THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Economic History Working Papers No: 375

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April 2025

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The commercialization of labour markets: Evidence from wage inequality in the Middle Ages

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April 14, 2025

Abstract

Much of our understanding of the dynamics of historical economies has been shaped by insights drawn from long-run wage series. Behind much scholarship concerning pre-industrial wages lies the quest for a representative 'average' wage trend. Indeed, much methodological discussion surrounds what characterizes an 'average' labourer and how best to capture their wages. This paper offers an alternative perspective by undertaking a comprehensive assessment of the diverse forms and levels of remuneration, including both pay rates and methods of payment. We find groups of workers whose working and earning was seemingly unaffected by the societal transmutations which followed the Black Death. At the same time, we find evidence of the 'commercialization' of labour markets: a process in which cash wages on lords' demesne farms were increasingly shaped by market forces, and a more professionalized labour force was supplemented by a variety of higher-paid peripheral jobs. This paper highlights the need for a holistic perspective to fully appreciate the dynamics and statics of pre-industrial labour markets.

JEL classification codes: J33, J42, N33, N53

Keywords: Wages, Labour Markets, Medieval England, Inequality

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Acknowledgements: Jordan Claridge is grateful for research funding from the Suntory and Toyota International Centres for Economics and Related Disciplines (STICERD) and the Research and Impact Support Fund, both at LSE, and to the Huntington Library for a Myers Fellowship. We are grateful for the research assistance of Dan Booker, Selma Korbach and Ryan Wicklund. We thank participants at the following conferences for useful feedback: The Economic History Society Conference 2024, Newcastle; the European Social Science History Conference, Leiden. Thanks to Grace Owen and Philip Slavin for sharing photographed manorial accounts. We would also like to thank the staff at all the archives and record offices visited over many years in collecting the data for this article.

1 Introduction

Much of our understanding concerning the development and dynamics of historical economies are underpinned by long-run wage series. Wage evidence has become the fulcrum upon which several grand theories, like the Little and Great Divergences and the 'Malthusian' nature of pre-modern economies, now pivot. Many studies have endeavoured to find long run wage trends that are broadly representative and could be argued to reflect an 'average' wage for a 'typical' labourer. Given the importance of wage evidence, it is unsurprising that much scholarship concerning the earnings of pre-industrial workers has focused around representativeness.[1] Indeed, much methodological discussion surrounds what characterizes an 'average' labourer and how best to capture their wages. The utility of a single wage series is undeniable, especially for more macroeconomic questions.[2] However, by necessity, such series mask an array of variation across a number of variables which are vital for our understanding of working and earning. Further, the methods employed in deriving some long-run wage series make it impossible to use the underlying data to accurately 'zoom in' beyond annual, or even decadal, average figures. Appreciating the utility of long-run wage series as historical evidence requires close attention to the heterogeneity of the underlying individual wage observations. Such granularity is also essential for addressing more substantive economic questions: wage distribution(s) and inequality are key to understanding the functioning of historical labour markets (Carvalhal, Lucassen, Stephenson, & De Zwart, 2025).

This paper focuses predominantly on the period of the long fourteenth century: a period for which our knowledge on both the levels and drivers of wage inequality is especially limited. This is a glaring gap in knowledge, because this period is typically considered to have been transformative for pre-industrial labour markets.

[1] For a critical overview of the methods and data used to reconstruct historical earnings, see Hatcher and Stephenson (2018).

[2] Case-in-point is the recent appraisal of long-run productivity growth in England by Bouscasse, Nakamura, and Steinsson (2024), which hinges on the day wage time series by Clark (2010). In a robustness check, the authors consider the use of various other day and annual wage series (Allen, 2007; Humphries & Weisdorf, 2019). Chilosi and Ciccarelli (2025) assess the representativeness of real wage evidence in interpreting long-run growth by deriving GDP with a general equilibrium model and comparing these results with those derived from wage observations.

Indeed, the Black Death of 1348-50 - and its negative effects on medieval labour supply - is sometimes said to have ushered in a 'golden age' for labourers and perhaps even modern economic growth (Voigtländer & Voth, 2013). Most of these claims have focused solely on the average earnings of a relatively homogeneous group of labourers who worked by the day and earned cash in agriculture and construction (Allen, 2001; Clark, 2005, 2007). However, recent work on workers employed on a longer term basis and remunerated (at least in part) with in-kind wages has reframed thinking about both the scale and the timing of a post-plague increase in labour remuneration (Humphries & Weisdorf, 2019; Claridge, Delabastita, & Gibbs, 2024). This raises a question concerning the degree to which the most frequently-cited wage series might hide substantial variation in the labour market experiences of fourteenth-century workers. Such concerns are demonstrated particularly clearly by fierce discussions about whether female workers benefited as much as men from the windfall wages that are argued to have followed the Black Death (Bardsley, 1999; Hatcher, 2001; Humphries & Weisdorf, 2015; de Pleijt & Van Zanden, 2021).

This paper has two objectives. First, it aims to present a more holistic perspective on the evolution of work and pay in the Middle Ages. It does so by focusing primarily on differences, or inequities, between workers and the wages they earned. Where previous studies have endeavoured to control for heterogeneity, here we embrace it. We explore new data concerning both the wages earned and work performed by the central group of agricultural labourers in medieval England. These labourers, called *famuli*, contributed the largest share of agricultural labour on the seigniorial demesne farms of medieval lords,[3] and, as a group, have been used fruitfully in the literature to explore not only wages, but the dynamics of medieval labour markets (Farmer, 1996; Claridge & Langdon, 2015; Humphries & Weisdorf, 2015, 2019; Claridge et al., 2024). We provide a new perspective on employment and remuneration patterns across a wide group of agricultural workers and how these changed over time. We adopt a novel empirical approach by analysing *famuli* earnings in the form of a weekly rate. This allows us to compare remuneration across the entire range of *famuli* workers, not only in terms of occupation and earnings, but also

[3] In his exhaustive exploration of manorial work and wages, David Farmer asserted that by the thirteenth century, the *famuli* were providing the bulk of agricultural labour on seigniorial demesnes (Farmer, 1988, 760)

tenure. This approach differs fundamentally from earlier work on medieval wages, where the emphasis has often been on the measurement of a representative series for a subgroup of workers such as day labourers (Allen, 2001; Clark, 2005, 2007) and workers on annual contracts (Humphries & Weisdorf, 2019; Claridge et al., 2024). We focus instead on a range of occupational groups within the *famuli* labour force, including both part-time and full-time workers, to ask how their working and earning differed and changed over time. We also employ sets of cross-sectional data to explore regional variations in earnings among ploughmen as a specific subset of labourers. Beyond their intrinsic importance, these themes also contribute to the broader literature on historical living standards by challenging the notion that any single type of worker can be truly 'representative,' given the varied impact of labour market shocks like the Black Death on occupational structure, on employment tenure, and upon regional differences.

Second, the analysis of a broad array of workers helps shed new light on long-running debates concerning the degree to which the late medieval English economy was commercialized, and how it did (or did not) affect certain segments of the labour market. In the wake of the trailblazing work by Richard Britnell (for an early example, see Britnell, 1981), who demonstrated the proliferation of markets in medieval England, a consensus has emerged in the literature: over the thirteenth and early fourteenth centuries, an increasing volume of economic exchange occurred within market settings. This, in turn, lead to increasing market orientation in both the seigniorial and peasant sectors; both groups produced a significant share of their output for sale rather than consumption (Britnell, 1993; Campbell, 2009; Bailey, 2021). These developments helped support Smithian growth in a period of dramatic population increase. Expansion is argued to have occurred in both product and factor markets, and this has been demonstrated through the growth of chartered markets (Britnell, 1981), high levels of integration in grain prices (Clark, 2015; Federico, Schulze, & Volckart, 2021), the responsiveness of both demesne managers and peasants to commercial opportunities (Stone, 2001; Dodds, 2007), the depth of credit markets (Briggs, 2009) and the extent of land transactions at all social levels (Whittle, 1998; Bekar & Reed, 2013).

Labour markets are generally assumed to have followed a similar trend, although the evidence for this has been largely indirect. Several interpretations have highlighted the precarity of those who held little or no land before the Black Death. For people in this position, their survival must have been made possible - at least in part - by the availability of waged work on both the estates of lords and larger-scale peasant farms (Campbell, 2009). Similarly, growing recognition of the relatively limited role of labour services - work owed by servile tenants as part of their rent - in demesne agriculture highlights the extent to which lords depended on the market to supply labour (Campbell, 2000, 2-3). Recently, Bailey (2023) has demonstrated that narratives of heavily-regulated labour markets in early fourteenth century England do not stand up to a systematic scrutiny of the evidence contained in court rolls and by-laws. In reality, English legal frameworks did very little to prevent the development of an open labour market before the Black Death. While attempts to more tightly control the labour market and suppress wages followed the Plague, the very necessity of such interventions demonstrates the extent and depth of the labour market at that time. Moreover, the limited success of this legislation, revealed by the dramatic increase of wages beyond the levels 'set' by the Statute and Ordinance of Labourers, shows that the labour market was already far too developed for the medieval English state to effectively control how workers were hired, the terms of their employment, or their rates of pay. (Bailey, 2025; Claridge et al., 2024).

On the other hand, there is also evidence for the limited reach of commercial forces and attitudes in wage-setting in medieval (and indeed post-medieval) labour markets. Strong social norms, referred to as 'customs', both at the national level and at the level of estates or even individual manors, played a role in a wide range of transactions in the pre-industrial world.[4] These were based around long-established local practices which had a binding effect on the behaviour of economic agents. For instance, in medieval England, levels of rents were frequently determined by custom, with many tenants paying rents set at sub-market rates, through appeals to

[4] 'Customs' are a slippery concept. This term is often used generally by economic historians, particularly when examining wage dynamics, to explain patterns and variations inexplicable using the logic of neo-classical economic theory (Woodward, 1994). For medievalists, 'customs' refer to something more specific, typically contemporary references in legal records to long-standing, localized practices that were regularly and explicitly invoked in courts and set down in custumals to resolve disputes and routinise obligations (Birrell, 2014; Bonfield, 1989). Throughout this paper we will consider both usages and how these were interrelated.

fixed obligations which had been agreed since 'time out of mind' (Hatcher, 1981). Customary practices could interact with market forces in ways that heightened inequality. For example, when tenants with customarily fixed rents profited by subletting their land to others who were compelled to pay higher market rates (Campbell, 2005). With regard to wages, de Pleijt and Van Zanden (2021) argue that custom played varying roles in shaping pre-industrial women's wages across Europe: in southern Europe, women consistently earned half as much as men, while in northern Europe they were relegated to the back of the labour market queue. In England, the persistence of in-kind wages for many workers throughout much of the fourteenth century, despite fluctuations in their value due to changing grain prices, perhaps reflects a customary entitlement to a defined level of consumption, effectively serving as an insurance mechanism for medieval workers (Claridge et al., 2024).[5] Therefore, despite the sustained scholarly attention paid to levels of commercialization in England, the significance of 'labour market commercialization' in determining the remuneration received by workers, and its interrelation with deep-rooted customary practices, has not yet been fully explored.

Our data and method allows us to examine the extent to which the medieval English labour market was commercialized. First, we examine *occupational* variation in wage rates to show how the nature of labour markets changed over the course of the fourteenth century in the wake of the most dramatic labour supply shock in European history. We find that the market for *famuli* labour was segmented and these segments developed at two different speeds. Wage rates and employment patterns for most annually-employed 'core' *famuli* changed very little throughout the fourteenth century: they remained the central workforce in manorial agriculture, but were largely excluded from any wage windfalls which followed the Black Death. At the same time, the nature and remuneration of some of the more peripheral *famuli* changed drastically: their work moved from a poorly-remunerated side activity to well paid and important activity of the *famuli* labour force. We supplement these findings with further evidence of a so-called 'professionalization' of the *famuli* labour force, in which the - primarily poorly remunerated - part-time jobs gradually

[5] It has been argued that these in-kind wages reflect a contemporary understanding of a respectable standard of living. See: (Humphries, 2025).

disappeared from demesnes.

Second, we also consider the *regional* dimension of medieval wage inequality, in which we find that - while the commercialization of labour markets likely had a distinct effect on various areas across England - regionally localized customs remained very important in determining the wage fate of the medieval worker. This is confirmed by a third stream of evidence, in which we quantitatively assess the extent to which *occupational* and *regional* dimensions, by themselves, are able to explain medieval wage inequality. We find that in 1300, much variation remains unidentified, again highlighting the importance of local customs in the determination of wages. However, our econometric findings also reveal that, throughout the fourteenth century, market forces and commercialization became increasingly determinant factors for wage inequality. In conclusion, this paper appreciates both stability, in terms of stable occupational wage premia and the role of customs, and change, in the form of skyrocketing wages for a select group of workers, and the market forces that defined these. An important consequence of our work is the understanding that any appraisal of medieval labour markets based on only one side of the labour market is destined to be incomplete.

The remainder of this paper is structured as follows: Section 2 introduces the historical sources and our data architecture. In Section 3, we describe the changing distribution and dimensions of *famuli* wages. Section 4 explores inequalities in wages between occupations. Section 5 explores growing 'professionalisation of the *famuli* workforce as measured through occupation structure and lengths of tenure. Section 6 examines regional trends in wage inequality. Section 7 quantitatively explores the factors that determined wages in the medieval labour market. In Section 8, we place our findings in a broader perspective. Finally, Section 9 concludes.

2 Data: The *famuli* as a case study

Our analysis is based upon the exceptional evidence found in medieval English manorial accounts, which we use to reconstruct and examine the weekly wage rates of all *famuli* labourers. Postan (1954) gave the *famuli* their first scholarly attention as a unique group of labourers in in 1954, focusing on the twelfth and thirteenth cen-

turies. His work provided an overview with some examples of wage levels drawn from the estates of the Bishop of Winchester, Crowland Abbey and the Earls of Cornwall. Farmer (1996) followed this up nearly forty years later with a chapter which examined the same group but in the later Middle Ages, looking into the fifteenth century. Farmer's approach was more data-heavy with wages quarried from a sample of manorial accounts of some 150 manors, chiefly drawn from the bishopric of Winchester and Glastonbury Abbey. Claridge and Langdon (2015) deployed a larger data sample of more than 300 manors, to examine the structure of the *famuli*, particularly in terms of their in-kind earnings. They argue that that, by 1300, the *famuli* labour force was divided into two tiers. 'First-tier' labourers did the more important work, and enjoyed both longer and more secure contracts as well as better rates of pay. 'Second-tier' *famuli* labourers were paid less, but also worked less regularly and tended to be restricted to less skilled and less desirable work. These findings were based only on the distribution of in-kind payment around c. 1300 and can be usefully tested and/or updated here with an improved methodology that considers cash and in-kind remuneration together over the entirety of the fourteenth century. While Farmer (1996, 229) had deemed it "impossible to construct any index of the remuneration received by the *famuli* as a whole", Claridge et al. (2024) used *famuli* wages to do exactly this in order to explore the changing dynamics of labour markets in medieval England. In this paper, we explore the same group of labourers with a focus on the *variation* of *famuli* wages.

This paper reconstructs weekly wage rates, which is a novel approach that deviates from established methods used to analyse pre-industrial earnings, which typically focus on the largest and most homogeneous groups of either day-wage earners or the total wages of annually-employed servants. Weekly rates, however, are actually most consistent with how both employers and *famuli* employees would have understood rates of pay. Therefore, our calculation of weekly rates is not an anachronistic concept. In fact, the medieval scribes who created these documents regularly reported wage rates in weekly terms directly in manorial accounts.[6] That is, medieval English manorial records express the in-kind wages paid to *famuli* in terms

[6] We refer to Appendix A for more information on the calculation of medieval wage rates and the underlying assumptions.

of the number of weeks each worker was required to work to earn a fixed quantity of grain. In addition, these accounts record the number of weeks a worker was employed (Claridge & Langdon, 2015).

