Department of Economics
Group for Economic Analysis at Reading (GEAR)

University of Reading

Why wages don't fall in jobs with incomplete contracts

By Marco Fongoni, Daniel Schaefer, and Carl Singleton

Discussion Paper No. 2023-12

Department of Economics
University of Reading
Whiteknights
Reading
RG6 6EL
United Kingdom

https://www.reading.ac.uk/economics/

Why wages don't fall in jobs with incomplete contracts

Marco Fongoni Daniel Schaefer Carl Singleton

2nd August 2023

Abstract

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 involvement of employees in workplace decision-making reduces this correlation. We also describe how contract incompleteness and wage cuts tend to vary across different jobs. These findings provide the first quantitative evidence of the notion 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 lab experiments.

Keywords: Wage rigidity; Employment contract; Workplace relations; Employer-employee data

JEL codes: E24, E70, J31, J41

Fongoni: Aix-Marseille Univ, CNRS, AMSE, Marseille, France (email: marco.fongoni@univ-amu.fr; corresponding author). Schaefer: Department of Economics, Johannes Kepler University Linz, Austria (email: daniel.schaefer@jku.at). Singleton: Department of Economics, University of Reading, Whiteknights, RG6 6EL, UK (email: c.a.singleton@reading.ac.uk).

We are grateful for helpful comments from Julia Darby, Mike Elsby, Matthias Fahn, Markus Gehrsitz, Jochen Güntner, Stuart McIntyre, Jonathan Norris, Heiko Stüber, as well as participants at the Scottish Economic Society Annual Conference in 2022. This work is based on the Annual Survey of Hours and Earnings Dataset and the Workplace Employment Relations Study (Crown copyright 2020), having been funded, collected, and deposited by the Office for National Statistics (ONS) under secure access conditions with the UK Data Service (SN:6689 and SN:6712). Neither the ONS nor the Data Service bear any responsibility for the analysis and discussion of the results in this paper.

Singleton thanks the Economic and Social Research Council and Administrative Data Research UK for the funding support of the Wage and Employment Dynamics project (ES/T013877/1).

Fongoni acknowledges funding from the French government under the "France 2030" investment plan managed by the French National Research Agency (reference: ANR-17-EURE-0020) and from Excellence Initiative of Aix-Marseille University - A*MIDEX, and also thanks the support of the Department of Economics at the University of Strathclyde at an early stage of this project.

Declarations of interest: none

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.[1] This offers an explanation for downward nominal wage rigidity, a well-established empirical fact and a central theme in macroeconomics, which theoretically affects a wide range of issues, from optimal exchange rate regimes to macroeconomic stabilisation policies.[2] Despite a vast empirical literature measuring the extent of nominal wage rigidity, little is known about whether managers' concerns systematically translate into actual restraint over wage cuts.[3] We offer new evidence on this question.

The notion that wage cuts damage employee morale and productivity relies on the premise that they 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. This predicts that nominal wage cuts lead to a disproportionate drop in discretionary effort, though this negative response can be mitigated by the involvement of employees in workplace decision-making. We test these predictions using a novel 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 that their employees have significant discretion over how they perform their jobs. This effect partially reverses when managers also report that employees are involved in workplace decision-making.

We contribute to the literature in a number of 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 and of any mediating role played by employee involvement in

[1] See Agell and Lundborg (1995, 2003); Bewley (1999); Campbell and Kamlani (1997); Kaufman (1984).

[2] Christiano et al. (2005) identify rigid nominal wages as the crucial nominal friction needed in New Keynesian models to match the empirical persistence of unemployment and inflation. Schmitt-Grohé and Uribe (2016) argue that economic interventions can be justified if excess supply in the labour market does not self-correct through wage adjustments in systems with fixed exchange rates.

[3] See Elsby and Solon (2019) for a recent survey of the empirical evidence on nominal wage rigidity.

decision-making. 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.

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 they are involved in workplace decision-making. 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 employee involvement in decision-making can affect a firm's optimal wage policy. If the employment contract is incomplete, then the firm will refrain from cuts whenever the benefits are more than offset by the resulting drop in effort. Employee involvement in decision-making 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-on-year wage cut decreases from 20.6 to 11.6 percent 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 think their employees are also involved in workplace decision-making. 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), but our findings also hold qualitatively within major occupation groups (e.g., professionals *versus* skilled construction and building trades). 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, 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 affects 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 little evidence of nominal wage rigidity (see the recent survey by Elsby and Solon, 2019). However, two recent studies by Grigsby et al. (2021) and Schaefer and Singleton (2022) show that basic wage cuts occur very rarely in administrative payroll-based data, and basic wage freezes are far more common than previously thought. 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, 2022). The only study that analyses at least one of the dimensions proposed in our framework is Wang and Seifert (2017), which shows that the adverse effects of real wage cuts on job satisfaction and organisational commitment are mitigated when employees feel involved in workplace decision-making. However, the authors do not investigate whether this mediating mechanism actually translates into a greater tendency of firms to cut nominal pay.

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 a number of robustness checks; and Section 5 concludes.

