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(In-kind) Wages and labour relations in the Middle Ages: It's not (all) about the money

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Abstract

This paper explores the prevalence of in-kind wages in medieval labour markets and the underlying reasons for their use. Using a new dataset of agricultural labourers in medieval England, we demonstrate that, until the late fourteenth century, wages were recorded anonymously and most remuneration was done through in-kind payment. From the 1370s, however, labour remuneration shifted increasingly to cash and workers began to be named individually in the accounts which recorded their wages. We argue that these changes reveal a fundamental shift in labour relations in late medieval England, providing new empirical insights into the 'golden age of labour' that followed the Black Death.

JEL classification codes: J33, J42, N33, N53,

Keywords:

Labour Markets, Labour Relations, Medieval Economy, (In-kind) Wages

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1 Introduction

While historians and economists have long appreciated that information concerning wages and standards of living are among the best evidence to explore the dynamics of pre-industrial economies, recent scholarship has pushed wages to the very centre of many key debates (for example, see Humphries & Weisdorf, 2019). Indeed, several grand theories, like the Little and Great Divergences and the Malthusian characterisation of pre-modern economies, use wage data as a core building block (for examples, see R. C. Allen, 2001; Clark, 2005; Pamuk, 2007). Yet, there remains a degree of arbitrariness surrounding both the data and the assumptions that underpin many wage series. A reality of many pre-industrial labour markets is that wages were paid both in cash and in non-monetary 'in-kind' remuneration, which often included grain but also sometimes accommodation, consumables, clothing, and tools. While the historical literature has long largely relied upon wages paid in cash, more recent studies have have begun to recognize the significance of non-monetary payments in a variety of historical settings (Drelichman & González Agudo, 2020; Humphries & Weisdorf, 2015, 2019; Humphries, 2023). In-kind wages played a major role in labour remuneration throughout the pre-industrial world and into the 19th century. Despite this, our understanding of *why* in-kind wages existed and persisted remains underexplored.

This paper presents an empirical exploration of the economics of in-kind wages in late medieval England. We not only observe in-kind wages in higher resolution than has been possible previously, but our empirical approach also allows us to investigate the role of in-kind payment in a watershed moment in labour history. The Black Death of 1348-50 was the single greatest negative labour supply shock in European history which, in the case of medieval England, killed between 45 and 65 percent of the population (Benedictow, 2021, 874-875, DeWitte & Kowaleski, 2017). Researchers have long asked how such cataclysmic mortality affected *levels* of labour remuneration. We argue that changes in the *composition* of wage payments, and the factors which drove these changes, remain an understudied dimension of the labour dynamics of that era. Wage composition is particularly useful in illuminating both the magnitude and timing of the forces behind fundamental changes in the medieval labour market.

Both the historical and economics literatures have long credited the spectacular

mortality of the Black Death with creating a subsequent 'golden age' for labourers. Historians have emphasized that the new scarcity of workers after the Black Death offered not only the prospect of higher wages for those that survived the plague but also the possibility to acquire further bargaining power in the labour market.[1] Alternatively, some economists have hypothesized that rises in wages after the Black Death were merely a function of sudden changes in land:labour ratios which, in turn, had a direct impact on the productivity characteristics of the medieval economy and thus the wages earned by labourers.[2] We explore these hypotheses with a robust sample of wage observations drawn from over 160 years of medieval English manorial accounts between 1270 and 1440.[3] Specifically, we gather the wages paid to manorial *famuli*, the core group of agricultural labourers employed on medieval English demesnes (the personal farms of lords as opposed to the lands of their peasant tenants) and accurately cost their cash and in-kind components with a novel methodology.

We find that, for these *famuli* labourers, the 13th and 14th centuries, including the two decades immediately following the plague, were periods of relatively stagnant wages. While the remuneration of *famuli* labourers did increase after the Black Death, several decades elapsed between the first outbreak of plague in 1348 and the eventual dramatic rise in wages from the 1370s. We contend that in-kind payments played an important role in this pattern of stagnation and change, and moreover, provide a crucial window for understanding the monumental shift in labour relations in late medieval England. Our findings generally support the notion of a 'golden age of labour', in the sense that the Black Death was followed by a period of moderate - albeit substantially delayed - growth in total remuneration, aligning with the findings by Humphries and Weisdorf (2019) albeit from a different empirical perspective.

We argue that the delay in wage growth was largely due to labour market power

[1] For perspectives from history and economics alike, see Hilton, 1969; Penn & Dyer, 1990; Bailey, 2014; Acemoglu & Wolitzky, 2011

[2] For instance, Voigtländer and Voth (2013, 787) model that population dynamics affect wages directly through the land:labour ratio. Such an assumption is also (implicitly) present in some economic history appraisals (for example, see Pamuk, 2007, 294). These Malthusian interpretations of the Black Death are rooted in the work of North and Thomas (1971) and Postan and Hatcher (1978), among others.

[3] The temporal bounds of our sample are determined by surviving manorial account evidence. While we do have observations from before 1270 and after 1440, the numbers of observations are generally too few and/or the accounting too idiosyncratic for robust statistical analysis. A replication package for the main analysis presented in this paper is available online (Claridge, Delabastita, & Gibbs, 2024).

dynamics at the time, specifically, an interaction between three factors: the particular utility that in-kind wages offered to workers, the variety and attractiveness of outside options available to *famuli* labourers; and the ability of lords to influence the labour market. When the utility of in-kind payment was high, the range and appeal of alternative opportunities were limited and lords held significant coercive power, the interplay of these factors worked to dampen wage growth. This was the case for most of the late Middle Ages, including the decades immediately following the Black Death. However, in the last three decades of the 14th century, these dynamics began to shift. The utility of in-kind payment in grain fell, outside options improved and lords, as employers, lost much of their ability to compel workers. These dynamics allowed labourers to increasingly command higher wages. We find that this rise in labour remuneration coincided with an increase in the cash component of composite wages and the frequency with which individual *famuli* are named in the accounts which record their employment.

This paper contributes to several interconnected strands of literature. First, our focus on in-kind wages allows us to shed new light on the economic effects of the Black Death. Historians and economists alike have seen the demographic collapse it created as a watershed moment in the development of Western Eurasia (for appraisals from both perspectives, see Bailey, 2021 and Jedwab, Johnson, & Koyama, 2022 respectively). Indeed, narratives concerning both the Great Divergence between Europe and the rest of the world (see North & Thomas, 1973, Voigtländer & Voth, 2013) and the Little Divergence between European regions (see R. C. Allen, 2001; Pamuk, 2007, among others) have all pointed to the Black Death as a key catalyst in setting economies on different economic trajectories. The demographic consequences of the plague are also argued to have been transformative for labour relations (Acemoglu & Wolitzky, 2011). Serfdom is often seen as the main channel of labour coercion in the Middle Ages and traditional perspectives have placed the Black Death and its impact on land:labour ratios as the key to driving its disappearance (North & Thomas, 1971).[4]

[4] The welfare consequences of labour coercion and coercive institutions such as serfdom have been fiercely debated in the literature. Evidence from the abolition of serfdom in the Russian Empire finds causal evidence of the negative productive effects of labour coercion and, relevant to our paper, suggests a negative impact on the diets and health of serfs (Markevich & Zhuravskaya, 2018). Other papers which examine the impact of feudal labour relationships on labour markets are Gary et al. (2022) and Geloso, Kufenko, and Arsenault-Morin (2023).

For much of the 20th century, social conflict between lords and peasants was seen as the prime mover in explaining not only the waxing and waning of serfdom, but also the broader vitality of the medieval economy (Hilton, 1969, Brenner, 1976). However, other historical literature has challenged such perspectives with a set of arguments that are more sympathetic to the role of market shifts, set in motion by the Black Death, in explaining the decline of serfdom (Postan & Hatcher, 1978, Bailey, 2014, 65-68). Recent work has highlighted that, rather than attempting to reimpose serfdom after the plague, lords instead sought to maintain their coercive powers by colluding with other employers in labour market. The key mechanism for employers was new legislation aimed at capping wages and restricting the mobility of labourers (Whittle, 2023).[5]

Our results uphold the notion that the Black Death had a significant impact on labour relations by increasing workers' bargaining power. However, the Plague's impact was delayed due to the interaction of the factors discussed above, namely the degree of successful collusion among employers and the utility of in-kind wages as a form of insurance which benefited workers. Therefore, while the Brenner debate had shifted focus away from the economic impact of the Black Death, our interpretation allows us to combine the insights of more recent literature, which sees the Black Death as a turning point, with an older literature more focused on the relationship between lords and labour. We argue that the demographic consequences of the Black Death did play a role in effecting significant changes in both labour remuneration and the wider economy, but that there is a place for labour market power dynamics in explaining these changes as well. These power dynamics played out not only in the arena of serfdom, but also in the rapidly changing labour markets of the late 14th and early 15th centuries.[6]

These insights also allow us to answer still-unresolved questions concerning the dynamic wage growth effects of the Black Death. At the macro level, pro-growth interpretations fit poorly within a Malthusian framework, in which positive income effects are temporary, and the "Iron Law of Wages" has a depressing effect on the rewards to labour once population levels begin to recover from an exogenous shock

[5] See Delabastita and Rubens (2023) for further discussion of employer collusion and its potential consequences in other historical contexts.

[6] Bailey (2021) argues along similar lines with a more developed legal angle than we provide here.

(Galor & Weil, 1999; Clark, 2007a; Ashraf & Galor, 2011).[7] The lack of historical consensus regarding both the causes and the scale of wage growth after the Black Death only adds fuel to this fire. While a range of studies have suggested that both the real wages of male workers (Clark, 2007b; Dyer, 2015) and the earnings of women relative to men increased after the Black Death (de Pleijt & Van Zanden, 2021), other studies have argued that these phenomena were more muted (Bardsley, 1999; Humphries & Weisdorf, 2015, 2019). Perhaps the most strident criticism has come from Hatcher (2011), who has persuasively questioned the credibility of much of the evidence that underpins views that wages rose so significantly in the 15th century. He highlights the literature's heavy reliance on largely unrepresentative samples of wages paid to day labourers collected and published more than fifty years ago.[8] We address this critique directly by providing a new series of earnings for annually-employed male workers in agriculture which measures both the levels and composition of composite wages with in-kind components at the individual level.

In so doing, we also contribute to a third and broader strand of literature on the reconstruction of historical living standards, which has long been a core mission of economists and economic historians. The centrality of wage evidence in this vast literature has triggered fierce methodological debates, for instance around how to interpret the available wage evidence (Stephenson, 2018), on how to transform it into accurate estimates of annual earnings representative of the wider population (Humphries & Weisdorf, 2019), and on the need for perspectives beyond the male-breadwinner model (Horrell, Humphries, & Weisdorf, 2022).[9]

We build upon recent work that has considered the composition of the payments that individual workers received (Drelichman & González Agudo, 2020; Humphries

[7] Voigtländer and Voth (2013) show how the Malthusian framework can be extended to allow for a higher-income steady state after a major demographic shock.

[8] In the history literature, the 'golden age of labour' hypothesis has been embraced in many grand narratives concerning the effects of the Black Death. Similar debates have more recently emerged in the economics literature concerning the scale of this phenomenon. In their literature review, Jedwab et al. (2022, 152) acknowledge that "existing wage series have serious limitations and the extent of this observed rise in the data might be overstated in some of the discussions of a late medieval "golden age" for workers". Bosshart and Dittmar (2021, 33) remark that "existing data on incomes do not permit the temporal and spatial comparisons at the heart of the key economic debates".