Cash wages were recorded differently. Money payments were typically recorded as a total sum received by a worker for a specific period of time, which could vary from a defined period of weeks to a whole accounting year. Dairymaids, for example, were often paid cash wages for the summer, when grass was plentiful and cows were producing the most milk. Carters, on the other hand, were typically employed year-round. Therefore, calculating the average weekly rate paid to a given worker in a given year involves combining information about the various in-kind and cash payments made to workers as well as the length of their employment. These pieces of information can all be retrieved from the historical sources. While a labour-intensive process for the historian, weekly rates have significant advantages over other measures of remuneration in that they allow for a simple comparative weekly wage for the full spectrum of workers. We are able to transform the often confusing array of payments made to both annually-employed and part-time workers across different parts of the year recorded in somewhat idiosyncratic medieval accounts into a single set of values per worker-year, which can be compared across space and time.

This paper uses both cross-sectional and long-run panel data, drawing from hundreds of manorial accounts. Our cross sections are centred around two key moments in medieval history. The first, from c. 1300, allows us to explore the dynamics of *famuli* work and wages at the height of the 'high farming' period of seigniorial agriculture which was also the height of the medieval English population. We drew this cross section from 433 manorial accounts.[7] Our second cross section from around c. 1400 captures *famuli* labour in the aftermath of the economic and social changes created by the Black Death and subsequent outbreaks of plague. Our 1400 cross section is drawn from 85 accounts. A third data set is comprised of long-run studies of a handful of well-documented manors from around the country which allow us to trace more closely the development of differences observed between the c. 1300 and c.1400 cross sections. This long-run sample includes 25 manors from five

[7] We are able to identify the composition of grain liveries and value the total composite wage paid to *famuli* for 254 of these 433 accounts.

estates and is drawn from a total of 483 accounts between 1270 and 1440. Together, our samples allow us to look for patterns of continuity and change in wage inequality in the wake of the structural changes of the fourteenth century. The spatial distribution of the manors from the three cross sections is seen in Figure 1.[8] While the samples are biased towards the South and East of England, this is broadly reflective of population density and economic activity, and all regions are represented by at least some manors in 1300 and 1400. We refer to Appendix A for a more in-depth discussion of the sources and the data collection process.

3 The dimensions of *famuli* remuneration

Famuli workers were heterogeneous in terms of occupation, tenure, and earnings, and the variation in these variables is recorded in manorial accounts. This allows us to gauge the individual-level drivers of wage inequality. Figure 2 provides a first appreciation of the variation in rates of pay the *famuli* received by showing the distribution of total wage rates in 1300 and 1400 respectively.[9] This total rate encapsulates all elements of what constitutes a 'total wage' for *famulus* which we introduce in this section. It is apparent that any appraisal based on an averaging technique, such as the 'raw' averages displayed by the vertical lines in the figure, obscures the wide variation of total wage rates within the wider workforce of even the limited category of *famuli* workers. Instead, we already find a relatively wide dispersion of total wage rates earned by the *famuli* in 1300, which became even more pronounced in 1400.

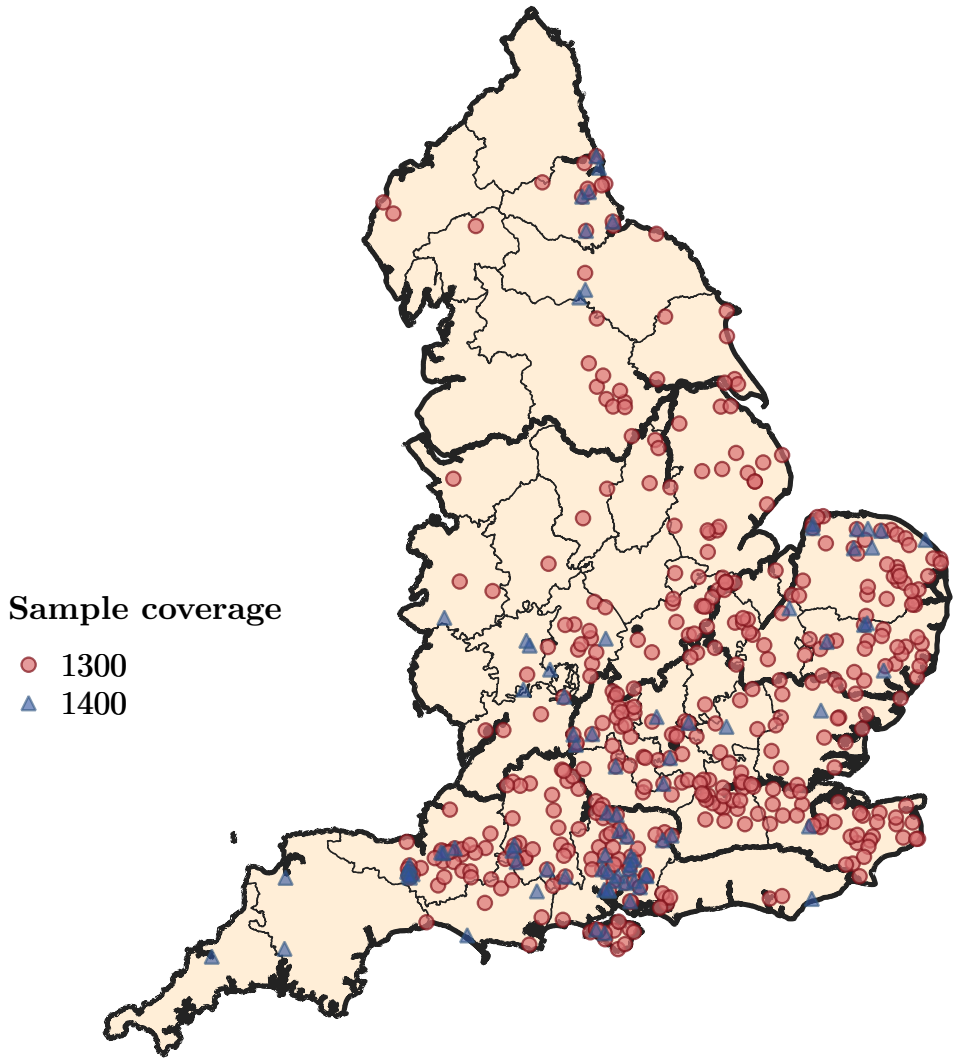
To illustrate the wide range of wage rates in Medieval England, let us take examples from both ends of the distributions in 1300 and 1400. Harvest workers were often among the higher earners. In 1301, a harvest worker stacking grain on the manor of Ditton Valence (Cambridgeshire) earned 5d. of cash and 1 bushel of a barley and rye mixture, together worth 11d., per week.[10] In 1409-10, harvest workers

[8] For a discussion of the composition of our regional macro-regions, see Appendix B.

[9] In Figure A3 in Appendix D, we perform the same exercise but in real rather than nominal terms. This paper is primarily focused on comparing nominal rates paid to medieval workers, but Figure A3 emphasizes that the stagnation we will describe for nominal wage rates becomes even more apparent in real terms.

[10] The National Archives (TNA), SC6 766/15.

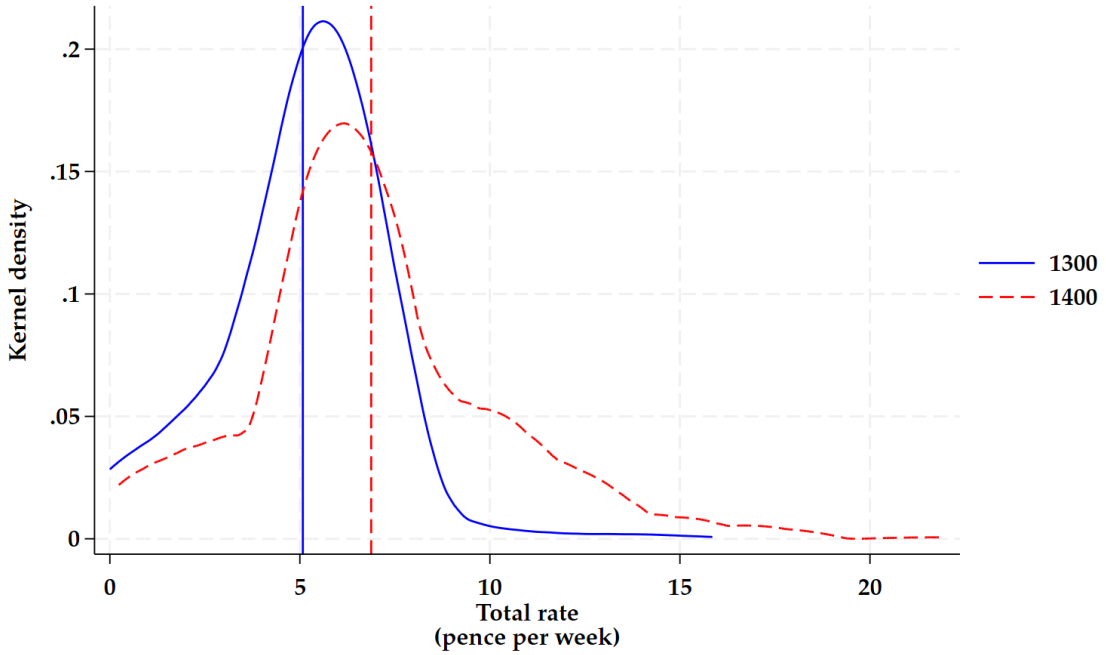
Figure 1: **Map of the manorial coverage of the two cross-sectional samples**



Notes: The bold borders represent the macro regions as discussed in the text. The non-bold borders represent historical county borders.

mowing at Sedgeford (Norfolk) earned 17d. per week in cash, considerably more than their forebears in 1300.[11] At the other end of the scale, a page (boy) guarding cows and geese working at Bewley (Durham) in 1302-3 earned only one quarter of a bushel of wheat per week, equating to around 2d. per week.[12] His equivalent in 1396-7, a page helping the shepherd at Carthorpe (Yorkshire), earned one third of a bushel of maslin (a mixture of rye and wheat) per week, again with no cash, worth about 1.5d. per week.[13] In this case, the boy in c. 1400 actually earned 25 percent less than his predecessor was paid nearly a century earlier.

Figure 2: **Wage distribution of *famuli* (total rates), ca 1300 and 1400 England**



Notes: The vertical lines represent the average total wage rate. The wage distributions are approximated through kernel density estimation using a Epanechnikov function with a smoothing parameter of 1.

Source: Authors' database

To understand how and why the wages paid to the *famuli* varied we need to first appreciate that they were paid a composite wage formed of cash and in-kind components as seen in the examples above. Then we must consider how the rates of remuneration paid to labourers varied across three dimensions. The first and

[11] Norfolk Record Office (NRO), DCN 60/33/13.
[12] Britnell, 2014, 178.
[13] North Yorkshire Archives, ZJX 3/2/35.

most straightforward is the amount of cash labourers received. In-kind remuneration, however, is more complicated as it could be adjusted in two separate ways. First, in-kind *quantity*, our second dimension, is simply the amount of grain given to labourers. In contemporary practice, this was expressed in the number of weeks it took a worker to earn a quarter of grain. The third dimension is in-kind *quality* which was determined by the types of grain paid to workers. This ranged from less desirable and lower-value grains like oats and even beans and legumes at one end of the spectrum, to the most desirable grain, wheat, which was at the heart of elite diets, exemplified by the exclusive preference for wheat bread at aristocratic and monastic tables (Dyer, 2023). The composition of grain liveries varied considerably between manors and over time; a full exploration of this dimension of remuneration is outside the scope of this paper, but most *famuli* received 'middling' mixtures, which, in terms of quality, sat somewhere between the poles of oats and wheat. For the remainder of this paper, we quantify the quality of a grain livery by calculating its weighted market price using both local prices quarried from the same accounts as the wages we record, as well annual prices calculated by Farmer (1988, 1991).[14]

To illustrate these three dimensions, and how they impacted on total earnings, we can focus on the example of the remuneration of one type of worker, ploughmen, at two Suffolk manors of the Benedictine monastery of Bury St Edmunds, Hinderclay and Redgrave, across the fourteenth century (Figure 3). Panel (a) shows the amount of cash received by ploughmen, expressed in pence (d.) per week. These rates were often quite sticky over time, but were adjusted at both manors across the fourteenth century, for instance rising from 0.8d. to 1.5d. at Hinderclay. Panel (b) illustrates the amount of grain received by ploughmen, expressed in bushels per week. Again, this quantity was very sticky, at Hinderclay remaining at 0.67 bushels per week (or 12 weeks per quarter) for almost the entire fourteenth century, before jumping to 0.8 bushels per week (or 10 weeks per quarter) from the 1390s. Panel (c) shows the quality of in-kind payments at both manors, expressed in the value of a quarter of the grain mix they received. The actual mixtures of grains received at each manor were also relatively sticky but varied between the two demesnes. At both manors, workers

[14] For more information on the calculation of the total wage rates, including the pricing of the liveries, we refer to Appendix A.

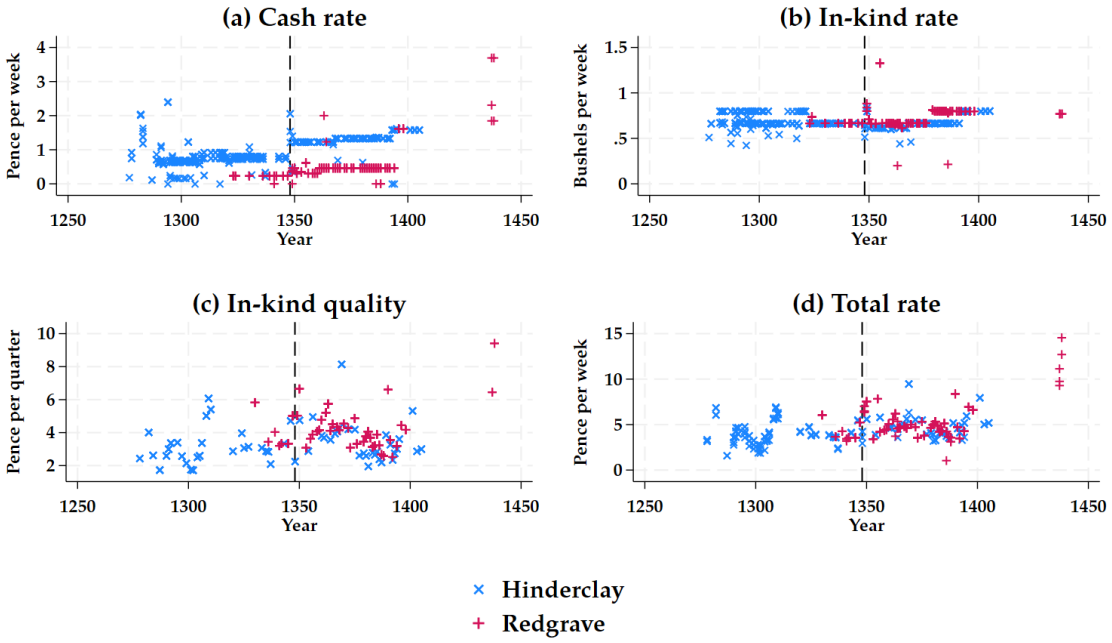
were paid a mix of barley, beans and peas, rye and wheat, but received different proportions of these. This explains some of the variation in livery quality between the two manors in the *same* year. However, the significant variation *between* years is explained by the changing prices of grains. Panel (d) combines the information across all three dimensions to provide the total pay rate of a ploughman at each manor expressed in pence per week.

