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ABSTRACT

Why Wages Don't Fall in Jobs with Incomplete Contracts*

We investigate how the incompleteness of an employment contract - discretionary and non-contractible effort - can affect an employer's decision about cutting nominal wages. Using matched employer-employee payroll data from Great Britain, linked to a survey of managers, we find support for the main predictions of a stylised theoretical framework of wage determination: nominal cuts are at most half as likely when managers believe their employees have significant discretion over how they do their work, though the involvement of employees, via information sharing, reduces this correlation. We also describe how contract incompleteness and wage cuts vary across different jobs. These findings provide the first observational quantitative evidence that managerial beliefs about contractual incompleteness can account for their hesitancy over nominal wage cuts. This has long been conjectured by economists based on anecdotes, qualitative surveys, and laboratory and field experiments.

JEL Classification: E24, E70, J31, J41

Keywords: wage rigidity, employment contract, workplace relations, employer-employee data

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1. Introduction

Firms tend to avoid cutting nominal wages. Surveys of compensation managers suggest that this is due to concerns about employee morale and productivity (Bewley, 1999; Campbell and Kamlani, 1997). This offers an explanation for downward nominal wage rigidity, a central theme in macroeconomics, which is considered crucial to understanding a wide range of issues, from cyclical fluctuations in unemployment, to optimal exchange rate regimes and macroeconomic stabilisation policies (see, e.g., Christiano et al., 2005; Schmitt-Grohé and Uribe, 2016). Despite a vast empirical literature measuring the extent of nominal wage rigidity (see Elsby and Solon, 2019, for a recent survey), little is known about whether managers' concerns systematically translate into actual restraint over wage cuts. We offer new evidence on this question.

The notion that wage cuts damage employee morale and productivity relies on the premise that cuts are sometimes perceived as unfair, especially when there is no apparent explanation for them. If employees have some discretion over how they perform their jobs, then they can use that margin to retaliate against anything they see as unfair treatment by their employer. In this paper, we investigate how contractual incompleteness relates to a firm's decision to cut nominal wages. We build on the existing theoretical literature and present a framework in which employees can choose their work effort after observing their wages set by the firm. The model predicts that nominal wage cuts lead to a disproportionate drop in discretionary effort, though this negative response can be mitigated by employee involvement via information sharing. We test these predictions using a novel linked dataset from Great Britain, containing both accurate payroll-based measures of employee wages and managers' beliefs about the nature of the employment contract. Confirming our predictions, year-to-year nominal wage cuts are at most half as likely when managers believe their employees have significant discretion over how they perform their jobs. But this effect attenuates when managers also report that they discuss significant upcoming changes within the organisation with their employees.

We contribute to the literature in several ways. First, we uncover a significant heterogeneity in the frequency of nominal wage cuts based on an *observable* feature of the employment contract: contractual incompleteness. This bridges the gap between models of wage-setting that are based on unobservable variables (such as fairness, morale, and effort) and what can be observed in employment data. For example, we show that all managers in higher education believe the job of a lecturer exhibits a significant degree of discretion, but air and rail traffic controllers are, reassuringly, seen as having no choice over how they perform their jobs. We quantitatively evaluate the economic significance of this contractual incompleteness. Our findings suggest that compensation managers tend to behave according to their concerns about morale and fairness. This helps to explain the differing tendencies of firms to cut nominal wages. We also evaluate the mediating role of employee involvement via information sharing on these tendencies, contributing to the literature on the communication and framing effects of pay changes (e.g., Chen and Horton, 2016; Greenberg, 1990; Kahneman et al., 1986; Sandvik et al., 2021). These studies show that providing reasonable justifications for pay cuts can make them more acceptable to workers. Our paper provides evidence suggesting that firms adopting such practices tend to cut nominal wages more frequently.

Our dataset is ideally suited for this analysis. It combines information on managers' perceptions of their employees' characteristics from the Workplace Employment Relations Study with accurate payroll-based data on wages and workplace characteristics from the Annual Survey of Hours and Earnings from Great Britain. Importantly, the linked dataset gives a manager's perspective on the degree of their employees' discretion over how they perform their jobs and whether the employees are informed about changes within the organisation — our measure of involvement. Since wages are set by firms in our conceptual framework, it is the employer's perspective that matters (see also Card, 2022). Second, we can analyse employer-reported wage data, which are more accurate than data from household surveys (Elsby et al., 2016). Results about the frequency of nominal wage cuts based on household survey data have frequently been discounted on the grounds that self-reported wages contain substantial response errors. Third, the dataset provides detailed records on basic wages, hours worked, and extra pay components. These allow us to study basic wages *per hour* separately from extra pay components, comparing like-for-like measures of hourly pay over time and jobs, and analysing separately the role of extra pay components, such as incentive pay. A shortcoming of our study is the absence of any (quasi-)experimental variation in the variables of interest, preventing us from identifying the direction of any causality. Regardless, our estimates provide the first evidence of a significant relationship between the likelihood of wage cuts and the extent of discretion within jobs.

Our key predictions are derived from a simple model of optimal wage-setting, building on the existing literature of dynamic efficiency wage models of downward wage rigidity (e.g., Dickson and Fongoni, 2019; Elsby, 2009). This framework is appropriate for the analysis of incomplete employment contracts, as it captures a number of important features of discretionary effort that are consistent with compensation managers' beliefs about employees' reactions to nominal wage changes (Bewley, 2007), as well as notions of fairness and reciprocity in labour relations more generally (Fehr et al., 2009): wage changes affect work morale, and the decrease in effort due to nominal wage cuts perceived as unfair is larger than the increase in effort following equivalent-sized raises. Further, motivated by the finding that nominal wage cuts become more tolerable when employees are informed about the reasons behind them (e.g., Bewley, 1999; Greenberg, 1990), we discuss how this aspect of employee involvement practices can affect a firm's optimal wage policy. If the employment contract is incomplete, the firm will refrain from wage cuts whenever the benefits would be more than offset by the resulting drop in effort. Employee involvement may help to mitigate the cost side of this tradeoff, enabling firms to cut wages more freely.

In our empirical analysis, basic wage cuts are substantially less likely when managers think that employees have some discretion over their performance, corroborating a key prediction of our theoretical framework. For example, the likelihood of observing a year-to-year wage cut decreases from 20.6% to 11.6% if the manager thinks that employees have some discretion at work, controlling for other employee and job characteristics. Further, we find that if employees have some discretion, then basic wage cuts are more likely when managers report that their employees are informed about upcoming organisational changes. We show that these findings are mainly driven by differences in the degree of discretion and involvement across minor occupation groups (e.g., air and rail traffic controller *versus* higher education lecturer). Still, our findings also hold qualitatively within major occupation groups (e.g., professionals *versus* skilled construction and building trades). Further, we investigate whether firm success, resignations among job stayers, and other aspects of the employment contract (e.g., duration, and salary *versus* hourly pay) affect our estimates. We find that the relationship between the likelihood of wage cuts and the extent of employee discretion remains remarkably robust. We also consider the role of extra pay components (e.g., incentive pay, travel allowances) - firms might prefer to cut pay along this margin rather than through basic wages. We find that discretion decreases the likelihood of a basic wage cut by more among employees who receive only basic wages, relative to those who receive extra pay components, and the relationship between discretion and the likelihood of a gross wage cut is weaker in this case but still significantly negative. This suggests that extra pay offers a margin for downward wage adjustments that managers believe to affect employee morale and performance less adversely than cuts to basic wages.

Our paper also contributes to the recent growth in literature on downward nominal wage rigidity. This literature typically analyses administrative data on *total* earnings, finding that nominal wage cuts are surprisingly common, while nominal wage freezes are less frequent (see the survey by Elsby and Solon, 2019). However, several recent studies show that *basic* wage cuts occur rarely in administrative payroll-based data, and basic wage freezes are far more common than previously thought (for the US see Grigsby et al., 2021, for Great Britain see Schaefer and Singleton, 2023, and for Iceland see Sigurdsson and Sigurdardottir, 2016). Only a few studies examine which employee characteristics affect the likelihood of wage cuts (e.g., Elsby et al., 2016; Kahn, 1997), and even fewer studies explore the connection between workplace characteristics and nominal wage rigidity (e.g., Schaefer and Singleton, 2023). Our contribution to this literature is to show that, regardless of the empirical extent of downward nominal wage rigidity, firms will adjust nominal wages downwards less frequently when their employees have discretion over effort.

The rest of the paper is structured as follows: Section 2 develops our conceptual framework and derives testable predictions; Section 3 describes the two datasets that we link, as well as our sample selection; Section 4 presents estimates on how employee discretion and involvement relate to the conditional likelihood of year-to-year nominal wage cuts, along with several robustness checks; Section 5 further investigates the robustness of this relationship by examining the role of occupations, firm success, and contract types; and Section 6 concludes.

2. Conceptual framework

We begin by describing how contractual incompleteness and employee involvement can shape the nature of an employment contract and why they may be important when thinking about firms' wage-setting decisions. Then, through the lens of a simple theoretical model, we discuss how these features can affect a firm's decision to cut nominal wages.

2.1 When are wages cut?

2.1.1 Contractual incompleteness, morale, fairness, and reciprocity

Our understanding of why firms tend to avoid cutting nominal wages is mainly informed by the surveys and interviews of compensation managers that economists conducted three decades ago (e.g., Bewley, 1999; Blinder and Choi, 1990; Campbell and Kamlani, 1997). The consensus that emerged from those studies is that managers refrain from cutting nominal wages due to concerns about morale, fairness, and reciprocity (see Bewley, 2007). Morale is especially important for fostering productivity and cooperation in the workplace, and it is in the firm's interest to preserve it and treat employees fairly. Nominal wage cuts, if perceived as unfair, can be detrimental to morale and can be costly due to productivity losses from employee retaliation. This is supported by a number of more recent field and natural experiments, which find that pay cuts can lead to higher quit rates, counterproductive behaviour, lower output, and increased absenteeism (e.g., Coviello et al., 2022; Kube et al., 2013; Krueger and Friebel, 2022; Sandvik et al., 2021), and by the wider literature on fairness and reciprocity in labour relations (see Fehr et al., 2009, for a survey). Importantly, employer concerns about fairness and morale are based on the premise that the contract is incomplete, such that employees have some *discretion* on the pace, quality, and amount of work – employee effort is discretionary and not contractible (Okun, 1981; Williamson, 1985).[1]

2.1.2 Employee involvement: Information sharing and justification

Are wage cuts always perceived as unfair? In a seminal contribution, Kahneman et al. (1986) provide convincing evidence that judgements of fairness are susceptible to framing effects. A number of surveys to compensation managers confirm this, finding that information sharing and justifications can alleviate the adverse effects of nominal wage cuts on morale (Bewley, 1999; Campbell and Kamlani, 1997). In a recent laboratory experiment, Guido et al. (2022) find that the negative effort response to wage cuts is significantly weaker when employees are informed about an exogenous decrease in employer profits. They also find employers cut wages more sharply when they know employees are informed. These observations find support in the organisational psychology and management science literature. For instance, a field experiment by Greenberg (1990) finds that providing an "adequate explanation" for the decision to cut nominal pay significantly reduces its effect on morale, making the cut more tolerable (for analogous evidence in an online labour market see Chen and Horton, 2016, and for pay freezes see Schaubroeck et al., 1994). More generally, this literature finds that employee involvement practices, of which *information sharing with employees* is a key dimension (Freeman and Kleiner, 2000; Wang and Seifert, 2017), tend to increase an employee's sense of control over the allocation of the wage fund, reduce feelings of hostility, enhance job satisfaction, and promote organisational commitment (e.g., Bordia et al., 2004; Timming, 2012). According to Freeman and Kleiner (2000), firms recognise the benefits of employee involvement practices, which is why these practices are widely adopted.

2.2 A theoretical model

Building on the existing theoretical literature, we develop a simple model of optimal wage-setting. The model exhibits what we think are the most distinctive features of the employment contract described above. First, we illustrate that contractual incompleteness introduces a trade-off for a firm with an employee who is particularly averse to nominal wage cuts, that is, when nominal wage cuts have a stronger negative effect on morale than equally-sized wage rises. Next, we discuss how employee involvement practices may help to mitigate the cost side of this trade-off, enabling firms to cut wages more freely.

[1] Williamson was among the first to recognise that the employment contract is an "incomplete agreement". Okun referred to the labour market as being governed by an "invisible handshake".