2. Conceptual framework

We begin by describing how contractual incompleteness and employee involvement can shape the nature of an employment contract, and why it is important to consider them 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 mostly 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 experiments, which find that pay cuts can lead to higher quit rates, counterproductive behaviour, lower output, and increased absenteeism (e.g., Kube et al., 2013; Krueger and Friebel, 2022; Sandvik et al., 2021), and by the wider literature on fairness and reciprocity in labour relations (for a survey see Fehr et al., 2009). 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).[4]

2.1.2 Employee involvement and information sharing

Are wage cuts always perceived as unfair? In a number of surveys, compensation managers report 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 the profits of their employers. They also find that employers cut wages more sharply when they know their employees are informed. These observations also find support in the literature of

[4] Williamson is 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".

organisational psychology and management science. 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 on responses to a pay freeze see Schaubroeck et al., 1994). More generally, this literature finds that employee involvement practices, defined by Wang and Seifert (2017) as *information sharing* and *employee participation in decision-making*, 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 they are widely adopted.

2.2 A theoretical model

Building on the existing theoretical literature, we develop a simple model of optimal wage setting. This 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 matched with an employee who is particularly averse to nominal wage cuts. 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.

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 a nominal shock capturing the aggregate state of the economy (e.g., a shock to nominal aggregate demand) 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, then the employee will exert the contractually agreed effort, which is chosen by the firm. If the contract is incomplete, then the employee will have discretion over the effort to exert.[5] The aggregate state of the economy evolves according to $Z = Z_{-1}\exp(\Pi + \varepsilon)$, where Π is the inflation rate and $\varepsilon \overset{\text{IID}}{\sim} N(0,\sigma^2)$ – the subscript $_{-1}$ denotes backward values.

After observing the aggregate state of the economy, the firm makes a take-it-or-leave-it nominal wage offer W to the employee, who then decides whether to accept, stay employed,

[5] In an earlier working paper version of this manuscript, 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 provided 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 that we now describe.

and begin producing, or quit and become unemployed.[6] 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.[7]

2.2.2 Complete contracts

Under a complete employment contract, the employee has no discretion and will exert the agreed level of effort: $E = e^c \in (0, \bar{e}]$. This case reflects a standard approach in the literature, in which 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:

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

In this case, it is straightforward to deduce that the firm would want the employee to exert the highest possible effort and to set the lowest possible wage, where a necessary condition to be profitable is that $\bar{e} > \phi$. 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 set by the firm changes smoothly with changes in the aggregate state of the economy, implying that the firm can adjust freely in response to shocks.[8]

[6] 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.

[7] 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 in which agents are forward-looking, see Dickson and Fongoni (2019) and Elsby (2009). Fongoni (2022) extends this framework to include search frictions.

[8] 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.

2.2.3 Incomplete contracts

Consider now the case in which the employee has, at least in part, some degree of discretion over how much effort to exert. Discretionary effort, denoted by $e^d > 0$, is not contractible by the firm. We consider e^d to come from an effort function that is assumed rather than derived from the employee's optimal choice. In Appendix A, we show how such an effort function can be derived from a model based on reference dependence, loss aversion, and the effect of wage changes on work morale.[9] 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}:[10]

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

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 based on 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.

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 as follows:

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

When the contract is incomplete, the firm will optimally consider the effect that wage changes can have 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

[9] 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 adopted here. Other models of incomplete employment contracts that assume a kinked, reduced-form, effort function are Eliaz and Spiegler (2014), Elsby (2009), and Kaur (2019).

[10] 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).

employee's effort. Moreover, as the firm expects their employee to be averse to wage cuts, they will refrain from cutting the wage whenever the benefit is more than offset by the reduction in output due to the employee's negative effort response.

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

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

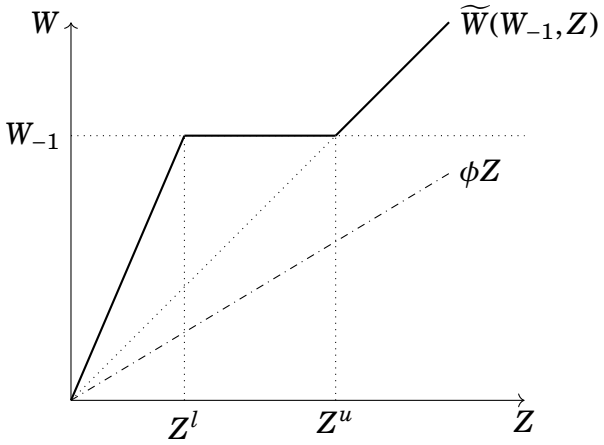
whereby

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

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 (see Figure 1 below). This range is non-empty due to the employee being particularly averse to nominal wage cuts.

FIGURE 1: Optimal wage and contractual incompleteness



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 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, in the form of information sharing and increased participation in decision-making, 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 in the event of a nominal wage cut. Involvement could also be interpreted more generally as any managerial practice which tends 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 part of the key features of the employment contract.

Alternatively, involvement practices could be viewed as a device by which the firm informs the employee about the state of the economy, influencing their perception of fairness. The more employees are involved in the decision-making process, the more they understand the economic and financial conditions of their firm, 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 state of the economy when forming their reference wage (the model of the previous section being a special case with $\beta = 0$). This approach would imply that, as long as $\beta > 0$, employees expect procyclical wage changes. The firm can then cut wages following negative shocks, without the cost of a disproportionate drop in their employee's effort.