Looking at these four panels together illustrates two important aspects of the remuneration of *famuli* workers. First, cash typically provided only a small proportion of total earnings at these Suffolk manors. This reflects national trends: although its share grew over the course of the fourteenth century, cash accounted for less than half of total *famuli* remuneration. In the 1300-09, on average, 18 percent of annually employed male *famuli* wages were paid in cash. By 1400-09 this had risen to 37 percent (Claridge et al., 2024). Changes in the cash share of remuneration probably have a disproportionally large effect on our understanding of long-run wages in the Middle Ages because it is variation in this dimension which drives the influential Humphries and Weisdorf (2019) series, despite it only accounting for a small share of most medieval workers' earnings.

Secondly, we can see that differences in cash remuneration could be evened out between workers due to differences in the quality and quantity of in-kind payments. While between 1350 and 1400 ploughmen at Hinderclay were paid around 1d. in cash per week more than those at Redgrave, the total rates of pay at both manors were very similar. This was because workers at Redgrave received higher quality grains, and later, a higher quantity than *famuli* at Hinderclay. That lords, as employers, adjusted remuneration across all dimensions is also seen at other estates. When grain prices rose in the first decade of the fourteenth century, some of the bishop of Winchester's manors reduced the rate of grain payment from one quarter every eight weeks to one quarter every ten, while increasing the cash payment from 3s. to 4s. With grain liveries paid in barley, this meant that workers lost about 5s. worth of grain while gaining only 1s. in cash (Farmer, 1988, 762). After the plague, on Ramsey Abbey manors, many *famuli* also received more cash, but any rise in total remuneration was cancelled out by a reduction in the quality of grain they received,

with peas increasingly substituted for wheat (Farmer, 1991, 481-2). Therefore, it is only by combining information on all of these three dimensions of remuneration, that we can understand the full 'pay packet' earned by *famuli* workers, and how this varied across space and time.

Figure 3: **Changes in the remuneration of *famuli* ploughmen in three dimensions: Hinderclay and Redgrave**



Notes: The dotted vertical line is plotted at 1348, when the Black Death arrived in England.

Source: Authors' database

4 Occupational wage inequality

The question at hand is now how we can break down the distribution of total wage rates to observe the different drivers of wage inequality, and whether these drivers changed over the course of the fourteenth century. An intuitive point to start is the occupational composition of the *famuli* labour force. The *famuli* were a diverse group, and, collectively, they undertook a wide variety of tasks and responsibilities. For analytical purposes, we distinguish between twelve major occupational groups among the *famuli*. We refer to Appendix A.1 for a Latin list of occupational titles. In Appendix C, we present a more detailed discussion of the employment structure of

the *famuli* in 1300 and 1400. Here, we focus on the key trends in employment and wage rates.

A first major group of occupations was what we term the 'core' *famuli* occupations: well-defined roles which are found consistently in accounts from across England, especially at the highpoint of demesne agriculture in c.1300. These consisted of ploughmen,[15] carters (*carectarii*) cowherds (*vaccarii*), dairymaids (*dayae*/*daiae*), shepherds (*bercarii*) and swineherds (*porcarii*). These roles were essential to the basic exploitation of agricultural land and livestock on a large-scale medieval estate. The main tasks of individuals in these groups are reflected in their occupational titles, but their work could, and did, stretch to other jobs, especially in slack periods, which for arable roles, was between sowing and harvesting and for dairymaids, the winter, when cows produced less milk (Searle, 1974, 305; Penn & Dyer, 1990, 362; Britnell, 2001, 6-7).[16] These workers are joined by a further 'core' group, which we call 'titular *famuli*'. What differentiates these labourers from other 'core' workers is that they were described in the accounts not by occupational designators, but more generic terms such as *famuli* of the court (*famulus curiae*) , 'servant' (*serviens*) and simply '*famulus*'. These individuals often performed one of the occupations outlined previously, but were not explicitly tied to the occupation in the accounts. The reason for this, as discussed below, may lie in the greater use of names to identify individual workers in accounts from the last quarter of the fourteenth century, which meant occupational titles were no longer recorded as consistently (Claridge et al., 2024). A focus on the most important agricultural work, combined with a degree of flexibility ensured that 'core' *famuli* were essential throughout the agricultural year and, accordingly, most were employed on an annual basis.[17]

The other five categories of workers can be described as more peripheral for a variety of reasons. Harrowers (*herciatores*) and harvest workers (performing tasks such as stacking, forking and reaping) were important for agricultural production, but only at specific times in the year. Hiring *famuli* to perform these tasks was

[15] This group consists of workers designated as 'ploughmen' (*carucarii*, as well as the more specific designators of 'driver of the plough' (*fugatores*) and 'holder of the plough' (*tentores*)

[16] For more on the specific tasks of these workers, see Appendix C.

[17] As shown in Table 1, in 1300 the average 'core' *famulus* or *famula* worked 316 days per year and 79 percent were full time. These trends were heightened by 1400, when they worked on average for 352 days per year and 95 percent were full time

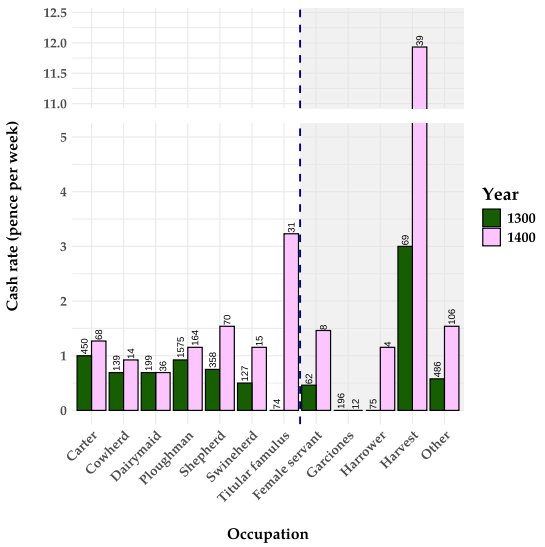
only one option available to demesne managers, who could also hire day labour, use labour services owed by tenants (where available) or redeploy 'core' *famuli*. *Garciones*,[18] who were typically younger workers, and often children, performed a wide variety of more marginal tasks. Their work was often centred around animal herding tasks, such as scaring birds, tending geese and horses, helping shepherds and swineherds, but they also frequently were employed in harrowing (Claridge & Langdon, 2015). Female servants, a role similarly defined by the type of person rather than task, performed roles such as managing the *curia*, making the pottage (a type of gruel fed to *famuli* workers for breakfast) and making malt.[19] Finally, the remaining category of 'other' *famuli* represents a variety of different lesser-seen occupations doing more specialist or supplementary work including parkers, warreners, animal carers, grooms, and general workers without occupational titles, among others. We exclude managers, such as reeves, bailiffs and serjeants entirely from this analysis, as their remuneration is complex to reconstruct.[20]

[18] Our *garciones* category also includes 'pages' (*pagettii*), another title typically used to denote young male workers

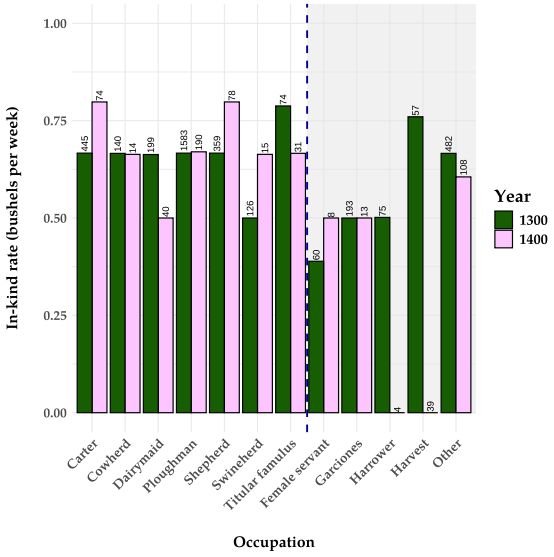
[19] We include the Latin terms *mulieres*, *ancillae* and *puellae* in our 'female servants' category.

[20] For instance, many of these workers were so-called 'service' *famuli* who received rent-remission as part of their remuneration, while others received an annual payment in clothes, typically consisting of a robe and hood.

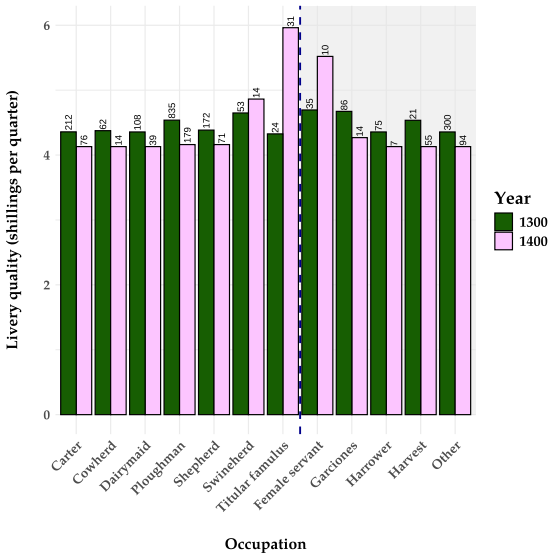
Figure 4: **Median wage rates in *famuli* occupations, c. 1300 and 1400 England**



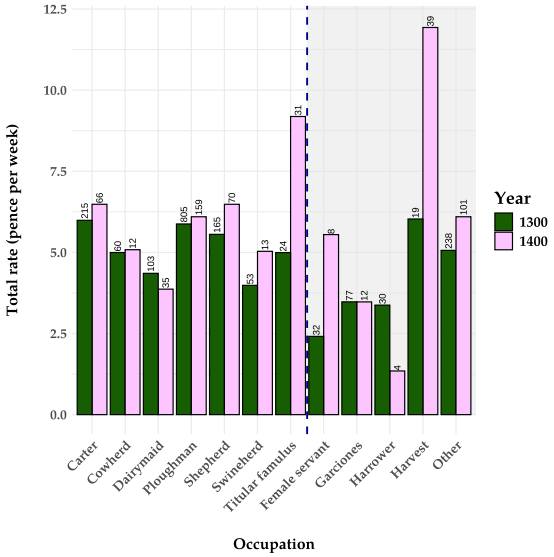
(a) **Cash rate**



(b) **In-kind rate**



(c) **Quality of livery**



(d) **Total rate** (cash and in-kind income)

Notes: The occupations left of the dashed line and without the shaded background are the 'core' famuli occupations. The number of observations per wage rate are displayed on top of the respective bars.

Source: Authors' database

Figure 4 shows median rates of pay for these twelve different occupational categories.[21] Examining these occupational differences brings out two key observations. First is the clear variation (or hierarchy) between occupations at the period of peak demesne production in 1300. We see that the core and male-dominated occupations of carters, ploughmen and shepherds earned the highest *total* wage rates of between 5.5d. to 6d. per week (see panel 4d). Cowherds, dairymaids, swineherds and titular *famuli* form a second grouping, earning between 4d. and 5d. per week. Meanwhile, the more marginal groups had a diversity of experience. Harvest workers were paid relatively well in 1300, earning around 6d. per week thus placing them on the same level as the best paid 'core' workers (if only for a few weeks of the year). 'Other' workers earned around 5d. a week, placing them within the second grouping of 'core' workers - although it is important to remember they represent a diversity of experience. On the other hand, *garciones*, harrowers and female servants earned much less, at 2d. to 3.5d. per week.

Unique to our empirical approach is that we can break divergence in *total* remuneration down into *cash* payments (panel 4a) on the one hand and *quantities* (panel 4b) and *quality* (panel 4c) of grain payments on the other hand. This shows that differences in total wage rates were typically not due to disparities in the quality of grain paid in-kind, which was remarkably stable between workers, but rather by differences in the quantities of grain and cash they received.[22] In-kind rates (see panel 4b), which made up the majority of total remuneration, were divided broadly, into two tiers, mirroring the earlier findings of Claridge and Langdon (2015). This follows a different pattern than what we observe in total remuneration. In terms of in-kind rates, first-tier workers, consisting of carters, ploughmen, shepherds, cowherds, dairymaids, harvest workers, titular *famuli* and 'others' earned on average 0.67 bushels or higher per week.[23] The second tier of consisted of *garciones*, harrowers and swine-

[21] This analysis of differences in median wage rates *between* occupations does not account for *within*-occupation inequality. In Sections 4 and 6, we respectively consider between-occupation and between-region inequality. In Section 7, we return to the issue of inequality *within* those units of analysis.

[22] Some workers did receive a typically higher 'individual' grain payment rather than receiving part of the collective livery given to all workers. This is not captured by our median payments but is accounted for in our observation of total rates. A similar analysis as in Figure 4c but based on average rates, reveals only slightly more variation, showing that these individual livery cases had a modest impact on the overall picture of wage inequality.

[23] In the calculus of the sources working for 8-12 weeks per quarter of grain.

herds, who earned 0.5 bushels or less per week.[24] Variation in total wages beyond these relatively sticky levels of in-kind remuneration (which, in many cases may have been fixed by custom) came from differences in cash stipends (see panel 4a) which ranged significantly more than in-kind payments. Harvest workers received the largest cash stipends at 3d. While carters and ploughmen were given around 0.9d.-1d. per week. Shepherds, cowherds, dairymaids and other workers were typically paid less cash, at 0.7-0.75d. per week. Trailing them were swineherds and female servants who earned around 0.5d. per week, and, more dramatically, *garciones*, harrowers, and titular *famuli* who, in most cases, received no cash at all. Therefore, it is clear that while broad occupational variation in pay was set through liveries, more discrimination was maintained through cash payments, which were more easily changed between workers than liveries.

The second key finding is that the Black Death did not impact workers' earnings in all occupations equally. For some workers wage growth was modest, while for others it completely transformed their earnings (see panel 4d). Harvest workers, who were already well paid in 1300, saw an astronomical increase in earnings, following a pattern similar to those who worked by the day or other short-term waged labour (Penn & Dyer, 1990; Clark, 2007). They also received this in cash rather than as an in-kind payment, allowing them greater flexibility than in the early fourteenth century. This is likely explained by the sheer demand for labour during this crucial point of the agricultural year, exacerbated by the disappearance of harvest labour services on some manors, which gave workers an especially strong bargaining position at this point in the year. Similarly, the titular *famuli* also experienced dramatic wage growth driven by both growing cash stipends and an increase in the average quality grain they received as in-kind payment. As the manorial accounts record these labourers with the generic term '*famulus*', we cannot be certain exactly what these workers were doing but it seems likely they were performing many of the same 'core' jobs of ploughing and carting which were specified elsewhere. However, the use of generic terms was often accompanied by the inclusion of workers' names, which may be an indication of individual bargaining (Claridge et al., 2024) and thus explain why the titular *famuli* specifically were able to secure higher wages

[24] In the calculus of the sources, working for 16-21 weeks per quarter of grain.

unlike other 'core' workers. The small number of female servants similarly saw a substantial increase in weekly rates up to 5.5d. allowing them to catch up with 'core' occupations like swineherds and cowherds.

Overall, however, the evidence suggests stagnation was more characteristic of *famuli* wages than the upturn often alluded to in discussions of the fourteenth century. For most 'core' workers, and many marginal workers, wage growth over the fourteenth century was far more muted and did little to disrupt occupational wage hierarchies which had existed since 1300. The male-dominated roles of carters, ploughmen and shepherds saw increased wages, and swineherds gained in relative terms, while dairymaids, a role dominated by women, saw a small fall in income, largely because they did not receive the increase in cash stipends enjoyed by their colleagues. 'Other' workers in the aggregate saw a modest growth in their total wages, but this was largely in-line with the first grouping of 'core' workers. *Garciones* and harrowers remained the worst paid workers. While the former continued to earn 3.5d. per week, harrowers saw a decline in wages to 1d. per week, although the fact that only four workers exist in our dataset shows how marginal this group of workers had become.