2.2.1 Environment

We consider a representative one-employee-one-firm job match between a job stayer and a firm. The output of the firm is given by $Y = ZE$, where Z is an aggregate nominal shock (e.g., a shock to nominal aggregate demand),[2] and E is the effort exerted by the employee. Importantly, the determination of effort depends on the nature of the employment contract: if the contract is complete, the employee will exert the contractually agreed effort that the firm chooses. If the contract is incomplete, the employee will have discretion over effort.[3] The aggregate shock evolves according to $Z = Z_{-1}\exp(\Pi + \varepsilon)$, where Π is the inflation rate, $\varepsilon \overset{\text{IID}}{\sim} N(0, \sigma^2)$, and the subscript $_{-1}$ denotes backward values.

After observing Z, the firm makes a take-it-or-leave-it nominal wage offer W to the employee, who then decides whether to accept, stay employed, and begin producing, or quit and become unemployed.[4] If unemployed, the worker will receive compensation given by ϕZ, where $\phi \in (0,1)$. This assumption is motivated by evidence that the opportunity cost of employment is procyclical (Chodorow-Reich and Karabarbounis, 2016).

In general, an employment relationship will not break down if it is mutually advantageous: the firm will operate if it is profitable to do so, while the employee will stay if the value from work (net of effort costs) exceeds the value of unemployment. Throughout the analysis, we assume that these conditions are always satisfied and will provide the assumptions needed to ensure this when required. For simplicity, we abstract from labour market frictions, such as search, and assume that agents are myopic.[5]

2.2.2 Complete contracts

Under a complete employment contract, the employee has no discretion and will exert the agreed level of effort: $E = e^c \in (0, \bar{e}]$, where the superscript c stands for *complete*. This is a standard approach in the literature, where a firm's output is produced with labour as the only input. The firm will then decide on the employee's effort and set the nominal wage that maximises profit in each period, subject to the employee's participation constraint:

$$\begin{aligned} &\max_{e^c, W} Ze^c - W \\ &\text{s.t. } \; W \geq \phi Z. \end{aligned} \tag{1}$$

[2] For the derivation of our theoretical results, it is sufficient that Z is an aggregate shock affecting both the firm and the employee's outside option, as we model below. Hence, Z could also capture a sector- or industry-specific shock not necessarily correlated with the economy-wide business cycle.

[3] In an earlier working paper version, we described a model in which the firm's output is a weighted average of a contractually agreed level of effort and discretionary effort, the weight being a parameter measuring the degree of incompleteness of the employment contract. While such a setting provides a richer framework to study the effects of contractual incompleteness on a firm's wage-setting, its predictions are equivalent to those that can be derived from the simpler model we now describe.

[4] Alternatively, this approach can be derived from a wage bargaining framework in which the employees have no bargaining power. For evidence on the relative incidence of take-it-or-leave-it offers and bargaining in employment relationships, see Brenzel et al. (2014) and Hall and Krueger (2012). See also Card (2022) and Manning (2021) for summaries of the evidence on firms' wage-setting power.

[5] We abstract from these features to keep the framework free of unnecessary complications that only lengthen the exposition. Models of complete employment contracts with search frictions, and in which agents are forward-looking, have been studied extensively in the literature since the development of the search and matching model (see for a review Pissarides, 2000). For models of incomplete employment contracts that consider aversion to nominal wage cuts and forward-looking agents, see Dickson and Fongoni (2019) and Elsby (2009). Fongoni (Forthcoming) extends this framework to include search frictions.

The firm wants the employee to exert the highest possible effort and to set the lowest possible wage, where a necessary condition to be profitable is $\bar{e} > \phi$. We denote the optimal wage with $\widetilde{W}$.

Proposition 1. *If $\bar{e} > \phi$, then in each period the firm will set $e^c = \bar{e}$ and $\widetilde{W}(Z) = \phi Z$.*

Under complete contracts, the nominal wage thus changes smoothly with changes in the aggregate state Z, implying that the firm can adjust freely in response to shocks.[6]

2.2.3 Incomplete contracts

In the case the contract is incomplete, effort will be dicretionary and therefore not contractible by the firm. Denote discretionary effort by $e^d > 0$ (the superscript d standing for *discretionary*). We consider e^d to come from an effort function that is assumed rather than derived from an employee's optimal choice. In Appendix A.1, we show how such a function can be derived from a model based on reference dependence, loss aversion, and the effect of wage changes on work morale.[7] We assume that discretionary effort is a function of the nominal wage in relation to a reference 'fair' amount R, given by the past wage W_{-1}:[8]

$$e^d = e^d(W, W_{-1}, \gamma) = \begin{cases} e^n + \ln W - \ln W_{-1} & \text{if} \quad W \geq W_{-1} \\ e^n + \gamma[\ln W - \ln W_{-1}] & \text{if} \quad W < W_{-1}\ ; \end{cases} \tag{2}$$

where $e^n > 0$ is constant and denotes 'normal' effort, i.e., the effort that the employee will exert without relative pay considerations, and $\gamma > 1$ is a parameter capturing the employee's aversion to nominal wage cuts through their effect on morale. We assume e^n is high enough to ensure $e^d > 0$ for any given (W, W_{-1}). Discretionary effort responds to wage changes, not wage levels, and since $\gamma > 1$, the decrease in effort due to nominal wage cuts is larger than the increase in effort following equivalent-sized raises. These properties reflect a number of key features of employee behaviour that are documented in the behavioural economics literature of fairness and reciprocity in labour relations (Fehr et al., 2009). They are also consistent with the evidence on compensation managers' beliefs about the effects of wage changes on morale and productivity that we discussed above: wage increases (perceived as gifts) boost morale and are positively reciprocated with higher effort; wage cuts (perceived as unfair) are particularly detrimental to morale and negatively reciprocated even more so with lower effort.

[6]Richer models of complete contracts, featuring *endogenous* wage rigidity, need the employee's value of unemployment to be unresponsive to shocks to generate wage rigidity (e.g., Hall, 2005; Hall and Milgrom, 2008). As Chodorow-Reich and Karabarbounis (2016) show, once this assumption is relaxed (as we do here), wages change (upward and downward) with shocks. Hence, we consider the simple model of this section as a reduced form of existing complete contract models of wage setting.

[7]See also Dickson and Fongoni (2019) and Sliwka and Werner (2017) for models of employee effort choice that yield a function similar to the one we adopt here. Other models of incomplete employment contracts that assume a kinked, reduced-form, effort function are considered by Eliaz and Spiegler (2014), Elsby (2009), and Kaur (2019).

[8]The assumption that past contracts can serve as a reference point is supported by a large body of evidence from behavioural economics (e.g., in the context of labour markets, Bewley, 2007; Kahneman et al., 1986; Sliwka and Werner, 2017, and in the context of incomplete contracts, Bartling and Schmidt, 2015; Fehr et al., 2011; Herz and Taubinsky, 2017).

Anticipating the response of the employee, $E = e^d$, and for given W_{-1} and Z, the firm will set the nominal wage to maximise profit in each period:

$$\begin{aligned} &\max_{W} Ze^d(W, W_{-1}, \gamma) - W \\ &\text{s.t. } \; W \geq \phi Z \; . \end{aligned} \tag{3}$$

When the contract is incomplete, the firm will optimally consider the effect of wage changes on effort and output. In line with standard predictions of efficiency wage models, there is a trade-off between the cost of paying a higher wage and the benefit of inducing the employee's effort. Moreover, as the firm expects their employee to respond more strongly to nominal wage cuts, they also anticipate that nominal wage cuts generate a disproportionate change in this trade-off.

The optimal wage takes the form of a trigger policy characterised by two thresholds: an upper threshold Z^u, such that if $Z > Z^u$, then the firm will set a wage above the past wage; and a lower threshold Z^l, such that if $Z < Z^l$, then the wage will be set below the past wage. Instead, if $Z^l \leq Z \leq Z^u$, then the firm will keep the wage constant because, in this region, the benefit of a wage cut is more than offset by the reduction in output due to the employee's negative effort response.[9]

Proposition 2. *In each period, the firm will set*

$$\widetilde{W}(W_{-1}, Z) = \begin{cases} Z & \textit{if} \quad Z > Z^u(W_{-1}) \\ W_{-1} & \textit{if} \quad Z \in [Z^l(W_{-1}), Z^u(W_{-1})] \\ \gamma Z & \textit{if} \quad Z < Z^l(W_{-1}) \; ; \end{cases} \tag{4}$$

whereby

$$Z^u(W_{-1}) = W_{-1} \; , \quad Z^l(W_{-1}) = \frac{W_{-1}}{\gamma} \; ; \tag{5}$$

and $\widetilde{W}(W_{-1}, Z) > \phi Z$ *for all* Z.

If the employment contract is incomplete, and the firm believes that their employee's effort has properties akin to those captured in (2), then there is a range of shocks within which the wage is not adjusted. This range is non-empty due to the employee being particularly averse to nominal wage cuts.

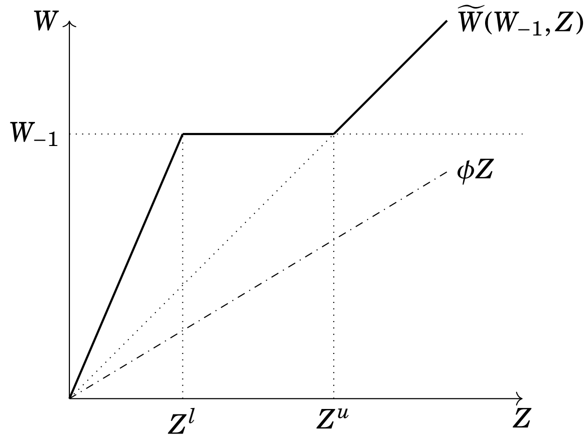
The firm's optimal wage policy is illustrated in Figure 1 below. Recall that the employee's aversion to nominal wage cuts is captured by $\gamma > 1$, which governs the slope of the effort function whenever $W < W_{-1}$, and, therefore, the strength of the employee's effort response to nominal wage cuts. Anticipation by firms of this asymmetric effort response not only generates the incentive to freeze the wage when $Z \in [Z^l, Z^u]$ but also reduces the extent to which the wage is cut when $Z < Z^l$. If the employee is not particularly averse to wage cuts, the optimal wage-setting policy would follow the 45-degree (dotted) line from the origin.

2.2.4 The role of employee involvement

The kink around the past wage in the employee's effort function in (2) generates a trade-off for the firm, which affects their decision to cut the nominal wage. Although we did not provide a formal derivation

[9] See Appendix A.2 for details.

FIGURE 1: Optimal wage and contractual incompleteness



of this function, we commented that employees' aversion to nominal wage cuts stems from feelings of unfair treatment, triggering a drop in work morale and effort. Employee involvement practices are believed by managers to alleviate the adverse effects of nominal wage cuts. A direct corollary of this observation is that involvement will reduce the employee's aversion to nominal wage cuts (γ will be lower), enabling the firm to adjust the wage downwards for a larger range of shocks. For instance, employee involvement may boost morale and reduce the psychological cost of exerting effort following a nominal wage cut. Involvement could also be interpreted more generally as any managerial practice tending to make the employee's work morale more or less sensitive to an 'unfair' wage. In this discussion, we treat employee involvement as fixed, effectively being a key feature of the employment contract.

Alternatively, involvement practices could be viewed as the firm informing their employees about the reasons for a pay change, influencing their perception of fairness. This would imply that changes in the aggregate state Z, the only source of shocks in our model, would become more salient when employees evaluate the fairness of a pay change. The more employees are involved, the more they understand their firm's economic and financial conditions and will accordingly adjust expectations about how much they should be paid. A simple way to model this would be to assume that the reference 'fair' wage, R, is an increasing function of both the past wage, W_{-1}, *and* the firm's economic conditions, captured by the nominal shock Z. One possible and tractable form of R is:

$$R = R(W_{-1}, Z) = W_{-1}^{1-\beta} Z^{\beta} ,$$

where $\beta \in [0,1]$ is the degree of employee involvement. A higher β increases the relative weight that the employee places on information about the firm's economic conditions when forming their reference wage (the model of the previous section being a special case with $\beta = 0$).[10] This approach would imply that, as long as $\beta > 0$, the firm can then cut wages following adverse shocks without the cost of a disproportionate drop in their employee's effort.

[10] A number of recent studies show that employees' perception of their relative pay can be significantly influenced by information disclosure (Carter et al., 2024; Cullen and Perez-Truglia, 2022; Flynn, 2022). In particular, Carter et al. (2024) and Flynn (2022) interpret this as an update of the reference wage to the new information disclosed.