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

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

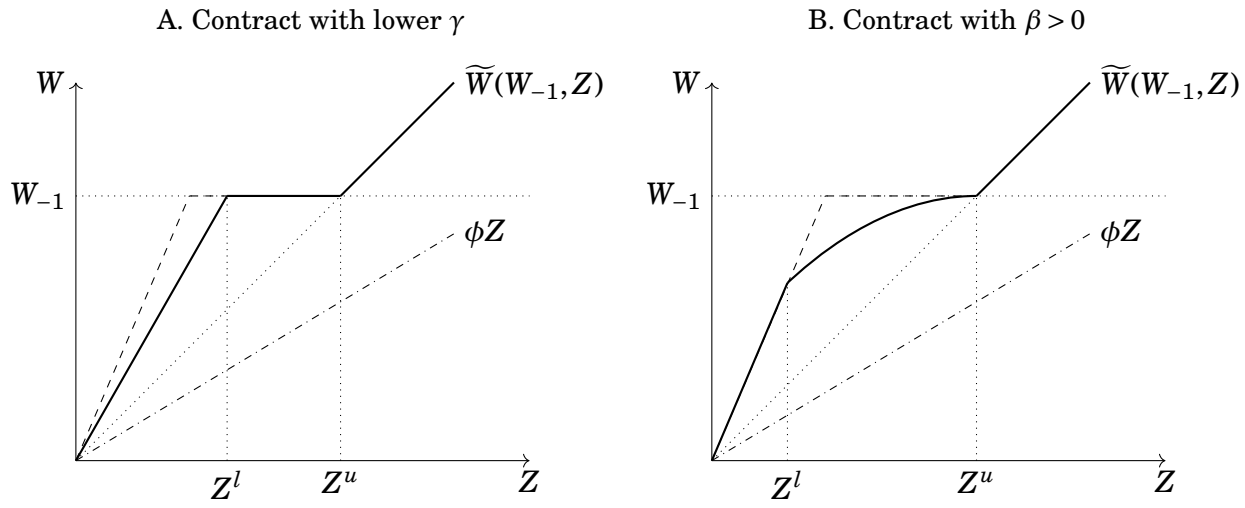
whereby

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

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 also Figure 2 below).

FIGURE 2: Effect of employee involvement.



2.3 Empirical predictions

We use the conceptual framework developed in this section 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 with job stayers viewed as having complete contracts.*

Second, we have discussed how employee involvement in workplace decision-making may affect the firm's trade-off between wages and effort under incomplete contracts. This suggests that employee involvement 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 in decision-making 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 involvement in decision-making. Importantly, since wages are set by the firm, it is the employer's perspective on these two dimensions of an employment contract that are most relevant. In the remainder of the paper, we construct a dataset to test both of 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 percent 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, but 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 analyse two wage measures: the nominal basic wage per hour and the gross wage per hour. The basic wage, typically a salary or an hourly wage rate, is an employee's earnings before any extra payments. The ASHE contains information on both 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 (2022) show that the basic wage in ASHE accounts for over 90 percent 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, 2022, 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. We divide weekly nominal gross earnings by total weekly hours worked (basic hours plus overtime hours) to obtain gross earnings per hour, hereafter referred to as the 'gross wage'.

[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). For the latter, also see the description and analysis of the 2004 WERS by Kersley et al. (2013).

[12] Hourly wages can decline year-to-year either because earnings decline while hours worked remain constant, or because 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 empirical analysis.

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 with respect to this occupational group.[14]

The two key variables in the WERS that we are interested in are the following. First, managers were asked to what extent employees "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 answered either 'A lot' or 'Some'. The second key variable is 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." If managers indicated that they either 'Strongly agree(d)' or 'Agree(d)', then we say that employees are perceived as being involved in workplace decision-making. 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, which is why we link it with the ASHE.

3.2 ASHE–WERS dataset and sample construction

To link the ASHE and WERS datasets we use firm identifiers as described by Davis and Welpton (2008). This allows us to use the ASHE to track the previous and subsequent careers of employees who were in workplaces observed in the 2004 WERS. The 2004 link gives us 5,922 jobs (employer-employee matches). 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 number of employees and workplaces in our matched ASHE-WERS dataset is displayed in Table 1 below. In total, we have 14,819 employee-year observations, obtained by tracking employees over time who stayed in the same firm from year-to-year. Starting with the link in 2004, we use the employee and firm identifiers in the ASHE to track firm

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

[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.

stayers forwards and backwards for two years, such that we have observations for 2002-06.[16] Before linking to the WERS, we also trimmed the top and bottom one percent 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	3,322	447
2003-04	4,234	511
2004-05	4,060	500
2005-06	3,203	415
Total	14,819	1,873
Unique	5,021	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. Out of those 4,234 employees, 3,322 employees were employed by the same firm again in 2002 and 2003. The forward-linking follows a similar pattern.

Our focus is 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 will report the results for both definitions. We define a 'cut' as a year-to-year negative change in wages that exceeds -0.5 log points.[17] Our variables of interest for discretion and involvement are only observed for the year 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 in the absence of large shocks. However, any random, unobserved changes to workplace characteristics would have the effect of classical measurement error, attenuating our regression model estimates toward zero.