[9] For a clear illustration of these methodological debates, we refer to the collection of papers in Hatcher and Stephenson (2018).

& Weisdorf, 2015, 2019; Humphries, 2023).[10] Not only do we add a new empirical approach to medieval in-kind payments, providing further evidence on the *extent* to which in-kind payments played a role in shaping living standards, but we further consider *why* in-kind wages prevailed throughout the Middle Ages. Particularly relevant to our contribution here is the study by Drelichman and González Agudo (2020), who use price data to accurately cost a wide range of in-kind payments made to nurses in early modern Toledo. Their approach allows them to demonstrate that, far from being a consistent basket of goods designed to meet a fixed consumption need, in-kind payments were a crucial part of remuneration that could be varied in a period where rigid nominal cash wages declined in real terms. We apply a similar methodology to medieval labour markets in order to shed new light on the role of these in-kind payments in shaping labour relations. This empirical approach allows us to chart individual-level variation in the importance of in-kind wages and to show how some workers bargained for an increase in the cash component of their wages.

The remainder of this paper is structured as following. The next section explores how in-kind wages can illuminate various market frictions. The third section explains our empirical approach and contextualizes this methodology within the vast literature on historical wages. Section 4 then explores the historical sources and the structure of our data sample. In Section 5, we discuss the results and place these in the perspective of changing labour relations in the second half of the 14th century. Section 6 provides further evidence of this shift in labour relations through the emergence of 'individual contracting'. Finally, Section 7 concludes.

[10] Some earlier studies have attempted to account for in-kind benefits, albeit in an arguably less structured way than we attempt here. Many of these examples focus on the payment of perquisites in the early modern period, including, for instance, studies on agriculture (Muldrew, 2018), domestic service (Hill, 1996, ch.4), the wool industry (Randall, 1990) and the overall prevalence of this payment system (Schwarz, 1992, ch.6). Other work on grain payments has focused exclusively on the quantities of grain paid in the remuneration of *famuli* labourers (Claridge & Langdon, 2015). Particularly relevant to our work are the studies by Rush (2001) and Liu (2012, 273-278), which value grain payments made to *famuli* in 14th-century Glastonbury Abbey and the two 15th-century manors of Lullington and Pittington, respectively. Finally, the (renewed) interest by historians in alternative forms of payment is also illustrated by the new edited volume by Orlandi (2024).

2 The economics of in-kind wages

Why were wages paid in-kind? In the absence of frictions on input or output markets, we might expect remuneration to happen through cash as the means of exchange because the most efficient solution for conducting transactions of goods and services, including labour, is the use of an agreed commodity of exchange.[11] Nonetheless, in-kind wages have long been a feature of many labour markets, especially in the pre-industrial era, even when money existed and circulated widely. As such, we must look at the range of frictions and information asymmetries which might have had a role in determining forms of labour remuneration. We can distinguish between frictions prevailing in product markets, those potentially arising from monetary factors, as well as frictions in labour markets. In this section, we discuss these potential factors in turn. In the later empirical sections of this paper, we will explore which of these theoretical channels is best supported by our medieval evidence.

A first, and arguably the most straightforward, explanation for the historical presence of in-kind payments is the under-development of product markets and shortages in money supplies which potentially disrupted cash transactions of labour and goods. Such scenarios could have inhibited workers' abilities to independently acquire staple products. A possible solution, then, would have been for employers, if they could acquire such staples more easily, to supply them as labour remuneration.[12] A direct transfer of goods would circumvent the need to rely upon under-developed product markets, or to acquire scarce coins. Both product market and monetary developments could have had a role in determining the prevalence of in-kind wages in the Middle Ages, as this era is characterized by the irregular growth of product, and especially grain, markets (for England, see Britnell, 1993), as well as significant monetary turmoil (for a synthesis, see Spufford, 1988).

Labour market frictions might also explain the existence (and persistence) of in-

[11] The classic account of this argument is the work of Jevons (1875, 1-18). A similar starting point can be found in a more contemporary strand of economics literature which explores why governments choose to provide transfers in cash or in-kind (Currie & Gahvari, 2008).

[12] Similarly, we could hypothesize that some employers might have been able to provide grain for their employees at a cheaper rate than employees could purchase it themselves.

kind payments.[13] We outline three potential, non-mutually exclusive labour market failure scenarios which could explain the prevalence of non-cash wages. First, information asymmetries between employers and employees (or, principal-agent problems), in that the former had far less 'on the ground' knowledge than the latter, might have raised the need for payment systems that remunerated workers directly with a share of their output. Specifically, employers could have provided a portion of the total production as an in-kind payment, thereby incentivizing labourers to be more productive, as they shared in the benefits of efficiency gains. While piece rates and other manifestations of similar systems were common in a number of historical contexts,[14] the concept is not relevant for our case of medieval England. Here, the wages of agricultural labourers were rarely, if ever, mechanically linked to the productivity of a manor. Indeed, the quantities of grain paid to *famuli* as in-kind payments were typically fixed at discrete levels depending on occupation and seniority (Claridge & Langdon, 2015).

Second, nominal wage rigidities in labour markets, or fixed wage rates, might have hampered the income security of labourers in the face of varying food prices. As such, in-kind payments could have been favoured by workers for their utility as an insurance mechanism.[15] From an employer's perspective, this can also be connected to the use of efficiency wages to guarantee worker productivity through the provision of (at least) subsistence-level nutrition. This explanation for the historical persistence of in-kind wages must have some traction. In the Middle Ages, food insecurity was an existential threat, as famines were still commonplace due to economic vulnerability caused by climatic instability (Campbell, 2010). In-kind remuneration was likely to have been an efficient way to insure one against the price swings in staple goods that

[13] The existence of labour market frictions typically implies that employers have labour market power, or 'monopsony power', over their employees. As a consequence, employers have the ability to push wages below the perfectly competitive level, which equals the marginal product of labour. Economists are increasingly becoming aware of monopsony's potentially important ramifications for employment and wages in current-day settings (for recent examples and discussions, see Sokolova & Sorensen, 2021; Yeh, Macaluso, & Hershbein, 2022). Labour market power might also have had a strong impact on determining labour market outcomes in historical contexts, and recent evidence suggests that this is particularly relevant in the presence of feudal labour relations (Gary et al., 2022; Geloso et al., 2023). For a broader overview of what an understanding of monopsony adds to the economic history literature on wages, we refer to the discussion in Paker, Stephenson, and Wallis (in press).

[14] An example can be found in 19th-century American agriculture, as suggested by Alston and Ferrie (1993, 858).

[15] Ito and Kurosaki (2009) provide contemporary evidence for such considerations in the context of agricultural labourers in developing economies. Kurosaki (2011) formalizes this and provides a broader, 20th-century perspective.

accompanied these periods of crisis. In sum, labour market frictions in the form of nominal wage rigidities, combined with the presence of product market inefficiencies and insecurities, might have led to the necessity of in-kind wages.[16]

A third theoretical option is that in-kind wages were used to foster the dependency of employees on employers. The payment of wages in-kind could have made it more difficult for workers to move away from their employers than if wages were paid in cash. In-kind payment could bind both logistically, as wages paid in heavy and bulky goods like grain are difficult to move, and financially, as in-kind payments are less straightforward for capital accumulation relative to cash wages.[17]

In sum, these connections between market imperfections and the historical existence (and persistence) of in-kind wages underline how the latter can illuminate labour relations in medieval England. Historically, wages were not determined simply by the marginal product of labour, as in the neoclassical framework without frictions, but also by varying levels of labour market power. The idea that labour market frictions play an important role in the determination of medieval wages is, of course, not new.[18] Nevertheless, our understanding of medieval labour relations lacks an empirical grounding in quantitative evidence.[19] To address this, we utilize evidence of in-kind payments to shed further light on the drivers of post-Black Death changes in the medieval English labour market. To do so, we need an empirical framework to quantify the in-kind remuneration we observe.

[16] Furthermore, if labourers had preferences for specific in-kind payments, employers could obtain more bargaining power by offering preferable commodities. The idea that amenities grant employers labour market power has a long history (Robinson, 1933), and workers' preferences for certain amenities is considered a key driver in influential current-day models of labour market power (Card, Cardoso, Heining, & Kline, 2018). In our medieval setting, this would imply that workers who valued a specific composition of grain payment might have found it hard to find another employer offering a similar collection of grains as a wage payment.

[17] For the logistical concerns involved in storing and moving grain in medieval England, see Claridge and Langdon (2011). For a discussion of the potential for in-kind wages to constrain migration across labour markets, see Friebel and Guriev (2005).

[18] For instance, Munro (2003, 204) posits that "wages would, however, clearly not be determined in the short-term by the Classical equation: i.e. that $W_L = MRP_L$ - not then and just as certainly not now." We also refer to Paker et al. (in press) for an early modern perspective.

[19] See Jedwab et al. (2022, 162-164). Such a lack of quantitative studies persists despite the fact that there are several indications that the late Middle Ages were marked by a transformation of labour relations (Hilton, 1969; Bailey, 2014). It is worth noting that in much of the economics literature on the (decline of) feudalism and serfdom, scholars speak of *labour coercion* rather than *market power* (notably, see Acemoglu & Wolitzky, 2011). In our discussion, these terms are synonymous.

3 Empirical framework

3.1 Working with medieval wages

To date, most studies of pre-industrial labour remuneration have avoided tackling in-kind wages directly, largely because doing so is a very complicated and time intensive endeavour. Historians have long noted the complexity which in-kind payments present for the calculation of incomes (Farmer, 1988, 760). A common solution to the difficulties associated with disaggregating and valuing such an assortment of in-kind payments has simply been to ignore them. Many studies have instead focused on a subset of workers for which cash wages were predominant, be it day labourers in agriculture (as in Burnette, 2004; Clark, 2007b; Munro, 2012), construction workers (as in R. C. Allen, 2001; Clark, 2005; Malanima, 2013; Rota & Weisdorf, 2020; Geens, 2023), or a combination thereof across multiple industries (as in Munro, 2003; Ridolfi, 2019; Losa López & Piquero Zarauz, 2021).

However, turning day wages into annual incomes is fraught with difficulties, chiefly because, in many contexts, it is impossible to know how many days of work were actually available to labourers.[20] To sidestep this problem, Humphries and Weisdorf (2019) focused only on workers who were contracted annually, obviating the need to make any assumptions about the length of the working year.[21] Specifically, they posit that $\tilde{Y}_{\ell,t}$ should be captured using the cash income of annual workers, $Y^{\text{cash}}_{\ell,t}$, as follows:

[20] While a working year of 250 days is a common assumption (R. C. Allen, 2001, 2009; R. C. Allen & Weisdorf, 2011), this has been heavily criticised. Such criticisms often rest on the suggestion that, for the many labourers who worked casually, rather than on annual contracts, 250 days of work would have been difficult to string together. Other critics point to the so-called 'backward-bending' labour supply curve to suggest that labourers may not even have desired to take on 250 days of work, even if they could find it. Some workers may have prioritized the utility of leisure over increasing incomes in periods of higher wages. The available quantitative evidence suggests indeed that annual working days varied widely (for instance, see R. C. Allen & Weisdorf, 2011). There is also anecdotal evidence that some workers opted to work less in the wake of the Black Death, much to the chagrin of employers (Hatcher, 1998). Finally, the fragmentary and seasonal nature of medieval labour markets make it very unlikely that medieval labourers were fully employed at all times (Hatcher, 2011).