Proposition 3. *If $\beta > 0$, in each period, the firm will set*

$$\widetilde{W}(W_{-1}, Z) = \begin{cases} Z & \text{if} \quad Z > Z^u(W_{-1}) \\ W_{-1}^{1-\beta} Z^{\beta} & \text{if} \quad Z \in [Z^l(W_{-1}), Z^u(W_{-1})] \\ \gamma Z & \text{if} \quad Z < Z^l(W_{-1}) \, ; \end{cases} \tag{6}$$

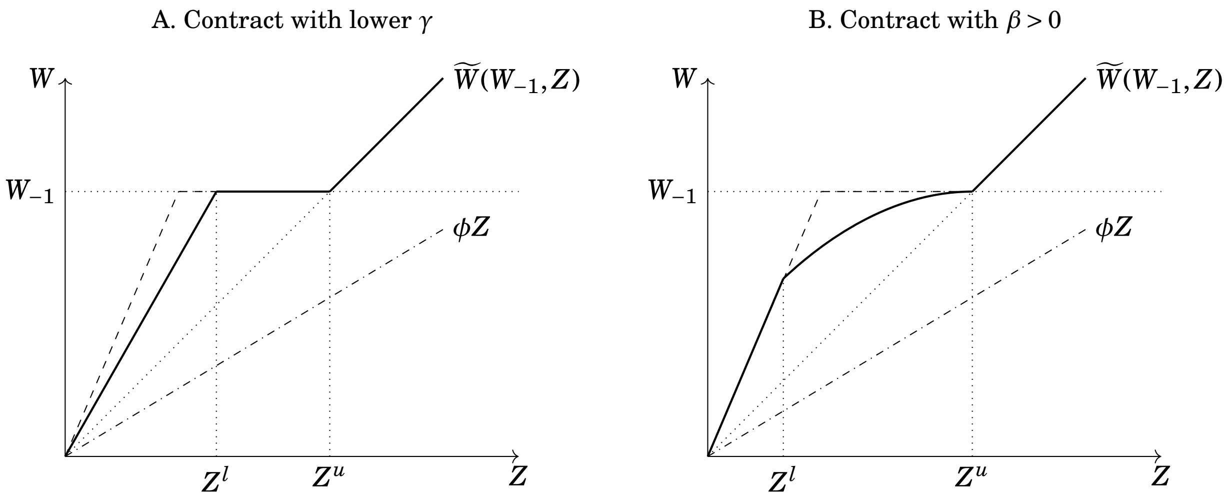
whereby

$$Z^u(W_{-1}) = W_{-1} \,, \quad Z^l(W_{-1}) = \frac{W_{-1}}{\gamma^{\frac{1}{1-\beta}}} \, ; \tag{7}$$

and $\widetilde{W}(W_{-1}, Z) > \phi Z$ for all Z.

In both cases discussed here, employee involvement increases the range of shocks where the firm optimally adjusts the wage relative to a relationship where the employee is not involved (see Figure 2 below).

FIGURE 2: Effect of employee involvement.



2.3 Empirical predictions

We use the conceptual framework above to derive two main predictions. First, contractual incompleteness, combined with a concern about a reciprocal effort response to nominal wage cuts, generates a range of inaction over which the firm optimally freezes the wage. This compares with the case of contractual completeness, where wages always adjust to shocks.

Prediction 1. *Job stayers viewed by firms as having incomplete contracts have a lower likelihood of nominal wage cuts, compared to job stayers viewed as having complete contracts.*

Second, since employee involvement may affect the firm's trade-off between wages and effort under incomplete contracts, it enables the firm to cut nominal wages more freely.

Prediction 2. *Conditional on the employment contract being viewed as incomplete by the firm, job stayers also viewed as being involved have a higher likelihood of nominal wage cuts.*

These predictions are testable, but they require either an experimental setting or data from real-world employment relationships about the degree of contractual incompleteness and employee involvement. Importantly, since wages are set by the firm, it is the employer's perspective on these two dimensions of an employment contract is most relevant. In the remainder of the paper, we construct a dataset to test our predictions on the likelihood of employees receiving nominal wage cuts.

3. Data and descriptive statistics

3.1 Data

We use two datasets from Great Britain: the Annual Survey of Hours and Earnings (ASHE) and the Workplace Employment Relations Study (WERS).[11] The ASHE is an ongoing longitudinal panel of employees, based on a one per cent random sample of all employees who pay income tax or make National Insurance contributions in Great Britain. Firms provide information from the pay period that includes a specific date in April, either by returning a survey questionnaire or directly through their payroll by a special arrangement with the Office for National Statistics (ONS). This setup implies that we only have data each year for employees in the panel who were employed on the survey reference date. Firms are legally obliged to report employee earnings with reference to payrolls, making the ASHE data more accurate than those obtained from household surveys (Elsby et al., 2016; Schaefer and Singleton, 2020). The longitudinal aspect of the ASHE allows us to track employees over time. The ASHE dataset contains only limited information about employee characteristics and their workplaces. Still, the accuracy and scope of the pay information make it ideal for measuring how wages per hour change from year to year (Schaefer and Singleton, 2019).

We focus on the nominal basic wage per hour, from a salary or a stated hourly wage rate, which is an employee's earnings before any extra payments. The ASHE contains information on the weekly basic earnings received and the basic hours worked within a reference week in April. We divide basic weekly earnings by basic weekly hours to obtain basic earnings per hour, hereafter referred to simply as the 'basic wage'.[12] Schaefer and Singleton (2023) show that the basic wage in ASHE accounts for over 90% of all labour income for job stayers over the period 2006-18. Further, basic wages are the most persistent and procyclical component of labour income, which makes them the best widely available proxy for marginal labour costs, the key variable in macroeconomic workhorse models (see for Great Britain, Schaefer and Singleton (2023), and for the United States, Grigsby et al., 2021). The second wage measure that we study, nominal gross pay per hour, includes basic earnings plus all other extra payments that an employee could receive from their job, e.g., overtime, shift premiums, and incentive pay (see Appendix B for definitions). We divide weekly nominal gross earnings by total weekly hours

[11] See Office for National Statistics (2022) and Department for Business, Innovation and Skills, National Institute of Economic and Social Research, Advisory, Conciliation and Arbitration Service, Policy Studies Institute (2018). Also, see the description and analysis of the 2004 WERS by Kersley et al. (2013).

[12] Hourly wages can decline year-to-year because either earnings decline while hours worked remain constant, or earnings remain constant while hours worked increase, or a combination of both. Since our theory does not distinguish between the origins of a wage cut, we do not distinguish how hourly wages changed in the main empirical analysis of this section. Nevertheless, we show that increases in year-to-year hours only occur for around 10% of our job stayer observations, and our main results are robust to excluding these.

worked (basic hours plus overtime hours) to obtain gross earnings per hour, hereafter referred to as the 'gross wage'.

We use the 2004 WERS for relevant information on workplace characteristics. This was the fifth in a series of surveys on employment relations in Britain.[13] For a nationally representative sample of workplaces, it collected information from managers and up to 25 randomly selected employees per workplace. The WERS records the 4-digit code of the largest occupational group within a workplace, and it requires the managers to provide their answers regarding workplace characteristics and its employees concerning this occupational group.[14]

The two key variables in the WERS that interest us are the following. First, managers were asked to what extent employees in the largest occupational group represented at the workplace "have discretion over how they do their work?" The possible answers were 'A lot', 'Some', 'Little', or 'None'. We say that employees are perceived as having *discretion* when the manager answers either 'A lot' or 'Some'. We discuss this binary classification in Section 4 below. The second key variable is what we will refer to as involvement via information sharing, or simply as *involvement*. Managers were asked how much they agreed with the following statement: "We do not introduce any changes here without first discussing the implications with employees." We see this as effectively capturing the information-sharing aspect of involvement practices that interest us. If managers indicated that they either 'Strongly agree(d)' or 'Agree(d)', then we say that employees are perceived as being involved. It is important that the WERS provides the extent of employee discretion and involvement from the manager's perspective, which is the relevant perspective according to our conceptual framework. However, the WERS does not collect information on individual employee wages over time, so we link it with the ASHE.

3.2 ASHE–WERS dataset and sample construction

Within the ASHE, each record includes a unique Inter-Departmental Business Register (IDBR) reference number that identifies the employer. The IDBR was also used as the sampling frame for WERS, and therefore, IDBR numbers are available in the WERS dataset. As described by Davis and Welpton (2008), these IDBR reference numbers provide a common variable that can be used to link information between the WERS and ASHE datasets, as employers who serve as the respondents to both surveys can be traced back to the IDBR. The ASHE-WERS link gives us 5,922 jobs (employer-employee matches) in 2004. Larger workplaces in WERS are more likely to be linked to ASHE because they employ a disproportionate share of all employees (Davis and Welpton, 2008).[15]

The longitudinal dimension of the ASHE allows us to track employees over time and observe their employers each year. We use this information to identify the previous and subsequent careers of the 5,922 employer-employee matches observed in 2004 in the ASHE-WERS. The number of employees and workplaces in our matched ASHE-WERS dataset is displayed in Table 1 below. Starting with the link in

[13]The follow-up to the 2004 version of the WERS was published in 2011. We prefer to use the WERS 2004 because the sample sizes after linking workplaces to the ASHE are much larger for the earlier year.

[14]For information on the UK's Standard Occupational Classification (SOC) 2000 see www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/socarchive

[15]Davis and Welpton (2008) analyse the representativeness of the linked ASHE-WERS 2004 dataset and find that the compositions of gender, age, and hours worked match the ones in nationally representative data. However, the linked data contain relatively fewer private sector firms and more employees whose pay is affected by a collective agreement.

2004, we use the employee and firm identifiers in the ASHE to track firm stayers forward and backward for two years, such that we have observations for 2002-06. We have a total of 14,819 employee-year observations obtained by tracking 5,020 employees who stayed in the same firm from year to year over time.[16] Before linking to the WERS, we also trimmed the top and bottom one per cent of observations in the basic wage distribution of the 2002-06 pooled ASHE datasets.

TABLE 1: ASHE and WERS match

	Number of matched employees	Number of firms
2002-03	3,324	448
2003-04	4,234	511
2004-05	4,059	500
2005-06	3,202	415
Total	14,819	1,874
Unique	5,020	576

Notes: WERS and ASHE are linked in 2004, providing 5,922 employer-employee matches. For the backward-linking, we identify 4,234 matches that correspond to employees who were employed by the same firm in 2003 and 2004. Of those 4,234 employees, 3,324 were employed by the same firm again in 2002 and 2003. The forward-linking follows a similar pattern.

We focus on job stayers and the likelihood of them receiving pay cuts. We define a 'job stayer' as an employee observed working in the same firm as in the previous April, such that we can measure year-to-year wage changes. An alternative, stricter definition of 'job stayer' may also require an employee to be recorded with the same occupation from year to year. Below, we report results for both definitions. We define a 'cut' as a year-to-year negative wage change that exceeds -0.5 log points.[17] Our variables of interest for discretion and involvement are only observed for 2004. After matching employees in the ASHE and WERS, we also use these 2004 values for the other years in our matched dataset since it seems reasonable that such workplace-level characteristics are relatively persistent over a short period. Any random, unobserved changes to workplace characteristics would have the effect of classical measurement error, attenuating our regression model estimates toward zero. If Discretion and Involvement correlate with worker retention, then focusing on job stayers might induce sample selection bias. We investigate this issue further in Section 5, finding evidence that such bias likely results in *underestimating* the strength of the relationship between Discretion and wage cuts.

3.3 Descriptive statistics

Table 2 displays descriptive statistics for all job stayers in the ASHE for 2003-04 and for job stayers in our ASHE-WERS matched analysis sample. The average hourly basic wage in our sample is £12.83, which is higher than in the ASHE. This is likely explained by the firm-size differences between the datasets and because the matched ASHE-WERS dataset contains a lower share of private sector

[16] For years before 2002, many firm identifiers are missing in the ASHE, which prevents us from linking firms across time in earlier periods. We do not link observations further forward because the sample size of the ASHE was reduced by 20% from 2006 to 2007, with that reduction targeting those industries that exhibit the least variation in their earnings patterns, possibly creating endogeneity issues when analysing pay changes over time.

[17] By defining only wage changes of more than -0.5 log points as 'cuts', we take into account the presence of small measurement errors in the data on hours worked in ASHE (see Schaefer and Singleton (2023) for a detailed description of such measurement error). Accordingly, a 'freeze' occurs when wages only change in the interval $(-0.5, 0.5)$ log points.

employees than the ASHE (44.9% *versus* 63.3%, respectively).[18] The ASHE-WERS dataset has, with 49.1%, a higher share of employees whose pay is set with reference to a union agreement than in the ASHE with 33.7%.