These changes were driven by the quantity of *cash* (see panel 4a). The transformation in cash payments for harvest workers particularly stands out. While work during the harvest season had always received generous cash compensation, by 1400 money payments had quadrupled to 12d. per week, around four times higher than the next largest amount of around 3d. paid to the titular *famuli* - who themselves also received a notable pay bump throughout the fourteenth century. Female servants and 'other' workers also enjoyed substantial rises in stipends.[25] Inequalities in in-kind wages remained relatively static, with small adjustments in *quantity* (see panel 4b) and *quality* (see panel 4c) of livery rates. The most substantial change was that workers who laboured at specific times of the year, namely harvesters and harrowers, saw a complete disappearance of in-kind payment, becoming solely re-

[25] The cash stipends of female servants tripled across the fourteenth century (although the wider significance of this finding is difficult to gauge as only eight female servants are found in the 1400 sample). 'Other' workers saw a doubling in cash stipends to 1.6d. per week. Within this group, some specific occupational groups drove this growth. For instance, parkers saw a twelve-fold increase in their cash rate (from 1d. per week to 13d. per week), warreners a ten-fold increase (from 0.6d. per week to 6.5d. per week) and woodwards a five-fold increase (from 0.7d. per week to 4d. per week).

munerated in cash, further underlining the shift towards an increasingly commercialized and cash-based labour market.

The evidence of occupational wage hierarchies reveals the cross-currents of custom and market in determining remuneration in fourteenth-century England. Rigidity in in-kind payments, which had a strong insurance value for workers, meant that much of workers' pay was determined by fixed values. These tended to follow pre-established hierarchies, with certain 'core' workers paid at first-tier rates and others paid at second-tier rates. The Black Death did help lead to some equalisation, with improvements for swineherds and female servants, but also perpetuated lower rates for *garciones*, dairymaids, and swineherds , than for the better remunerated roles of carters, cowherds, ploughmen and shepherds. More variety in cash seems to have allowed a few workers who were particularly in demand, or whose pay was more closely determined by their individual skill, to particularly benefit from the Black Death. Titular *famuli*, harvest labourers and certain 'other' workers saw their total wage rate grow dramatically through large cash increases, while the growth experienced by carters, cowherds, ploughmen, shepherds and swineherds remained more modest. *Garciones* and dairymaids saw no increase in cash, leading to stagnation and even modest decline in their total earnings. Accordingly, it seems the type of workers who were best placed to overcome the customary limitations implied by in-kind payment were most able to take advantage of changed conditions after the Plague.

5 Towards a full-time labour force

An important follow-up question is now whether our analysis of inequalities of wage rates does not obscure changes in employment or time worked (or in other words, the possibility to earn said wage rates).[26] In this section, we describe that wage differentials between types of worker were accompanied by an increasing professionalisation of the *famuli* labour force. This is revealed by the continuity of employment within 'core' occupations and decline in some more peripheral occupations and a

[26] This issue is also raised by Hatcher (2011), who questions whether day labourers were in fact able to secure consistent employment at the elevated wage rates observed after the Black Death.

shift from part-time to annual employment.

As shown in Table 1 (panel 'employment'), 'core' workers like ploughmen, carters, and shepherds remained a significant presence within the *famuli* across the fourteenth century, even if there were some shifts within this group towards pastoral workers reflecting the broader reconfiguration of English agriculture after the Black Death (Biddick, 1989, Campbell, 2000, 183-7, 430-6). The consistent picture for 'core' roles can be contrasted with the decline of some more marginal roles within the workforce. Harrowers and other soil-preparation workers virtually disappeared between 1300 and 1400, and *garciones*, once accounting for 6 percent of all workers, fell to 2 percent. The exception was harvest workers who grew as a part of the workforce.[27] This likely reflects a few manors' policies of hiring harvest workers for longer periods, perhaps in places where they were faced exceptional competition for day-waged labour to perform these roles.[28]

[27] For a more detailed discussion of employment patterns of *famuli* in our sample, please see Appendix C.

[28] These workers were hired in large numbers on the Norfolk Cathedral Priory manors of Gnatingdon, Plumstead and Sedgeford. Hiring harvest workers for specific terms may have been a response to Norfolk's tight labour market in the early fifteenth century. See NRO, LEST/IC 30, DCN 60/29/40, LEST/IB 52.

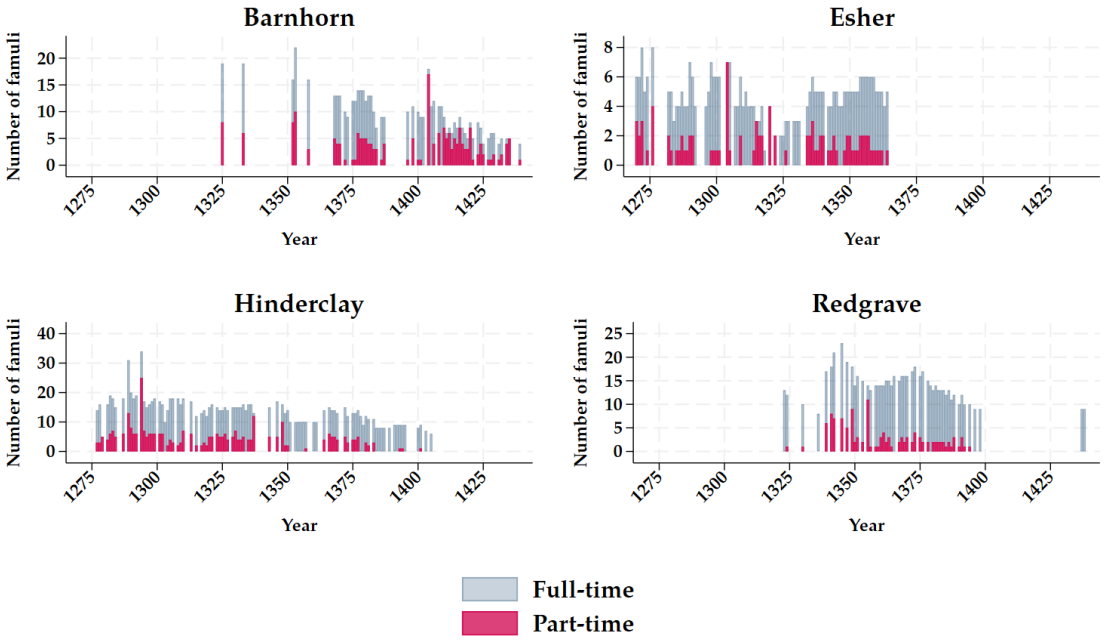
Table 1: **Occupational Structure and Length of Employment of *Famuli*, c. 1300 and 1400**

Occupation	Year	Employment		Tenure	
		Freq.	% Freq.	% part-time	Mean days
Carter	1300	461	0.11	0.23	306
	1400	79	0.12	0.06	345
Cowherd	1300	152	0.04	0.24	310
	1400	16	0.02	0.00	359
Dairymaid	1300	210	0.05	0.24	304
	1400	43	0.06	0.02	357
Ploughman	1300	1658	0.39	0.18	323
	1400	199	0.29	0.05	354
Shepherd	1300	379	0.09	0.23	308
	1400	80	0.12	0.06	350
Swineherd	1300	146	0.03	0.17	320
	1400	16	0.02	0.12	344
Titular famulus	1300	74	0.02	0.36	301
	1400	31	0.05	0.06	354
All core workers	1300	3080	0.72	0.20	316
	1400	464	0.68	0.05	352
Female servant	1300	88	0.02	0.23	291
	1400	12	0.02	0.17	316
Garciones	1300	254	0.06	0.67	124
	1400	15	0.02	0.67	149
Harrower	1300	144	0.03	0.50	93
	1400	9	0.01	0.11	289
Harvest	1300	80	0.02	0.86	49
	1400	55	0.08	0.71	48
Other	1300	608	0.14	0.34	253
	1400	126	0.19	0.32	260
All non-core workers	1300	1174	0.28	0.46	198
	1400	217	0.32	0.42	207
All workers	1300	4254		0.27	288
	1400	681		0.17	311

Notes: The column 'year' refers to the cross sectional sample from which observations are drawn. The column '% part-time' refers to share of part-time (worked less than 300 days) workers in the occupational group. The column 'mean days' refers to the average number of work days per year for workers in the occupational group.

Source: Authors' database

Figure 5: **Proportions of full-time and part-time *famuli* labour across four manors**



Notes: The full-time/part-time distinction of workers is made based on whether they worked less or more than 300 days respectively.

Source: Authors' database

This shift towards dominance by a 'core' group of 'professional' *famuli* workers is also seen when examining the proportion of part-time (here defined as under 300 days a year) workers. This is illustrated by the right two columns of Table 1 (panel 'tenure'). While part-time workers were always a minority of the *famuli* workforce, their representation fell significantly between 1300 and 1400, dropping from 30 percent to 18 percent of all workers. This led to a significant increase in the average number of days worked across all labourers, growing from 288 days to 311 days. Among all 'core' *famuli* The proportion of part-time workers declined markedly, indicating that demesnes increasingly preferred to employ only those who were available year-round. Aside from harvest workers, the only role in which part-time workers still made up the majority, namely, *garciones*, was precisely the one that was vanishing during this period.

The increasing disappearance of part-time workers is also apparent in our long-run sample. Figure 5 shows the proportion of full-time and part-time workers at four manors between the thirteenth to fifteenth centuries. While in nearly all years

part-time workers were a minority of the workforce, their proportion declined significantly in the last quarter of the fourteenth century at both Hinderclay and Redgrave. While Esher's accounts stopped recording labourers when the manor was leased in 1366, we can see that part-time workers were not recorded in the final years of the manor being directly managed. Barnhorn exhibits a different trend, with the retention of a large number of part-time workers into the fifteenth century. This reminds us that national trends were driven by the individual decision making of many different demesne managers under the direction of their lords, who had varying priorities in the exploitation of their estates.

What explains the decline of some more marginal roles and part-time work in the aggregate? This process was driven by economic changes caused by the demographic collapse of the Black Death which impacted both on the demand for *famuli* from demesne managers and the supply of these labourers. Firstly, from the demand side, around 1300, acute Malthusian pressures led to significant demand for grain and persistently high prices. This in turn led to a medieval peak in total sown acreage of an estimated 8.16 acres (of which demesnes accounted for 25 percent) as both lords and tenants sought to expand production both for their own consumption and sale on the market. Land productivity was also at a medieval peak from the 1270s to 1300s, as measured in crop yields per acre (Broadberry, Campbell, Klein, Overton, & Van Leeuwen, 2015, 80-90). To achieve such high yields, especially from more marginal lands, demesne managers often deployed significant amounts of labour on soil preparation techniques, as part of a rational response of intensification to commercial stimuli. While some of this labour came from the labour services of tenants and day-waged workers, the hiring of *famuli* like harrowers, marlers and furrow spreaders, often on part-time contracts at specific points of the year, was a crucial part of this strategy (Stone, 2001; Stone, 2005, 231-76).

The Black Death and subsequent outbreaks led to a changed situation by the end of the fourteenth century. While grain prices remained high and volatile for two decades after the first wave of Plague, these fell from 1370, squeezing the profit margins of demesnes. A release on pressure on land led to a fall in national sown acreage, which fell to 5.75 acres by 1380. The share of land held by demesnes also

declined to only 19.5 percent. Moreover, crop yields dropped between 1300 and the mid-fifteenth century as demand for grain decreased (Broadberry et al., 2015, 90-97). These patterns led to changing demand for soil-preparation labour. Firstly, the abandonment of arable land was presumably selective, with the most fertile soils continuing to be cultivated while more marginal lands were converted to pasture, leased to farmers, or abandoned. Consequently, there was simply less need for workers to perform the labour-intensive soil preparation tasks previously required to boost cereal yields. Secondly, even on more productive lands yields also fell, demonstrating that it was the declining profitability of arable farming which meant that expending resources for increasingly expensive labour to increase yields was no longer worthwhile. With a changed land:labour ratio, there was shift away from intensive to more extensive cultivation (Campbell, 2000, 232-8). This is not to say that such soil-preparation tasks disappeared entirely, but likely these were increasingly performed by more targeted use of day-labour or by the remaining 'core' *famuli* at times of the year when they were not performing their main roles (Stone, 2005, 109-113, 146-8, 231-76).

From the supply-side, it was likely difficult for demesne managers to recruit workers for more marginal tasks and in particular to find large numbers of child and adolescent labourers. While in 1300 many child labourers were likely drawn from the families of 'core' *famuli* workers (Claridge & Langdon, 2015), wages for these workers had increased, at least modestly, in real terms by 1400, alleviating the need for these workers to send their children to work (Horrell, Humphries, & Weisdorf, 2022). Women and children often act as a 'reserve' labour force, used to augment male labour, and our evidence support such arguments (Langdon, 2011; Lancy, 2015). Similarly, as average landholding sizes grew in some areas due to an increase in land availability (Mullan & Britnell, 2010, 136-151; Dyer, 2022, 64-66), tenants may not have sought part-time roles for themselves or their family members due to having more land to cultivate which could absorb all of their household labour. Furthermore, for those who did remain as waged labourers and smallholders, growing opportunities for industrial employment, may have proved more attractive than work as a part-time *famulus*/*famula* especially outside the exceptionally well-paid harvest period (Broadberry et al., 2015, pg.347; Poos, 1991, 58-72). In-

creasing day wages likely tempted workers who remained in agriculture to take up more flexible opportunities on both the estates of lords and large holdings of tenants, travelling between employers in search of better pay at the harvest and perhaps prioritising leisure over finding additional work at other points in the agricultural year (Hatcher, 1998; Penn & Dyer, 1990; Claridge et al., 2024). When faced with the persistently low wages on offer for *garciones* in 1400, it is hardly surprising that it was hard to recruit these workers in a world flush with new opportunities.

In combination, these trends helped further 'professionalise' the *famuli* as a group between 1300 and 1400. The proportion of 'core' workers employed on an annual basis remained relatively stable over time, except for a broader shift toward pastoralism driven by changes in how lords sought to exploit their estates. Additionally, the emergence of the titular *famuli* signalled a new way of defining labour roles, reflecting workers' increasing bargaining power Even the broader 'other' category of workers saw a small decline in the proportion of part-time workers and a rise in days worked. Conversely, the share of part-time workers and more marginal labourers such as harrowers and *garciones* fell across this period. Increasingly, the *famuli* labour market was characterised by competition among seigniorial employers (or in reality their demesne managers) for a set of standardised 'core' workers. These all-round workers, whose wages had been subject to the least inflation since the Black Death, were vital for running remaining in-hand manors while trying to keep costs down as far as possible.

6 Regional wage inequality

We now examine another possible factor behind the variation in wage rates among the *famuli* workforce: regional differences. To explore this, we focus on ploughmen, the largest and most homogeneous occupational group in c.1300, exploiting our most representative cross-sectional sample.[29] Figure 6 maps regional differences in the median rates of all wage components for ploughmen in our c.1300 sample. The point of this exercise is not to argue that the ploughman's experience was represen-

[29] We explore wage differences for ploughmen specifically due to their ubiquity, as ploughmen represent c.40 percent of all workers in our 1300 sample, as well as the relatively consistent nature of their role - we can be reasonably sure that ploughmen were doing similar work in 1300 and 1400.

tative of the *famuli* as a whole, but rather to illustrate the diverse wage rates paid to a (relatively) homogeneous group of medieval workers. The map is divided into five regions: East Anglia, the Midlands, the North, the South and South-west, and the Thames Basin.