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. In our matched dataset, firms are on

[16] For years prior to 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 forwards, 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] We follow the recommendation in Schaefer and Singleton (2022) by using year-to-year basic wage changes of more than -0.5 log points as defining a basic wage cut. This definition takes into account the presence of small measurement errors in the data on hours worked in ASHE (see Schaefer and Singleton (2022) 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.

average larger than in the ASHE, and basic wage cuts and freezes occur less frequently. Gross wages, which are the sum of basic wages and all extra pay components (overtime pay, shift premium pay, incentive pay, and other pay such as meal allowances), are cut more frequently than basic wages; on average 25.7 percent of job stayers in the ASHE experience year-to-year cuts in gross wages (24.2 percent in the linked ASHE-WERS sample). Around 52.9 percent of job stayers in the ASHE receive no other pay in addition to basic wages, compared with 45 percent in the linked dataset. Overtime pay is earned by 32.5 percent of job stayers in the ASHE, compared with 31.3 in the linked dataset. The average hourly basic wage in our sample is £12.82, 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 higher share of public sector employees than the ASHE (44.8% vs. 63.3%, respectively).[18] The higher share of public sector employees is also associated with a higher share of employees whose pay is set with reference to a union agreement: 33.7% in the ASHE and 49.1% in our matched dataset.

TABLE 2: Sample averages (shares) of outcomes and characteristics for job stayers in ASHE and ASHE-WERS

	ASHE 2003-04	ASHE-WERS 2002-06
Basic wage cuts	0.181	0.146
Basic wage freezes	0.096	0.055
Gross wage cuts	0.257	0.242
Gross wage freezes	0.068	0.041
Only basic wage	0.529	0.450
Has overtime pay	0.325	0.313
Male	0.513	0.509
Age (years)	42.08	42.38
Hourly basic wage	£10.93	£12.82
Full-time	0.757	0.801
Private sector	0.633	0.448
Collective agreement	0.337	0.491
Firm size (N. employees)	17,736	19,942
Firm growth, year-to-year	0.2%	0.4%
N: job stayers	103,856	14,819

Notes: 'Basic wages' give weekly basic earnings divided by weekly basic hours worked. 'Gross wages' give weekly basic earnings plus extra pay divided by basic hours worked plus overtime hours. 'Full-time' gives the share of employees who work more than 30 hours per week. 'Firm size' refers to the total number of employees in the firm, and 'Firm growth' refers to the year-to-year percent change in the total number of employees in the firm. Variables such as age and firm size refer to the second linked year of a job-stayer observation.

[18]The employment figures of firms in the ASHE dataset come from the Inter-Departmental Business Register (IDBR), which is 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.

Table 3 displays the distribution of job stayers across industries in the ASHE and in our ASHE-WERS baseline sample. The two distributions are roughly similar, except that our baseline sample under-represents job stayers in industries with UK 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 in workplace decision-making across industries. In our baseline sample, the largest share of job stayers with no discretion is employed by firms in industries with UK SIC code 01-49 (Agriculture, Hunting and Forestry; Fishing; Mining and Quarrying; Manufacturing; Electricity, Gas and Water Supply; Construction). The large majority of job stayers who are perceived as having some discretion and involvement is employed in industries with UK SIC code 75-89 (Public Administration and Defence; Compulsory Social Security; Education; Health and Social Work).

TABLE 3: Shares of job stayers across industries (%), 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	103,856	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;
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 in workplace decision-making; (3) Employees who have some discretion and are involved in workplace decision-making. Table 4 displays descriptive statistics for each group. The percentage of

employees who are perceived as having no discretion and receive only basic wages is 36.1 percent, which is *smaller* than among employees with discretion. This is perhaps surprising, because extra pay components, such as incentive pay, are likely used by firms to motivate employees. Table 4 also shows that employees with no discretion tend to experience basic wage cuts (17.2 percent) more frequently than employees with discretion (13.0 and 13.4 percent). Once we consider extra pay components, the pattern is similar. The percentage of year-to-year gross wage cuts is 28.4 percent among job stayers with no discretion, compared with 22 percent among job stayers with discretion. Moreover, the hourly basic wage of job stayers with no discretion is £12.12, which is lower than among 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.

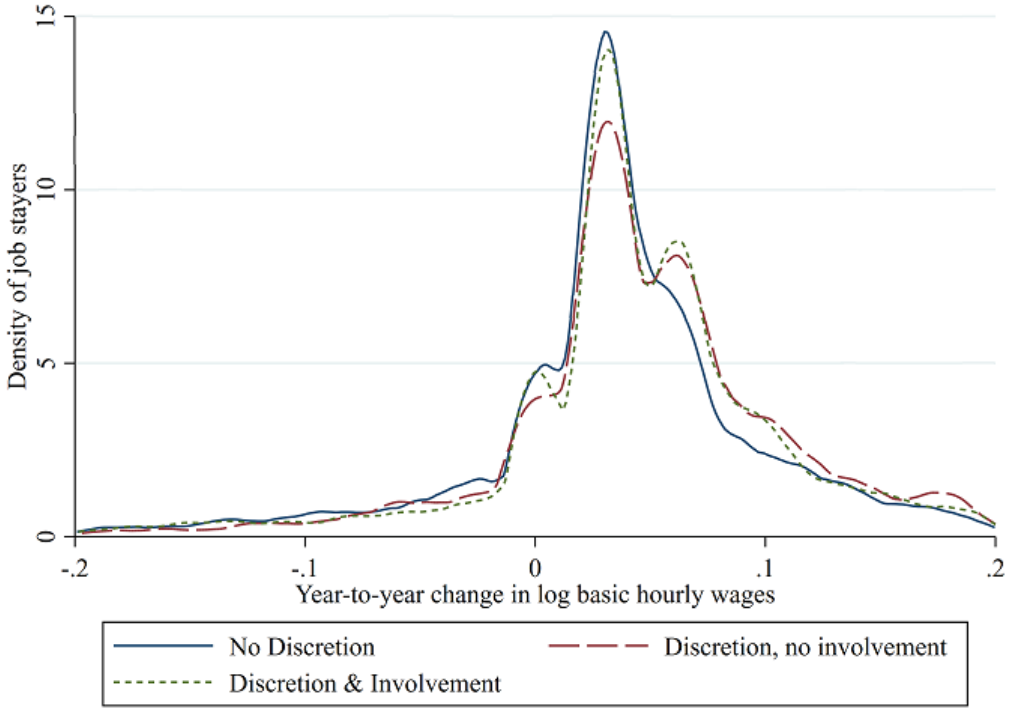
TABLE 4: Sample averages (shares) of outcomes and characteristics for job stayers in the ASHE-WERS, 2002-06, according to the presence of discretion and involvement