TABLE 2: Characteristics for job stayers in ASHE and ASHE-WERS

	ASHE 2003-04	ASHE-WERS 2002-06
Basic wage (£)	10.93	12.83
Basic wage cut	0.181	0.146
Basic wage freeze	0.096	0.055
Male	0.513	0.509
Age (years)	42.08	42.38
Tenure (months)	121.11	144.87
Full-time	0.757	0.802
Private sector	0.633	0.449
Union agreement	0.337	0.491
Firm size	17,737	19,940
Firm growth	0.022	0.004
N: job stayers	103,856	14,819

Notes: 'Basic wage' is weekly basic earnings divided by weekly basic hours worked; 'Basic wage cut' is a year-to-year negative change in basic wages that exceeds -0.5 log points; 'Basic wage freeze' is a year-to-year change in basic wages that is within $(-0.5, 0.5)$ log points; 'Tenure' is the time in months since an employee began working for a company; 'Private sector' indicates that the employer has the legal status of either a private company, sole proprietor, or partnership. 'Full-time' gives the share of employees who work more than 30 hours per week; 'Union agreement' indicates that pay was set with reference to either a national, subnational, or industry-level agreement; 'Firm size' refers to the total number of employees on payroll; 'Firm growth' refers to the year-to-year log change in firm size. Variables such as age and firm size refer to the second linked year of a job-stayer observation.

The key variable in our study is the share of year-to-year basic wage cuts, which is somewhat higher in the ASHE than in our matched dataset, 18.1% *versus* 14.6%. These numbers are consistent with previous findings in Elsby et al. (2016), who analysed the same ASHE dataset and found that over 2003-04, the prevalence of year-to-year negative changes of at least one per cent in average earnings per hour, excluding overtime, was 18.5%. Moreover, Elsby and Solon (2019) show that the high prevalence of wage cuts is not exclusive to Great Britain, presenting similar findings across many countries.

Table 3 displays the distribution of job stayers across industries in the ASHE and our ASHE-WERS baseline sample. The two distributions are roughly similar, except that our baseline sample under-represents job stayers in industries with UK Standard Industrial Classification (SIC) 2003 code 50-59 (Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles and Personal and Household Goods; Hotels and Restaurants), and over-represents job stayers in industries with UK SIC code 75-89 (Public Administration and Defence; Compulsory Social Security Education; Health and Social Work). The last three columns of Table 3 show the distribution of job stayers in workplaces where the manager reports some/no discretion and/or employee involvement across industries. In our baseline sample, firms in industries with UK SIC code 01-49 (Agriculture, Hunting and Forestry; Fishing; Mining and Quarrying; Manufacturing; Electricity, Gas and Water Supply; Construction) employ the largest share

[18]The employment figures of firms in the ASHE dataset come from the IDBR, the official list of UK enterprises. We use the more common term 'firm' interchangeably with 'enterprise', which refers to a UK-specific administrative definition of an employer that could contain several local units or plants.

of job stayers with no discretion. The large majority of job stayers who are perceived as having some discretion and involvement are employed in industries with UK SIC code 75-89 (Public Administration and Defence; Compulsory Social Security; Education; Health and Social Work).

TABLE 3: Industry distribution of job stayers (%), according to the presence of discretion and involvement

			Discretion & involvement, ASHE-WERS		
SIC 2003	ASHE 2003-04	ASHE-WERS 2002-06	No discretion	Discretion & no involvement	Discretion & involvement
01-49	20.95	21.08	29.47	25.70	14.38
50-59	17.28	5.81	8.21	6.37	4.11
60-64	3.81	7.61	20.95	1.35	0.91
65-74	19.39	11.77	12.45	10.31	11.75
75-89	35.23	51.03	27.97	53.72	64.97
90+	3.34	2.70	0.94	2.56	3.87
N: job stayers	103,860	14,819	4,906	2,230	7,683

Notes: Column totals might not sum to 100 due to rounding.
SIC 01-49: Agriculture, Hunting and Forestry; Fishing; Mining and Quarrying; Manufacturing; Electricity, Gas and Water Supply; Construction
50-59: Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles and Personal and Household Goods; Hotels and Restaurants
SIC 60-64: Transport, Storage and Communication; F
SIC 65-74: Financial Intermediation, Real Estate, Renting and Business Activities;
SIC 75-89: Public Administration and Defence; Compulsory Social Security; Education; Health and Social Work
SIC 90+: Other Community, Social and Personal Service Activities; Private Households Employing Staff and Undifferentiated Production Activities of Households for Own Use

Guided by our theoretical framework, we define three distinct groups of job stayers, all as perceived by their managers: (1) Employees who have no discretion about how they perform their job; (2) Employees who have some discretion but are not involved; (3) Employees who have some discretion and are involved. Table 4 shows that employees with no discretion tend to experience basic wage cuts (17.2%) more frequently than employees with discretion (13.0% and 13.4%). Moreover, the hourly basic wage of job stayers with no discretion is £12.12, which is lower than among other job stayers. This finding is consistent with our theoretical framework: firms do not pay relatively higher (efficiency) wages to employees without discretion since, for these employees, effort is not as responsive to the wage. Among job stayers who have no discretion, there is, on average, a higher year-to-year decline in the number of employees on their employer's payroll compared with firms where employees have discretion.

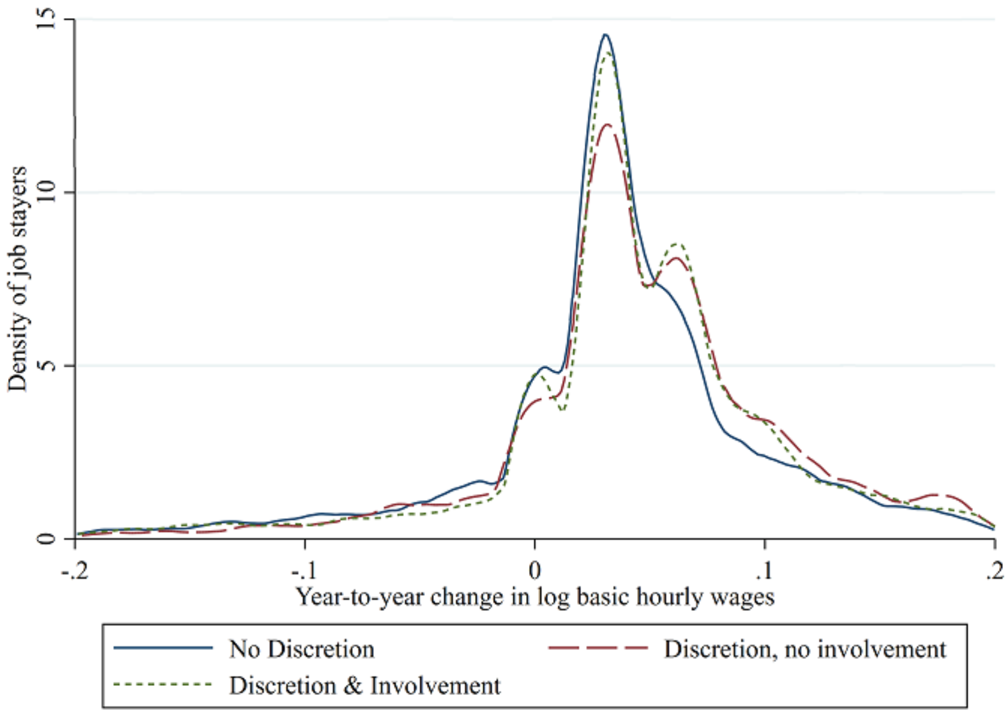
TABLE 4: Characteristics for job stayers in the ASHE-WERS, 2002-06, according to the presence of discretion and involvement

	No discretion	Discretion & no involvement	Discretion & involvement
Basic wage (£)	12.12	13.97	12.94
Basic wage cut	0.172	0.130	0.134
Basic wage freeze	0.056	0.052	0.054
Male	0.611	0.499	0.448
Age (years)	41.37	42.50	43.00
Tenure (months)	154.36	145.18	138.72
Full-time	0.825	0.781	0.793
Private sector	0.676	0.438	0.307
Union agreement	0.348	0.486	0.584
Firm size	27,927	12,598	16,971
Firm growth	−0.005	0.005	0.009
N: job stayers	4,906	2,230	7,683

Notes: See Table 2 for details on the variables.

A first impression of the baseline data, before controlling for differences in observable characteristics, is provided by Figure 3, which displays kernel density estimates for the distribution of year-to-year changes in nominal log basic hourly wages for the three different groups of employees.

FIGURE 3: Kernel density estimates for the distributions of year-to-year nominal changes in log basic hourly wages for job stayers



Notes: Raw data are pooled across job stayers in all years 2003-2006, i.e., the sample described in Table 4. The kernel estimator uses the Epanechnikov function and optimal Silverman plug-in bandwidth.

Compared to employees with discretion, Figure 3 suggests that employees with no discretion experience wage cuts and wage freezes more frequently and have lower wage growth. The relationship between involvement and nominal wage changes among employees who have some discretion is less clear. Although employees who are involved experience wage freezes more frequently than employees who are not, they also experience wage cuts less frequently, which is in contrast with what we would expect. Finally, employees who are involved are less likely to see their wages grow by more than ten log points relative to those without involvement.

4. Empirical framework and main results

In this section, we present our empirical framework to test the theory's predictions. First, we set out the probit regression model and our baseline covariates. Second, we show estimates. Finally, we show that our main results are robust to variations in the regression model and the dependent and independent variables.

4.1 Description of the empirical framework

To control for differences in observable employee characteristics, we estimate probit models for the conditional likelihood of a year-to-year basic wage cut among job stayers. The following process describes whether a wage cut between periods t and $t-1$ is observed for job stayer i in firm j:

$$\text{WageCut}_{ijt} \equiv \ln\left(W_{ijt}\right) < \ln\left(W_{ijt-1}\right) - 0.005 = \begin{cases} 1 & \text{if} \quad y^*_{ijt} > 0\,, \\ 0 & \text{otherwise}\,, \end{cases} \tag{8}$$

which accounts for possible small classical measurement errors in wage records as described in Section 3, and whereby the latent variable is:

$$\begin{aligned} y^*_{ijt} = {} & \omega_0 + \omega_1 \text{Discretion}_{ij} + \omega_2 \text{Involvement}_{ij} + \omega_3 (\text{Discretion} \times \text{Involvement})_{ij} \\ & + \beta_1 \text{Male}_i + \beta_2 \text{Age}_{it-1} + \beta_3 \text{Age}^2_{it-1} \\ & + \gamma_1 \text{PrivateSector}_{jt-1} + \gamma_2 \ln\left(\text{FirmSize}_{jt-1}\right) + \gamma_3 \text{FirmGrowth}_{jt} \\ & + \delta_1 \text{UnionAgreement}_{ijt-1} + \delta_2 \text{Full-time}_{ijt-1} + \delta_3 \ln\left(\text{BasicWage}_{ijt-1}\right) \\ & + \varepsilon_{ijt}, \quad \varepsilon_{ijt} \sim \mathcal{N}(0,1)\,. \end{aligned} \tag{9}$$

Here, WageCut_{ijt} represents a basic wage cut, defined as a year-to-year decline in the basic wage of job stayer i in firm j. The first row of Equation (9) displays the key variables of our framework: Discretion_{ij} is an indicator variable that equals one if the manager thinks that employee i in firm j has some discretion over how they perform their job, and is zero otherwise. Involvement_{ij} is an indicator variable that equals one if the manager thinks that employee i in firm j is involved, and is zero otherwise. Both variables, discretion and involvement, are measured in 2004 and are constant within firm-job-stayer matches throughout our sample period. Our theory predicts that involvement should only matter for the likelihood of wage cuts if employees have some discretion over how they work because, otherwise, managers do not need to be concerned with the possible negative consequences of wage cuts on morale.

Therefore, we include an interaction term of Discretion and Involvement in Equation (9). This term equals one if managers think that employees have some discretion *and* are also involved.

The second row of (9) displays employee-specific variables: an indicator variable for the employee's gender and terms for the employee's age and age squared, both measured in years. The third row shows firm-specific variables: an indicator of whether the employer is in the private or non-private sector, the natural logarithm of firm size (measured by the total number of employees), and FirmGrowth, the change in the natural logarithm of firm size, to proxy for the state of the firm. The fourth row displays employee-firm-specific variables: an indicator of whether the employee's wage is set according to a collective agreement (either national, sub-national, or industry-level), an indicator of whether the job is a full-time position (more than 30 hours per week), and the natural logarithm of the employee's last basic wage. We include the employee's last wage to control for the proximity of wage floors, e.g., the UK's National Minimum Wage and Living Wage, which can affect the likelihood of nominal basic wage cuts. By including this variable, we also model the general tendency, in the cross-section, that hourly wage cuts are more common as the level of pay increases. Because jobs with discretion are better paid on average (see Table 4), omitting some control for the pay level might introduce omitted variable bias. Hereafter, we refer to the covariates in rows 2-4 as 'baseline covariates'.