Considerable regional differences are evident in both the composition and the remuneration of ploughmen. In terms of total wage rates, the North emerges as the highest-paying region, followed by the Thames Basin. By contrast, ploughmen in the Midlands and the South and South-west received markedly lower wages, with those in East Anglia earning the lowest pay.[30] Breaking remuneration into its three dimensions shows that, unlike worker-level differences, regional wage disparities were not caused by variations in in-kind grain payments. Ploughmen were paid at nearly identical rates across most of the country; only in the Thames Basin did ploughman earn more than 0.67 bushels per week (or 12 weeks per quarter). It was the quality of grains paid and rates of cash that instead determined wage levels. Northern manors paid both exceptionally high-quality liveries, often comprised entirely of wheat, and also relatively generous cash rates.[31] Similarly, the Thames Basin supplied liveries of moderate quality and broadly similar cash rates. While the ploughmen in the Midlands were paid the most cash, this seems to have been reflected in a lower quality of in-kind payment, leading to lower rates to total pay than their brethren in other regions.[32] Lower-quality liveries and smaller stipends in the South and South-west, and especially East Anglia, led to ploughmen in these regions earning lower wages than elsewhere in England.[33]

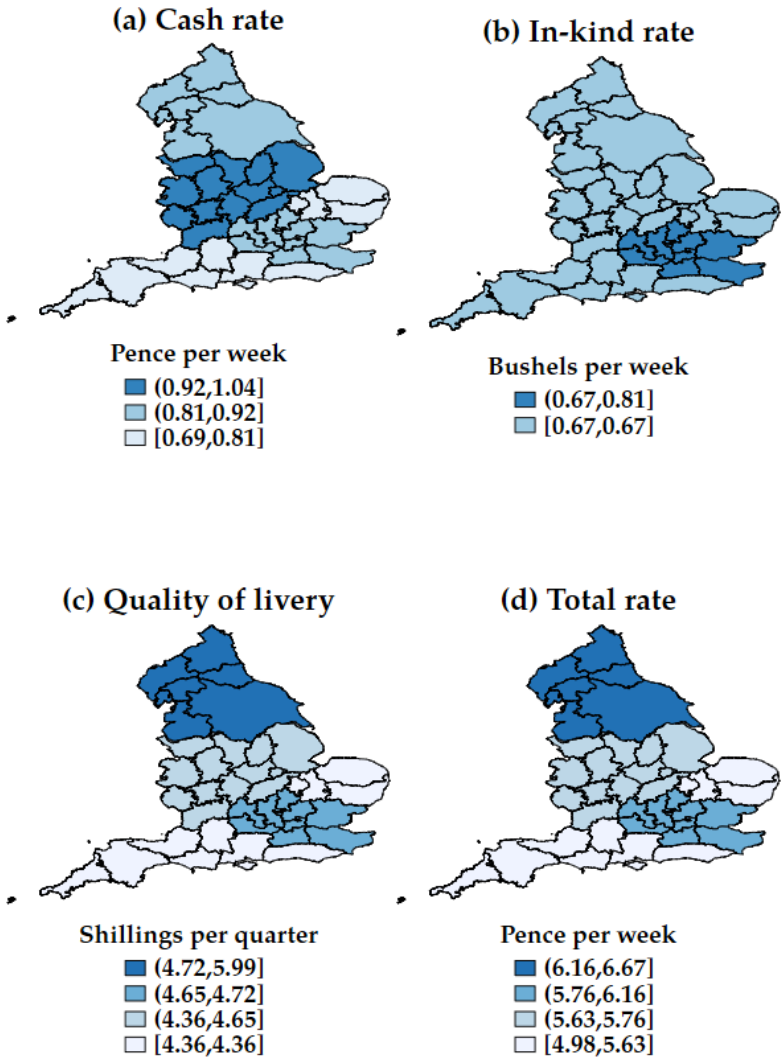
[30] For example, ploughmen at the northern manor of Bolton (Cumberland) in 1296-7 earned a total rate of 7.5d.-8d. per week; ploughmen at the Midlands manor of Tinwell (Rutland) in 1300-01 earned at total rate of 6d. per week; and ploughmen at the East Anglian manor of Ditchingham (Norfolk) in 1299-1300 earned a total rate of 4.5d. per week. See respectively: TNA, SC6 824/2; NRO, F(M) Charter/2388; TNA, SC6 934/8.

[31] For example, the ploughmen at Bolton were paid entirely in wheat flour and given an annual stipend of 3s. per year.

[32] For example, the ploughmen at Tinwell were given an annual stipend of 4s., but their liveries were comprised of wheat mixed with the cheaper grains of barley and rye.

[33] For example, the ploughmen at Ditchingham were given an annual stipend of 3s. per year, but their livery was paid in a less valuable mixture of '*curallum*' (low-quality wheat), rye, barley and peas.

Figure 6: **Maps of median-level wage rates for ploughmen at regional level, c. 1300 England**



Notes: Wage rate categories correspond to quintiles of the respective regional wage distributions

Source: Authors' database

These patterns suggest that in 1300, high levels of commercialization were not visibly correlated with high wage rates, whether in cash or in total remuneration. While the Thames Basin, due to its proximity to London, was characterised by high levels of market-oriented agriculture (Campbell, Galloway, Keene, & Murphy, 1993; Campbell, 2000, 209-10), parts of the northern Midlands, and especially the North, are typically seen as comparatively less developed. Using taxpayers per acre as an in-

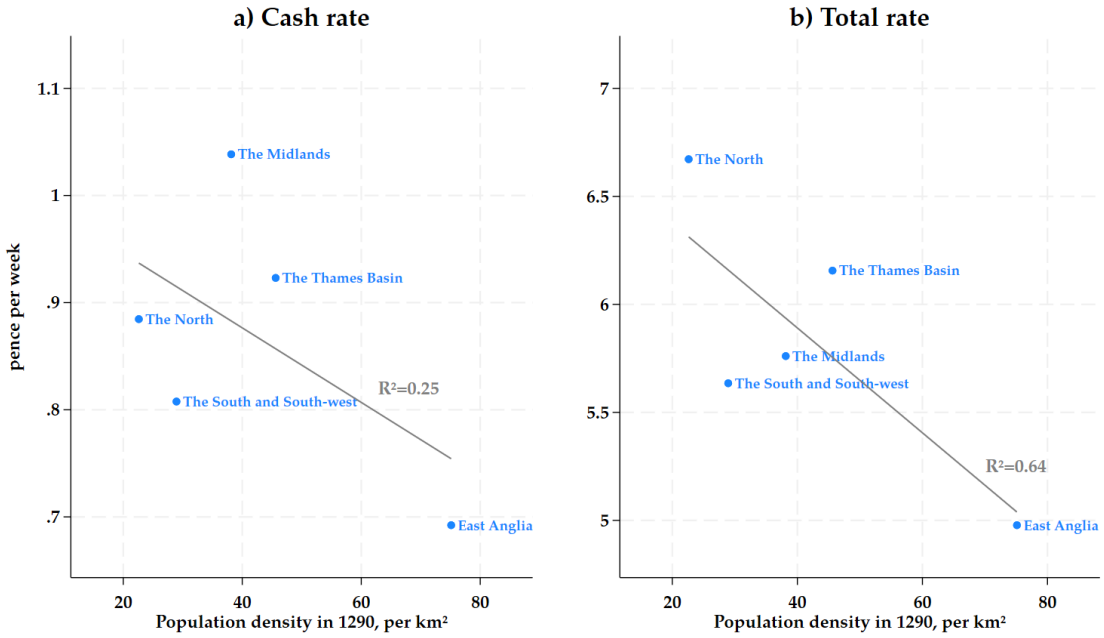
dicator, these regions had low numbers of relatively poor taxpayers as well as lower levels of market density (Campbell & Bartley, 2006, 302, 347-8). Conversely, East Anglia is often seen as the commercial region par excellence, supporting high numbers of taxpayers per acre making use of the most productive agricultural techniques (Campbell & Bartley, 2006, 302, 342-7; Campbell & Overton, 1993).

What explains these differences in wage levels, and why did the most productive and most commercialized parts of the country pay lower wages to ploughmen than less developed regions did? Two interrelated factors may help explain this pattern. First, this may simply be a story of labour supply and limited outside options for *famuli* workers, driven by an essentially Malthusian dynamic. As shown in Figure 7, there was a strong correlation between the wages of ploughmen and population density.[34] In 1300, East Anglia, and Norfolk in particular, was characterized by a densely settled and intensively cultivated landscape, which placed considerable pressure on living standards, leaving much of the population in this part of the country living on the edge of subsistence (Campbell, 2005). Although the dynamic land market in the East of England offered peasants holding both villein and free land opportunities to alienate and subdivide their holdings, it also created rural 'congestion'.[35] In other parts of the country, such as the Midlands and northern England, lords were more successful in preserving holdings and avoiding subdivision (Whittle, 1998, 49-54). Where labour was relatively plentiful and land scarce, lords may have been able to compel *famuli* to accept low(er) wages, because they had fewer viable outside options, especially ones which provided the benefits of consistent work and regular payment. In the North, and to a lesser extent in the Midlands, lords may have faced greater competition for a limited labour supply, potentially driving wages higher in these parts of the country.

[34] We show this correlation for both cash (panel (a)) and total (panel (b)) rates. The correlation seems to be even stronger for total rates, providing further suggestive evidence for the importance of incorporating both cash and in-kind components of medieval remuneration in the inference of meaningful economic relationships.

[35] One interpretation of this is that population pressure necessitated the expansion of agriculture on to more marginal and less fertile land, imposing a drag on average agricultural productivity and wages. However, there is much evidence which demonstrates that parts of Norfolk were characterised by very high agricultural productivity on a per acre bases (Campbell, 2000, 375). In light of this, high levels of labour supply and a strong bargaining position for local lords seems a more likely explanation for laggard wages in East Anglia.

Figure 7: **Regional population densities and median wage rates for ploughmen**



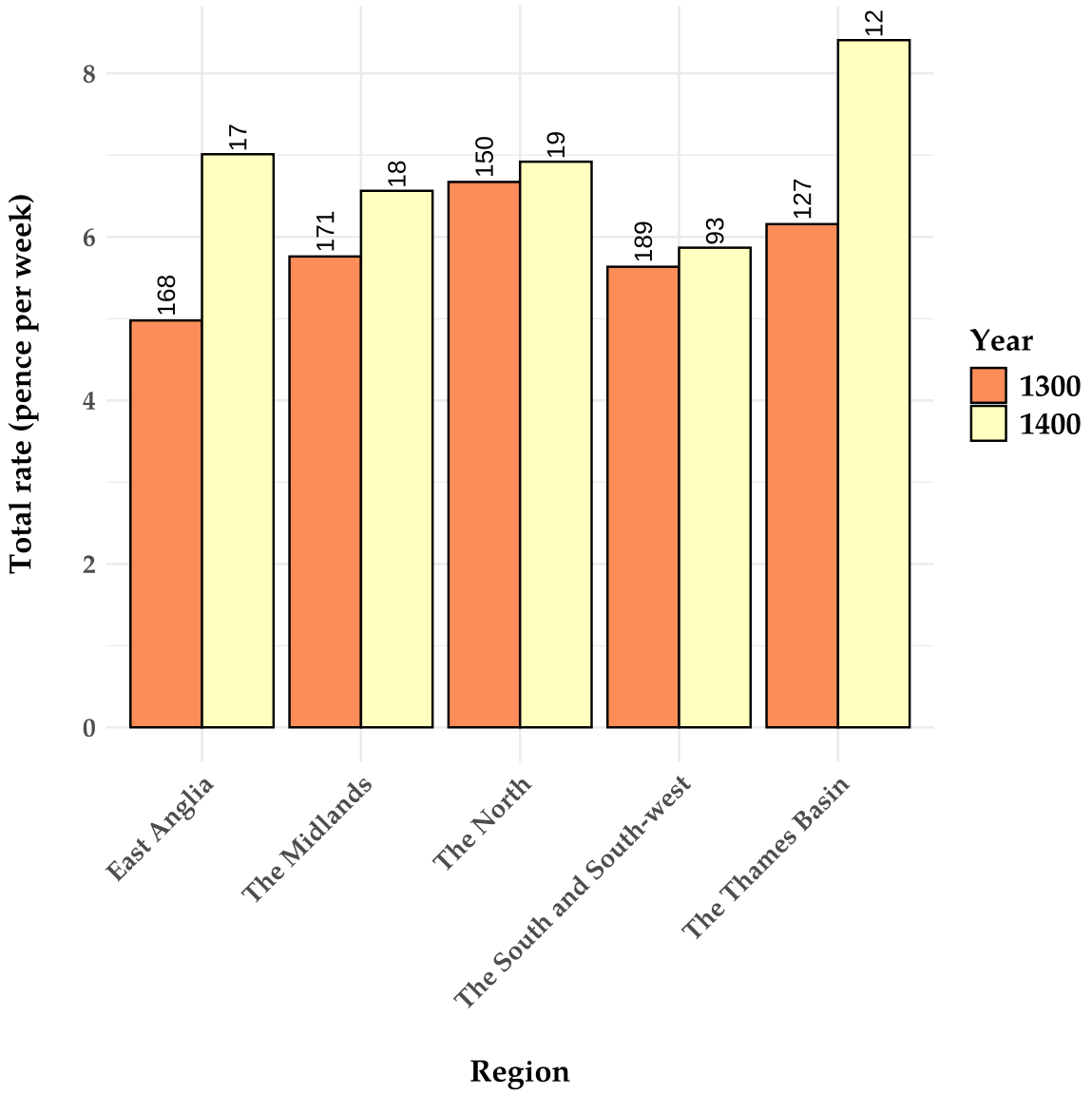
Source: Population density: calculated at the regional level from Campbell (2008); Wage rates: Authors' database.

These trends may have been linked to the second factor, namely the relative importance of custom in setting wages. We have already seen that custom had a role in creating variation between occupations in the way wages responded to the Black Death. Workers who were less subject to the customary elements of in-kind payment seem to have benefited more than the 'core' *famuli* who were paid primarily in fixed quantities of grain. Here we suggest that geographical variation in custom, alongside population density, may also help explain the - perhaps surprising - *inverse* relationship between commercialization and wage rates. While the influence of custom is difficult to measure directly, it appears to have remained stronger in regions such as the North and much of the central band of the Midlands, as evidenced by a continued reliance on non-standard units of land measurement and the prevalence of manors with high proportions of villein tenancies(Campbell & Bartley, 2006, 34-39, 261-5). In the context of thirteenth and early fourteenth-century England, custom perhaps dampened market forces which should have benefited lords over the peasantry. Specifically, tenants used appeals to custom to maintain fixed rents on land well below those which lords could demand for lands not subject

to this constraint(Hatcher, 1981; Kanzaka, 2002). Custom may have similarly moderated market forces in the setting of *famuli* wages, at least in some parts of the country. The custom of paying labourers with prescribed quantities of grain provided a benefit to workers in regions where such customary payments were maintained. However, in areas where commercialization flourished over this same period, the customary 'protections' that worked to keep wages buoyant may have eroded, leading to a fall in earnings to levels which better reflected the reduced bargaining power of workers in places of ample labour supply.[36]

[36] Population density and the weakening of custom cannot easily explain the comparatively low wages in the South and South-west, a region characterized, much like the North, by generally lower population density and low numbers of low-paying taxpayers. (Campbell & Bartley, 2006, 342-9). The manors we sample in this region are concentrated in Wiltshire, Hampshire and coastal Sussex. These were more commercialized and densely populated than the more westerly counties of Devon and Cornwall and therefore potentially also subject to the processes we describe above for East Anglia.