[21] A core assumption in this approach follows Clark and Van Der Werf (1998) in positing that day and annual labourers were perfectly homogeneous and that there were no frictions between these labour markets. Therefore, information on annual wages not only provides insights into the earnings of annual workers, but also the annual incomes earned by day labourers based on the number of days worked. We present an alternative interpretation in Section 5.

$$\tilde{Y}_{\ell,t} = \underbrace{Y_{\ell,t}^{\text{cash}}}_{\text{cash}} + \underbrace{CPI_t}_{\text{in-kind}} \tag{1}$$

However, the consequence of a focus on annual contracts is that in-kind payments play a much more important role, as annually-employed workers are most often found in agriculture, and these labourers typically received payments both in cash and in-kind, particularly in the Middle Ages. Therefore, such an approach requires the inclusion of in-kind payments in some form. When workers were paid with a range of goods (or even services) some kind of common denominator is needed to value these in-kind payments. In a lot of historical contexts, however, "the evidence needed to support such an exercise is rarely provided" (Humphries & Weisdorf, 2015, 413).

Instead, Humphries and Weisdorf use a Consumer Price Index basket, CPI_t, to value the in-kind payments labourers received. Specifically, they utilize Allen's 'respectability basket' (R. C. Allen, 2009), which they argue "provides a tool for capturing and valuing the goods commonly consumed by an average person during the pre-modern era" (Humphries & Weisdorf, 2019, 2871).[22] In other words, this approach assumes that all workers in receipt of any in-kind payment received *at all times* a (respectable) subsistence wage for their labour efforts.[23]

While this approach works well for observing long-run trends over the entire pre-industrial period, at the national level, it cannot accurately capture the value of in-kind wages at a micro-level resolution. This is problematic because in-kind payments varied significantly across space and time. Workers were paid in a dizzying array of grains, with considerable differences in both market value and calorie content. Importantly, in-kind payments also varied significantly by the age, gender and role of the worker. Finally, some studies have explored in-kind payments structurally but without full consideration of the cash portion of wages that labourers also often received (Claridge & Langdon, 2015). To address these gaps, we focus on a time period for which we do have access to the necessary historical evidence to monetize in-kind wages.

[22] For another application, see Kumon (2022) in the context of Japan.

[23] Related to our study, Humphries (2023) also quantifies the values of various in-kind remuneration. This work presumes that these wages capture a contemporary understanding of living standards. As in Humphries and Weisdorf (2019), however, this approach relies on the assumption that wages were always determined by an efficient market mechanism.

3.2 Towards a complete appraisal of composite wages

This paper presents an approach that completely appraises both the cash *and* in-kind wages of workers in the Middle Ages:

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

For the cash component, we simply use the amounts of cash paid to annual *famuli* workers in the form of $Y_{\ell,t}^{\text{cash}}$. For the in-kind component we quantify the total grain payment (called "liveries" in the sources) 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. In the following section, we discuss in further detail the data and historical sources needed to implement this methodology.

Our approach therefore allows a complete appraisal of the market values of both the cash and in-kind components of labour remuneration. While many workers (and their families) may have simply consumed in-kind grain payments, the cash conversion is indicative of the market value of a grain payment in any given year, as it reflects how much a worker would have received if they had sold their liveries on the market, or alternatively, the amount of cash they would have had to spend if they purchased that grain. The conversion of in-kind payments into cash would have been necessary for many labourers in order to provide them and their families with the necessities not provided by employers, like clothing, shoes and fuel (Claridge & Langdon, 2015). We calculate Equation (2) at the level of labourer ℓ, allowing us to quantify the value of in-kind payments at the individual level. We believe our method brings two key contributions: first, it facilitates a more accurate empirical analysis of labour remuneration in the Middle Ages, and, second, it allows us to capture critical changes in labour market dynamics and relations through the observation of the composition of wages. In what follows, we discuss the data requirements needed to implement this method.

4 Data

4.1 The medieval sources

Agricultural work was by far the most common type of employment available in medieval England. It is estimated that almost 60 percent of the entire labour force worked in this sector (Broadberry, Campbell, Klein, Overton, & Van Leeuwen, 2015). The *famuli* labourers we draw upon were employed on medieval English demesnes: the working farms of medieval lords as opposed to the lands of their tenants. The wages paid to these labourers are recorded in manorial accounts created by demesne managers which survive in the thousands for late medieval England. *Famuli* can be distinguished from the two other sources of labour available to medieval lords, namely waged day labour and the 'customary' labour provided by a subset of tenants as part of their rent. While these were also undoubtedly important sources of labour, especially at times of peak demand such as harvest, the *famuli* formed the core of the demesne workforce and it is estimated that they accounted for at least a third and up to a half of all labour deployed on demesnes (Claridge & Langdon, 2015). Relative to other types of labourers, *famuli* were typically hired for longer periods of time, most commonly for the whole agricultural year. As the most permanent staff on demesne farms, the *famuli* were responsible for a range of core tasks across both the arable and pastoral operations of demesnes, such as ploughing and animal herding (Campbell, 2009).[24]

The *famuli* were a unique group of workers whose main source of income came from the wages paid to them by landlords. Their jobs were very secure relative to other labourers, leading Bruce Campbell (2009, 85) to describe them as the "aristocracy of labour". Many day-wage earners, in comparison, were smallholding tenants who used temporary employment to supplement the incomes they generated from their own land. However, the *famuli* were not a small group, with a total estimated population of around 105,000 in c.1300, representing perhaps two percent of the total English population, and a much larger proportion of wage-earners.[25] The legal status of the

[24] John Hatcher, in his critique of the use of day wages to impute annual incomes commented that the wages of the *famuli* "provide a further opportunity to place the reputed wages of day labourers in a broader context..." (Hatcher, 2011, 14).

[25] This is our estimate based on a population of 4.75 million in 1290 (Broadberry et al., 2015, 20).

famuli is somewhat murky, but the two authoritative general accounts of this group suggest they were generally personally unfree and remained so up to the end of the 14th century (Postan, 1954; Farmer, 1996).

The wages paid to *famuli* provide an excellent data set for our purposes for several reasons. The records specify precisely both the cash and in-kind payments made to each individual worker. Further, the sources classify these workers by occupation, allowing us to explore and control for changes in wages according to responsibilities and skill. The records also detail how many weeks in a given year each *famulus* (or *famula*) worked, meaning we do not have to make any assumptions about the length of the working year.

We do not always capture the full remuneration received by *famuli* and our wage estimates are probably best understood as a lower bound. The total wage of any individual *famulus* could have been slightly higher than the figures we calculate, once all the other elements we are unable to systematically quantify have been considered. The most important consideration is the payment of routine perquisites to some *famuli* throughout the working year.[26] The value of these perquisites, and the forms they took, differed between manors according to local custom, but could include meals and small cash tips. Unlike the main wage components, which were directly attributed to individuals in the accounts, the value of these peripheral benefits cannot be consistently quantified or consistently and accurately linked to individual workers. As a result, the wages we reconstruct are likely underestimates in some cases. Be that as it may, the evidence in Appendix D establishes that our data still capture the overwhelming majority of *famuli* remuneration. That is, we show that the economic value of these perquisites were likely small, and, while there were changes in these perquisites and how they were paid across time, they did not dramatically influence the trends that we observe. Thus, changes in the wages we construct accurately reflect changes in the total remuneration of *famuli* workers.

[26] We refer to Appendix D.1 for an in-depth discussion of perquisites. Another - arguably less important - consideration is the remission of rent, which we discuss in Appendix D.2.

4.2 The data sample

As outlined in Section 3, three key ingredients are necessary to provide a complete valuation of the remuneration of *famuli* labourers in the Middle Ages: 1) cash wages; 2) the quantities of grain paid and, 3) the value of that grain. Fortunately, manorial accounts, which survive very well for medieval England, provide us with exactly this information. To address potential concerns of changing sample compositions, we collected data from manors for which accounts generally survive in long runs. In Appendix B, we provide a detailed exposition of the data collection process. In essence, the manorial accounts allow us to identify both cash wages and in-kind grain payments at the level of individual labourers. The relevant data must be assembled from different sections of individual accounts. Fortunately, in most cases, it is straightforward to match workers between the two sections of the account, giving us a comprehensive overview of all workers' payments, both in terms of cash and quantities of grain. Furthermore, we can trace various other characteristics, like occupation and length of employment, for individual workers.

A third key ingredient necessary for our empirical strategy is the price information needed to quantify the market value of the *famuli*'s in-kind earnings. Here, we can rely on the seminal work of David Farmer (1988, 1991), who constructed annual price series for five key grains (wheat, rye, barley, oats and peas) from the 12th to 15th centuries. For grains not included in the Farmer series, we created a new database of grain prices recorded in the same manorial accounts from which we draw our wage data, as most manors recorded price information in the context of both the sale and purchase of grains. With this extended database of grain prices, alongside significant work on medieval English grain markets in the secondary literature, we were able to assign a market value to most grain livery payments. In some instances we had to make some minor assumptions, which are also outlined in Appendix B.

4.3 Representativeness

In Figure 1, we present the geographical distribution of our sample. This map shows sampled manors across the entirety of medieval England, with four out of five - what we consider to be based on their unique agricultural, demographic and economic struc-

tures - 'macro-regions' represented.[27] A notable omission is any wage data from Midlands manors.[28] Our sampling strategy is influenced by the survival of records, which may not be exogenous to the phenomena we are aiming to investigate. Hence, we follow other historical research on wage trends (notably, see Margo, 2000; Humphries & Weisdorf, 2019) by adopting a 'hedonic-like' regression design to account for the potential sampling biases. More specifically, we estimate the following Ordinary Least Squares (OLS) regression model:

$$y^{i}_{\ell,t} = \alpha_{\ell} + \sum_{o \in O} \beta_{o} \, \text{Occupation}_{o} + \sum_{r \in R} \gamma_{r} \, \text{Region}_{r} + \sum_{d \in D} \zeta_{d} \, \text{Decade}_{d} + \varepsilon_{\ell,t} \qquad (3)$$
$$\forall i \in \{\text{Cash}, \text{In-kind}\}$$

For every annually-employed (more than 300 days) male labourer ℓ in our sample, we regress the logarithm of the value of their in-kind earnings $\sum_{g \in G} P_{g,t}.Q_{\ell,g,t}$ and cash earnings $y^{\text{cash}}_{\ell,t}$ on dummies capturing their occupational group, region and decade of observation.[29] Collection O contains the following major occupational groups: ploughmen, pastoral workers, carters, child workers, managers and two miscellaneous categories (one for miscellaneous agricultural workers and one for miscellaneous non-

[27] See Appendix A for a full list of sampled manors. Figure A5 in Appendix C provides an overview of the sample composition by estate.