We use cross-sectional variation to examine the association between the likelihood of wage cuts and the variables of Discretion and Involvement. Given the absence of (quasi-)experimental variation in our variables of interest, our estimation strategy does not allow for causal identification. There are two primary sources of possible statistical endogeneity: reverse causality and unobserved confounding variables. Reverse causality would occur if the likelihood of wage cuts impacts managers' perceptions about the extent of employee discretion and involvement, conditional on the other included covariates. For instance, managers anticipating pay cuts might take action to limit the scope of discretion to prevent employees from retaliating. Similarly, managers might increase the degree of involvement to improve worker satisfaction through a higher amenity value of the job. Consequently, the effects of discretion may be underestimated, while involvement may be overestimated. Another possibility is that firms in which employees are assigned greater discretion and involvement may be more successful and, therefore, less likely to cut wages. This situation may lead to overestimating the true effects of discretion and involvement on the likelihood of wages being cut. We attempt to control for these and other potential confounding variables - using firm success and contract type measures - finding that our main results are robust (see Section 5 below). Despite the limitation that our study lacks a clear identification strategy to test for the causal role of contract incompleteness on employers' decision to cut wages, we consider the coefficient estimates obtained from Equation (9) as a valuable contribution to the literature. These estimates, however imperfect, provide the first observational quantitative evidence of the relationship between the likelihood of employee wage cuts and the presence of discretion (contractual incompleteness) and involvement (via information sharing) in the workplace.

4.2 Main results

Table 5, panel A, column (1), shows that basic wage cuts are significantly less likely when managers think their employees have some discretion over effort but are not involved. The corresponding predicted probability in panel B indicates that an employee who is not involved is 6.5 percentage points (19.4-12.9) less likely to receive a wage cut if they have some discretion. This finding supports Prediction 1. The association between involvement and the likelihood of a wage cut, without discretion, is negative but not statistically significant. The estimated coefficient of the interaction term is positive, consistent with Prediction 2, but also not statistically significant. To help with the interpretation of the magnitudes implied by the coefficient estimates, we provide results from estimating an equivalent linear probability model in Appendix Table C1.

Column (2) of Table 5 displays the estimates and predicted probabilities when we include the baseline covariates in the regression model. The coefficient estimates of Discretion and Involvement are more negative in this case – having some discretion is associated with a decrease in the probability of receiving a nominal wage cut by nine percentage points (20.6-11.6) when not involved. The coefficient of the interaction term is significantly positive, indicating that wage cuts are *more* likely when managers perceive that employees with discretion are also involved, supporting Prediction 2. On average, the probability of a wage cut is higher by 0.7 percentage points (12.3-11.6) for a job stayer who has some discretion and who is also involved, relative to a job stayer who is not involved but still has discretion. The significant negative coefficient on Involvement, in the absence of discretion, suggests than firms do not generally tend to adopt involvement practices to enable wage cuts. This is confirmed by the predicted probabilities for the state of involvement in Panel B, which are less that one percentage point different. We also find that the higher the basic wage in the previous year, the more likely year-to-year wage cuts are. Employees working more than 30 hours per week (full-time) are significantly less likely to experience cuts. These estimation results also suggest that employees in larger firms are significantly more likely to experience wage cuts, and there is no evidence that whether an employee is working for a firm with growing or shrinking employment relates to the likelihood of receiving cuts.

As described earlier, the WERS collects information about employee discretion and involvement in the most common 4-digit occupation within a firm. In column (3) of Table 5, we exclude all employees in our ASHE-WERS linked dataset who were not working in the same (3-digit) minor occupation group that the managers were referring to in their WERS responses. We analyse 3-digit instead of 4-digit occupations because using the latter would decrease our sample size without notably decreasing attenuation bias.[19] Indeed, the estimated associations between Discretion, Involvement, and wage cuts is stronger in this reduced sample. We find that having discretion is associated with a decrease in the predicted probability of receiving a wage cut by more than half (25.6-11.5) for an employee who is not involved. When employees have no discretion, the association between Involvement and wage cuts is significantly negative. Again, the estimated coefficient on the interaction term is significantly positive – the predicted probability of a wage cut increases by two percentage points (13.5-11.5), or by almost 20%, for a job stayer with discretion and who is also involved.

[19]Examples of 3-digit occupations and their associated 4-digit occupations are: SOC 322 “Therapists”; SOC 3221 “Physiotherapists”; SOC 3222 “Occupational therapists”, SOC 3223 “Speech and language therapists”, SOC 3229 “Therapists n.e.c.”. See the Standard Occupational Classification 2000 for details:
https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/socarchive

TABLE 5: Probit model estimates for the likelihood of a year-to-year nominal wage cut for job stayers

	Baseline sample (1)	(1) with baseline covariates (2)	(2) for 3-digit occupation match (3)
Panel A. Coefficient estimates			
Discretion (ω_1)	-0.268^{***}	-0.376^{***}	-0.543^{***}
	(0.095)	(0.085)	(0.135)
Involvement (ω_2)	-0.114	-0.180^{**}	-0.245^{**}
	(0.115)	(0.073)	(0.122)
Discretion × Involvement (ω_3)	0.132	0.217^{**}	0.339^{**}
	(0.135)	(0.098)	(0.163)
Male (β_1)		-0.013	-0.075
		(0.044)	(0.075)
Age (β_2)		-0.006	-0.028^{*}
		(0.009)	(0.015)
Age^2 ($\beta_3 \times 100$)		0.007	0.000^{*}
		(0.011)	(0.000)
PrivateSector (γ_1)		-0.020	0.111
		(0.088)	(0.114)
ln(FirmSize) (γ_2)		0.047^{**}	0.083^{**}
		(0.022)	(0.037)
FirmGrowth (γ_3)		0.070	0.252
		(0.095)	(0.156)
UnionAgreement (δ_1)		0.084	0.115
		(0.092)	(0.127)
Full-time (δ_2)		-0.399^{***}	-0.335^{***}
		(0.063)	(0.068)
ln(BasicWage) (δ_3)		0.467^{***}	0.566^{***}
		(0.051)	(0.092)
Constant (ω_0)	-0.886^{***}	-1.945^{***}	-1.890^{***}
	(0.075)	(0.246)	(0.511)
Year-fixed effects	✓	✓	✓
Panel B. Predicted probabilities (at sample means)			
Discretion:			
0	0.171	0.169	0.199
1	0.132	0.122	0.130
Involvement:			
0	0.149	0.142	0.151
1	0.143	0.134	0.149
Discretion × Involvement:			
0×0	0.194	0.206	0.256
0×1	0.165	0.159	0.184
1×0	0.129	0.116	0.115
1×1	0.133	0.123	0.135
N: job stayers	14,819	14,819	4,091

Notes: Coefficient estimates and predicted probabilities of the probit model given by Equations (8) & (9).
***, **, * indicate significance from zero of the model coefficients at the 1%, 5% and 10% levels, respectively, two-sided tests, and standard errors in parentheses that account for clustering at the firm-level.

4.3 Robustness

Last basic wage. Including the last basic wage as a control variable might raise concerns about the statistical validity of our approach. Since we do not estimate a dynamic panel-data model, including the last basic wage does not necessarily introduce endogeneity. However, because some unobserved confounders might affect the last basic wage and the likelihood of wage cuts, we also show that the negative association between the likelihood of basic wage cuts and employee discretion is robust to dropping this covariate (see Appendix Table C2, column (2)). However, the strength of the mitigating effect of Involvement is somewhat diminished.

Contract duration. According to the theoretical literature on incomplete contracts, reputational concerns (MacLeod and Malcomson, 1988) and seniority premiums (Lazear, 1979, 1981) can be used by employers to diminish the degree of contractual incompleteness in long-term employment relationships. In the context of our study, these aspects could interact with our discretion and involvement measures and the likelihood of experiencing nominal wage cuts. While we think the level of the basic wage may be a reasonable proxy for the presence of seniority wages, we attempt to control for a form of contract duration by including tenure at the current employer in our probit estimation. We find that the coefficient estimates of an employee's firm tenure and its square are not significant, and including these terms does not notably affect any of the results (see Appendix Table C2, column (3)).

Degree of discretion. In our regressions so far, Discretion was a binary indicator variable. However, the strength of the association between the likelihood of wage cuts and employee discretion may depend on the *degree* of discretion. For example, employees with 'A lot' of discretion might have more room for reciprocal reactions to a wage cut than employees with only 'Some' discretion. Appendix Table C3 displays the coefficient estimates of varying degrees of employee discretion. The degree of discretion matters, but we also find that only the coefficients of 'A lot' and 'A little'/'None' significantly differ, thus justifying our binary classification of the Discretion variable in our preferred model specification.

Cuts, freezes, and raises - Ordered probit model. In a related exercise, we assess whether our findings are robust to changing the classification of the outcome variable. For that, we estimate an ordered probit model for the conditional likelihood of a year-to-year basic wage cut, freeze, and rise among job stayers. We present the estimates in Appendix C, Tables C4-C5, where we also discuss the findings. In summary, the estimates are largely consistent with Predictions 1 and 2.

5. Further analysis and discussion

In this section, we further investigate the relationship between the likelihood of wage cuts and the extent of employee discretion and involvement. First, we examine how much variation in Discretion and the likelihood of wage cuts is left once we control for occupations. Second, we check whether the potential confounding variable of firm success drives our results. Finally, we study how several aspects capturing the nature of the employment contract and pay structure interact with the relationship between employee discretion and the likelihood of wage cuts. In particular, we investigate the role of contract types (salaried and hourly-paid), adjustments in hours, and extra pay components such as overtime and incentive pay.

We use a number of additional variables in this section, for which we provide descriptive statistics in Table 6. The rationale behind each will be discussed in the context of the analyses below. As with basic wages, we observe that gross wages – the sum of basic wages and all extra pay components – are more frequently cut among job stayers with no discretion (28.4%) than among job stayers with discretion (22%). Extra pay components include overtime, shift premium, incentive, and other pay such as meal allowances (see Appendix B for definitions). The percentage of employees with no discretion who receive only basic wages is 36.1%, which is *smaller* than among employees with discretion. This is perhaps surprising because extra pay components, such as incentive pay, are typically thought to be used by firms to motivate employees. Employees without discretion are more likely to receive at least one of the extra pay components, with the largest difference being observed for shift premium pay: 33% *versus* 21%. Job stayers with no discretion also experience year-to-year increases in basic hours more frequently (13.5%) than those with discretion (12.4%). Large employment declines, exceeding 10%, are somewhat more likely where job stayers have no discretion, while resignations are lower in firms where employees have discretion. Finally, firm redundancies are roughly the same across our job stayer groups.

TABLE 6: Additional characteristics for job stayers in the ASHE-WERS, 2002-06, according to the presence of discretion and involvement

	No discretion	Discretion & no involvement	Discretion & involvement
Gross wage cut	0.284	0.222	0.220
Gross wage freeze	0.036	0.040	0.044
Only basic wage	0.361	0.448	0.507
Basic hours increase	0.135	0.124	0.061
Any incentive pay	0.590	0.558	0.540
Any overtime pay	0.356	0.343	0.278
Any shift premium pay	0.330	0.211	0.217
Any other pay	0.179	0.153	0.128
Firm growth < 0	0.475	0.453	0.408
Firm growth $< -10\%$	0.127	0.108	0.124
Resignation share	0.074	0.092	0.086
Redundancy share	0.013	0.016	0.013
N: job stayers	4,906	2,230	7,683

Notes: 'Gross wage' gives weekly basic earnings plus extra pay divided by basic hours worked plus overtime hours; 'Only basic wage' indicates that only basic earnings are received; 'Basic hours increase' is a year-to-year positive change in basic hours that exceeds 0.5 log points; 'Any incentive pay', 'Any overtime pay', 'Any shift premium pay', and 'Any other pay' indicate that a positive amount of the relevant extra pay component is received (see Appendix B for definitions); 'Resignation share' measures for a job stayer the share of employees on their firm's payroll 12 months ago who have since left or resigned voluntarily; 'Redundancy share' measures for a job stayer the share of employees on payroll 12 months ago who have since been made redundant. See Table 2 for details on the other variables.