Figure 8: **Median total wage rates of ploughmen across regions, c. 1300 and 1400 England**



Source: Authors' database

Figure 8 demonstrates differences in the median wages of ploughmen between 1300 and 1400.[37] The differences in increases in wage rates across the board are striking. The Thames Basin saw the greatest increase, with wages in 1400 far in excess of any other region. Similarly, East Anglia saw a dramatic increase over the fourteenth century, bringing ploughmen's wages in line with that of the North. The Midlands

[37] We note that the sample for 1400 is more limited than our 1300 sample, particularly for regions beyond the South and South-west, with fewer than twenty individual ploughmen captured per region. Moreover, undoubtedly some of the titular *famuli*, a designation which was more common in c.1400, were in fact ploughmen, meaning some of the increases we see in ploughmen's wages may actually be understated.

saw a modest increase, while ploughmen in the North and South and South-west only enjoyed a very minor bump. The different scales of wage growth between regions can be explained by the same factors which created regional inequality in 1300. In a period where labour demand was not matched by supply, and a dramatic decline in the land:labour ratio opened up opportunities for skilled agriculturalists as leaseholders or tenant-occupiers, East Anglian wages dramatically converged with other regions. In 1300, custom may have insulated workers from exposure to the market forces which tended to depress wages, much as it maintained rents below market levels. However, in 1400, custom now had the opposite effect, muting wage increases where it was stronger, while in places which were already more commercialized, workers enjoyed the benefits of their increased productivity and bargaining power.

7 Decomposing wage inequality

Having explored occupational and regional variation in wages, we might also ask to what extent the occupation or location of a *famulus* or *famula*, determined his or her remuneration, and how this changed between the fourteenth and fifteenth centuries. Our data allows us to decompose wage inequality among *famuli* in 1300 and 1400 to answer this question. We break down the variation in cash, in-kind and total wage rates into a region component (which captures variation across regions), an occupation component (which captures variation across occupations) and an individual component (which captures the covariance between the former two):

$$Var(y_i) = \underbrace{Var(y_{i,r})}_{\text{Region component}} + \underbrace{Var(y_{i,o})}_{\text{Occupation component}} + \underbrace{2 \cdot Cov(y_{i,r}, y_{i,o})}_{\text{Individual component}} \quad \forall i : r \in R, o \in O \tag{1}$$

This is a common tool used to assess changes in wage inequality.[38] In essence,

[38] Behind this variance decomposition, lies an Ordinary Least Squares (OLS) regression, in which one regresses wage rates on occupational and regional dummies and assesses the explanatory power of these dummy variables. Such variance decompositions are a key tool in the analysis of wage inequalities, for instance in the study of the role of firm-level earnings dispersion (for example, see Barth, Bryson, Davis, & Freeman, 2016). For another historical application, see Buyst and Delabastita (2023).

we hypothesize that, in a commercialized economy, *what* any individual worker did (occupation, indicated by o), and *where* they did it (location, indicated by r), should have played a sizeable role in the determination of their wage. If this hypothesis is correct, the region and occupation components would play a significant part in explaining the variation in wage rates.

Table 2: **Variance Decomposition for *famuli* labourers, c. 1300 and 1400**

(a) **All workers**

Rate	Year	Gini	Individual	Occupation	Region	N	R^2
Cash	1300	0.532	0.914 %	0.076 %	0.009 %	3810	0.083
	1400	0.575	0.451 %	0.444 %	0.024 %	567	0.536
Livery	1300	0.182	0.870 %	0.089 %	0.047 %	3793	0.127
	1400	0.304	0.696 %	0.337 %	0.011 %	614	0.286
Total	1300	0.215	0.817 %	0.127 %	0.053 %	1821	0.176
	1400	0.250	0.615 %	0.221 %	0.088 %	550	0.368

(b) **Core workers only**

Rate	Year	Gini	Individual	Occupation	Region	N	R^2
Cash	1300	0.451	0.951 %	0.024 %	0.020 %	2922	0.046
	1400	0.403	0.840 %	0.072 %	0.063 %	398	0.138
Livery	1300	0.149	0.905 %	0.044 %	0.058 %	2926	0.092
	1400	0.178	0.877 %	0.040 %	0.085 %	442	0.103
Total	1300	0.188	0.848 %	0.061 %	0.080 %	1425	0.146
	1400	0.184	0.628 %	0.122 %	0.210 %	386	0.355

Notes: Column 'R^2' reports the adjusted R^2 of regressing wage rates on occupational and regional dummies.

Table 2 presents the results obtained from testing this hypothesis. We do so for our sample of all workers (Table 2(a)), as well as a sample with only the 'core' famuli included (Table 2(b)). For our full sample in panel (a), we find that, indeed, for both cash and total wage rates, the region and occupation in which a *famulus* or *famula* was active, became much more important over the course of the fourteenth century.

For instance, in the 1300s, occupational and regional variables explain roughly 18 percent of the variation in total wages of all workers. By the 1400s, their explanatory power more than doubled to nearly 40 percent, as both variation across regions and across occupations became more important. An even more striking pattern emerges when we look at the evolution of cash wage rates. Table 2(a) demonstrates that, in the 1300s, occupation and location barely mattered for determining cash wage rates, as individual and occupation dummies explain less than 10 percent of the variation in wage rates. This suggests that while goods markets may have been relatively well integrated in England, labour markets may not have enjoyed similar levels of commercialization at that time. In other words, late thirteenth- and early fourteenth-century labour markets were characterised by much variation beyond the occupational and regional dimensions we have discussed so far, leaving much room for local customs to play a role in determining wage rates. This finding also provides quantitative evidence for observations concerning the local nature and uneven development of factor markets on the eve of the Black Death (Campbell, 2009, 97). By the end of the fourteenth century, a worker's occupation, and to a lesser extent their location, had become a more important determinant of cash earnings. This highlights a shift in labour market development toward greater reliance on money wages and the rise of a small number of exceptionally well-paid occupations, as discussed in Section 4.

Panel (b) presents findings for 'core' *famuli* only. The results reveal a similar, though less pronounced, trend toward the growing significance of occupational and regional determinants of wages. That occupational and regional variables are less important in our restricted sample of 'core' *famuli* is an consequence of a more homogeneous sample. The most striking difference between panels (a) and (b) is that, if we assess all workers, we find increasing levels of wage inequality among *famuli* as evidenced by changing Gini coefficients for cash, livery and total wage rates. Wage inequality remained more stable for the more traditional 'core' roles of the *famuli* workforce. This not only corroborates our earlier observations of stability in relative occupational and regional pay rates, as well as underlining patterns of continuity in the background of the institutional and commercial transmutations of the fourteenth century. This also undergirds the heterogeneous experience of labourers following

the Black Death, as highlighted earlier in Figure 2.

8 Beyond the *famuli*

What does our exploration of *famuli* workers suggest about the wider labour market in medieval England? How does it augment earlier research on medieval wage inequalities? A significant debate in the historical wage literature has been the extent to which we can even speak of a general 'labour market' in pre-modern economies. Some approaches, particularly those that seek to generalise results from a specific pool of workers, have assumed markets with no frictions, in which wage differences between different sectors or labour market segments would be arbitraged away by the reallocation of workers. If any frictions existed, such as cases where worker preference for the security of annual employment over the uncertainty of earning by the day prevented some workers from moving between labour market segments, these frictions are assumed to have been constant over time (Clark & Van Der Werf, 1998).[39]

Hatcher (2011) has argued persuasively that such assumptions are unrealistic for medieval labour markets. Indeed, the idea that day and annual labour markets were perfect substitutes, or that any frictions between these two labour market segments were stable, is questionable. A friction between annual and day-labour markets that is both demonstrable and potentially significant was labourers' preference for the in-kind payment that almost universally accompanied annual employment contracts. This ensured that workers were willing to trade off higher daily wage rates for the increased food security of annual employment (Claridge et al., 2024). It is also improbable that this friction remained static throughout the fourteenth century - especially in light of the aforementioned commercialization of grain markets - and hence that (imp)perfect arbitrage remained stable over time.

An overarching question in this paper is which factors best explain the persistent levels of wage inequality amongst *famuli*, and the differential impact of the

[39] Humphries and Weisdorf (2019) also start from this hypothesis, but present an interesting elaboration to their analysis where they assume full segmentation between the markets for day and annual labour. By quantifying the relative sizes of both labour markets, they gauge how the earnings of an "average worker" evolved (2019, 2881).

Black Death on 'core' and peripheral members of this labour force. One explanation, which would arise even under assumptions of perfect competition and arbitrage, is that there were significant and persistent productivity differentials between certain labour market segments due to differences in levels of human capital. This issue has received some attention in the literature through examinations of the long-run evolution of skill premia. For the medieval period, this is typically done by comparing the wages of 'skilled' masons against 'unskilled' construction workers. For England, Clark (2005) identifies a relatively consistent decline in the skill premium throughout the fourteenth century, which accelerated following the Black Death. According to van Zanden (2009), wage inequality in England increased during the first half of the fourteenth century, driven by a rising skill premium, before declining sharply. This is a similar pattern found in other European labour markets. These findings largely mirror earlier evidence on declining skill premia during the long fourteenth century, (see: Beveridge, 1936; Postan, 1950; Phelps Brown & Hopkins, 1955) and have also been translated into broader claims about the equalizing nature of the Black Death (Alfani, 2022, 3-10).

Our findings of growing wage inequality between the 'core' famuli - who were largely excluded from the sharp wage increases following the Black Death - and more peripheral *famuli*, who did benefit from these gains, support this claim in two ways. First, it is worth reiterating that the *famuli* were a particular - yet sizeable - group of medieval workers (Claridge & Langdon, 2015). As Campbell (2009, 85) asserted, they benefited from high levels of job security and were embedded in the institutional context of the demesne, therefore forming an 'aristocracy of labour'. From this perspective, it is fair to conclude that the Black Death *did* had an equalising effect, as 'core' *famuli*, such as ploughmen, lost their comparative wage advantage, and a new, more commercialized market for highly-remunerated peripheral jobs opened up. The latter was likely to have been more accessible to all layers of medieval society - be it smallholders or the relatively small group of landless individuals - as compared to finding one's way into the labour aristocracy of the *famuli*. Second, the sheer variation of wages within the *famuli* illustrates the need for careful examination of any claims concerning who might have been 'left behind' in the wake of the Plague. Even within the more peripheral group of workers, who, with some imag-

ination, might be seen as the 'unskilled' among the *famuli*, we have found a wide diversity of experiences in terms of wage growth: wage rises were largely restricted to harvest workers (and the increasingly-rare female servants). Furthermore, our variance decomposition in Section 7 quantitatively illustrates how difficult it is to narrow down wage variation to occupational or regional dimensions, especially in 1300 before the increased commercialization of labour markets which followed the Plague (Bailey, 2021). Clearly, we must be careful in creating large-scale narratives based on the wages of a handful of occupational groups.[40]

A second important consideration is the significant role played by custom in determining how far workers were able to benefit from changed conditions after the Black Death. The changes in wages between different occupations and worker types appear to have been - at least in part - driven by their exposure to the market before the Plague. Workers who enjoyed the most flexibility, such as harvest workers and the wide range of individuals in our 'other' category, and those with the greatest bargaining power, such as the titular *famuli*, were the workers who saw the most rapid growth in their wages by 1400. This was driven by significant increases in the cash component of their wages. Meanwhile, the 'core' *famuli*, many of whom who had enjoyed customary wage protections before the Plague, found that their remuneration, which was often largely in-kind, and customarily sticky, grew more modestly. It is likely that day workers were an even more extreme version of the 'flexible worker' case, helping explain why their wages grew so much faster than those of annually-employed *famuli* (Claridge et al., 2024).

The differential impacts customs could potentially have is illustrated well by the examples of gender and age status, both of which were bound up with cultural ideas about property and remuneration. There were supported by the institutional framework of medieval England, where women were subject to legal discrimination in inheritance, credit relationships, and employment contracts (Bardsley, 2014; Briggs, 2004; Bennett, 2010). There is significant debate over whether the transfor-

[40] For instance, how representative were the 'unskilled' construction workers whose wages skyrocketed after the Black Death? As such, this paper provides further quantitative support of earlier criticisms by Hatcher (2011). Our interpretation also strongly concurs with the recent 'apology' for wages offered by Geens and Blondé (2025), which demonstrates that building workers moved up and down the wealth hierarchy according to changes in remuneration.

mative events of the fourteenth century, and the Black Death in particular, improved (Barron, 1989; Goldberg, 1992; Hatcher, 2001) or deteriorated (Bennett, 1996; Bardsley, 1999) the opportunities for women on medieval labour markets. More recently, Humphries and Weisdorf (2015) convincingly shows the female labour market developing along two distinct paths following the Black Death. Using a wide array of sources to gather female wages in both short-term and long-term unskilled employment, they demonstrate that the growth of 'annual' wages stagnated while wages for women employed on 'casual' (short-term) terms followed a trend more similar to the 'golden age of labour' experienced by men.

Our results are consistent with the somewhat more 'pessimistic' appraisal of the prospects for annually-employed women. Dairymaids, a common role for female *famuli*, were a group that modestly expanded between 1300 and 1400 due to increasing pastoralisation in the agrarian economy. However, this expansion was not accompanied by any of the even limited wage increases, either in total or in the proportion of cash, that their male counterparts, such as ploughmen and shepherds, received. Yet, female servants, who occupied a significantly more marginal role before the Plague and were paid some of the lowest wages of any *famuli*, saw a dramatic improvement, although they were far smaller as a proportion of this labour force. Some women likely also benefited from the surge in wage rates paid for harvest labour; the sources do not typically allow us to observe the sex of these labourers. Some fragmentary evidence does suggest that women featured prominently in all types of harvest labour and were sometimes paid equally to men when doing the same task (Penn, 1987). On average, the day wages of women climbed alongside those of men, but a gender gap continued to exist largely due to women working in more poorly remunerated tasks.[41]

Similarly, age status acted as an important customary brake on wage increases for the worst-remunerated workers. *Garciones*, for example, who were often children, experienced wage stagnation after the Black Death. Children were already paid poorly in terms of in-kind wages at the turn of the fourteenth century (Claridge & Langdon, 2015). This in part reflected their lower levels of strength and human

[41] We are grateful to Grace Owen and Jane Whittle for sharing an early version of their work on the gender wage gap in medieval English agriculture.

capital more generally as well as their consistent deployment in less productive roles. However, contemporary norms surrounding notions of adulthood surely also played a role. Full adulthood was linked to becoming a household head, with male ages of majority typically being between fifteen and twenty-one and marriage taking place after the acquisition of property. The fact that *garciones* was itself a slippery category which could include adolescent and even adult men who did not hold property shows the power of 'juvenility' as a customary status in late medieval England (Bennett, 2019). However, the decline in the number of *garciones* reveals that these customary forces would have had a limited impact on the welfare of workers in England - faced with persistently low customary wages, *garciones* simply ceased to be an occupational group on many manors as the children and young men in this category found more attractive ways to make a living.