[28] We have no reason to believe that manors in the Midlands would have been significantly different from those sampled in other regions. While the Midlands was characterised by large demesnes and heavy labour obligations among customary tenants, this is also true for many of the manors in our sample such as those held by Glastonbury Abbey and the Abbey of Bury St Edmunds. Admittedly, the Midlands was dominated by open-field arable agriculture with a lack of pasture before the Black Death, and consequently experienced a greater shift to pastoralism after the plague. Nonetheless, the comparison presented in Figure A12 in Appendix G shows that the occupational structure of our sample is broadly similar to the national sample created by Claridge and Langdon (2015), which includes a large number of Midlands manors.

[29] We leave the analysis of female *famuli* and those employed more casually for further research. We express logarithms with lower-case letters, vectors are indicated with bold font. We also note that taking logs entails the loss of any wage observations equal to zero, which are fortunately quite rare in our data. We ascertained the robustness of this approach in two ways. First, running the same model without logs delivers similar results. Second, if we denote the observed share of zero wages as s_i, and we assume this to be nationally representative, we can can calculate a counterfactual wage in the following way:

$$\tilde{y}^{i}_{\ell,t} = s_i \times 0 + (1 - s_i) \times y^{i}_{\ell,t}$$

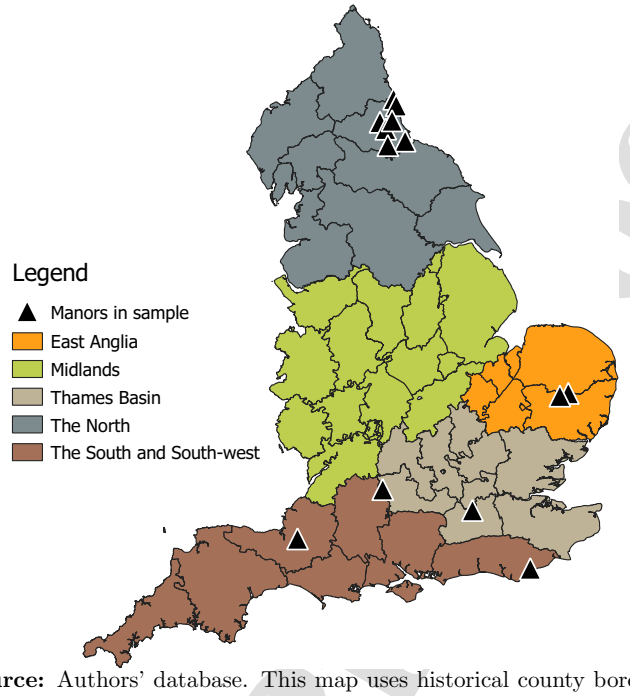
We do this exercise for both cash and in-kind wages. This delivers results very similar to our main trends, and further accentuates the shift in wage composition from in-kind payment to cash payment which we describe in Section 5.1 below.

agricultural workers). Individual labourers who did not fit into any of the occupational groups were placed in the appropriate miscellaneous category. Managers (typically reeves and bailiffs) are a relatively small group in our dataset. In the interest of examining the most homogeneous group of agricultural labourers, these managers were dropped from the analysis. Collection R captures the aforementioned four macro-regions: East Anglia, the North, the South and South-West and the Thames Basin. For an overview of the distribution of our sample over these categorical variables, we refer to Table A1 in Appendix C. Table A2 in Appendix C shows the sample conditions for our regression analysis. The output of the OLS regressions in Equation (3) can be found in Table A4 in Appendix G.

Finally, we can now use the resulting estimates $\hat{\boldsymbol{\beta}}$, $\hat{\boldsymbol{\gamma}}$ and $\hat{\boldsymbol{\zeta}}$ and exogenous weights derived from the closest approximations of nationally-representative data to calculate the 'hedonic average'. First, we multiply $\hat{\boldsymbol{\beta}}$ with a vector containing the employment shares of the *famuli*, following the cross-sectional sample of Claridge and Langdon (2015). Second, we use $\hat{\boldsymbol{\zeta}}$ and the 1290 population shares from Broadberry et al. (2015) to account for England's population distribution.[30] Adding these elements to our estimates $\hat{\alpha_\ell}$ and $\hat{\zeta_d}$ for every respective decade d, we create the hedonic decadal averages for annual cash and in-kind labour remuneration which will be the core of our analysis for the remainder of this paper.

[30] In other words, we use time-invariant weights for both the occupational and demographic dimensions of this reweighting exercise. We argue that this is innocuous. From an occupational perspective, Figure A12 in Appendix G demonstrates that our sample is representative at the national level and that there were no significant structural changes in the occupational composition of the *famuli* over the course of the period we study. From a population perspective, we can also use the 1377 estimates of Broadberry et al. (2015). These confirm the widely-held belief that "population decline was fairly evenly spread across the country, affecting both core and periphery alike" (Broadberry et al., 2015, 15), mitigating concerns over the use of time-invariant population weights.

Figure 1: **Geographic distribution of sampled manors**



Source: Authors' database. This map uses historical county borders by The Cambridge Group for the History of Population & Social Structure, or CAMPOP (Satchell et al., 2018).

5 Results

5.1 Main trends

What does our new wage data reveal? Figures 2 and 3 provide our series of decadal hedonic averages of total composite wages and the in-kind and cash components of which they were comprised between 1270 and 1440. Figure 2 provides the nominal trend and Figure 3 shows the trend in real terms. The nominal series in Figure 2 are presented against the backdrop of scatter-plotted raw annual averages for both cash and in-kind components, as well as raw wage totals, in order to demonstrate the intuition behind our hedonic averaging approach.[31] In Appendix F, we also perform a similar analysis for one manor in our dataset, Hinderclay, to illustrate that the findings

[31] For the raw data, we refer to Figure A10 in Appendix G. For a table of the nominal averages of cash, in-kind and total wages, we refer to Table A5 in Appendix G.

we discuss below can also be observed at the micro level.[32]

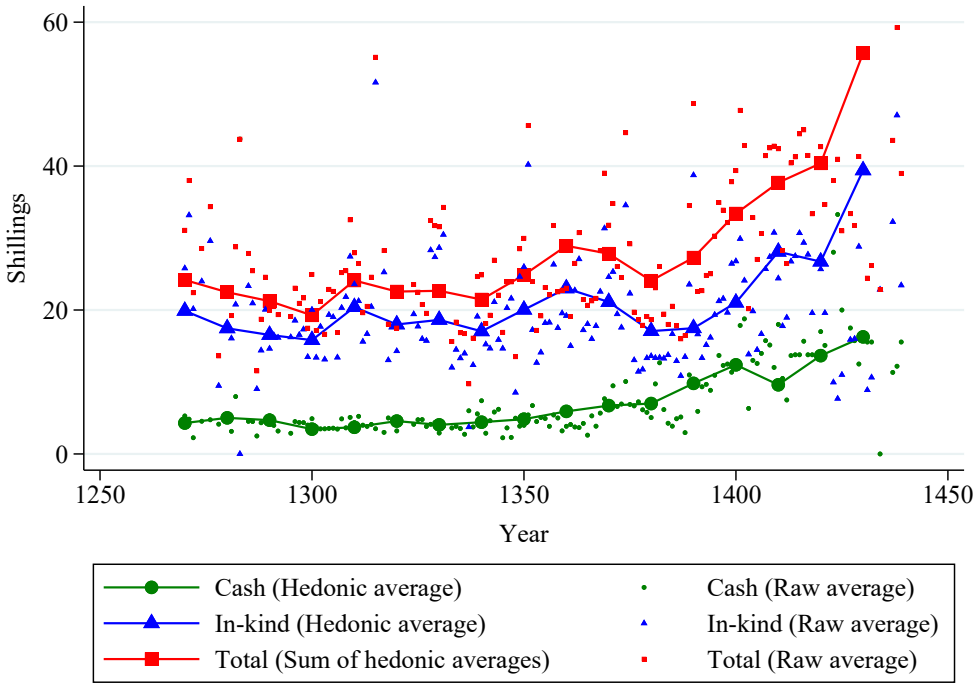
The scattered data in Figure 2 shows that the nominal value of in-kind wage components varied considerably year-on-year due to fluctuations in the prevailing price of grains. However, for the hundred years between the 1270s and 1370s, *average decadal* nominal wage levels for annually-employed *famuli* labourers were relatively stagnant, ranging between 19s. and 29s. While the 1350s and 1360s did see a small increase in nominal levels of both in-kind and total remuneration, this was not sustained and was largely caused by price inflation, meaning it had little impact in real terms. Nominal wages briefly fell nearly back to pre-Black Death levels in the 1380s but then climbed dramatically and persistently, reaching an average of 41s. by the 1420s (and even 56s. by the 1430s).

In terms of real wages (Figure 3), average *famuli* wages between 1270 and 1370 could have purchased the equivalent of 1.1 to 1.5 Allen 'respectability' baskets, thus ensuring a standard of living moderately above subsistence for a single, average *famuli* labourer. In these decades, a *famulus* could have sustained themselves at a relatively comfortable level, but would have had little surplus to save or to support non-working dependents. In the 15th century, growth in *famuli* incomes would have furnished a real wage of more than two 'respectability' baskets. Our method allows us to accurately decompose this increase in total wages into its cash and in-kind components. The decomposition in Figure 3 shows that workers were able to bargain for real increases in both cash and in-kind wages, with the in-kind component alone surpassing the value of a respectability basket towards the end of the 14th century. Much of the increase in total wages was, however, carried by an increasing cash component, as we discuss further below.

Overall, the documented surge in labour remuneration would have been transformative for the household budgets of workers, allowing for greater consumption and savings or perhaps a reduction in the number days other members of the household needed to work. Put simply, after over a century of stagnation, the average real wage of annually-employed, male *famuli* workers basically doubled in the space of sixty years, and this certainly translated into a significantly improved standard of living.

[32] Hinderclay (a manor within the larger estate of the Abbey of Bury St Edmunds) was chosen because of its exceptional completeness extending over the long 14th century, which is truly a unique feature. It goes without saying we do not make any strong claims about the manor's representativeness for England as a whole, and we perform this exercise mostly for illustrative purposes.

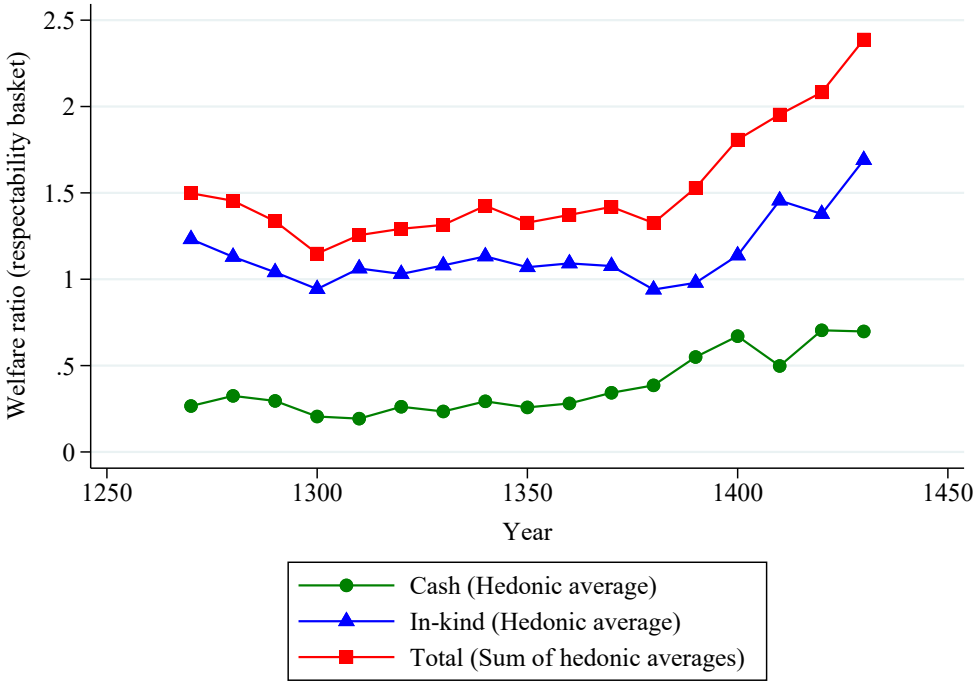
Figure 2: **Annual cash and in-kind nominal wages in England, in Shillings, 1270-1440**



Notes: The raw averages are calculated annually.