5.1 Variation within occupations

Our main results raise the question of whether firms with discretion differ in other unobservable dimensions that could explain the lower prevalence of wage cuts. To understand whether certain types of occupations have both high discretion and a high likelihood of wage cuts, first, we display in Table 7 the shares of job stayers within 2-digit sub-major occupation groups in our dataset who have some discretion, as well as the associated frequency of nominal wage cuts. Employees working in occupation groups 21-23 (professionals) have the highest degree of discretion (95.2%), and most are also involved. At the other extreme are occupations 81-82 (operatives and drivers), in which 74.8% of employees have no discretion. Despite these differences in the degree of discretion, the frequency of wage cuts differs between the two occupation categories only by 1.4 percentage points (14.4-13.0).

TABLE 7: The shares of job stayers with discretion and involvement by occupation, and the share of nominal wage cuts by occupation

SOC 2000	No discretion	Discretion & no involvement	Discretion & involvement	Wage cut
21-23	0.048	0.238	0.715	0.144
24	0.514	–	–	–
31-32	0.178	0.194	0.627	0.161
33-34	0.186	0.114	0.701	0.186
35	0.736	–	–	–
41-42	0.271	0.081	0.648	0.145
52-54	0.537	–	–	0.116
61-62	0.714	–	–	0.244
71-72	0.305	0.205	0.490	0.162
81-82	0.748	0.036	0.215	0.130
91-92	0.711	0.041	0.248	0.257
Total	0.307	0.144	0.549	0.162

Notes: Uses Standard Occupational Classification 2000, from the Office for National Statistics (UK). The sample size is 4,091 job stayers. Some cells are omitted due to statistical disclosure control.
21-23: Science and technology professionals; health professionals; teaching and research professionals (e.g., Physicists; medical practitioners; higher education teaching professionals). *24*: Business and public service professionals (e.g., solicitors and lawyers, judges and coroners; probation officers. *31-32*: Science and technology associate professionals; health and social welfare associate professionals (e.g., laboratory technicians; nurses). *33-34*: Protective service occupations; Culture, media and sports occupations (e.g., police officers; journalists, newspaper and periodical editors). *35*: Business and public service associate professionals (e.g., air traffic controllers; brokers). *41-42*: Administrative occupations; secretarial and related occupations (e.g., Civil Service executive officers, receptionists). *52-54*: Skilled metal and electrical trades; skilled constructions and building trades; textiles, printing and other skilled trades (e.g., precision instrument makers and repairers; vehicle body builders and repairers; bricklayers, masons). *61-62*: Caring personal service occupations; leisure and other personal service occupations (e.g., nursery nurses; hairdressers, barbers). *71-72*: Sales occupations; customer service occupations (e.g., retail cashiers and check-out operators; call centre agents). *81-82*: Process, plant and machine operatives; transport and mobile machine drivers and operatives (e.g., energy plant operatives; bus and coach drivers). *91-92*: Elementary trades, plant and storage related occupations; elementary administrative and service occupations (e.g., industrial cleaning process occupations; postal workers, mail sorters, messengers, couriers)

Using the sample of job stayers who are matched at the 3-digit occupation level, we estimate linear probability models for the likelihood of Discretion, including a constant term and fixed effects for the different levels of the Standard Occupational Classification (SOC). The resulting R^2 measures of model fit are 0.28 (1-digit SOC effects); 0.34 (2-digit SOC effects); and 0.39 (3-digit SOC effects). This suggests that even 3-digit minor occupation categories can explain at most 39% of the variance in Discretion.

How much variation in Discretion and the likelihood of wage cuts is left *within* occupations? To answer this, Table 8 displays the estimation results from including fixed effects for 1-digit or 2-digit occupations in our probit model. As expected, the overall likelihood of wage cuts declines when we account for the relevant differences between occupations. The association between Discretion and wage cuts is weaker within 1-digit major occupation groups, though not zero. The association is no longer statistically significant within 2-digit sub-major groups. Within 1-digit occupations, Discretion is associated with a 7.1 percentage point (19.9-12.8) lower likelihood of wage cuts among employees who are not involved and only with a lower likelihood of 0.8 percentage points (14.6-13.8) among other job stayers.

TABLE 8: Probit estimates for the likelihood of year-to-year nominal wage cuts: occupation group fixed effects

	3-digit occ. match (1)	(1) with 1-digit SOC effects (2)	(1) with 2-digit SOC effects (3)
Panel A. Coefficient estimates			
Discretion (ω_1)	-0.543^{***}	-0.290^{**}	-0.176
	(0.135)	(0.122)	(0.122)
Involvement (ω_2)	-0.245^{**}	-0.205^{*}	-0.156
	(0.122)	(0.121)	(0.123)
Discretion × Involvement (ω_3)	0.339^{**}	0.254	0.155
	(0.163)	(0.160)	(0.159)
Baseline covariates	✓	✓	✓
Year-fixed effects	✓	✓	✓
Panel B. Predicted probabilities (at sample means)			
Discretion × Involvement:			
0 × 0	0.256	0.199	0.174
0 × 1	0.184	0.146	0.136
1 × 0	0.115	0.128	0.132
1 × 1	0.135	0.138	0.132
N: job stayers	4,091	4,091	4,091

Notes: Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). See the notes of Table 5 for more details.

5.2 Firm growth, resignations, and redundancies

A possible explanation for a negative correlation between the likelihood of basic wage cuts and the extent of discretion might be that more successful firms are also those in which employees have more discretion. Successful firms could have less need to implement wage cuts, which could account for the observation that employees with discretion are less likely to experience wage cuts. To investigate this, we use three different proxy variables for firm success.

Our first proxy is the employment growth rate at a job-stayer's firm, measured as the log change in the number of employees on payroll from a year before, as reported in the ASHE. We expect more successful firms to grow more than less successful ones, on average. The second proxy variable for a firm's success is the resignation share. The WERS provides information on the share of employees on payroll 12 months ago who have since left or resigned voluntarily. A higher share of resignations, all else equal, may result from employees having better outside options, indicating that the current employer is less successful. Our third proxy is the redundancy share, also from the WERS, measuring the share of employees on payroll 12 months ago who were made redundant. A higher redundancy share may suggest that the firm is less successful.

While none of our proxy variables will capture a firm's success perfectly, a combination of FirmGrowth, Resignation share, and Redundancy share may provide at least some approximation. We include all three proxies and interaction terms of each proxy with Discretion in the probit model (9). Reassuringly, doing so does not affect our main findings about Discretion and Involvement: the correlation between Discretion and the likelihood of basic wage cuts remains significantly negative, and the coefficient of the interaction term between Discretion and Involvement remains significantly positive (Table 9).

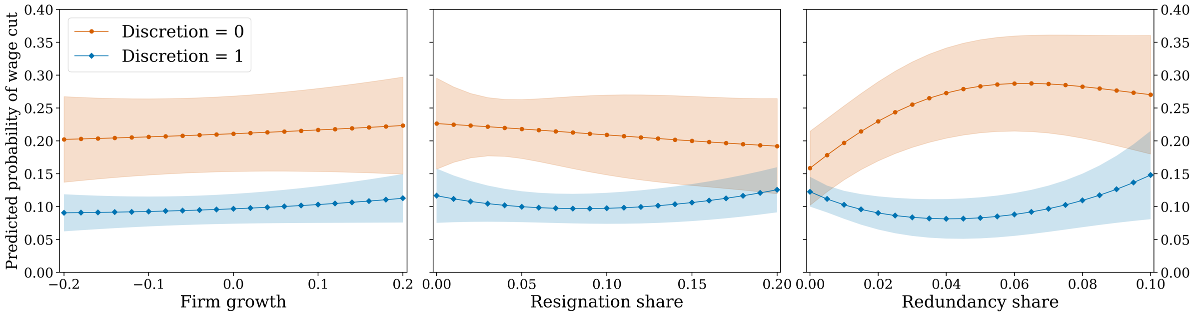
TABLE 9: Probit estimates for the likelihood of year-to-year nominal basic wage cuts for job stayers: controlling for measures of firm success

	Coefficient estimates
Discretion (ω_1)	-0.592^{***}
	(0.165)
Involvement (ω_2)	-0.251^{*}
	(0.140)
Discretion × Involvement (ω_3)	0.347^{**}
	(0.183)
Proxy variables for firm success	
FirmGrowth	0.267
	(0.179)
FirmGrowth × Discretion	0.168
	(0.365)
Resignation share	−0.120
	(0.602)
Resignation share × Discretion	1.465^{**}
	(0.725)
Redundancy share	3.986^{***}
	(1.293)
Redundancy share × Discretion	−2.125
	(2.244)
Baseline covariates	✓
Year-fixed effects	✓
N: job stayers	3,561

Notes: Probit estimation results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). We include additional controls for firm growth, resignations, redundancies, and interactions of these variables with Discretion. 'FirmGrowth' measures the year-to-year log change in the number of employees on payroll; 'Resignation share' measures the share of employees on payroll 12 months ago who have since left or resigned voluntarily; 'Redundancy share' measures the share of employees on payroll 12 months ago who were made redundant. See the notes of Table 5 for more details.

To assess possible non-linear effects of our proxy variables, we repeat the probit estimation but also include cubic polynomials of all three proxies in the probit model (9), as well as interaction terms of each polynomial with Discretion. The results are visualised in Figure 4, which shows how the predicted probabilities of basic wage cuts depend on the three proxies of firm success, holding all other covariates at their sample means. The left panel of Figure 4 displays the predicted probability of basic wage cuts across the Firm growth distribution. The graphs for employees with and without discretion are approximately parallel, implying that firm growth does not significantly affect the association between discretion and wage cuts, conditional on the other covariates. This is supported by the coefficient estimate of the interaction term between Firm growth and Discretion in Table 9, which is not statistically significant.

FIGURE 4: Predicted probabilities of year-to-year nominal basic wage cuts at sample means



Notes: Predicted probability (at sample means) of basic wage cuts for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). We include cubic polynomials for firm growth, resignations, redundancies, and interactions of these variables with Discretion. 'FirmGrowth' measures the year-to-year log change in the number of employees on payroll; 'Resignation share' measures the share of employees on payroll 12 months ago who have since left or resigned voluntarily; 'Redundancy share' measures the share of employees on payroll 12 months ago who were since made redundant.
The shaded areas indicate the 90% confidence bands.

We also find that the interaction term between Discretion and Resignation share is significantly positive. To investigate what drives this effect, the middle panel of Figure 4 displays the predicted probability of receiving a basic wage cut when the share of resignations increases. For values of the latter below 10%, the predicted probabilities are roughly parallel, suggesting that moderate shares of resignations do not meaningfully affect the association of Discretion and basic wage cuts. For higher values of Resignation share, the gap between the lines begins to narrow, implying that the effect of employee discretion on the likelihood of wage cuts becomes weaker. It is conceivable that wage cuts are not needed with high rates of voluntary separations, as companies can substantially reduce their wage bill by letting their workforce decline.

Table 9 shows that a higher share of redundancies is associated with a significantly higher likelihood of wage cuts, regardless of Discretion. Intuitively, a higher percentage of redundancies signals a less successful company, all else equal. The right panel of Figure 4 shows no evidence that the predicted probability of wage cuts for employees with some discretion is notably affected by the share of redundancies. This contrasts with employees without discretion, where an increase in the share of redundancies is associated with a higher likelihood of basic wage cuts.

The results in this section provide evidence that the negative association between an employee's discretion and the likelihood of a basic wage cut somewhat depends on the employer's success, as proxied by our available measures. Regardless, discretion is still associated with a significantly lower likelihood of basic wage cuts.

Finally, we return to the potential selection bias induced by focusing on job stayers. If workers with some discretion were more likely to resign upon receiving a wage cut, we would underestimate the likelihood of wage cuts for the average worker with discretion. Reassuringly, controlling for Resignation share does not overturn the estimated negative correlation between Discretion and the likelihood of cuts. Figure 4 shows that the likelihood of wage cuts among job stayers without discretion falls as the share of resignations rises; if sample selection bias were present, workers *without* discretion would be more likely to resign. Similarly, the predicted likelihood of wage cuts increases with the Redundancy share among employees without discretion but not among those with discretion. This cannot be explained by an increased likelihood of employees with some discretion leaving the company upon receiving a wage cut, on average, since we hold the Resignation share constant in the right panel of Figure 4. Rather, the results are consistent with managers not cutting the wages of employees with discretion - possibly due to concerns about negative reciprocity - but making those employees redundant instead. By excluding job leavers, our results thus appear to provide a lower bound on the effect of Discretion on the likelihood of wage cuts.