9 The emergence of formal *famuli* labour markets: from custom to markets?

This paper has presented a new perspective on wage inequality and labour market transformation in medieval England through a high-resolution analysis of the remuneration of *famuli* labourers across the fourteenth century. Our findings demonstrate that the Black Death did not uniformly elevate the earnings of all labourers. While some marginal or flexible categories - such as harvest workers and titular *famuli* - saw substantial increases in wages, driven largely by increases in cash payments, 'core' occupational groups, like ploughmen and carters, experienced only modest gains, and levels of in-kind payments remained relatively stagnant. These trends suggest that customary wage structures persisted for many, even amidst major demographic and economic upheaval. At the same time, the growing significance of cash wages, the disappearance of certain marginal roles, the increased prevalence of full-time employment, and the increased explanatory power of occupational and regional dimensions of wage inequality point toward a commercializing and professionalising labour market.

Taken together, our paper illustrates the pitfalls of taking any part of the me-

dieval workforce as 'representative' of incomes of the whole population of workers in this era. With so much variation among even a relatively well-defined group such as the *famuli*, it is impossible to make secure claims about earnings, let alone living standards, from a single group of workers. It is only by trying to reconstruct the wages of various types of workers in concert, rather than looking for particular representative groups, that we will be able to fully appreciate the experience of wage earners in pre-industrial economies.

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Appendices

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A Data appendix

A.1 Data collection

To explore the variation in wages paid to workers in late medieval England, we draw on records of the remuneration paid to *famuli* labourers recorded in manorial accounts. The *famuli* were the main labour force on most demesne farms of medieval lords. Their labour was sometimes supplemented at certain times of the year by both labourers who worked either by the day (e.g. harvest workers) or for piece rates (e.g. in the construction or repair of manorial buildings) as well as labour rendered by certain (and typically unfree) tenants as part of their rent. Many *famuli* were hired for the entire year, while others worked for only a few weeks, but all *famuli* were clearly distinguished from the day labourers who were paid by the day and exclusively in cash. Significantly, the *famuli* were almost always clearly designated in the documents by their occupations like 'ploughman' or 'carter' or by the specific agricultural tasks they were responsible for such as guarding sheep, milking cows and/or ewes or more miscellaneous 'casual' work such as breaking up clods of soil, a process called 'spreading furrows' (*spargens sulcos*) or stacking crops at harvest. We focus exclusively on the so-called 'stipendiary *famuli*' who were paid a grain livery and cash stipend as their primary remuneration. Other workers, the so-called 'service *famuli*', or *famuli*-in-serjeanty' were instead given a rent remission for their labour. As this is difficult to quantity and represents a very different form of relationship between seigniorial employer and worker, we have ignored these workers in our analysis. By 1300, the 'service *famuli*' represented around only a tenth of the total *famuli* workforce, so we capture the largest share of this group of labourers.

Our data is both cross-sectional and longitudinal and combines four datasets together. In all datasets, we have extracted a range of information about each worker we observed. This included their occupational title or work tasks, the number of weeks they worked in the year, and their grain and cash wage. As a further step we transformed grain wages into their cash equivalents by recording the varieties of grains in which these wages were paid and 'pricing' these with contemporary grain prices. This provides information on the weekly nominal cash payment, nominal

grain payment, and total cash equivalent payment for every worker in our dataset (For more information about this methodology please see appendices B and D of Claridge et al. (2024)).

Our first dataset uses the 1300 cross section of Claridge and Langdon (2015) as a starting point. We augmented this dataset by adding information about the types of grain paid to workers which was not originally collected for 254 of these 433 manors. We also collected additional occupational information from the original manuscripts. This sample contains observations drawn from the decade before and the decade after the turn of the fourteenth century and contains a total of 433 manors (see Figure 1). Any given manor was only sampled once during this time period to avoid double-counting and giving undue weight to specific workers or individual demesnes. The cross section is skewed towards the south and east of the country, with fewer observations from the north and very few from the far south west. However, this distribution is broadly correlated with population density and economic activity at the turn of the fourteenth century.

Our second cross section is entirely new and is centred on 1400. The structure mirrors our 1300 database, containing observations drawn from the decade before and the decade after the turn of the fifteenth century, samples individual demesnes only once in that range, and includes information on the quantity of cash and in-kind wages, and the grains in which the latter were paid. Due to the fact that many lords switched to leasing rather than directly managing their demesnes in the changed economic conditions of the late fourteenth century, leading to the creation of far fewer manorial accounts in this period, there are fewer surviving examples to sample. As a result, our 1400 sample contains a total of 85 manors (see Figure 1). As with the 1300 sample, the sample is biased towards the south and east although with reasonable coverage of the West Midlands, north east and south west.

Thirdly, we utilise the longitudinal sample from Claridge et al. (2024). This draws on observations from 25 manors held by five estates (Battle Abbey, the Bishopric of Winchester, Glastonbury Abbey, the Abbey of Bury St. Edmunds and Durham Cathedral Priory) across England with the observations spanning the period 1270 to 1440. In total it contains 483 accounts. A key difference between this long-run sam-

ple and our two cross sections is that single demesnes, by necessity, *were* sampled for multiple years. The sample covers the four regions of the North, the Thames Basin, East Anglia and the South and Southwest. For discussion of our long-run panel data, see dataset from Claridge et al. (2024).

Table A1 presents the key summary statistics of our samples. While we have endeavoured to create representative data, there are inevitable biases in our samples given the nature of the sources. Our samples are biased towards institutional ecclesiastical estates. All manors in longitudinal were part of large ecclesiastical estates, while 68 percent of the 1300 cross-sectional manors and 88 percent of the 1400 cross-sectional manors come from these types of institutions. Ecclesiastics and religious houses were some of the largest landlords in medieval England and therefore employed significant labour forces. They also kept detailed records which have survived far better than those kept by lay institutions and smaller clerical lords. We have, however, sought to include non-ecclesiastical accounts where possible, in order to better balance our sample.

To explore the impact of occupation on remuneration we have identified the following groups in our dataset, identified by their Latin names:

1. Carters (*carectarii*)
2. Cowherds (*vaccarii*)
3. Dairymaids (*dayae*/*daiae*)
4. Female Servants (*mulieres, ancillae, puellae*)
5. *Garciones* (*garciones, pagii*)
6. Harrowers (*herciatores*)
7. Harvesters (a variety of harvest occupations including *tassatores, furcatores, famulus messuerunt*)
8. Other (a broad array of other occupations outside of the eleven main categories)
9. Ploughmen (*carucarii, tentores, fugatores*)
10. Shepherds (*bercarii*)
11. Swineherds (*porcarii*)
12. Titular *Famuli* (*famulus, famulus curiae, serviens*, but only in cases where these were paid a substantial wage akin to carters, ploughmen and shepherds).

A.2 Summary statistics

Table A1: **Summary statistics of the different datasets used in this paper**

		1300		1400		Panel	
Variable		**Freq.**	**Share**	**Freq.**	**Share**	**Freq.**	**Share**
Region	East Anglia	718	0.17	150	0.22	2020	0.41
	The Midlands	824	0.19	52	0.08	0	0.00
	The North	340	0.08	78	0.11	1610	0.33
	The South and South-west	968	0.23	305	0.45	843	0.17
	The Thames Basin	1404	0.33	96	0.14	448	0.09
Occupation	Carter	461	0.11	79	0.12	605	0.12
	Cowherd	152	0.04	16	0.02	80	0.02
	Dairymaid	210	0.05	43	0.06	185	0.04
	Ploughman	1658	0.39	199	0.29	1760	0.36
	Shepherd	379	0.09	80	0.12	486	0.10
	Swineherd	146	0.03	16	0.02	139	0.03
	Titular famulus	74	0.02	31	0.05	369	0.07
	Female servant	88	0.02	12	0.02	117	0.02
	Garciones	254	0.06	15	0.02	232	0.05
	Harrower	144	0.03	9	0.01	80	0.02
	Harvest	80	0.02	55	0.08	73	0.01
	Other	608	0.14	126	0.19	795	0.16
Gender	I(Female)	294	0.07	55	0.08	303	0.06
All workers		4254		681		4921	
Number of manors		433		85		25	
Number of estates		43		24		5	

Notes: The columns denoted by '1300' and '1400' refer to the 1300 and 1400 cross-sectional samples respectively. The final two columns, denoted by 'panel', refer to the full sample of Claridge et al. (2024). Our 'female' gender dummy is largely based on occupational category as we assume all dairymaids and female servants were women unless we have positive evidence to the contrary.

Source: Authors' database

A.3 Timing and tenure assumptions

To calculate wage rates, an accurate measure of the length of employment for each individual labourer is required. The cash and grain wages paid to workers are typically recorded in different parts of manorial accounts. Cash wages are usually found in the 'expenses' section, which itemised all outlays on the manor and expressed in monetary terms. Most grain wages were recorded in the 'grange account', found near the end of the manuscript, which details all grain produced, consumed and sold on the manor. This means that many workers are described in the manuscripts as having two terms of employment, one for their cash stipend, and another for their grain livery. In the vast majority of cases, if the same worker was given both types of remuneration, the two terms are identical, but for a small number of workers, one term was longer than the other. In these cases, we term associated with the in-kind grain payment as the default term of employment. If the worker was paid only a cash stipend, we necessarily take the term of their stipend as their term of employment.

Manorial accounts almost invariably supply employment terms in periods of weeks and/or days. In some cases, workers are described as having worked for a specific season or other 'qualitative' period of time. In order to capture such observations into our dataset, we make two additional assumptions. First, a common 'qualitative' term of employment was workers described as employed in 'harvest' (*in autumpno*). For these cases we have assumed that this meant seven weeks, as the harvest season typically varied between six and eight weeks. Similarly, we assume those who are described as having worked 'at lambing' worked for five weeks. This is informed by contemporary (as well as current-day) observations of the lambing season. For instance, at Hambledon (Hampshire) in 1409-10, an attendant helping the shepherd of ewes at lambing, is explicitly noted to have worked for 5 weeks (Page, 1999, 289).

A.4 Pricing and wage assumptions

In this section, we describe our use of decadal average grain prices in the calculation of in-kind wages for our cross-sectional samples. This paper follows Claridge et al. (2024) in quantifying the economic value of in-kind wages as following:

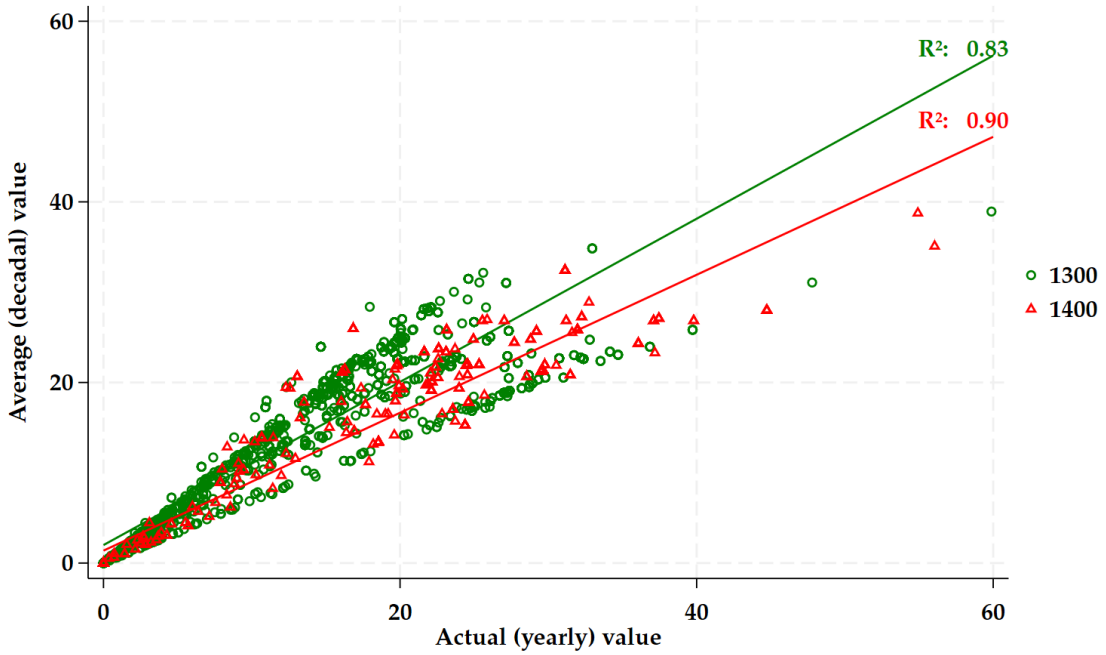
$$\tilde{Y}_{\ell,t}^{\text{in-kind}} = \sum_{g \in G} P_{g,t}.Q_{\ell,g,t} \tag{2}$$

In practice, this means that we have to retrieve the total grain payment, or "liveries", paid to workers, $Q_{\ell,g,t}$, as well as the market value of grain (g) in the year (t) it was paid, $P_{g,t}$. We do so over the universe of different grains paid to workers G. To achieve this, our cross sectional samples for '1300' and '1400' are drawn from the decades predeeding and following the turn of the century. That is, our 1300 sample is drawn from accounts ranging from 1289-90 to 1310-11 and our 1400 sample draws on accounts from 1389-90 and 1410-11. A consequence of this sampling strategy is that we might compare, for example, the earnings of a ploughman at manor i at year $t = 1398$ to those of a ploughman at manor j at year $t = 1403$. To ensure that price differences between the years 1398 and 1403 do not skew the wage comparison of both workers, we value $\tilde{Y}_{\ell,t}^{\text{in-kind}}$ based on the average grain prices of all $g \in G$ for the period 1390-1410. For worker comparisons across the 1300 cross-section, we use prices over the period 1290-1310. Formally, we thus calculate decadal average prices such that:

$$\tilde{P}_{g,t} = \begin{cases} \frac{\sum_t^{1290 \leqslant t \leqslant 1310} P_{g,t}}{20}, & \text{if } 1290 \leqslant t \leqslant 1310 \\ \frac{\sum_t^{1390 \leqslant t \leqslant 1410} P_{g,t}}{20}, & \text{if } 1390 \leqslant t \leqslant 1410 \end{cases} \tag{3}$$

Figure A1 compares the values of the in-kind wages in our two respective cross-sectional samples as calculated by this 'decadal-averaging' method (on the vertical axis), compared to the value they actually earned in current (annual) prices (on the horizontal axis). Two observations stand out. First, the spread of in-kind values is significantly lower, showcasing the 'averaging out' of the volatile prices in medieval grain markets, which was the main goal of this exercise. Second, the values of in-

Figure A1: **Comparing the values of in-kind wages based on annual valuations and decadal averages, c. 1300 and 1400 England**



Notes: .

Source: Authors' database

kind earnings using decadal average prices and current annual prices respectively are (unsurprisingly) highly correlated, reassuring us that we do not impose any bias towards certain manors or occupational groups.

B Macro Regions

We have defined the macro-regions in our analysis as follows:

East Anglia: Cambridgeshire, Huntingdonshire, Norfolk, Suffolk;

The Thames Basin: Bedfordshire, Berkshire, Buckinghamshire, Essex, Hertfordshire, Kent, Middlesex, Oxfordshire and Surrey;

The South and South-west: Cornwall, Devon, Dorset, Hampshire, Somerset, Sussex, Wiltshire;

The Midlands: Cheshire, Derbyshire, Gloucestershire, Herefordshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Rutland, Shropshire, Staffordshire, Warwickshire and Worcestershire;

The North: Cumberland, Durham, Lancashire, Northumberland, Westmorland and Yorkshire.

C Employment structure and occupations of the *famuli*

This appendix describes in more detail the occupational structure of the *famuli* in our cross sectional datasets and how this changed over the fourteenth century. It also provides some more detail on the tasks performed by key occupational categories. Figure A2 shows the occupational structure of *famuli* labourers in 1300 and 1400 according to the ten categories we establish in our paper. Our 1400 sample is significantly smaller than that of 1300 (partly due to the fact that many demesnes were leased rather than directly managed by this date), but we are reassured that it corresponds with wider economic changes over the fourteenth century, demonstrating its representativeness.[42] Growth in the share of occupations in animal husbandry, such as dairymaids and ploughmen, reflect the wider shift to pastoralism in the wake of the Plague (Biddick, 1989, Campbell, 2000, 183-7, 430-6).

