.5.3.

[72] Ibid, p. 60.

commonplace and, even in institutions, eaten regularly. But poultry and eggs were rarely mentioned. The consumption of dairy products varied in the accounts, fish was not often eaten, but vegetables and fruit were grown and used. Sugar was available. Although refined sugar was prohibitively expensive for most, recent work has emphasized its consumption in various forms, both by type; white powder, brown crystals or molasses; and by use; jam and preserves, biscuits, cakes, and puddings.[73] A rapid decline in price made it increasingly accessible by the mid-eighteenth century and it became widely used in the new mass-consumption beverage of tea.[74] We recognize this shift in beverage consumption and substitute some sugar for honey in household purchases.

Aside from this shift, we assume the quantity of food consumed by a family of five to be unchanged from 1650 to 1750. There is evidence that the quantity of food available nationally may have increased from 1700 to 1770 but, in the absence of informed estimates, we retain fixed quantities for this time period.[75] Plenty peaked around 1770 so, without doubt, households entered a more parlous nutritional state as the eighteenth century ended.

On the estimates presented here, total food consumption per annum for a family of five cost around £24 per annum. In the mid-eighteenth century, Muldrew estimates that food for a very poor family of five would have cost between £9 and £13 per annum, and for a well-employed family of nine between £24 and £43.[76] Our family fits nicely into the reasonably employed, mid-sized, range of expenditure.

Some of the other items of expenditure are harder to estimate. We make sensible assumptions to compute the amount of soap and candles used, and adjust fuel expenditure to reflect the gradually increasing use of coal as a source of domestic energy. Housing continued to improve. Initially, the cost to build a more durable dwelling remained beyond the reach of the majority, and the home was still a one- or two-roomed earth-walled dwelling.[77] However, by the later-seventeenth century, labourers' accommodation had expanded from a one- to a three-room dwelling, purpose-built chimneys allowed upper floors to be created, and some had window glass.[78] We use the information on average build costs to estimate rent.

We have more information on the furniture and durable goods possessed by families. Surviving probate inventories list and value the moveable property of the deceased, and analyses of those for labouring households enables us to estimate annual expenditure on household goods.[79] Domestic comfort improved. The main bed was a significant item. People desired enhanced comfort as they slept so they invested in featherbeds with deep mattresses, made them up with sheets, pillows, and bolsters, and adorned them with coverlets and curtains. This upgrading is reflected in the probate inventories, but note that children and servants still slept on trundles and in wool-stuffed flockbeds.[80]

[73] Goodall, 'Rise'; idem, 'Consumption'.

[74] Muldrew, *Food*, p. 113; Shammas, *Pre-industrial*, t.4.3, p. 82, t.4.4, pp. 83–5.

[75] Meredith and Oxley, 'Food'.

[76] Muldrew, *Food*, p. 29.

[77] Shammas, *Pre-industrial*, pp. 157–61. In 1628, Thatcher Richard Wix lived with his family in a small house with two rooms, a loft, and a hearth. (Whittle, 'House', p. 145.).

[78] The number of rooms recorded in labourer's probate inventories rose from 2.7 in 1550–99 to 3.6 by 1700–49. (Muldrew, *Food*, p. 178; Nicholls, *Almshouses*, p. 140.).

[79] Muldrew, *Food*, pp. 163–207; Sears and Sneath, *Origins*.

[80] One-quarter of inventoried labourers died owning a featherbed by the late eighteenth century; some had owned one in the previous century. For instance, Henry Stanworth, a cordwainer, had a bed worth £1 10s 4d on his death in 1685. Sears and Sneath, *Origins*, t. 9.3, p. 284; p. 134.

Other items too saw a shift towards better quality purchases.[81] While heavier, wood furniture remained much as previously, with households possessing tables, chairs, stools, cupboards, hutches, and chests, smaller items were transformed. Pewter items were still owned by many, but wooden bowls and cooking vessels became obsolete, with brass, china, and glassware entering ordinary households' lexicon. Changed beverage tastes were reflected in the ownership of teacups and saucers as well as tea pots and tea kettles. Cutlery now encompassed knives and forks, as well as small teaspoons. Concern for appearance and time keeping was reflected in the ownership of mirrors, clocks, and watches. Some 40 per cent of labourers owned a clock in the latter half of the eighteenth century and maybe one-fifth owned mirrors.[82] We approximate a value for these domestic items and consider that they yielded consumption services for 5 years.

Clothing is estimated from various sources. The churchwardens of Ashburton had to clothe three children between 1575 and 1589, and the Quaker workhouse at Clerkenwell purchased clothing for its resident children 1712–3.[83] The values given to items of clothing stolen and prosecuted at the Old Bailey London provide detail for 1750.[84] The resultant expenditure is almost exactly the £4 per annum Young deemed to be spent by a labouring family in 1750.[85]

How realistic are these annual expenditures of early modern working households? We compare with the incomes and expenditures suggested in existing analyses.[86] The results are reassuring (see online appendix S1, t.4.e).