	No discretion	Discretion & no involvement	Discretion & involvement
Basic wage cuts	0.172	0.130	0.134
Basic wage freezes	0.056	0.051	0.054
Gross wage cuts	0.284	0.222	0.220
Gross wage freezes	0.036	0.040	0.044
Only basic wages	0.361	0.448	0.507
Has overtime pay	0.356	0.343	0.278
Male	0.611	0.498	0.448
Age (years)	41.37	42.49	43.00
Hourly basic wage	£12.12	£13.97	£12.94
Full-time	0.825	0.781	0.792
Private sector	0.676	0.447	0.307
Union agreement	0.348	0.486	0.584
Firm size (N. employees)	27,931	12,597	16,974
Firm growth, year-to-year	−0.5%	0.5%	0.9%
N: job stayers	4,906	2,230	7,683

Notes: See Table 2.

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 different groups of employees. We compare employees who are perceived as having no discretion in how they perform their work with employees who have some discretion, where the latter group is further split depending on whether managers perceive they are also involved in workplace decision-making or not.

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 Tables 2-4. 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 both wage cuts and wage freezes more frequently, as well as lower wage growth. The relationship between involvement and nominal wage changes among employees who have some discretion is less clear in Figure 3. Although employees who are involved in decision-making 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 in decision-making are less likely to see their wages grow by more than ten log points relative to those without involvement.

4. Empirical framework and results

To control for differences in observable characteristics between employees, 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:

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

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 main 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 in workplace decision-making, and is zero otherwise. Both variables Discretion and Involvement are measured in 2004 and 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 also 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 involved in decision-making at their workplace. 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 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 basic wage.

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 main potential sources of statistical endogeneity: reverse causality and omitted variables. First, 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 extent 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. Second, omitted variables pose a concern in our analysis. For example, certain firms may exhibit greater discretion and involvement due to the adoption of modern management practices. These firms may also be less likely to experience adverse demand shocks and subsequent wage cuts, owing to their management's better foresight. This situation may lead to overestimates of the true effects of discretion and involvement on the likelihood of wages being cut. Despite these potential issues, we consider the coefficient estimates obtained from Equation (9) as a valuable contribution to the literature. These estimates, however imperfect, provide the first quantitative evidence of the relationship between the likelihood of employee wage cuts and the presence of discretion (contractual incompleteness) and involvement in the workplace.

4.1 Results

Table 5, panel A, column (1), shows that basic wage cuts are significantly less likely when managers think that their employees have some discretion over effort but are not involved in decision-making. The corresponding predicted probability in panel B indicates that an employee who is not involved in decision-making is 6.5 percentage points (19.4-12.9=6.5) less likely to receive a wage cut if they have some discretion. This finding supports Prediction 1. The association between involvement in decision-making and the likelihood of a wage cut is negative, but not statistically significant. The estimated coefficient of the interaction term is positive, consistent with Prediction 2, but also not significant.

Column (2) of Table 5 displays the estimates and predicted probabilities when we include additional 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 9 percentage points (20.6 - 11.6 = 9) when not involved in decision-making. 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 in decision-making, supporting Prediction 2. On average, the probability of a wage cut is higher by 0.7 percentage points (12.3-11.6=0.7) for a job stayer who has some discretion and who is also involved in decision-making, relative to a job stayer who is not involved but still has discretion. The significant negative coefficient on Involvement by itself suggests that there is not a general tendency of firms to adopt involvement practices to enable wage cuts. We also find that the higher the basic wage in the previous year, the more likely are year-to-year wage cuts and that employees working more than 30 hours per week (full-time) are significantly less likely to experience cuts. These

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

	Baseline sample (1)	(1) with added controls (2)	(2) for 3-digit occupation match (3)
Panel A. Coefficient estimates			
Discretion (ω_1)	-0.266^{***}	-0.374^{***}	-0.543^{***}
	(0.095)	(0.085)	(0.135)
Involvement (ω_2)	-0.111	-0.179^{**}	-0.245^{**}
	(0.115)	(0.073)	(0.122)
Discretion × Involvement (ω_3)	0.129	0.216^{**}	0.339^{**}
	(0.135)	(0.098)	(0.163)
Male (β_1)		-0.012	-0.075
		(0.044)	(0.075)
Age (β_2)		-0.007	-0.028^{*}
		(0.009)	(0.015)
Age^2 (β_3)		0.000	0.000^{*}
		(0.000)	(0.000)
PrivateSector (γ_1)		-0.019	0.111
		(0.088)	(0.114)
ln(FirmSize) (γ_2)		0.048^{**}	0.083^{**}
		(0.022)	(0.037)
Δln(FirmSize) (γ_3)		0.066	0.252
		(0.097)	(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)		0.440^{***}	0.566^{***}
		(0.051)	(0.092)
Constant (ω_0)	-0.891^{***}	-1.948^{***}	-1.890^{***}
	(0.075)	(0.247)	(0.511)
Year-fixed effects	✓	✓	✓
Panel B. Predicted probabilities (at sample means)			
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.

estimation results also suggest that employees in larger firms are significantly more likely to experience wage cuts, and whether an employee is working for a firm with a growing or shrinking number of employees does not significantly affect the likelihood of receiving cuts.