Ploughmen were the most common *famuli* workers on demesnes in the late Middle Ages, accounting for more than 41 percent of all *famuli* labourers in 1300 and 31 percent in 1400. Ploughing was probably a year-round task on most manors. Active fields were typically ploughed twice in a year, while lands left fallow were often ploughed more frequently in an effort to replenish the soil. It was only possible for an ox-driven plough team to plough about half an acre per day, although all-horse or mixed plough teams would have presumably been faster (Langdon, 1986). Therefore, a demesne of 100 acres would have taken 200 days to plough with a single plough team, and this could not be done while crops were growing or being harvested. Even more time would be required for multiple ploughings. Most ploughmen were also kept busy with other tasks over the course of the year. Indeed, caring for the draught animals and maintaining the ploughs and harrows dominates much of the discussion that the anonymous author of the thirteenth-century *Seneschaucy* treatise devoted to describing the work of the ploughman (Oschinsky, 1971).[43] The *Seneschaucy* actually leaves the impression that ploughmen were perhaps more akin to general agriculturalists, who, in addition to ploughing and managing and main-

[42] See Appendix A for further discussion of the sample.

[43] Indeed, one Bartholomew Goche, a *famuli* ploughman at the manor of Walsham le Willows, in Suffolk, was amerced for 6d. in 1346 because "he guarded the stotts [plough horses] badly, and as a result one died, by his negligence." (Lock, 1998)

taining the draught animals and equipment, were widely engaged in the full cycle of crop growing from sowing seed to threshing harvested grains. This probably explains why ploughmen were such a large presence among the *famuli*. After ploughmen, carters and shepherds were the next most common types of *famuli* labourers, each accounting for ∼10 percent of the total workforce. Carters were required throughout the year to transport a range of cargoes. Manure and marl had to be moved to fields for applications of fertilizer. Produce and provisions had to be moved within and between manors, back and forth to markets and to seigniorial households, connecting the activities of individual manors to the larger estate. Like ploughmen, they might perform other roles at different parts of the year, including ploughing and harrowing in Winter (Farmer, 1996).[44] Shepherds also had a virtually full-time job, reflected in the fact that unlike other *famuli*, they were not 'seconded' to the harvest and given food at the lord's table in the Autumn. The *Seneschaucy* describes their tasks as including protecting flocks from dogs and from wandering into unsafe pastures as well as making barriers with hurdles. The treatise also advised that shepherds should go as far as to sleep with their flocks at night to ensure their safety. The full-time nature of the role is clearly brought out in instructions that they could only go to the market or tavern if they had left a suitable person in their place (Farmer, 1996).

While most manors would employ several ploughmen and at least one carter and shepherd, only a subset kept permanent dairymaids. This was a job typically done by women, but occasionally men found their way into this role as well.[45] They also performed a wide variety of roles which kept them busy throughout the year (Atkins, 2024). These comprised the more obvious role of milking and making cheese, but also other tasks including winnowing grain, making malt, looking after buildings, tending poultry, keeping fires in hearths going and making the pot-

[44] In the accounts, we see explicit discussions of carters performing such secondary tasks at Great Berkhamstead (1296-7) and Ditton Valence (1301) among others. See respectively, (Midgley, 1945, 20, 24), SC6 766/15.

[45] For example, a 1306-6 account for King's Langley (Hertfordshire) explicitly describes a 'man' who was dairying and making pottage for the other *famuli*. See: TNA SC6 866/16; a 1291-2 account for Popenhoe (Norfolk) records wages for a 'Nicholas Dairymaid'; see: TNA SC6 942/13.

tage for the other *famuli* (Farmer, 1996).[46] After dairymaids, the next most common occupationally-specific *famuli* were harrowers and swineherds. These were accompanied by other workers described in the documents more vaguely as *garciones* and female servants. Each of these groups accounted for c.5 percent or less of the workforce.

It is hardly surprising that 'core' workers, such as ploughmen, carters and shepherds, were a consistent presence in both 1300 and 1400 - they were specialised roles (even if they were flexible enough to vary their tasks according to the rhythm of the agricultural year) without which neither demesnes, nor the wider estates of which these were part, could easily function. Table A2 brings this out even more clearly. The first column in each panel (empl.) shows what proportion of total workers on the average manor came from each occupational group in 1300 and 1400. The second column (manors at least one), shows the proportion of manors which had a single worker from each occupational group in each cross section. As can be seen, the 'core' roles generally made up a similar proportion of workers across time. Carters and shepherds each accounted for around 10 percent of workers on the average manor, while dairymaids accounted for 5 percent. This again shows how significant these workers were to the running of the manor.

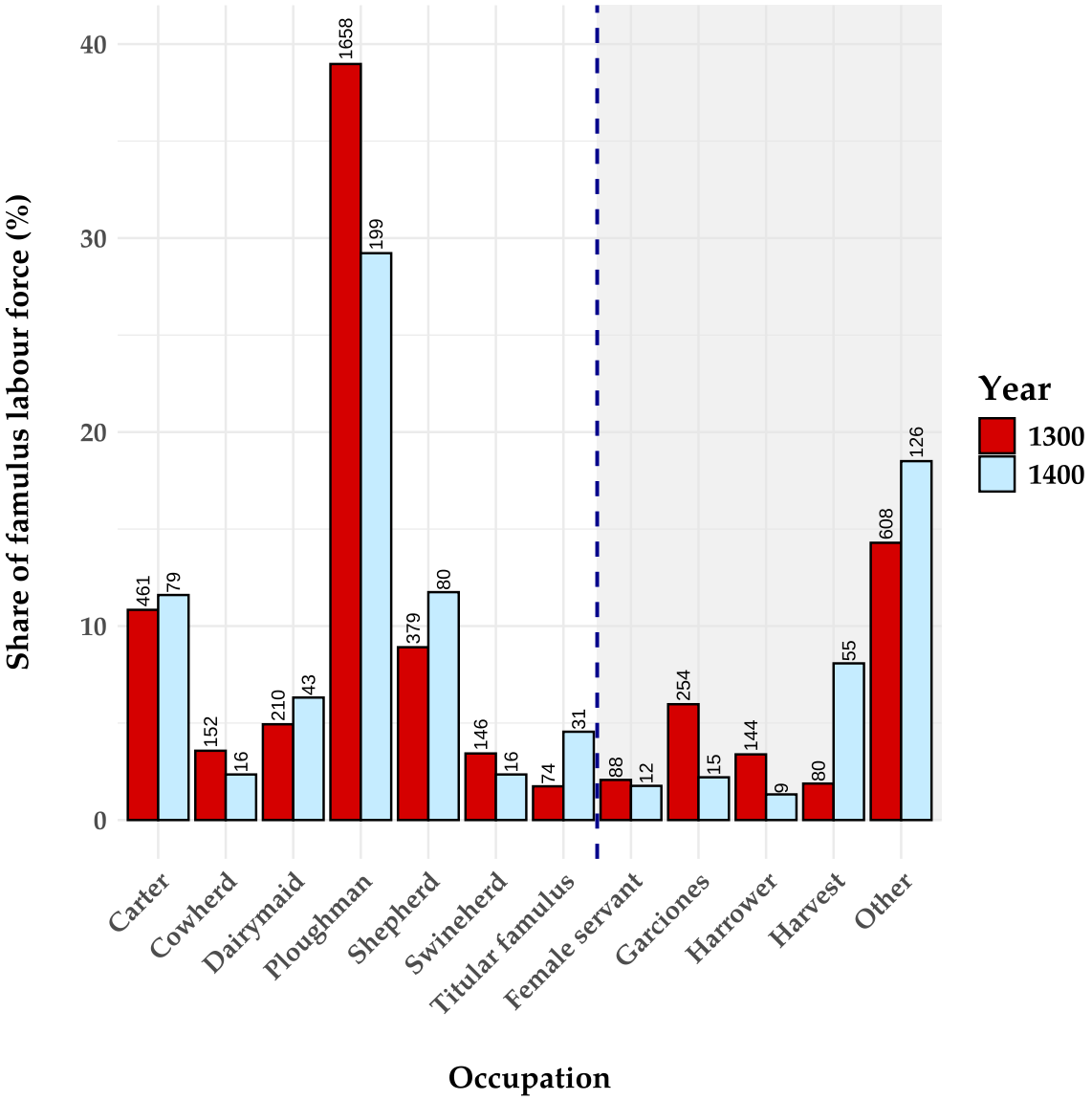
However, there were some changes within the balance of occupations within this 'core' group. Most obviously, the share of ploughmen, as the central arable worker, declined between 1300 and 1400, although they remained the dominant occupation among *famuli*. The proportion of dairymaids and shepherds increased, as seen in Figure A2. Similarly, ploughmen declined as a proportion of workers on the average manor, falling from accounting for 39 percent to 30 percent of the workforce on an average manor (see Table A2). These shifts in occupational structure away from ploughman reflect a broader reconfiguration in English agriculture over the fourteenth century. As grain prices fell, pastoral agriculture became attractive for demesne managers due to rising demand for animal products and the relatively cheaper labour costs of pastoralism. Consequently, the amount of arable land un-

[46] In our dataset, we see explicit discussions of dairymaids performing such secondary tasks in the accounts of Queen Carmel (1301-2, Somerset), Cleeve (1394-5, Worcestershire), Gnatingdon (1401-2, Norfolk), among others. See respectively: TNA, SC6 1090/6; Worcestershire Archives and Archaeology Service, 001:9 162/92114 BA 2636; NRO, LEST/IC 30.

der cultivation on many demesnes shrank, meaning that fewer ploughmen were required by the average demesne (Biddick, 1989, Campbell, 2000, 183-7, 430-6). Finally, we see an increase in the number of titular *famuli* with this more than doubling between cross sections. As discussed in our paper (section 4), these workers often seem to have been increasingly defined as individuals rather than by their occupation. More generally, looking at the minimum frequency reveals certain categories of worker disappearing from many demesnes. This likely reflects a process of specialisation in the post Black Death manorial economy, as demesnes which were kept in hand, tended to focus on the production of particular products for specific markets or for consumption by seigniorial households.

The story of stasis found for 'core' roles can be contrasted with the decline in the proportion of more marginal roles. Several of these were involved in labour-intensive soil preparation work. Harrowers more than halved as a proportion of workers between 1300 and 1400. They fell from constituting 4 percent of workers on the average demesne to just 1 percent, and from being found on 30 percent of manors to just 9 percent. Furrow spreaders and marlers who were found on a handful of manors in 1300, but completely disappeared in 1400. Similarly, *garciones* also disappeared as an occupation from among the *famuli*. These workers performed a wide variety of more marginal tasks, such as scaring birds, tending geese and horses, helping shepherds and swineherds and harrowing (Claridge & Langdon, 2015). While in 1300, *garciones* were present on 34 percent of manors, by 1400 they were present on just 11 percent of manors. Harvesters represent an exceptional case - while they increased as a proportion of all *famuli* in the 1400 sample, the number of manors on which they fell decreased from $\sim$11 to $\sim$7 percent.

Figure A2: **Employment structure of *famuli*, c. 1300 and 1400 England**



Notes: The occupations left of the dashed line and without the shaded background are the 'core' famuli occupations. The number of observations per relative frequency are displayed on top of the respective bars.

Source: Authors' database

Table A2: **Prevalence of *famuli* across manors, c. 1300 and 1400 England**

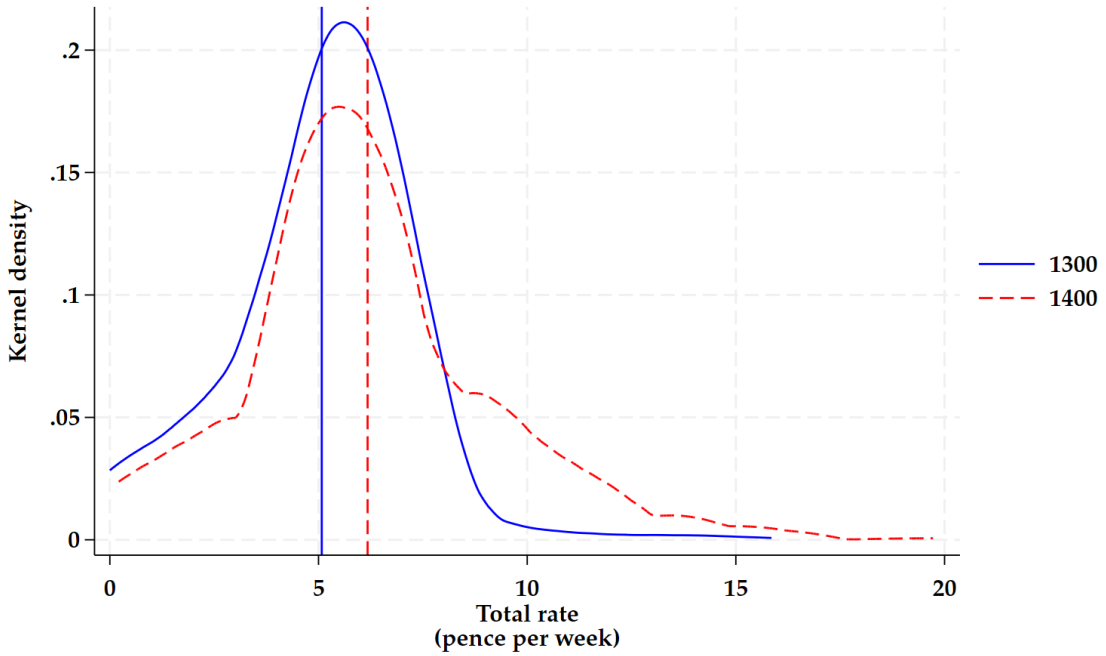
Occupation	1300		1400	
	% Empl.	**% Manors** at least one	**% Empl.**	**% Manors** at least one
Carter	11.38 %	71.82 %	11.92 %	61.18 %
Cowherd	3.47 %	34.41 %	2.33 %	17.65 %
Dairymaid	5.66 %	46.88 %	6.03 %	48.24 %
Ploughman	39.48 %	91.92 %	30.32 %	71.76 %
Shepherd	8.88 %	60.51 %	10.87 %	56.47 %
Swineherd	2.87 %	32.33 %	2.00 %	17.65 %
Titular famulus	1.93 %	3.70 %	4.66 %	9.41 %
Female servant	1.99 %	17.78 %	1.44 %	10.59 %
Garciones	5.30 %	34.18 %	2.05 %	10.59 %
Harrower	3.98 %	29.79 %	1.23 %	9.41 %
Harvest	1.22 %	10.62 %	2.47 %	7.06 %
Other	13.85 %	65.59 %	24.68 %	63.53 %

Notes: The column denoted by '% Empl.' indicates the (unweighted) average employment share of workers across manors. The column denoted by '% Manors at least one' indicates the share of manors which employ at least one of the different occupational groups.

Source: Authors' database

D Extra figures and results

Figure A3: **Wage distribution of *famuli* in real terms (total rates), ca 1300 and 1400 England**



Notes: The vertical lines represent the average total wage rate. The wage distributions are approximated through kernel density estimation using a Epanechnikov function with a smoothing parameter of 1. We deflated the 1400 wage distribution using the ratio of the average value of the Allen consumption basket for the period 1390-1410 over the average value for the period 1290-1310.

Source: Consumption baskets: Allen (n.d.). Wage rates: Authors' database.