II.IV | Family Expenditure in the Industrial Revolution

We commence by using the extensive set of household budgets detailing sources of income collected by Horrell and Humphries and focus on the 283 accounts that also recorded expenditure, as analysed by Horrell.[87] These budgets also form the backbone of the expenditure patterns used to construct Feinstein's and Clark's cost-of-living indices.[88] We select those households with men employed in agriculture, both in high- and low-wage regions, and in mining, outwork, and trade occupations. We weight each equally in our expenditure analysis, so continuing our earlier focus on households that could be considered rural or in market towns, semi-skilled and unskilled, and ignoring the rapidly growing group of urban-dwelling factory workers.[89] While these budgets inform us about food, housing, and energy expenditures, they require further adjustment and augmentation. We estimate the contribution to the household from self-provisioned

[81] Muldrew, *Food*, p. 200.

[82] Sears and Sneath, *Origins*, pp. 158, 294.

[83] Hanham, *Churchwardens' accounts*; Hitchcock, *Richard Hutton's Complaints book*.

[84] Horrell et al., 'Cupidity'.

[85] Quoted in Muldrew, *Food*, t.3.11, p. 215.

[86] Muldrew, *Food*, t.5.19, p. 257; t. 5.4, p. 217; Wrightson and Levine, *Poverty*, p. 25; Botelho, *Old age*, p. 148.

[87] Horrell and Humphries, 'Old questions'; Horrell, 'Home demand'.

[88] Feinstein, 'Pessimism perpetuated'; Clark, 'Long march'.

[89] The budgets for 1787–96 were taken from Eden, *State*, for a range of occupations, and Davies, *Case*, for agricultural workers. Those for 1840–54 were taken from 12 different sources covering a range of occupations. The Eden and Davies budgets were collected at a time of hardship, suggesting that expenditure may be understated (see Muldrew, *Food*, p. 136), but they also include examples such as the relatively prosperous Ealing gardener used to demonstrate respectable consumption by Allen, 'Great divergence', and criticized for its bias towards the better off by Humphries, 'Lure of aggregates'. The less well-off agricultural labourers' households are not given undue weight in the computation of the expenditure for the average ordinary working household, and many categories of consumption are added from other sources.

activities, add information on alcohol consumption, and utilize other sources to estimate expenditures on clothing and furniture. Various services also entered working-class consumption, and we take these expenditures as detailed in the household budgets. We focus on the periods 1787–96 and 1840–54.

Over industrialization food expenditure showed a marked shift towards the imported goods of tea, coffee, sugar, and tobacco. Consumption of these items became ubiquitous; even workhouse dietaries show inmates being provided with sweetened beverages. Service expenditure also took on new importance, with workers insuring against adversities such as sickness, injury, and unemployment through friendly societies, and families finding the few pennies necessary to provide a child with a basic education at school. While clothing items remained much as previously, there is evidence that more items were owned and that new materials and prints found favour, particularly in the form of cotton gowns and stockings.[90] It is difficult to assess the quality of housing, as it varied from place to place and between urban and rural settings. We have an account of a miner who lived in a two-room cottage in 1840 and workers in industrial trades living in abodes with four or five separate rooms, sometimes with one used as a workshop.[91] Rents certainly rose in urban areas such as London and Manchester, where they exhibited a threefold increase.[92] Even the same stock of housing in Staffordshire showed a 50 per cent rise between 1801 and 1851.[93] We find similar large increases in the rents paid by the households analysed here. Additionally, workers aspired to new standards of comfort in their accommodation: bedding for the labourer's family might include a feather bed and coverlet or counterpane, china plates and knives and forks were used for eating, and teacups and glasses for drinking. The better off might even have a rug on their floor, many could own a mirror, and a number now had a clock or watch. We use evidence from inventories of workers' possessions to assess their furniture and estimate the value of the flow of consumption services from these durables.

The overall expenditure of the household computed by these methods was some £43 9s 5d in 1787–96 and £61 4s 9d in 1840–54. This is higher than the amount that could be earned by a single farm servant or an agricultural day labourer, but we need to add to this the often substantial contributions made by wives and children. Any remaining upward bias reassures that we are capturing 'respectable' living for the more fortunate.[94]

III | THE EXPENDITURE WEIGHTS

Table 1 reports the expenditure weights extracted from the household expenditure analysis above. These are compared with those used by Allen and Clark.[95] Figure 1 represents the aggregation of these expenditure weights into the categories used by Allen.[96]

[90] Horrell, Humphries and Sneath, 'Cupidity'; eisdem, 'Consumption'.

[91] *P.P. Royal Commissioners. Children's Employment (Mines)* 1842, vol. XVI; Le Play, *Les Ouvriers.*

[92] Crafts, 'Regional price', p. 41.

[93] Lindert and Williamson, 'English workers' living standards'.

[94] Humphries and Weisdorf, 'Unreal wages', app. 2. 1790–1800: annual worker £18 6s 1d, day labourer £16 4s 7d; 1840–50: £30 7s 5d annual, £21 10s 2.5d labourer.