As described earlier, the WERS collects information about employee discretion and involvement in the most common 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. This decreases our sample size but should decrease possible attenuation bias due to measurement errors in the Discretion and Involvement variables at the employee level. Indeed, the estimated negative association between Discretion without 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 in decision-making. When employees have no discretion, the association between Involvement and wage cuts is significantly negative. The estimated coefficient on the interaction term using this more selected sample is, again, significantly positive – the predicted probability of a wage cut increases by 2 percentage points (13.5-11.5=2), or by almost 20 percent, for a job stayer with discretion who is also involved in decision-making.

4.2 Robustness checks

Variation within occupations

Our results raise the question of whether firms with discretion are different 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 6 the shares of job stayers within sub-major occupations 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 percent), and most of them are also involved in decision-making at the workplace. At the other extreme are occupations 81-82 (operatives and drivers), in which 74.8 percent 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).

Moving beyond descriptive statistics, we examine how much of the variation in Discretion can be accounted for by occupation groups. 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. The resulting R^2 measures of model fit are 0.28 (1-digit SOC effects); 0.34 (2-digit SOC effects); 0.39 (3-digit SOC effects). This suggests that even minor 3-digit occupation categories can explain at most 39 percent of the variance in Discretion.

How much variation in Discretion and the likelihood of wage cuts is left *within* occupations? To answer this question, Table 7 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 (see Table 6). We find that the association between Discretion and wage cuts is weaker, though not zero, within 1-digit major occupation groups. 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 in decision-making, and only with a lower likelihood of 0.8 percentage points (14.6-13.8) among other job stayers.

TABLE 6: Shares of job stayers with discretion and involvement, and nominal wage cuts, by occupation sub-major group

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	0.171
33-34	0.186	0.114	0.701	0.161
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 (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)

TABLE 7: Probit estimates for the likelihood of year-to-year nominal cuts: occupation group fixed effects, basic wages, and gross wages

	3-digit occ. match (1)	(1) with 1-digit occ. effects (2)	(1) with 2-digit occ. effects (3)	(1) basic wage income only (4)	(1) Using gross wages (5)
Panel A. Coefficient estimates					
Discretion (ω_1)	-0.543^{***}	-0.290^{**}	-0.176	-0.510^{**}	-0.272^{**}
	(0.135)	(0.122)	(0.122)	(0.214)	(0.071)
Involvement (ω_2)	-0.245^{**}	-0.205^{*}	-0.156	-0.181	0.070
	(0.122)	(0.121)	(0.123)	(0.259)	(0.082)
Discretion × Involvement (ω_3)	0.339^{**}	0.254	0.155	0.307	0.010
	(0.163)	(0.160)	(0.159)	(0.299)	(0.114)
Covariates included	✓	✓	✓	✓	✓
Year-fixed effects	✓	✓	✓	✓	✓
Panel B. Predicted probabilities (at sample means)					
Discretion × Involvement:					
0×0	0.256	0.199	0.174	0.216	0.304
0×1	0.184	0.146	0.136	0.166	0.329
1×0	0.115	0.128	0.132	0.097	0.216
1×1	0.135	0.138	0.132	0.121	0.240
N: job stayers	4,091	4,091	4,091	1,722	4,091

Notes: Results for job stayers in the sample of matched 3-digit occupations, controlling for year-fixed effects and observable characteristics as in Equation (9) and the estimates shown in column (3) of Table 5.
***, **, * 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.

Extra pay components and gross wages

One concern is that the large coefficient estimates for Discretion on the likelihood of basic wage cuts could be driven by the presence of extra pay components. 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 job. In such cases, firms might be able to cut pay along this margin rather than having to cut 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 (4) of Table 7 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=11.9) 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 of basic wages and extra pay (column (5) of Table 7). The coefficient estimate of Involvement is in this case insignificant: there is no evidence that involvement in decision-making relates to the likelihood of cuts in employee gross wages. However, we find that Discretion is associated with a significant decrease in the likelihood of a gross wage cut.

Variations of benchmark regression models

We experimented with a number of variations to capture the effects of firm growth and other controls, using polynomial terms, but our results remained virtually unchanged. We also included the natural logarithm of the square of basic wages (e.g., to control for the effects of the National Minimum Wage), but the coefficient of this variable was not significant. Finally, we also considered the degree of employee turnover within a firm; if it is easier to replace employees for jobs in which there is no discretion, then we might expect wage cuts to be more prevalent among employees in these jobs. This could be an alternative explanation for why we observe a negative correlation between Discretion and the probability of receiving a wage cut. However, we did not find any evidence that this is the case.