Source: Authors' database.

Figure 3: **Annual cash and in-kind real wages in England, in welfare ratios, 1270-1440**

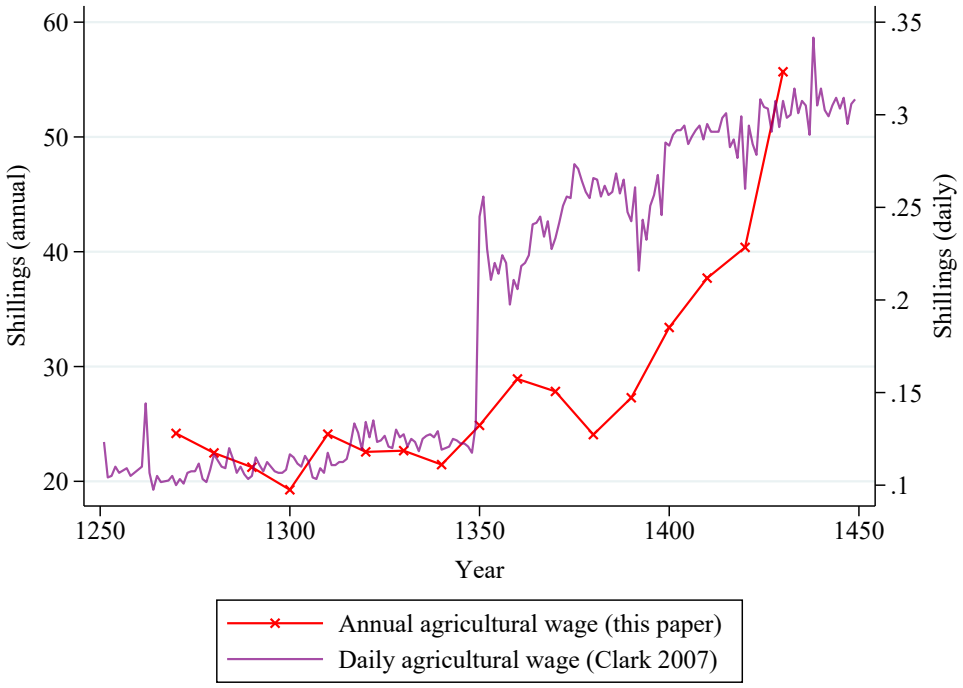


Source: Authors' database.
The welfare ratios are calculated using the values of a 'respectability' consumption basket (R. C. Allen, n.d.).

Our findings differ dramatically from the wages of individuals employed by the day.[33] Figure 4 compares the *trends* in nominal wage levels received by the *famuli* labourers we observe against day labourers as measured by Clark (2007b). This is not a comparison of *earnings*, as we make no attempt here to equate wages earned by the day with the incomes *famuli* earned by the year. We can appreciate that the trends in levels of remuneration were similar for *famuli* and day labourers before the Black Death. However, we see a significant divergence after 1348, when the wages of day labourers climbed quickly and significantly. In 1349, the average wage of a day labourer was 0.13s.; by 1350 it had climbed to 0.25s., basically doubling in a single

[33] Day wage evidence under-girds most arguments for a 'golden age of labour' after the Black Death. The annual-wage evidence of Humphries and Weisdorf (2019, 2877) reveals that this post-Black Death 'golden age' might have "glittered much less brightly" than previously presumed. It is also worth noting that recent work on day wages in previously unexplored historical contexts has failed to replicate findings of immediate and meaningful increases in living standards for labourers (for example, see Geens, 2023 on construction workers in medieval Flanders).

Figure 4: **Comparison of daily and annual agricultural nominal wages in England, 1270-1440**



Source: Authors' database (annual wages, decadal averages) and Clark (2007b) (daily wages).

year. *Famuli* wages, as we have discussed above, remained largely stagnant until the 1370s, when they began to increase. In fact, *famuli* wages took 80 years to achieve the same nominal growth that day wages experienced in a year, doubling from 25s. to 50s. per year, on average, by the 1430s.

These general trends are broadly consistent with recent studies of annually-employed agricultural labourers, such as in Humphries and Weisdorf (2019), who also compare their results with day wages. However, Humphries and Weisdorf assume that there were no frictions restricting movement between the markets for day labour and annually-contracted work, following Clark and Van Der Werf (1998). This allows them to gauge the length of a working year by looking at the number of days a day labourer needed to work in order to earn an annual income. In contrast, we argue that the divergence in wage rates between day and annual labourers can be explained by the different frictions present in these labour markets. Day labourers were mobile and faced relatively few frictions. In contrast, annual workers, like *famuli*, were limited in

their mobility and bargaining power until several decades after the Black Death, as we will see in Section 5.4.

Because we do not rely upon static CPI baskets to value in-kind payment, but rather observe the specific value of every individual's grain livery, an advantage of our empirical approach is that it is sensitive to the situation workers would have faced when a major part of their income was subject to the dramatic fluctuations that characterized grain prices in medieval England.[34] This observation is not only important to fully appreciate the economic reality of the Middle Ages, but also to better understand the general developments in labour markets in that era. As we will see, uncertainty of income was itself a driver of wage trends and can explain the different behaviour of annual and day wage rates after the Black Death.

What might explain the patterns in wage growth as described in the previous figures? As outlined in Section 2, a first and obvious candidate is the effects of monumental changes in factor ratios which occured in the wake of the Black Death. England moved from a situation where labour was abundant and land was scarce to one where land was abundant, but labour was scarce. The logic of such an argument is that high mortality caused the supply of labour to contract, and Malthusian mechanisms allowed the rewards of labour to soar (Postan & Hatcher, 1978; Voigtländer & Voth, 2013). This is typically the explanation given to explain the rapid growth of day wages in the 1350s. While this popular interpretation is certainly credible, it does not work very well as an explanation for the remuneration of annual workers. For *famuli* workers, wages, in nominal and real terms, only increased significantly in the last quarter of the 14th century. This meant that an entire generation of workers who survived the Black Death did not experience any significant rises in wages or, indeed, improvements in their standards of living. The substantial delay in wage growth for these workers suggests that market frictions must have been significant in this period for this group of annual workers. Our empirical framework allows us to investigate this by assessing the relative importance of in-kind payments.

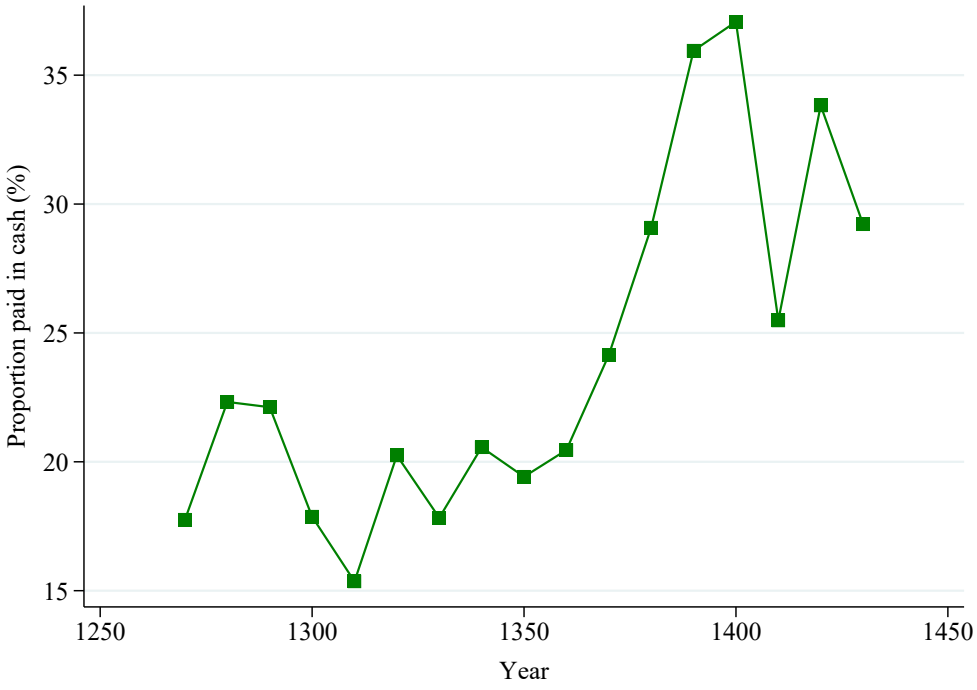
Our analysis reveals that not only did *famuli* wages increase in the latter decades of the 14th century, but their composition also changed. *Famuli* increasingly received a greater proportion of their wages in cash. Figure 5 shows that, after the 1370s,

[34] This becomes especially apparent when one directly compares our estimates of in-kind income to the value of CPI baskets. We refer to Figure A11 in Appendix G for this exercise.

the cash component of wages increased dramatically. While the quantities of grain paid to labourers remained largely static, the cash component of wages increased from about 20% to 35% as a proportion of total remuneration. The increasing importance of cash payments in the determination of total labour remuneration becomes even more apparent when decomposing the total year-on-year wage variance into its cash and in-kind components.[35] Before the Black Death, about 85% of total wage variance between years was explained by movements in the economic value of the grain liveries. After 1370, this share decreased to only about 54%, with the importance of cash wage variance increasing to 38%.

How do we explain this increase in the proportion of wages paid in cash? Following the theoretical framework from Section 2, we identify the potential for frictions in monetary markets, product markets and factor markets to have driven the changes we observe in the latter parts of the 14th century. We discuss these in detail below.

Figure 5: **Proportion paid in cash of wages in England, 1270-1440**



Source: Authors' database.

[35] We note that $Var(\tilde{Y}_{\ell,t}) = Var(Y^{\text{cash}}_{\ell,t}) + Var(Y^{\text{in-kind}}_{\ell,t}) + 2Cov(Y^{\text{cash}}_{\ell,t}, Y^{\text{in-kind}}_{\ell,t})$. These figures are based on raw averages rather than the figures produced by our regression models.

5.2 Looking for explanations: the cost of holding and using cash

One potential explanation for a rise in the proportion of cash paid to *famuli* could be that there was an expansion in the money supply that allowed employers, who previously had no alternative but to pay wages in-kind because of scarce currency, to now remunerate workers in coin. This argument might be most famously articulated by Herlihy (1967, 125) who argued that, in the Black Death, "men were dying but coins were not", a phenomenon which led to a significant increase in the money supply on a *per capita* basis. However, a monetary explanation does not fit well with the timing of our results for three reasons. First, if a sudden increase in the availability of coinage per capita due to the Black Death allowed lords to pay a greater proportion of wages in cash due to the easing of money supply constraints, we should expect to see a sharp increase in the cash component of wages soon after 1349. Instead, the results show a delayed response that we observe only decades after the plague first visited England. Second, recent estimates of the *total* money supply in medieval England all point to a tightening over the late 14th and 15th centuries at precisely the point in time when our data show an increase in the proportion of remuneration paid in coin (Palma, 2018).[36] Similarly, Farmer (1991) has argued that, after the 1370s, the money supply was shrinking both absolutely and per capita.