[95] Clark, 'Long march', t.4; Allen, 'Great divergence', t.3, p. 421; R. C. Allen, www.nuffield.ox.ac.uk/people/sites/allen-research-pages/, Data – Age and Price History, London.xls. Last accessed 03/08/2022, shares calculated from price spreadsheet for bundle at London prices 1750.

[96] The aggregation and resultant expenditure shares are reported in online app. S3, t.1, t.2.

TABLE 1 Expenditure weights calculated from information on household consumption 1260–1850

Year	1299	1475	1590	1650	1700	1750	1790	1850	1750	1800
Source	t.1, app. S1	t. 2, app. S1	t. 3, app. S1	t. 4, app. S1	t. 4, app. S1	t. 4, app. S1	t. 5, app. S1	t. 5, app. S1	Allen	Clark
Food										
Bread			0.368	0.311	0.265	0.264	0.216	0.247	0.398	
Wheat	0.257	0.246					0.003	0.011		0.4
Barley	0.33	0.119					0.026	0.005		0.03
Oats	0.019	0.009	0.021	0.002	0.002	0.003	0.076	0.015		0.025
Ale	0.054	0.179	0.133				0.084	0.06		
Beer small				0.096	0.088	0.068				
Beer strong				0.048	0.044	0.042			0.122	0.047
Cheese	0.032	0.05	0.05	0.055	0.048	0.034	0.018	0.021	0.019	0.023
Butter			0.028	0.061	0.050	0.050	0.045	0.029	0.054	0.051
Milk				0.023	0.016	0.014	0.044	0.022		0.043
Pork/bacon	0.009	0.03	0.039				0.011	0.022		0.01
Beef	0.006	0.037		0.100	0.113	0.108	0.084	0.064	0.138	0.105
Mutton	0.004	0.021								
Geese/hens	0.006	0.004								
Eggs	0.019	0.005	0.017					0.001	0.034	0.005
Fish			0.022				0.0003	0.002		0
Vegetables	0.024	0.022	0.101	0.072	0.066	0.063			0.033	0.025

(Continues)

TABLE 1 (Continued)

Year	1299	1475	1590	1650	1700	1750	1790	1850	1750	1800
Potatoes							0.039	0.042		0.04
Rice								0.002		
Honey			0.002	0.016	0.015	0.007				0.03
Sugar						0.012	0.029	0.032		
Tea							0.021	0.018		0.033
Coffee								0.006		0
Other food							0.009	0.016		0
Salt										0.005
Tobacco								0.006		0
Household										
Tallow candles	0.008	0.019	0.017	0.016	0.014	0.014			0.042	0.035
Soap				0.006	0.006	0.007			0.022	0.005
Soap & candles							0.036	0.044		
Firewood	0.022	0.047	0.021	0.070	0.077	0.066	0.048	0.041	0.049	0.05
Rent	0.06	0.047	0.04	0.033	0.044	0.070	0.055	0.096	0.048	0.06
Clothing	0.115	0.115	0.101	0.055	0.105	0.111	0.095	0.109	0.043	0.05
Furniture	0.037	0.05	0.04	0.038	0.047	0.061	0.057	0.065		0.05
Services						0.006	0.001	0.026		0.005

Sources: see online app. S1 and text. Allen, 'Great divergence', t.3; idem, 'Data' spreadsheet; Clark, 'Long march', t.4.

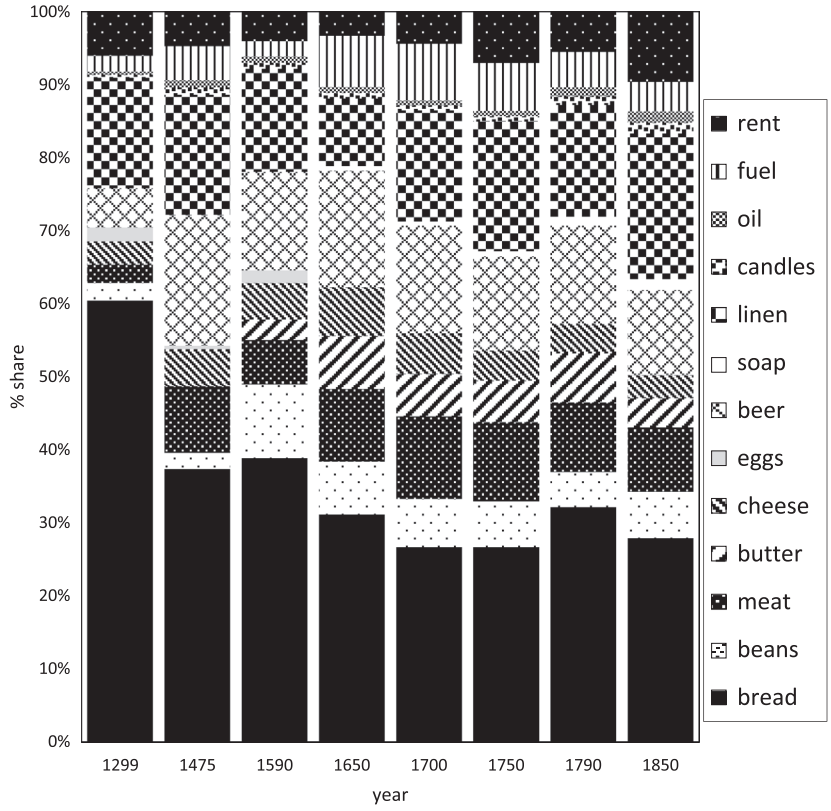

FIGURE 1 Expenditure shares using Allen's commodity categorization. *Source*: see online app. S1, online app. S3, t.1, t.2, and text.