5.3 Nature of contract and pay structure

The likelihood of experiencing nominal wage cuts may also depend on the type of contract, namely, a fixed salary or an hourly pay rate. Indeed, Schaefer and Singleton (2023) find that hourly-paid employees are substantially less likely to see year-to-year nominal basic wage cuts than salaried employees in the UK. To check whether our measure of discretion is merely capturing the type of contract, we split our sample of 3-digit occupation matches in the WERS-ASHE into salaried and hourly-paid employees and repeat the baseline probit estimation. The results displayed in Table 10, columns (1)-(2), suggest that Discretion is significantly negatively associated with the likelihood of receiving a wage cut, with similar estimates across contract types. The mitigating effect of involvement is only significant among hourly-paid employees.

Although not addressed in our theoretical model, it is conceivable that compensation managers believe their employees to be less averse to basic wage cuts if these are the outcome of an increase in hours worked (keeping earnings constant) rather than a decrease in basic earnings (keeping hours constant), where the former might be less salient to employees.[20] In our main analysis, we did not distinguish between these two possibilities. Columns (3)-(4) of Table 10 show that when excluding workers with year-to-year increases in hours, Discretion is still significantly and negatively correlated with the likelihood of experiencing wage cuts.

Another concern is that the presence of extra pay components could drive the significant coefficient estimates for Discretion. We would expect extra pay components, such as incentive pay, to be more prevalent among employees who are considered to have some discretion over how well they perform their jobs. However, as Table 6 shows, this is not the case in our sample. Even so, firms might be able to cut pay along this margin rather than through basic wages. To investigate this, we repeat the probit model estimation for job stayers who did not receive any extra pay on top of basic wages in consecutive years. Column (1) of Table 11 displays the results, with a significantly negative coefficient for discretion and a predicted probability of a wage cut that is 11.9 percentage points (21.6-9.7) lower for a job stayer with discretion (and no involvement). The estimated coefficient of the interaction term is positive, consistent with previous findings, but no longer statistically significant. We also consider how employee discretion and involvement correlate with the likelihood of a year-to-year cut in gross wages, the sum

[20] For instance, recent findings in the literature on tax-benefit linkage suggest that salience is important for the incidence of payroll tax changes (Bozio et al., 2023).

TABLE 10: Probit estimates for the likelihood of year-to-year nominal cuts: Contract types and hours changes

	Contract type		Basic hours worked	
	Salaried (1)	Hourly-paid (2)	Increase (3)	No increase (4)
Panel A. Coefficient estimates				
Discretion (ω_1)	-0.544^{***}	-0.515^{***}	-0.582	-0.347^{**}
	(0.158)	(0.177)	(0.372)	(0.138)
Involvement (ω_2)	-0.167	-0.483^{**}	0.072	-0.266
	(0.131)	(0.192)	(0.293)	(0.131)
Discretion × Involvement (ω_3)	0.248	0.551^{**}	0.227	0.276
	(0.173)	(0.257)	(0.411)	(0.177)
Baseline covariates	✓	✓	✓	✓
Year-fixed effects	✓	✓	✓	✓
Panel B. Predicted probabilities (at sample means)				
Discretion × Involvement:				
0 × 0	0.270	0.221	0.507	0.184
0 × 1	0.218	0.106	0.536	0.122
1 × 0	0.124	0.100	0.286	0.106
1 × 1	0.141	0.112	0.395	0.108
N: job stayers	2,895	1,196	466	3,625

Notes: Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). 'Hourly-paid' workers' pay is calculated by multiplying an hourly pay rate by the hours worked. For basic hours worked, an 'Increase' is when the reported weekly basic hours worked increase by at least one hour. See the notes of Table 5 for more details.

of basic wages and extra pay in the original estimation sample (column (2) of Table 11). Discretion is associated with a significant decrease in the likelihood of a gross wage cut, although the effect appears weaker. The coefficient estimate of Involvement is insignificant and close to zero: there is no evidence that involvement relates to the likelihood of cuts in employee gross wages.

Next, we investigate what component of extra pay might be responsible for the weaker effect of employee discretion on the likelihood of gross wage cuts. We repeated our probit estimation but included dummy variables that equal one when a job stayer received a positive amount of an extra pay component within their reference period gross pay in any of the two consecutive years considered. The excluded category includes year-to-year job stayers who receive only basic wage income, as in column (1). The results are displayed in Table 11, last column. The coefficient estimates of Discretion (ω_1), Involvement (ω_2), and the interaction term (ω_3) are comparable to the results in column (1) (they are not identical because we do not interact the baseline covariates with the extra pay dummies). Shift pay significantly weakens the negative association of Discretion and the likelihood of basic wage cuts. By contrast, the coefficient estimates of the interaction terms of incentive pay, overtime pay, and other pay are small and statistically insignificant. This implies that the presence of these extra pay coefficients does not affect the relationship between the likelihood of basic wage cuts and the degree of employee discretion.

TABLE 11: Probit estimates for the likelihood of year-to-year nominal cuts: basic wages, gross wages, and the effect of receiving extra pay components

	Basic wage income only (1)	Using gross wages (2)	Extra pay components (3)
Panel A. Coefficient estimates			
Discretion (ω_1)	-0.510^{**}	-0.272^{**}	-0.601^{***}
	(0.214)	(0.109)	(0.146)
Involvement (ω_2)	-0.181	0.070	-0.266^{**}
	(0.259)	(0.082)	(0.125)
Discretion × Involvement (ω_3)	0.307	0.010	0.361^{**}
	(0.299)	(0.114)	(0.163)
Extra pay components			
Incentive pay			0.132
			(0.145)
Incentive pay × Discretion			0.054
			(0.282)
Overtime pay			0.113
			(0.098)
Overtime pay × Discretion			-0.063
			(0.136)
Shift premium pay			0.012
			(0.123)
Shift premium pay × Discretion			0.340^{**}
			(0.151)
Other pay			0.247^{**}
			(0.106)
Other pay × Discretion			-0.027
			(0.140)
Baseline covariates	✓	✓	✓
Year-fixed effects	✓	✓	✓
Panel B. Predicted probabilities (at sample means)			
Discretion × Involvement:			
0 × 0	0.216	0.304	0.252
0 × 1	0.166	0.329	0.175
1 × 0	0.097	0.216	0.117
1 × 1	0.121	0.240	0.136
N: job stayers	1,722	4,091	4,091

Notes: Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). See the notes of Table 5 for more details.

6. Summary and concluding remarks

Wage cuts can be perceived as unfair by employees, with negative consequences for morale and productivity. Hence, it can be in the firm's interest to refrain from cutting wages if possible. However, evidence of a firm's concerns about the potential costs of nominal wage cuts is mainly based on qualitative surveys and interviews with compensation managers. Much less is known about the quantitative consequences of those concerns, and whether they systematically affect the actual frequency of observed nominal wage cuts.

We have provided some evidence on how two important features of the employment contract can affect decisions to cut nominal wages. Our theoretical framework showed that contractual incompleteness and employee involvement via information sharing can be two crucial factors that underlie a firm's concern about the cost of implementing nominal wage cuts. We then empirically investigated the predictions of our framework using a novel matched employee-employer dataset from Great Britain, linking payroll wage data with a survey of managers. Consistent with these predictions, we found that nominal wage cuts are 6.5 to 14.1 percentage points less likely to occur when managers think their employees have discretion over how they perform their work. Moreover, cuts become 0.7 to 2 percentage points more likely when, conditional on the employment contract being incomplete, managers report that their employees are informed about upcoming organisational changes. We also ran a series of robustness checks and further examined the roles of occupations, firm success, contract types, and extra pay components. Our findings on the effects of discretion remain remarkably robust throughout, and suggest that firms do tend to act on their concerns about morale and fairness when deciding whether to cut nominal wages. But, while there are reasons to think that employee involvement via information sharing can alleviate those concerns, we found that its association with the likelihood of receiving nominal wage cuts is relatively weaker.

To the best of our knowledge, this is the first attempt to uncover and quantitatively evaluate using observational data a form of heterogeneity in the frequency of nominal wage cuts based on two important features of employment contracts, which have only been previously conjectured by economists. Yet, our study cannot address the issue of causality. For example, it could be that exactly those firms who have to cut wages are the ones that choose to involve their employees in decision-making. Future research should aim to overcome this shortcoming of our study, either by collecting new longitudinal data from employers or conducting lab and field experiments.

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Online Appendix:
Why wages don't fall in jobs with incomplete contracts

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Appendix A. Further details of the model

This section provides more details on the model presented in the main text. First, we present a model of an employee's optimal choice of discretionary effort, which yields a best-response effort function equivalent to the one we assume in the main text. Next, we study the firm's optimal wage-setting problem underlying the results established in Propositions 2 and 3.

A.1 Employee choice of discretionary effort

This section closely follows the model of asymmetric reference-dependent reciprocity developed by Dickson and Fongoni (2019). Consider an employee's utility in each period that is additively separable and takes the following form:

$$u(e^d, W, R) = W - [0.5(e^d)^2 - be^d] + M(e^d, W, R). \tag{10}$$

The first term captures the benefit of being paid the wage W. The second term captures the employee's intrinsic psychological net cost of effort, which implies that if there were no relative pay considerations, then the employee would choose to exert $b > 0$, which in the main text is referred to as 'normal' discretionary effort, denoted by e^n. Finally, the term $M(e^d, W, R)$ captures a 'morale function' that depends on the employee's evaluation of the wage with respect to a reference 'fair' wage R:

$$M(e^d, W, R) = e^d \mu(\ln W - \ln R)\ , \tag{11}$$

where μ is an asymmetric piecewise-linear gain-loss function: $\mu(x) = x$ if $x \geq 0$, and $\mu(x) = \gamma x$ if $x < 0$; and $\gamma > 1$ is a parameter capturing the relative weight of unfair wages on morale (Dickson and Fongoni (2019) consider γ to be determined by an employee's degree of loss aversion). As such, the morale function captures the psychological cost, or benefit, of discretionary effort associated with the employee's evaluation of the fairness of the wage they are paid.

When combined with the assumption that $R = W_{-1}$, the morale function in Equation (11) has a number of important features. First, it captures the effects of nominal wage changes on an employee's utility: a wage increase implies some additional benefit of exerting effort, hence, higher effort will increase utility; a wage cut implies that effort is more psychologically costly to exert, and lower effort will increase utility. Since effort is discretionary, the morale function implies that the employee's preferences exhibit reciprocity: when a firm improves the terms of the contract by increasing the wage (which the employee perceives as a kind action), the employee will positively reciprocate by increasing effort (a kind action toward the firm); and *vice versa*, when a firm decreases the wage (perceived as an unkind action), the employee will negatively reciprocate by decreasing effort (an unkind action towards the firm). Second, $\gamma > 1$ implies that nominal wage cuts have a stronger negative effect on an employee's morale than equally-sized wage increases have a positive effect. These mechanisms closely reflect compensation managers' beliefs about the effects of wage changes on employee morale and productivity, which are discussed in the main text.

If the employment contract is incomplete, effort is discretionary and the employee will choose the optimal level of effort e^d that maximises their utility in (10), for a given wage W and reference wage R. The necessary and sufficient first-order condition for optimal effort is:

$$-e^d + b + \mu(\ln W - \ln R) = 0,$$

which yields an explicit solution equivalent to the effort function, (2), assumed in the main text.

A.2 The firm wage-setting problem

We begin by studying the wage-setting problem of the firm in (3), in which the employee reference wage is R. We then comment on how the optimal wage policy can be adapted to establish the results in Propositions 2 and 3.