Finally, constraints in the overall money supply were compounded by the "problem of small change" during this period. After gold coins were first introduced in England in 1344, an increasing proportion of mint output was struck in these high-value gold coins rather than the silver pennies which were more suitable for smaller-scale transactions (M. Allen, 2011, Sargent & Velde, 2002, 131-135). A shortage of lower-value coins could have made paying the relatively small sums to *famuli* more difficult. The English crown's failure to debase its coinage to the same extent as its European neighbours was also a missed opportunity to expand the money supply (Mayhew & Ball, 2022). These patterns are reflected in the archaeological evidence which reveals

[36] Palma (2018) also estimates that the supply of coinage increased significantly in England between the late 13th century and the first quarter of the 14th century. However, this marked expansion in the money supply was not reflected in the proportion of cash in the composite wages paid to *famuli* in these decades. We refer to Figure A8 in Appendix E for Palma's series of nominal coin supply per capita. It is apparent that swings in the per-capita coin supply do not coincide with our observed structural changes in the cash payments to *famuli* labourers.

that most coin finds date from the 13th and early 14th century, with significantly fewer examples for the post-Black Death era (Dyer, 2022, 261-262). Therefore, while monetary explanations are compelling in theory, changes in the money supply in late medieval England were at best a neutral factor, or perhaps even worked against the payment of cash wages.

5.3 Looking for explanations: product markets

Another explanation for the persistence of in-kind payments could be frictions in the markets for the products which employers used for this form of labour remuneration. In medieval England, such a scenario would be that lords, as both employers and agricultural producers, were able to provide grains for their employees (in the form of labour remuneration) more efficiently than workers could acquire food themselves as consumers at markets. In terms of the increasing cash component we see in *famuli* wages, one might speculate that grain markets experienced a structural transformation after the Black Death which might have significantly reduced or eliminated such an asymmetry in access to staple food products, if such a friction had existed previously.

However, our understanding of medieval English grain markets does not support this supposition. Many of the key technological and institutional changes, which were required to support well functioning markets, were innovations of the 13th, not the 14th, century. Historians have reconstructed the precocious development of markets in England as part of a wider commercialization literature.[37] While the extent of market integration and commercialization more generally is still being debated (for instance, see Schneider, 2014), recent studies have pointed to both markets (Clark, 2015; Federico, Schulze, & Volckart, 2021) and ownership structures (Delabastita & Maes, 2023) as factors which made the medieval English economy relatively more integrated than its European neighbours. By the late 13th century, England was characterized by a highly commercialized economy in which a significant proportion of the population engaged with product markets to secure their basic necessities (Britnell, 1993, 228-231, Campbell, 2009). In most places markets were easily accessible and all strata of society used them regularly (Britnell, 1981; Masschaele, 1994; Britnell, 2012).

[37] For overviews of this literature, see Hatcher and Bailey (2001, 121-173) and Schofield (2016, 117-148).

Grain was typically (with the notable exception of famine years) widely available to purchase on the market. For example, between 1288 and 1315, 38 percent of all grain produced by demesnes in the London region was sold (Campbell, Galloway, Keene, & Murphy, 1993, 153-156). What is crucial for our argument is not so much the *level* of commercial development, which might be up for debate, but rather that market access did not change substantially at the structural break we observe in Figure 5. Instead, the traditional literature paints a picture of stagnation, if not decline, in the decades following the Black Death (Britnell, 1993, 156). So, much like for variation in the money supply, any long-term structural changes that might have occurred in grain markets simply do not fit the patterns of cash wages we observe.

However, this does not mean that markets were perfectly integrated or that there were no fluctuations in the price or availability of grain. While grain was available for purchase for most people in most years, falling supplies in (not infrequent) years of poor harvests could lead to dramatic price increases and, in particularly bad years, the availability of grain could become uncertain. The frequency of such 'bad' years, and thus nominal prices and price volatility, declined in the late 14th century.[38] However, this change was not driven by humanly-devised technological or institutional improvements, but rather by exogenous factors, namely the fall in aggregate demand for grain after the Black Death combined with improvements in harvest yields after the extreme climate volatility experienced from the 1320s to the 1360s (Campbell, 2010). While product markets have a role to play in explaining changes in the importance of in-kind payments, we shall see that it was their interaction with labour markets, rather than any simple linear shift towards greater commercialisation in the production and sale of grain, that contributed to the changes we observe.

5.4 Looking for explanations: labour market frictions

In this section, we argue that the patterns of secular wage stagnation which defined *famuli* remuneration up to the 1370s, and both the subsequent increase in wages *and* the proportion of these paid in cash, are all best explained by changing labour market dynamics. A close reading of the historical record reveals that the bargaining power of labourers was shaped by the interaction of three separate factors in this period,

[38] For the price trends of principle grains in medieval England see Figure A6 in Appendix E.

namely the attractiveness of outside options for workers, the effectiveness of collusion among employers, and the value of in-kind payments as a form of insurance. These factors changed significantly across the late Middle Ages and in combination led to the changes in wages we observe. However, all three only worked in concert from the 1370s onwards, helping to explain why dramatic improvements in *famuli* remuneration were delayed to the last quarter of the 14th century.

Outside options

What other economic opportunities were available to *famuli* labourers beyond annually-contracted work for lords, and how did these change over time? In simplistic terms, *famuli* in late medieval England could have pursued two alternative ways to earn a living. The first was to earn as a tenant-cultivator, by farming free or customary land held from a lord in return for rent. The second option was to work as a labourer for day wages on the lands of either lords or other tenants who might hold more land than they could work with their own household labour. In many cases, these two activities were likely combined by many peasants. To leave a *famuli* role to pursue tenant farming would have, of course, meant the acquisition of land. For opportunities as a day labourer the availability of work would have been an important consideration.

The availability and attractiveness of these outside options both changed significantly over the course of the late Middle Ages. When grain prices were buoyant before the Black Death, it was possible for those who had managed to acquire sufficient quantities of land to maintain a reasonable standard of living. However, land had become increasingly scarce by the latter parts of the 13th century leading to significant land hunger and the creation of sub-divided holdings which were insufficient to feed families.[39] Moreover, the low land-to-labour ratio created heavy competition for already-limited opportunities for employment outside of specific periods of the agricultural year and day wage levels were consistently modest (Bailey, 1998; Clark, 2007b).[40]

[39] The significant demand for land in England c.1300 is illustrated by the proliferation of sub-divided holdings, high inequality in tenement sizes and subletting at 'rack rents' (Campbell, 2005; Bekar & Reed, 2013). This led many peasants to hold smallholdings of five acres or less (Dyer, 1989, 119).

[40] The most widely available opportunities for day labour were the tasks of harvesting and threshing (separating the inner kernel of grain from its stalk and fibrous shell). As harvesting was typically completed in six or eight weeks in the late Summer and early Autumn, work as a day labourer would have been harder to find outside of this busy period.

Between 1264 and 1348, a day labourer would have had to find an average of 156 days of work just to earn the equivalent of a typical *famulus*' in-kind grain livery.[41]

However, the 1350s and 1360s, led to a rapid improvement in the quantity and quality of outside options available to *famuli* workers. The sudden reduction in population led to a glut of available tenancies at relatively low prices, putting the acquisition of land within reach of a far larger proportion of the population (Bailey, 2014, 326; Bailey, 2021, 150-53).[42] Alongside improvements in land availability, day labour also became an increasingly viable option for workers. As we have established above, day wages increased dramatically and quickly in the wake of the Black Death: between 1349 and 1379 a day labourer would only have had to find 91 days of work to earn the equivalent of an average *famuli* labourer's grain livery.[43] These trends largely continued into the late 14th and 15th centuries. From the mid-1370s the value of both customary and leased land fell even further, signifying a depressed land market where supply outstripped demand (Poos, 1991, 49-51; Bailey, 2021, 246-247). This led to a period of unprecedented access to land outside of familial inheritance (Whittle, 1998). Simultaneously, day wages kept rising, meaning that from 1380 to 1439, a day labourer required only an average of 87 days' work to match the value of an average *famulus*' livery. Outside of agriculture, the expansion of textile production and metal working led to growing opportunities for industrial employment, with recent estimates suggesting that 15 percent of men worked in this sector by 1381 (Broadberry et al., 2015, 347; Oldland, 2014; Poos, 1991, 58-72).

The impact of the Black Death led to an immediate and persistent improvement in the outside options available to *famuli* workers in 14th century England, dramatically

[41] This and subsequent estimates of day-labourer-working-days required to earn the equivalent of an average *famulus*' livery are calculated by dividing our series of decadal in-kind grain livery values by Clark's (2007b) series of day wages.

[42] Increased opportunity to acquire land is demonstrated by the fact that, at manors throughout England, the proportion of tenancies transferred outside of families increased significantly to over 50 percent after the Black Death (Mullan & Britnell, 2010, 87-90, Dyer, 2022, 68-70.) Moreover, in their desperation to find new tenants to take up the land vacated through either plague mortality or post-plague migration, most lords quickly dropped the servile elements attached to customary landholdings, making these even more attractive to potential new tenants (Whittle, 1998, Bailey, 2014, 315-326).

[43] That workers took advantage of new opportunities to work as day labourers rather than on annual contracts is revealed in the complaints made in contemporary literary sources. For instance, the poet John Gower complained that: "[Workers] are unwilling to serve anyone by the year. A man will retain them for scarcely a single month. On the contrary, I hire such men for even a day's pay-now here, now somewhere else, now for myself, now for you." (quoted in Hatcher, 1994, 17).

strengthening their bargaining power at the expense of employers. Before the plague, a secure job as a *famuli* labourer was likely very attractive. However, these roles became less appealing in a post-Black Death world flush with new opportunities, especially when the unfree legal status of *famuli* was unlikely to have posed a significant barrier to taking advantage of them.[44] This leads to an obvious question: why did *famuli* wages, and the proportion of these that were paid in cash, take three decades to adjust after the plague? While an improvement in the outside options available to *famuli* labourers goes some way to explaining the higher wages that they were eventually able to command, this alone does not explain why these changes took so long to appear.

Institutional frictions and collusion among employers

We have explored the possibilities that opened to *famuli* after the Black Death. Now, we consider how lords, as employers, responded to these new realities and how they attempted to use their political power to constrain wage growth. In the early 14th century, England's labour market was remarkably free; neither local regulation nor serfdom constrained the mobility of workers in any meaningful way (Bailey, 2014, 2023). The Black Death tipped the demographic balance even further in favour of labour. In response to this, the crown supported elites by introducing new legal institutions designed to maintain employers' labour market power (Whittle, 2023). The resulting Ordinance of Labourers (1349) and Statute of Labourers (1351), sought to cap wages, both cash and in-kind, compel labourers to accept work as and when it was offered, and to push workers towards enforceable annual contracts rather than more casual terms (Horrox, 1994, 287-290, 312-317). This legislation was enforced to some effect in the 1350s, an achievement made possible through the effective collusion between lords and wealthier peasants who also employed labourers (Poos, 1983; Hettinger, 1986, 127, 204).