Although our mid-period households had a similar reliance on bread and other grains to Allen's consumer, enabling consumption to shift with prices and economic conditions allows for a greater reliance on farinaceous products in the medieval period and their decreasing importance to be represented as the economy developed. Meat and poultry were less important and dairy products more important in overall consumption than allowed by Allen, but again, consumption of these categories exhibited responsiveness to periods of relative prosperity. The switch away from dairy consumption as industrialization progressed is also evident.[97] Beer consumption featured more prominently than in Allen's basket but its consumption declined from the mid-eighteenth century as other beverages, such as tea, became increasingly popular. The share of food behaves predictably; within the overall downward trend the share increased in periods of economic distress, such as the turmoil observed in late-sixteenth-century Tudor times and the late-eighteenth-century Napoleonic Wars.

Non-food categories of expenditure show similarities with their importance in Allen's basket, but they also demonstrate predictable shifts. Our households spent a rather smaller share of their budget on soap, candles, and lamp oil than Allen assumed, but the influences of prosperity, domesticity, and proto-industry are evident in the increased importance of these items over time.

[97] Shammas, *Pre-industrial*. Eden, *State*, reports little consumption of dairy products by southern labourers.

The fuel share is similar, although the high price of wood fuel in the early-modern period is reflected in the expenditure we compute. Rents too bumped along around the 5 per cent of total expenditure that Allen assumed until mid-nineteenth-century urbanization and general population growth pushed up the cost of housing. Our households devoted considerably more of their expenditure to clothing and home furnishings than the minimal amount allowed in Allen's basket, and we observe the rise in the share of the budget devoted to the increased range of household goods.

Comparisons with the budget shares used by Clark show strong similarities with those for our late-eighteenth and early-nineteenth-century households.[98] Notable differences are higher shares of meat, bread, and grains and a lower share of beer than observed here. The shifts in patterns over time, as identified above, are not reflected in the budget shares used by Clark.

IV | COMPUTING THE COST-OF-LIVING INDICES

We start by comparing the cost-of-living index constructed using our household expenditure patterns with those of Allen based on the 'respectability' basket and the 'bare bones' subsistence basket.[99] We use the annual price data provided by Allen on his website.[100] We construct a chained-Laspeyres index using the elided set of expenditure weights.[101] Each link in the chain has its own base year to match the expenditure weights being used, but the overall series is then rebased for 1750 = 100.[102] Decadal averages for the series are presented in online appendix S4.

Figure 2 shows the costs of Allen's 'respectability' and 'bare bones' baskets using constant quantities purchased and the chained-Laspeyres cost-of-living series based on the same limited set of consumption categories. There is surprisingly little to distinguish the 'respectability' basket based on fixed weights from the methodologically improved chained-Laspeyres index until the nineteenth century. There is a tendency for the Laspeyres index to overstate price rises in periods of inflation, as predicted by theory, but these results suggest little to discredit the respectability basket as an effective measure of medieval and early modern household consumption.

We also compare the cost-of-living changes implied when households can afford only the 'bare bones' subsistence basket. This again tracks the key movements of the chained-Laspeyres index, but its high reliance on one commodity makes it more susceptible to the overstatement of inflation and a less reliable indicator of the prices faced by consumers if there were options for substitution between commodities in the consumption bundle. Cross-country comparisons that allow consumption standards to differ to reflect national diet, climate, and income level should be alert to this bias in the computation of real wages.

Consideration of the proportionate difference in the series underlines these findings (figure 3).[103] The overstatement of the 'bare bones' series is particularly evident in the medieval

[98] Clark, 'Long march', t.4.

[99] For comparison, we recalculate Allen's Laspeyres index for the respectability basket based on the quantities stated in Allen, *British*, p. 36, t.2.1 (see online app. S3 t.3), and using his prices in d. until 1830 (Allen, 'Data', columns CQ–DI) by deflating silver prices by the stated conversion rate (Allen, 'Data', column BP). Our base year is London 1750. From 1815, coal price is used for fuel.

[100] Allen, 'Data'.

[101] Online app. S3, t.2.

[102] Online app. S3, t.4.