Due to the concavity of the firm's profit, there exists a unique optimal wage that solves its problem, which is characterised by the following necessary and sufficient first-order condition:

$$Z\frac{\partial e^d(W,R,\gamma)}{\partial W} - 1 = 0, \quad \forall W \neq R,$$

where $\frac{\partial e^d(W,R,\gamma)}{\partial W} = \frac{1}{W}$ if $W > R$ and $\frac{\partial e^d(W,R,\gamma)}{\partial W} = \gamma\frac{1}{W}$ if $W < R$. In this class of models, it is known that the resulting optimal wage takes the form of a trigger policy characterised by two thresholds: a lower threshold Z^l, which is such that if $Z < Z^l$, then profit is maximised where the first-order condition is satisfied at a wage strictly below R; and an upper threshold Z^u, which is such that if $Z > Z^u$, then profit is maximised where the first-order condition is satisfied at a wage exceeding R. Instead, if $Z^l \leq Z \leq Z^u$, profit will be maximised at the kink, i.e., where $W = R$. These thresholds, $Z^l \equiv Z^l(R)$ and $Z^u \equiv Z^u(R)$, are implicitly defined by:

$$Z^u(R)\frac{1}{R} - 1 = 0 \quad \text{and} \quad Z^l(R)\gamma\frac{1}{R} - 1 = 0.$$

It follows that $Z^u(R) > Z^l(R)$ if $\gamma > 1$, and that if $Z > Z^u(R)$, then the optimal wage is given by $\widetilde{W} = Z$, while if $Z < Z^l(R)$, the optimal wage is $\widetilde{W} = \gamma Z$. If $Z^l(R) \leq Z \leq Z^u(R)$, the optimal wage will be $\widetilde{W} = R$. If we substitute R with $W_{-1}^{1-\beta}Z^\beta$ (as is the case underlying the statement of Proposition 3) in the expressions defining the thresholds, we obtain $Z^u(W_{-1}) = W_{-1}$ and $Z^l(W_{-1}) = W_{-1}/\gamma^{\frac{1}{1-\beta}}$ as required. By setting $\beta = 0$ (i.e., no involvement via information sharing), we obtain the results established by Proposition 2 as required.

Appendix B. Further details of the data

The key earnings variables that we analyze are the answers to the following questions in the ASHE questionnaire, whereby monetary values are measured in Pound sterling (GBP), including pence:

Basic pay (BPAY):
"How much basic pay, before deductions, did the employee receive in the pay period?
Include: all basic pay, relating to the pay period, before deductions for PAYE, National Insurance, pension schemes, student loan repayments and voluntary deductions. Include paid leave (holiday pay), maternity/paternity pay, sick pay and area allowances (e.g., London).
Exclude: pay for a different pay period, shift premium pay, bonus or incentive pay, overtime pay, expenses and the value of salary sacrifice schemes and benefits in kind."

Overtime pay (OVPAY):
"How much overtime pay did the employee receive for work carried out in the pay period?

Exclude: any basic, shift premium and bonus or incentive pay in this period, as well as overtime pay from the previous pay period."

Shift premium pay (SPPAY):
"How much shift premium pay did the employee receive in the pay period?
Include: the element of shift premium pay. For example, for a 35 hour pay period, if the basic rate is £10 per hour and the premium rate is £12 per hour, multiply the difference of £2 by the hours worked (i.e. 35 multiplied by 2). The shift premium pay reported would therefore be £70.
Exclude: any basic, overtime and bonus or incentive pay."

Incentive pay (IPAYIN):
"How much [bonus or incentive payments did the employee receive,] related to work carried out in the pay period?
For example, if [an annual bonus was paid], the value should be divided by 12 if the employee was paid on a calendar month basis.
Include: profit sharing, productivity, performance and other bonus or incentive pay, piecework and commission.
Exclude: basic, overtime and shift premium pay."

Other pay (OTHPAY):
"How much pay did the employee receive for other reasons in the pay period?
Include: for example, car allowances paid through the payroll, on call and standby allowances, clothing, first aider or fire fighter allowances.
Exclude: paid leave (holiday pay), basic, overtime, shift premium, maternity/paternity, sick, bonus or incentive pay, redundancy, arrears of pay, tax credits, profit share and expenses."

Basic hours worked (BHR):
"How many basic hours does [basic pay] relate to?
If your pay period is calendar month and hours are weekly, multiply the weekly hours by 4.348 to get calendar month hours. If the employee uses a decimal clock, please convert to hours and minutes. For example, 4.3 hours should be 4 hours and (0.3 multiplied by 60) minutes = 4 hours 18 minutes.
Include: any hours paid at shift premium and paid hours even if not worked.
Exclude: any hours paid as overtime."

Overtime hours worked (OVHR):
"How many overtime hours does [overtime pay] relate to?
If the employee uses a decimal clock, please convert to hours and minutes. For example, 4.3 hours should be 4 hours and (0.3 multiplied by 60) minutes = 4 hours 18 minutes.
Include: the actual number of hours. For example, for 4 hours paid at time and a half, enter 4 not 6. Include any paid meal breaks taken during a period of overtime.
Exclude: any hours paid at the basic or shift premium rate."

Appendix C. Robustness

TABLE C1: Linear probability model estimates for the likelihood of a year-to-year nominal wage cut for job stayers

	Baseline sample (1)	(1) with baseline covariates (2)	(2) for 3-digit occupation match (3)
Discretion (ω_1)	-0.065^{***}	-0.089^{***}	-0.137^{***}
	(0.023)	(0.021)	(0.035)
Involvement (ω_2)	-0.029	-0.041^{**}	-0.063^{**}
	(0.030)	(0.019)	(0.032)
Discretion × Involvement (ω_3)	0.033	0.049^{**}	0.086^{**}
	(0.033)	(0.023)	(0.040)
Male (β_1)		-0.003	-0.016
		(0.009)	(0.018)
Age (β_2)		-0.002	-0.006^{*}
		(0.002)	(0.013)
Age^2 ($\beta_3 \times 100$)		0.002	0.007^{*}
		(0.002)	(0.004)
PrivateSector (γ_1)		-0.004	0.027
		(0.018)	(0.025)
ln(FirmSize) (γ_2)		0.011^{**}	0.018^{**}
		(0.005)	(0.009)
FirmGrowth (γ_3)		0.015	0.063
		(0.022)	(0.043)
UnionAgreement (δ_1)		0.017	0.025
		(0.020)	(0.030)
Full-time (δ_2)		-0.102^{***}	-0.090^{***}
		(0.021)	(0.018)
ln(BasicWage) (δ_3)		0.112^{***}	0.136^{***}
		(0.016)	(0.022)
Constant (ω_0)	0.189^{***}	-0.039	-0.020
	(0.020)	(0.055)	(0.117)
Year-fixed effects	✓	✓	✓
N: job stayers	14,819	14,819	4,091

Notes: Coefficient estimates and predicted probabilities of a linear probability model. See the notes of Table 5 in the main text for more details.

TABLE C2: Probit estimates for the likelihood of year-to-year nominal cuts: Changing the covariate vector

	3-digit occupation match (1)	(1) without the last wage (2)	(1) with tenure controls (3)
Panel A. Coefficient estimates			
Discretion (ω_1)	-0.543^{***}	-0.352^{***}	-0.509^{***}
	(0.135)	(0.122)	(0.134)
Involvement (ω_2)	-0.245^{**}	-0.197	-0.221^{*}
	(0.122)	(0.123)	(0.133)
Discretion × Involvement (ω_3)	0.339^{**}	0.237	0.316^{**}
	(0.163)	(0.158)	(0.170)
Tenure (estimates×100)			-0.021
			(0.089)
Tenure^2 (estimates×1,000,000)			-0.338
			(2.080)
Baseline covariates	✓		✓
Year-fixed effects	✓	✓	✓
Panel B. Predicted probabilities (at sample means)			
Discretion × Involvement:			
0×0	0.256	0.228	0.246
0×1	0.184	0.173	0.182
1×0	0.115	0.136	0.116
1×1	0.135	0.145	0.136
N: job stayers	4,091	4,091	3,985

Notes: Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9), displayed in column (1). Results excluding the last basic wage or including controls for employer tenure and its square in columns (2) and (3), respectively. See the notes of Table 5 in the main text for more details.

TABLE C3: Probit estimates for the likelihood of year-to-year nominal cuts: Degree of Discretion

Panel A. Coefficient estimates	
Discretion	
"Some"	0.094
	(0.228)
"A little"	0.522^{**}
	(0.237)
"None"	0.960^{***}
	(0.268)
Discretion × *Involvement*	
"Some"	−0.069
	(0.251)
"A little"	−0.321
	(0.265)
"None"	-0.792^{**}
	(0.329)
Baseline covariates	✓
Year-fixed effects	✓
Panel B. Predicted probabilities (at sample means)	
Discretion	
"A lot"	0.125
"Some"	0.133
"A little"	0.189
"None"	0.209
N: job stayers	4,091

Notes: Estimates relative to the excluded Discretion category "A lot". Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). See the notes of Table 5 in the main text for more details.

Ordered probit model

Here, we estimate an ordered probit model for the conditional likelihood of a year-to-year basic wage cut, freeze, and rise among job stayers. As before, we use the baseline covariates to control for differences in various relevant observable characteristics of job stayers and workplaces. The following process describes whether the observed outcome y_{ijt} between periods t and $t-1$ for job stayer i in firm j is a wage rise (base category), wage freeze, or wage cut:

$$y_{ijt} = \begin{cases} \text{WageRise}_{ijt} \equiv \ln\left(W_{ijt-1}\right) + 0.005 < \ln\left(W_{ijt}\right) & \text{if} \quad y^*_{ijt} < \kappa_1 \,, \\ \text{WageFreeze}_{ijt} \equiv \ln\left(W_{ijt-1}\right) - 0.005 \leq \ln\left(W_{ijt}\right) \leq \ln\left(W_{ijt-1}\right) + 0.005 & \text{if} \quad \kappa_1 < y^*_{ijt} < \kappa_2 \,, \\ \text{WageCut}_{ijt} \equiv \ln\left(W_{ijt-1}\right) - 0.005 > \ln\left(W_{ijt}\right) & \text{if} \quad y^*_{ijt} > \kappa_2 \,. \end{cases} \tag{12}$$

The parameters κ_1 and κ_2 are thresholds to be estimated for the ordered probit model. With a slight abuse of notation, we keep the latent variable y^*_{ijt} and the baseline covariates as described in Equation (9) in the main text. The coefficient estimates are shown in Table C4, and Table C5 displays the predicted probabilities at sample means for a wage rise, freeze, and cut.

As column (3) shows, an employee who is not involved is 14.3 percentage points (26.4-12.1) less likely to receive a wage cut when they have some discretion compared to when they have no discretion. The estimated coefficient of the interaction term is significantly positive, such that, conditional on having some discretion over effort at work, employee involvement is associated with an increase in the likelihood of a wage cut of 1.7 percentage points (13.8-12.1). These findings are consistent with our predictions, adding to the evidence about what relates to the likelihood of wage cuts reported in the previous section.

In terms of wage rises, column (1) of Table C5 shows that having some discretion has a strong positive effect on the predicted conditional likelihood of a wage rise, regardless of involvement: the probability of a wage rise is 4.8 percentage points (81.9-77.1) higher among employees with involvement, and even 16.5 percentage points (84.1-67.6) higher among employees without involvement. We also find that, conditional on having some discretion, involvement decreases the predicted probability of observing a wage rise by 2.2 percentage points (84.1-81.9). Finally, the results for wage freezes in column (2) imply that having some discretion, without involvement, decreases the likelihood of receiving a wage freeze by 2.2 percentage points (6.1-3.9). This does not support our theoretical framework. However, the relatively small number of observations for wage freezes in the data leads to coefficients and margins that are imprecisely estimated relative to those for wage rises and wage cuts.

TABLE C4: Ordered probit estimates for the likelihood of a year-to-year wage freeze and cut compared to a wage rise

	Coefficient estimates
Base category: Wage rise	
Discretion	-0.540^{***}
	(0.121)
Involvement	-0.288^{**}
	(0.119)
Discretion × Involvement	0.372^{**}
	(0.148)
Male	−0.040
	(0.069)
Age	−0.015
	(0.014)
Age^2	0.000
	(0.000)
PrivateSector	0.141
	(0.098)
ln(FirmSize)	0.045
	(0.034)
FirmGrowth	0.203
	(0.152)
UnionAgreement	0.129
	(0.120)
Full-time	-0.319^{***}
	(0.063)
ln(BasicWage)	0.506^{***}
	0.079
Cutoff 1 (κ_1)	1.507^{***}
	(0.420)
Cutoff 2 (κ_2)	1.683^{***}
	(0.415)
Year-fixed effects	✓
N: job stayers	4,091

Notes: Coefficient estimates of the ordered probit model, the base category is a year-to-year wage rise. Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). See the notes of Table 5 in the main text for more details.

TABLE C5: Predicted probabilities of nominal wage changes at sample means: ordered probit model estimates

Discretion × Involvement	Wage rise (1)	Wage freeze (2)	Wage cut (3)
0×0	0.676	0.061	0.264
0×1	0.771	0.050	0.179
1×0	0.840	0.039	0.121
1×1	0.819	0.043	0.138
N: job stayers	4,091	4,091	4,091

Notes: Results for job stayers in the sample of 3-digit occupation matches, controlling for year-fixed effects and baseline covariates as in Equation (9). See the notes of Table 5 in the main text for more details.