We also 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 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:

$$y_{ijt} = \begin{cases} \text{WageRise}_{ijt} \equiv \ln\left(W_{ijt-1}\right) + 0.005 < \ln\left(W_{ijt}\right) & \text{if} \quad y^*_{ijt} < \kappa_1 \ , \\ \text{WageFreeze}_{ijt} \equiv \ln\left(W_{ijt-1}\right) - 0.005 \leq \ln\left(W_{ijt}\right) \leq \ln\left(W_{ijt-1}\right) + 0.005 & \text{if} \quad \kappa_1 < y^*_{ijt} < \kappa_2 \ , \\ \text{WageCut}_{ijt} \equiv \ln\left(W_{ijt-1}\right) - 0.005 > \ln\left(W_{ijt}\right) & \text{if} \quad y^*_{ijt} > \kappa_2 \ . \end{cases} \tag{10}$$

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 all covariates as described in Equation (9). Table 8 displays the predicted probabilities at sample means for a wage rise, freeze, and cut.[19] An employee who is not involved in decision-making is 14.3 percentage points (26.4-12.1=14.3) 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 = 1.7). 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 8 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=4.8) higher among employees with involvement, and even 16.5 percentage points (84.1-67.6=16.5) higher among employees without involvement. We also find that, conditional on having some discretion, involvement in decision-making decreases the predicted probability of observing

[19] Coefficient estimates are shown in Appendix B, Table B1.

a wage rise by 2.2 percentage points (84.1-81.9=2.2). 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 =2.2). This does not support our theoretical framework. But 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 8: 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	0.841	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 matched 3-digit SOC occupations, controlling for year-fixed effects and observable characteristics as in Equation (9) and the estimates shown in column (3) of Table 5.

5. 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. This may explain why nominal wage cuts are relatively rare. However, evidence of a firm's concerns about the potential costs of nominal wage cuts is mainly based on qualitative surveys and interviews of compensation managers. Much less is known about the quantitative consequences of those concerns, in so far as how 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. In our theoretical framework, we showed that contractual incompleteness and employee involvement in decision-making can be two crucial factors that underly a firm's concern about the cost of implementing nominal wage cuts. We then empirically investigated the two main predictions stemming from our framework, using a novel matched employee-employer dataset from Great Britain, linking payroll wage data with a survey of managers. 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, and cuts become 0.7 to 2 percentage points more likely when, conditional on the employment contract being incomplete, employees are perceived

to be involved in the decision-making process. Our findings on the effects of discretion suggest that firms do tend to act on their concerns about morale and fairness when deciding on whether to cut nominal wages. But, while there are reasons to think that employee involvement can alleviate those concerns, we found that its association with the likelihood of receiving nominal wage cuts is relatively weak compared with discretion.

To the best of our knowledge, this is the first attempt to describe and quantitatively evaluate a form of heterogeneity in the frequency of nominal wage cuts, based on two important, and observable, features of employment contracts. 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.

6. References

Agell, J., and P. Lundborg. 1995. "Theories of Pay and Unemployment: Survey Evidence from Swedish Manufacturing Firms." *Scandinavian Journal of Economics*, 97(2): 295–307.

Agell, J., and P. Lundborg. 2003. "Survey Evidence on Wage Rigidity and Unemployment: Sweden in the 1990s." *Scandinavian Journal of Economics*, 105(1): 15–30.

Bartling, B., and K. M. Schmidt. 2015. "Reference Points, Social Norms, and Fairness in Contract Renegotiations." *Journal of the European Economic Association*, 13(1): 98–129.

Bewley, T. F. 1999. *Why wages don't fall during a recession*. Harvard University Press.

Bewley, T. F. 2007. "Fairness, Reciprocity, and Wage Rigidity." In *Behavioural Economics and Its Applications*. Eds. by P. Diamond, and H. Vartiainen, Princeton University Press.

Blinder, A. S., and D. H. Choi. 1990. "A Shred of Evidence on Theories Of Wage Stickiness." *Quarterly Journal of Economics*, 105(4): 1003–1015.

Bordia, P., E. Hobman, and E. Jones. 2004. "Uncertainty during organizational change: Types, consequences, and management strategies." *Journal of Business & Psychology*, 18(4): 507–532.

Brenzel, H., H. Gartner, and C. Schnabel. 2014. "Wage bargaining or wage posting? Evidence from the employers' side." *Labour Economics*, 29 41–48.

Campbell, C. M., and K. S. Kamlani. 1997. "The Reasons for Wage Rigidity: Evidence From Survey of Firms." *Quarterly Journal of Economics*, 112(3): 759–789.

Card, D. 2022. "Who set your wage?" *American Economic Review*, 112(4): 1075–1090.

Chodorow-Reich, G., and L. Karabarbounis. 2016. "The cyclicality of the opportunity cost of employment." *Journal of Political Economy*, 124(6): 1563–1618.

Christiano, L., M. Eichenbaum, and G. Evans. 2005. "Nominal rigidities and the dynamic effects of a shock to monetary policy." *Journal of Political Economy*, 113(1): 1–45.

Davis, R., and R. Welpton. 2008. "How Does Workplace Monitoring Affect the Gender Wage Differential? Analysis of the Annual Survey of Hours and Earnings and the 2004 Workplace Employment Relations Survey - A Research Note." *British Journal of Industrial Relations*, 46(4): 732–749.

Department for Business, Innovation and Skills, National Institute of Economic and Social Research, Advisory, Conciliation and Arbitration Service, Policy Studies Institute. 2018. "Workplace Employment Relations Survey: 1998-2011: Secure Access. [data collection]." 5th Edition. UK Data Service. SN: 6712, DOI: 10.5255/UKDA-SN-6712-5.