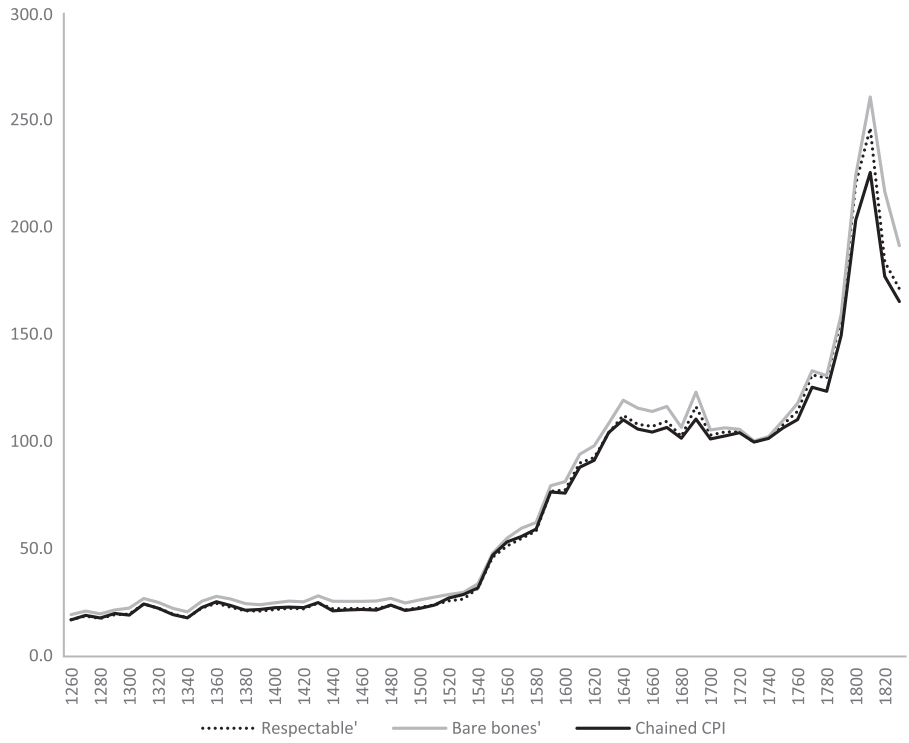

FIGURE 2 Comparison of CPI based on the 'respectable' and 'bare bones' consumption baskets and the chained-Laspeyres index (Allen's price data, decade average of indices) (1750 = 100). *Source*: see online app. S4 and text.

period when the gap between the 'bare-bones' and the chained-Laspeyres series is a large percentage of a relatively low CPI value. The overstatement is smaller subsequently, but noticeable in periods when prices are rising. The 'respectability' basket is a more reliable indicator, but still demonstrates a marked tendency to overstate costs as prices rise more generally.[104]

We cannot extend the comparison of the Allen basket indices and the chained-Laspeyres index beyond 1830, as Allen's price data end here. Yet the industrialization period is when improved income and the expansion of consumption choices might result in a more significant divergence in the CPI series.

We move through the industrialization period to 1869 and allow our detailed household budget accounts to provide the expenditure shares for a considerably wider range of products using the decadal price series on over 36 different commodities collected by Clark.[105] This allows

[103] Calculated as [(Allen CPI – chained Laspeyres)/Allen CPI] × 100. The annual gaps are Allen 'respectability' CPI, mean 0.61%, SD 8.79; Allen 'bare bones' CPI, mean 4.1%, SD 5.82.

[104] For the sub-series base years, we calculate both the Paasche (current weighted) and Laspeyres (1750 base weighted) price indices, based 1750 = 100. Their geometric average, the Fisher Ideal, conforms to the economic theory of consumer welfare. (Armknecht, 'Fixed basket'; Feinstein and Thomas, *Making history*, p. 517.) The chained-Laspeyres CPI calculated here lies between Paasche and Laspeyres and close to the Fisher Ideal index (online app. S3, t.5, figure 1).

[105] Clark, 'Condition', appendix t.4 provides decadal price indices for shelter, salt, spices, clothing, and sugar and honey, 1209–2004. Clark, 'Macroeconomic aggregates', appendix t.A1, www.core.ac.uk/download/pdf/6832298.pdf provides the remaining data. We adopt the index of clothing expenditure. The cost of books and paper represent the price of services