However, these new collusive mechanisms proved to be ineffective in the medium

[44] While Farmer (1996) suggests that legal status may have led the wages of unfree *famuli* workers to be lower than their free equivalents, this is largely based on the fact that workers living in areas of England where serfdom was less present or disappeared early were paid more, alongside a single example of this practice from a manorial account. Recent interpretations have challenged the notion that lords could effectively use serfdom as a tool to control the medieval peasantry, highlighting the difficulties lords faced in actually retrieving fled serfs even if they had information about where they were residing (Bailey, 2014, 337; Bailey, 2015).

term, at least as a means to cap the wages of skilled, male agricultural workers. As early as the 1360s, some employers (including lords), likely those who appreciated flexibility in terms of employment, began increasingly to collaborate with workers to circumvent the new labour legislation, acquiescing to worker demands (Hatcher, 1994).[45] Ineffective enforcement meant that the legislation could not stem these infractions,[46] and the failure of these post-plague labour market interventions to suppress wage rates was broadly acknowledged by the Statute of Cambridge of 1388, which established new maximum rates which were well above pre-Black Death levels (Horrox, 1994, 323-326).[47]

Ultimately, this was a hastily-drafted labour legislation which was initially imposed successfully, but started to show cracks towards the later quarter of the 14th century. This bears some similarity with our documented wage trends. That is, stagnating wage trends during the first decades following the Black Death could be partly explained by the (mostly) successful collusion of employers to enforce post-Black Death Labour legislation. By the 1360s, however, it would have indeed been obvious to many labourers that the legislation was largely ineffective. That workers had realised the benefits of this failure of employer collusion is demonstrated by high rates of worker turnover from the 1370s. Labourers frequently left positions for better conditions elsewhere, exploiting competition between employers.[48] This begs the question of why it still took a further two decades for wages to rise, bringing us to the third of our three factors which explain our reconstructed wage series.

[45] This circumvention can be seen in cases of prosecution for transgressions of the labour legislation. There are many cases of workers leaving contracted employment in order to take higher salaries offered elsewhere. For example, Walter and John Sire of Barrowby brought a case against Robert Tasker of Londonthorpe because he 'left his employment in return for the offer of a higher salary, contrary to statute' (Horrox, 1994, 321).

[46] Several factors explain the limited enforcement of the labour legislation. These include a bias towards punishing workers rather than employers (Poos, 1983, Hettinger, 1986, 108-121), the limited state capacity of the English crown which made it impossible to control a labour market long-characterised by large numbers of highly mobile workers, and resistance to a socially divisive piece of legislation in local communities, as seen by limited prosecutions under the statute in manorial and borough courts (Bailey, 2023, in press). These problems were recognized by contemporary elites, who complained vociferously both in parliamentary petitions and contemporary poems and chronicles (Hatcher, 1994; Bailey, 2019).

[47] While new iterations of labour legislation continued to be issued in the late 14th and 15th centuries, the laws increasingly focused on the problem of vagrancy, with its key targets becoming young, mobile, unmarried, property-less and female (Bailey, 2021, 266-270, Whittle, 2023).

[48] We further discuss the evidence for employee turnover in Section 6.

Wage rigidity and the need for an insurance mechanism

To fully understand why the remuneration of *famuli* labourers improved only from the 1370s we need to understand the changing dynamics of in-kind payment. For the majority of our period, most of the workers we observe received a quantity of grain which remained largely fixed even if its value changed dramatically due to fluctuating grain prices. While the monetary value of such payments varied unpredictably from year to year, the insurance that in-kind payment provided could have been valuable for *famuli* labourers. It is here where product market failures play a role in shaping the labour market phenomenon of in-kind payments. The era before the Black Death was characterized both by high grain prices, and, more significantly, high price volatility. These trends continued into the two decades following the plague. While the late 13th century saw reasonably consistent prices, the first three quarters of the 14th century were very volatile, in large part due to dramatic price rises caused by the harvest failures in the mid-1310s, the dislocation of the Black Death of 1349 and 'a combination of dearth and plague' in 1369 (Campbell, 2000, 7).[49] Therefore, although markets had proliferated in late medieval England, the prices that would be offered on these markets were difficult to predict, as is evidenced by the fact that agricultural managers showed limited price responsiveness in decisions about which crops to plant (Schneider, 2014). The potential danger this price volatility posed to wage earners is revealed by the significant hardship England experienced before the Black Death, most notably the infamous Great Famine of 1315-1317, which is generally seen as the worst subsistence crisis in European history.[50]

In these circumstances, in-kind payment in grain insulated *famuli* labourers from the unpredictable and volatile prices that resulted from the vagaries of medieval agriculture.[51] Labourers who were paid a large component of their annual wage in grain did not need to worry about rising prices because they generally received the same quantity of grain as wages no matter what the price. However, this insurance came with a trade off, as any degree of dependence on in-kind wages would have limited

[49] We quantify grain volatility in medieval England in Figure A7 in Appendix E.

[50] While such crises were undoubtedly caused by exogenous climatic events (Campbell & Ó Gráda, 2011), Slavin (2014) demonstrates that a combination of market segmentation, the decline of government price supervision, and hoarding by elites seriously exacerbated the impact of harvest shortfalls.

[51] Drelichman and González Agudo (2020) find a similar role for in-kind payments in early modern Toledo, where prices were subject to rapid inflation and similar year-on-year variation.

the mobility of *famuli* labourers and served to attach them to their lordly employers through the mechanisms which we identified in Section 2. Practically, this could work in several ways. First, in-kind payment in grain was heavy, bulky and difficult to move. Therefore, if workers wished to relocate they would either have to find a buyer for their accumulated grain payments in order to move without it, or face the not insignificant challenge of moving a store of grain to a new location.[52] Second, worker-specific preferences over different sets of grains could bind a worker to an employer offering the most preferable grain livery. Third, while grain markets worked reasonably well in medieval England, the local provision of staple grains, in the form of in-kind payment, surely eliminated some logistical concerns for *famuli* labourers, in that the storage and transport of grain was largely handled by their employers. Of course, such frictions were not impossible to overcome, but they were frictions nonetheless. These were reduced when *famuli* began to receive more of their wages in cash. Ultimately, the widespread practice of paying *famuli* labourers with grain benefited workers by providing them with a dependable standard of living, irrespective of the success of the harvest or the prevailing price of grain in any given year, but the provision of this assurance was tied to the service of a single employer.

From the 1370s onward, while *famuli* workers continued to be insulated from price fluctuations by in-kind payment, the value of this insurance - and thus its utility as a carrot to keep workers tied to particular employers - decreased significantly because grain became cheaper and its prices less volatile. More favourable temperatures in the latter decades of the 14th century allowed grain yields to improve from the 1370s (Campbell, 2016, 281-288). This led grain prices to recede from their post-plague heights in the 1370s and remain relatively low and stable throughout the 15th century (Farmer, 1991, 444). Ultimately, this meant that workers were far more likely to trust that they would be able to purchase the grain necessary for their subsistence on the market, even in years of poor harvests. By the 15th century, price volatility was definitely not entirely a ghost of the past, particularly due to an exceptionally bad

[52] An average worker's total annual in-kind grain payment would have weighed between 567 and 1248 kg depending on the quantity and type of grain in which it was paid. The low estimate assumes a quantity of 4.33 quarters (a lower-bound average), paid entirely in oats (the lightest grain at 131kg per quarter). The high estimate is based upon a payment of 6.5 quarters (a higher bound for average workers) paid entirely in wheat (the heaviest grain at 192kg per quarter). Furthermore, it is not certain that all workers would have had ready access to draught animals and/or carts required to transport this grain.

harvest in 1437, but, generally, prices remained low relative to the periods immediately before and after the Black Death. Therefore, the value of the insurance that could be provided by in-kind payment was significantly less in the late 14th century than it had been before.

Before the 1370s, when grain prices were both high and volatile, workers may well have been willing to accept the inflexibility of wages paid mostly in grain in exchange for the security such payments offered. This was especially true in the wider context of the 1350s and 1360s, which were characterized by recurrent plague outbreaks, climatic instability and animal murrains (Bailey, 2021, 168-170). With an uncertain economic outlook, rolling the dice and taking up newly-available land as a tenant cultivator or seeking high-paying but irregular opportunities as a day labourer could have seemed unattractive in comparison to a secure annual contract which guaranteed enough food irrespective of the wider economic trends.[53] However, a fall in both the levels and volatility of grain prices in the 1370s, coupled with the later stabilization of the economy from the 1390s, served to make in-kind payments less attractive (Bailey, 2021, 268-270). Workers were increasingly willing to abandon the safety net of in-kind payment and voted with their feet, or at least threatened to do so, in order to secure greater wages with a larger cash component from their employers.

6 The emergence of individual contracting: worker-level evidence of name use

This paper argues that the evolution of both the levels and composition of the wages paid to annual workers in the wake of the Black Death is best understood through the lens of changing labour market power. That workers had acquired considerably more agency in wage bargaining, and were regularly leveraging it, is further demonstrated by an additional seam of evidence. This is the propensity of *famuli* workers to be individually named in manorial accounts, which we understand as the emergence of

[53] Munro (2012, 312-313) further argues that price inflation rose faster than the prevailing nominal wages offered for piece-work between 1351 and 1375, leading to a fall in the real value of remuneration for this type of work in the two decades following the Black Death. Such a situation may have left some *famuli* labourers reluctant to leave annually-contracted employment to seek opportunities on the casual labour market.

'individual contracting'.

Before the Black Death, labourers were identified only by their occupation. However, in the late 14th century, demesne managers began to regularly record the names of individual workers. Figure 6 demonstrates this trend and illustrates how the practice of nominal identification began in earnest after the Black Death and increased quickly so that the majority of workers were identified by name before the end of the 14th century. Before the late 1360s, at maximum, fewer than 20 percent of workers were named and, in many years, none were identified in this way. Those who were named in this period were most often specifically skilled and richly remunerated workers, such as 'Alexander', who helped manage the Bishop of Winchester's vineyard at Esher.[54] In such cases, nominal information was only provided when exceptional wages were likely to be scrutinized by a lord's auditor.