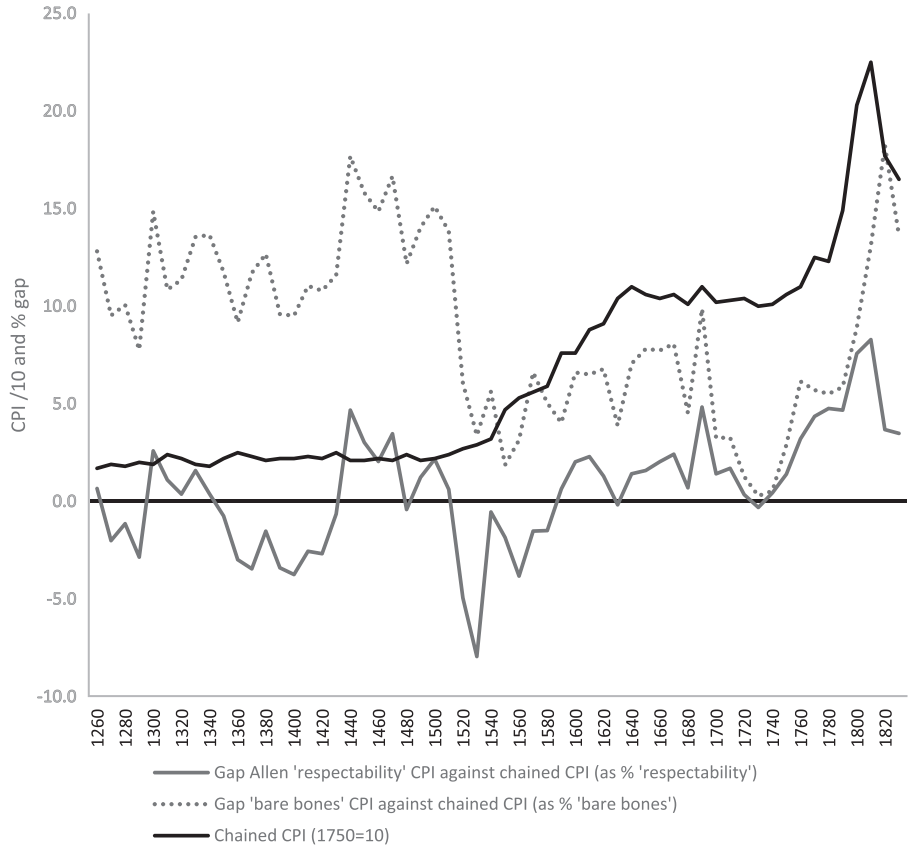

FIGURE 3 Percentage gap between Allen 'respectability' CPI and Allen 'bare bones' CPI with chained-Laspeyres CPI. *Source*: derived from online app. S4. *Notes*: Gap is [(Allen CPI – chained-Laspeyres CPI)/Allen CPI] × 100. Calculated from annual data, decade average shown here.

us to include consumption shifts, such as those between grains and across different beverages and sweeteners, and into the new categories of discretionary expenditure in clothing, domestic comfort, and commercial services. Allen's basket methodology cannot incorporate these new consumption standards.

This new expanded and extended chained-Laspeyres index (online appendix S4) shows more muted levels of price increase in periods of inflation than both Clark's own fixed-weight workers' CPI and the previously constructed chained-Laspeyres using Allen's expenditure categories (figure 4).[106] A wider range of goods may have allowed more opportunities for substitution and mitigated inflationary effects. Greater divergence in the price indices occur over industrialization. Again, the improved accuracy of the chained-Laspeyres methodology is underlined.

such as insurance and education. The price of clothing represents bedclothing and linen; timber represents furniture; and pewter, brass goods, pottery, glassware, scissors, cutlery, and window glass are used in various combinations through time to capture the cost of household ware. We use the price of beer 1260–1390 from Allen, 'Data' spreadsheet. Prices of 41 items are used to construct the chained-Laspeyres cost-of-living index.

[106] The proportionate difference in the series, [(Worker CPI – chained Laspeyres)/Worker CPI] × 100, shows average overstatement 6.9%, SD 4.11 1260–1860, 8.3% SD 3.34 for sub-period 1540–1800. The divergence is visually more noticeable when both series are based in 1860 (online app. S3, figure 2).

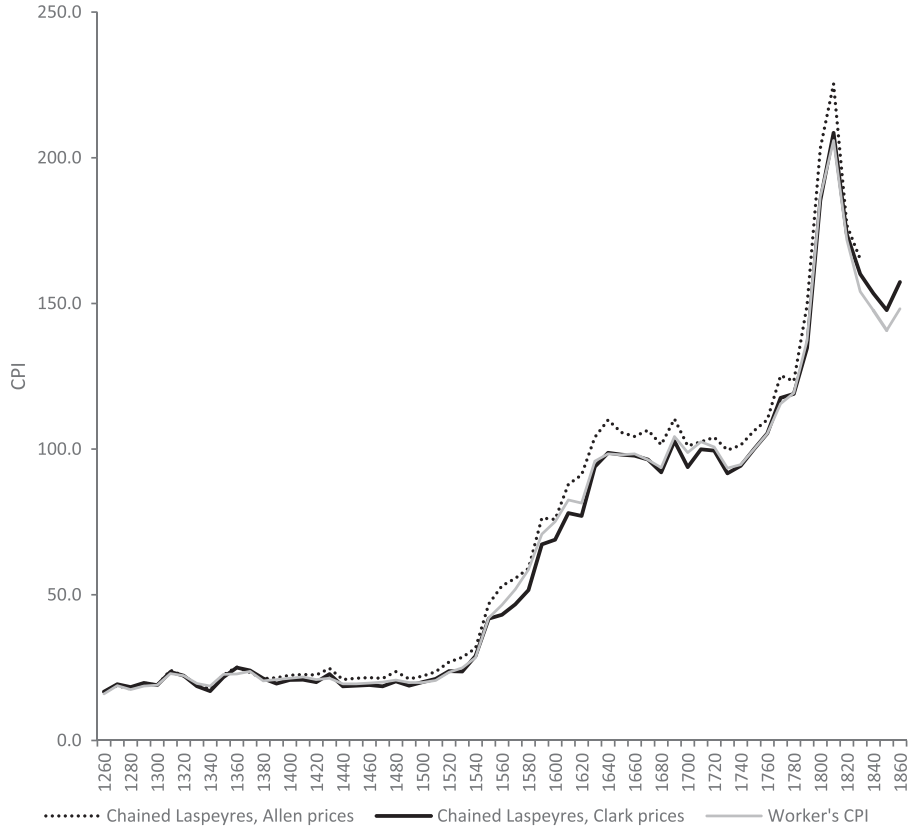

FIGURE 4 Comparison of chained-Laspeyres CPIs (Allen prices, decade average; Clark prices) with All Workers CPI (Clark) (1750 = 100). *Sources*: Online app. S4; Clark, 'Condition', t. A.2, pp.1324–5 (rebased 1750 = 100).

The difference observed between the Allen-based and Clark-based chained-Laspeyres indices invites a simple comparison of the effect of the differing underlying price series. We have three estimates for the price of a key item in the consumption bundle – bread: Allen's price for a 4 lb loaf in London for the period 1545–1900 and then estimated from wheat prices and a labour markup for earlier,[107] Clark's price inferred from regression analysis of price of bread on the price of wheat 1816–69,[108] and Horrell and Humphries' cost of 1500 kilocalories of wheat over time that comes from their work on children's wages.[109] The resultant bread prices differ significantly (online appendix S3, figure 3). Substituting each into a Laspeyres fixed-weight index where bread has a 26.4 per cent share demonstrates that the price series used for a key commodity has little impact on the overall cost-of-living index (online appendix S3, figure 4). This implies that differences in the two chained-Laspeyres series alternatively calculated using Allen's limited pre-modern commodities and Clark's fuller range of consumption goods likely arise from the differing expenditure weights applied rather than the underlying prices.

[107] Allen, 'Great divergence'.

[108] Clark, 'Condition', p. 1327.

[109] Details of construction fn. nos. 5, 6, and 7, Horrell and Humphries, 'Children's wages'. A long run, consistent series of the cost of wheat was converted into calories using estimates of nutrition from grain and extraction rates from milling.

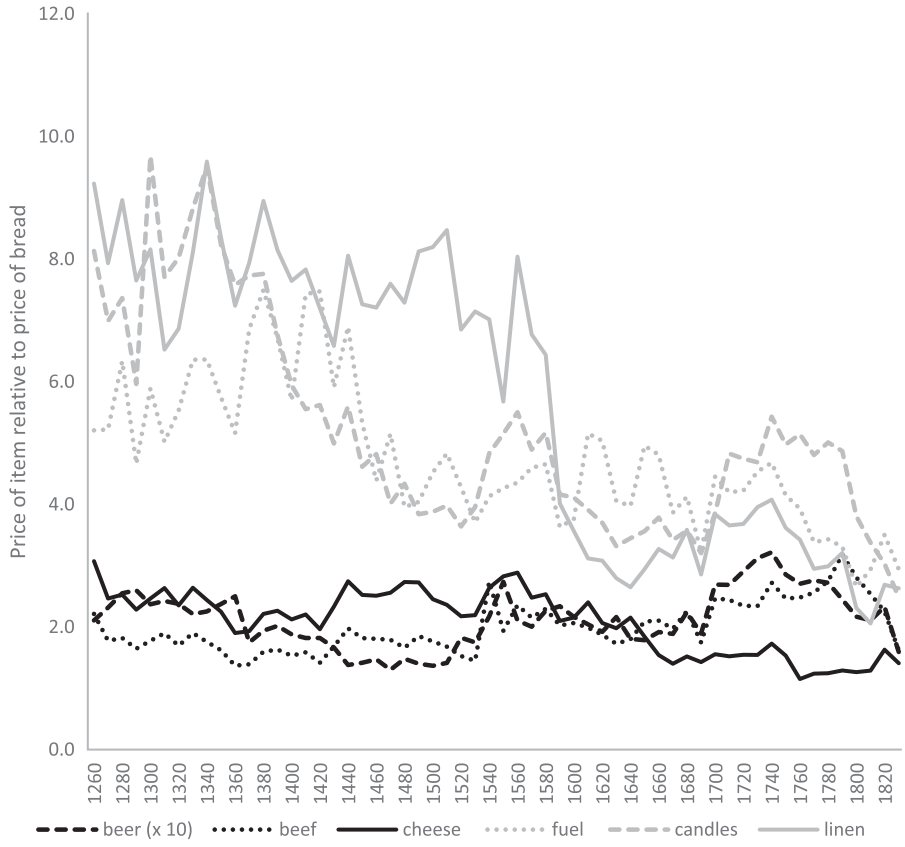

FIGURE 5 Prices of key commodities in the 'respectability' basket relative to price of bread
Source: Allen, 'Data', spreadsheet, decade averages.