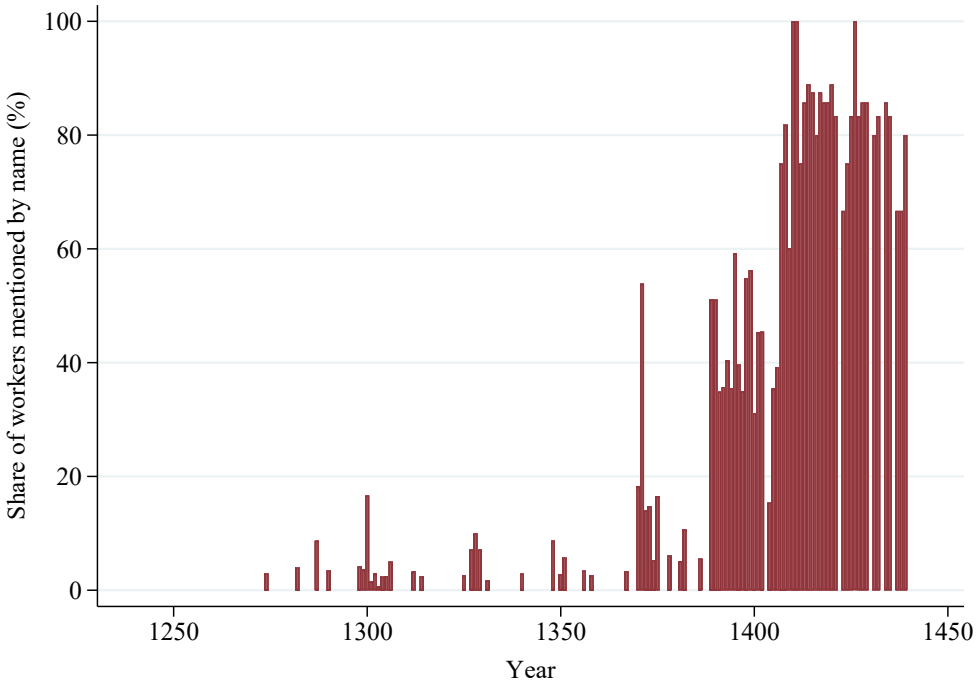
From the 1370s, the number of workers named in accounts grew substantially, to between 30 and 60 percent at the end of the 14th century, and then from 60 to 100 percent in the 15th century. Moreover, naming was no longer restricted to noteworthy workers but rather names were attached to a wide variety of rather unremarkable labourers, like ploughmen and shepherds. By the 1390s, *famuli* working on the estates of Battle Abbey and Durham Cathedral Priory began to be identified primarily by their name rather than their occupation, which had always been the norm since manorial accounting began in the thirteenth century. Within the wider context of the wide-ranging information recorded in manorial accounts, the naming of *famuli* is exceptional; no other group, be they waged day workers or servile customary labourers, had their names recorded in the same way as *famuli* did. Nor was there any fundamental innovation or change in accounting practice which would explain such a dramatic rise in the provision of nominal information (Bailey, 2002, 108-111). The appearance of nominal information for *famuli* workers was therefore not part of a wider transformation in demesne record-keeping.[55]

[54] Hampshire Record Office, 11 M59/B1/55-8

[55] It is also important to stress that this observation is also not simply a sample composition effect. We refer to Figure A13 in Appendix G, where we demonstrate this exercise for individual estates. Furthermore, we note that the explanation of the naming of workers as being due to the rise of individual contracting accords well with recent and more established arguments in the literature. These suggest that the creation of labour legislation in the wake of the Black Death helped spread more precise labour contracts which were enforceable using new legal mechanisms (Bailey, in press; Palmer, 1993, 294-306).

Of course, we cannot fully disregard the possibility that other confounding factors might also have a role in explaining the appearance of named *famuli*. For example, the Black Death's disruptive effects on kinship structures and the familiarity of local communities may have also created an incentive to identify individuals by name. However, that the emergence of naming occurred only for a specific group of long-term labourers seems to suggest that a drastic shift had happened in the relationship between *famuli* and their employers, and we see a study of the wider context and effects of this emergence of individual contracting as an exciting avenue for further research.

Figure 6: **Share of workers named individually in manorial accounts**



Source: Authors' database.

Our data allows us to provide a further piece of evidence in terms of the impact of nominal contracting on the labour remuneration of individual workers. Table 1 estimates an OLS regression with a similar range of control variables as in Section 4.3 but with an added indicator variable accounting for whether any worker is (or is not) named in the manorial accounts. We also include fixed effects for the individual manors which employed each worker. Put simply, we examine the extent to which named workers were remunerated differently to workers with identical occupations

who were not named. We do this while controlling for differences in our sample by decade, manor and region. We do so for the period before 1370 (panel (a)) and after 1370 (panel (b)) respectively. This time distinction is inspired by the aforementioned structural break in worker naming practices, as well as the patterns described earlier in Section 5.

The first panel of the table shows that - ceteris paribus - workers named in the account did not receive higher wages before 1370, be it in terms of cash (the first column) or in-kind (the second column). Things changed drastically after 1370. The first column in the lower panel shows that, in aggregate, workers named in the account received about a 32% higher cash wage than workers who were not named. There appears not to have been a similar change in in-kind remuneration; both named and unnamed workers were still paid in-kind wages at levels similar to those they received before the Black Death. Consequently, named workers after 1370 received a significantly lower share of in-kind payment in their total remuneration compared to unnamed workers (the third column). This negative effect on the share of in-kind payment did not exist before 1370. These results underline how workers with an individual 'contract' gained the ability to bargain for higher cash wages and, importantly, were less reliant on in-kind income. As such, increased mobility and greater bargaining power for these workers appears to have materialized mostly in the form of higher cash wages. This further supports our contention that, when workers demanded higher wages, they also insisted that the premium be paid in cash. This, in turn, increased their bargaining power by aiding mobility.

In terms of measuring this mobility, the emergence of individual contracting and nominal information also facilitates the quantification of worker turnover. Durham Priory manors saw turnover rates of 37-40 percent between 1370-1371 and 1409-1410. These same demesnes also paid workers in the same roles at different wage rates in this period, which is further evidence of individual wage bargaining. Britnell (2015) argued that the key driver of both trends was the new susceptibility of demesnes to lose workers to alternative employment. Estate managers were forced to increase wages to both retain workers and fill gaps in the labour force due to the departure of *famuli*. Turnover was similarly high on some Glastonbury Abbey manors in the early 15th century. Half of the ploughmen at the manor of Walton turned over between 1420 and

1421, and one-third needed to be replaced between 1427 and 1428 (Farmer, 1996). At Barnhorn, we calculate that the average annual turnover rate between 1400-1401 and 1435-1436 was similarly high at 42 percent. Substantial worker mobility would have led demesne managers to have to offer attractive terms to retain workers or attract new ones, explaining the increase in wages across the 15th century at this manor.[56] We can only observe turnover once *famuli* are named in the accounts, but we might speculate that high turnover in the late 14th century was one of the factors that induced demesne managers to begin recording nominal information for *famuli* labourers.[57]

In sum, we argue that these strategies were facilitated by an improvement in the quantity and quality of outside options available to *famuli* labourers. Their improved bargaining position made the threat of leaving employment as a *famulus* credible to the lords who depended upon their labour. Moreover, the collusive legal mechanisms, instigated by employers to prevent labour mobility and cap wages, failed to remain effective beyond the first decade after the Black Death, increasing the scope of action for disgruntled employees. Finally, a fall in the value of the insurance afforded by in-kind payments made cash payment more attractive and also made workers more certain that they would be able to enjoy an improved standard of living with new opportunities even if it meant leaving long standing and secure employment relationships.

[56] This is based on a sample of 20 years for which consecutive accounts with nominal information survive. Following Britnell (2015), it has been assumed that unnamed individuals should be identified as far as possible with named individuals employed in the preceding or subsequent year. This has the effect of minimizing the turnover estimates.

[57] Kussmaul (1981) makes a similar argument that the high levels of mobility found among early modern farm servants was in part a strategy to improve terms of employment.

Table 1: **The impact of individual contracting on cash wages ($y_{\ell,t}^{\text{cash}}$), in-kind wages ($y_{\ell,t}^{\text{in-kind}}$) and the share of in-kind remuneration (OLS)**

(a) **1270-1370**

Variable	$y_{\ell,t}^{\text{cash}}$	$y_{\ell,t}^{\text{in-kind}}$	Share in-kind
1(Worker is named)	-0.0837	0.0221	0.106
	(0.174)	(0.0947)	(0.0748)
Constant	0.422***	3.025***	0.917***
	(0.0998)	(0.141)	(0.0430)
Decade FE	X	X	X
Manor FE	X	X	X
Occupation FE	X	X	X
Region FE	X	X	X
Observations	1,557	1,602	1,644
R^2	0.488	0.300	0.247

(b) **1370-1440**

Variable	$y_{\ell,t}^{\text{cash}}$	$y_{\ell,t}^{\text{in-kind}}$	Share in-kind
1(Worker is named)	0.306**	0.0162	-0.166***
	(0.122)	(0.0479)	(0.0479)
Constant	0.916***	3.006***	0.861***
	(0.0734)	(0.0924)	(0.0123)
Decade FE	X	X	X
Manor FE	X	X	X
Occupation FE	X	X	X
Region FE	X	X	X
Observations	980	998	1,068
R^2	0.789	0.403	0.459

Notes: Standard errors clustered at the manor level are indicated in parentheses. The specification of the fixed effects (FE) is the same as in Section 4.3.
$***: p < 0.01, **: p < 0.05, *: p < 0.1$

7 Final thoughts

In this paper, we have demonstrated that in-kind wages can reveal new insights into the factors which underpinned significant moments in the wages of pre-industrial labourers. With a methodology which allows us to precisely value in-kind grain wages drawn from medieval English manorial accounts, we provide a wage series which accurately

captures not only total earnings, but also the changing proportions of the cash and in-kind components paid to annually-employed *famuli* workers between 1270 and 1440. We find that, after a century of stagnation, including two decades after the Black Death, the wages of *famuli* labourers rose substantially from the 1370s onwards, and that this growth was driven by an increasing proportion of cash remuneration.

We have considered several potential explanations for these findings. We argue that the delay in the rise of wages for several decades after the Black Death is not likely to be explained solely by a shift in factor ratios caused by plague mortality. We have also demonstrated that changes in the money supply or changes in the integration of grain markets, which we identified as likely explanations for the *existence* of in-kind wages, were not likely to have been core factors in explaining the *timing* of the rise in remuneration. Rather, taken holistically, the evidence supports a view that the growth of cash wages in the late 14th century is best explained by labour market frictions, and specifically the increased bargaining power of workers. *Famuli* labourers benefited from improved outside options and the failure of employer collusion. At the same time, exogenous climatic and demographic forces reduced the risk of product market failures, further weakening the insurance benefits of in-kind wages and undermining the frictional nature of in-kind remuneration. These factors allowed *famuli* to demand higher cash wages with the credible threat of leaving a lord's employment.

Our findings have important ramifications for broader debates in late medieval history and economic history more broadly. In understanding changes in living standards after the Black Death, our findings support interpretations which have highlighted the roles of both labourer agency and political institutions, rather than a single-minded focus on changes in production factor ratios. Our findings support the idea of a 'golden age of labour' insofar as living standards clearly rose for annually-employed male *famuli* labourers, but highlight how this rise was dependent on an increase in workers' bargaining power. Moreover, this paper helps to explain the demise of the 'direct farming' era in England, when lords managed their demesne lands directly and acted as institutional grain producers for the late medieval economy. In the face of demands for higher wages, combined with a fall in grain prices, many lords chose to lease out their demesne lands for fixed rents rather than manage these directly. This opened up new potentials for peasant entrepreneurship, potentially paving the way for the wider

increases in agricultural productivity of later centuries.

More generally, we hope to inspire more research into in-kind wages. Non-monetary wages were a significant, and in many cases dominant, form of labour remuneration in many economies in the pre-industrial world; and even remain so today in developing economies. For workers, preferences concerning forms of labour remuneration involve a trade-off between the practical utility and risk mitigation that in-kind payment provides and the flexibility and fungiblity of cash. Through the combination of careful theorizing about why in-kind wages might be paid in any given context and empirical work to accurately value these wages, we will be able to better understand the dynamics of labour markets in economies of various stages of development.

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