V | COMMODITY PRICES

The similarity of the various CPI indices, despite differing content, methodology, and underlying prices, may result from the dominance of products based on agrarian inputs in expenditure. This begins to break down as new items of consumption less reliant on domestic agriculture are introduced in the industrialization period. We briefly examine this hypothesis.

The close correspondence of the trajectories of prices of foodstuffs such as beef, beer, and cheese to that of a key agricultural product, bread, is visually evident (figure 5). This is unsurprising. The price of grains may move in tandem. They are subject to similar weather conditions, harvest fluctuations, supply constraints, and demand conditions. Beer, livestock, dairy products, wool, soap, candles, leather, linen, flax, timber, and firewood are all outputs of the land. Most have prices closely influenced, either directly or indirectly, by those of grain inputs. There is little in the household consumption of earlier centuries that originated outside the primary sector. Wrigley discussed this organic economy dependence on land when articulating the dramatic escape from Malthusian constraints that coal and the move to the industrial economy enabled.[110]

[110] Wrigley, *Energy*.

FIGURE 6 Price of non-food and new categories of expenditure; furniture, clothing, services, and rent; relative to the price of bread. *Source*: Clark, 'Condition', appendix t.4, 'Macroeconomic aggregates', appendix t.A.1.

Correlation coefficients reveal the strength of the price associations (online appendix S3, t.6a, 6b). The contents of the pre-modern basket exhibited high and significant correlation from 1260 to 1830, although correlation between the prime agricultural products and some key items of expenditure weakened after 1700. The smaller coefficient for firewood and the diminished significance for candles suggests the encroaching influence of alternatives: coal began to substitute for wood in heating, and oil, and eventually gas, were used for lighting. These alternatives were the energy sources of the industrial, mineral-based economy where the link with the land had been broken.[111]

The rapid decline in the prices of clothing and furniture relative to bread, as well as some reduction in the relative price of rent, was evident from the sixteenth century (figure 6). Services entered in the eighteenth century, also at a relatively low value. Correlations in prices of the broad commodity categories of furniture, clothing, and rent with bread remained high (online app. S3, t.7a), but were very much lower with new products such as tea, sugar, potatoes, paper, pottery, glassware, and cutlery (online app. S3, t.7b).

Eighteenth-century trade introduced a new set of exotic groceries and raw material inputs that utilized overseas land, forced labour, alternative climatic conditions, new crops, and improved transport – items such as tea, coffee, sugar, tobacco, potatoes, and cotton. Their prices exhibited only weak links with those of domestic agriculture. The advent of industrial manufacturing further shifted reliance from organic outputs to alternative fuels and onto new materials: china, cutlery, and glassware. The scene was set for the new industrial era to bring with it a shifting

[111] Wrigley, *Continuity*.

dynamic in household consumption choices. As Shammas has noted, tea and sugar became staples of the English diet because of relative price decrease and their assured availability at the local shop in times when purchasing dairy items and meat could be uncertain and expensive for the rural consumer.[112]

The implications of these findings for the long-run cost of living are twofold. Strong correlation between the prices of key commodities constrained consumers' ability to respond to price increases by switching between consumption alternatives. In the pre-industrial period, when most prices were related to the output of agriculture, the evolution of the consumption bundle over time had little impact on the cost of living. Hence the Laspeyres fixed-weight methodology of Allen's 'respectability' basket performs well. From the eighteenth century, the entry of new goods into consumption started to undermine this co-dependency. Initially, the proportion of the household budget devoted to these novel products was sufficiently small to exert only a minimal impact on the measurement of the cost of living. Subsequently, industrialization, economic growth, and income increases drove a wedge between the 'respectability' basket and actual consumption. The true cost of living faced by labouring households drifted ever further from that implied by the 'respectability' basket, making the use of a chained-Laspeyres CPI imperative.[113]

VI | CONCLUSION

The construction of a methodologically superior, chained-Laspeyres consumer price index reassures that existing, simpler measures of long-run inflation are largely accurate until the industrial era. That prices of key elements in household expenditure were highly correlated with the fortunes of agriculture underlies the similarity of different versions of a cost-of-living index. Once industrialization took hold, the shift in household expenditures towards imported groceries and manufactured goods introduced a new dynamic. From this stage forward, household expenditures more obviously adjusted to relative price changes and movements in income. Chained-Laspeyres indices have been demonstrated to better capture price levels over industrialization.[114] Existing series from the mid-nineteenth century onwards can be joined to the chained-Laspeyres index presented here. The consumer price inflation faced by ordinary households in England over nearly eight centuries, from 1260 to the present day, is revealed.

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[112] Shammas, *Pre-industrial*, ch.4.

[113] Allen, 'Data' spreadsheet overcomes this issue by splicing Feinstein's 'Pessimism perpetuated' cost-of-living index onto his series from 1830. This index encompasses expenditure on these new goods and allows for the possibilities of substitution between consumption items, keeping Allen's CPI relevant into the nineteenth century.

[114] Feinstein, 'Pessimism perpetuated'; Allen, 'Pessimism preserved'.

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