Dickson, A., and M. Fongoni. 2019. "Asymmetric reference-dependent reciprocity, downward wage rigidity, and the employment contract." *Journal of Economic Behavior & Organization*, 163(3): 409–429.

Eliaz, K., and R. Spiegler. 2014. "Reference Dependence and Labor-Market Fluctuations." *NBER Macroeconomics Annual*, 28: 159–200.

Elsby, M. W. L. 2009. "Evaluating the economic significance of downward nominal wage rigidity." *Journal of Monetary Economics*, 56(2): 154–169.

Elsby, M. W. L., D. Shin, and G. Solon. 2016. "Wage Adjustment in the Great Recession and Other Downturns: Evidence from the United States and Great Britain." *Journal of Labor Economics*, 34(S1): S249–S291.

Elsby, M. W. L., and G. Solon. 2019. "How Prevalent Is Downward Rigidity in Nominal Wages? International Evidence from Payroll Records and Pay Slips." *Journal of Economic Perspectives*, 33(3): 185–201.

Fehr, E., L. Goette, and C. Zehnder. 2009. "A Behavioral Account of the Labor Market: The Role of Fairness Concerns." *Annual Review of Economics*, 1(1): 355–384.

Fehr, E., O. Hart, and C. Zehnder. 2011. "Contracts as Reference Points - Experimental Evidence." *American Economic Review*, 101(2): 493–525.

Fongoni, M. 2022. "Asymmetric reciprocity and the cyclical behaviour of wages, effort, and job creation." *Mimeo*.

Freeman, R. B., and M. M. Kleiner. 2000. "Who benefits most from employee involvement: firms or workers?" *American Economic Review*, 90(2): 219–223.

Greenberg, J. 1990. "Employee theft as a reaction to underpayment inequity: The hidden cost of pay cuts." *Journal of Applied Psychology*, 75(5): 561–568.

Grigsby, J., E. Hurst, and A. Yildirmaz. 2021. "Aggregate Nominal Wage Adjustments: New Evidence from Administrative Payroll Data." *American Economic Review*, 111(2): 428–471.

Guido, A., A. Martinez-Marquina, and R. Rholes. 2022. "Reference dependence and the role of information frictions." *Gredeg Working Paper 2022–17*.

Hall, R. E. 2005. "Employment Fluctuations with Equilibrium Wage Stickiness." *American Economic Review*, 95(1): 50–65.

Hall, R. E., and A. B. Krueger. 2012. "Evidence on the Incidence of Wage Posting, Wage Bargaining, and On-the-Job Search." *American Economic Journal: Macroeconomics*, 4(4): 56–67.

Hall, R. E., and P. R. Milgrom. 2008. "The limited influence of unemployment on the wage bargain." *American Economic Review*, 98(4): 1653–74.

Herz, H., and D. Taubinsky. 2017. "What Makes a Price Fair? An Experimental Study of Transaction Experience and Endogenous Fairness Views." *Journal of the European Economic Association*, 16(2): 316–352.

Kahn, S. 1997. "Evidence of Nominal Wage Stickiness from Microdata." *American Economic Review*, 87(5): 993–1008.

Kahneman, D., J. L. Knetsch, and R. H. Thaler. 1986. "Fairness and the Assumptions of Economics." *Journal of Business*, 59(4): 285–300.

Kaufman, R. T. 1984. "On Wage Stickiness in Britain's Competitive Sector." *British Journal of Industrial Relations*, 22(1): 101–112.

Kaur, S. 2019. "Nominal Wage Rigidity in Village Labor Markets." *American Economic Review*, 109(10): 3585–3616.

Kersley, B., C. Alpin, J. Forth, A. Bryson, H. Bewley, G. Dix, and S. Oxenbridge. 2013. *Inside the workplace: Findings from the 2004 Workplace Employment Relations Survey*. Routledge.

Krueger, M., and G. Friebel. 2022. "A pay change and its long-term consequences." *Journal of Labor Economics*, 40(3): 543–572.

Kube, S., M. A. Maréchal, and C. Puppe. 2013. "Do Wage Cuts Damage Work Morale? Evidence from a Natural Field Experiment." *Journal of the European Economic Association*, 11(4): 853–870.

Manning, A. 2021. "Monopsony in labor markets: A review." *ILR Review*, 74(1): 3–26.

Office for National Statistics. 2022. "Annual Survey of Hours and Earnings, 1997-2022: Secure Access. [data collection]." 21st Edition. UK Data Service. SN: 6689, http://doi.org/10.5255/UKDA-SN-6689-20.

Okun, A. M. 1981. *Prices and Quantities: A Macroeconomic Analysis*. Basil Blackwell Publisher.

Pissarides, C. A. 2000. *Equilibrium Unemployment Theory*. MIT Press.

Sandvik, J., R. Saouma, N. Seegert, and C. Stanton. 2021. "Employee responses to compensation changes: Evidence from a sales firm." *Management Science*, 67(12): 7687–7707.

Schaefer, D., and C. Singleton. 2019. "Cyclical Labor Costs Within Jobs." *European Economic Review*, 120.

Schaefer, D., and C. Singleton. 2020. "Recent changes in British wage inequality: Evidence from large firms and occupations." *Scottish Journal of Political Economy*, 67(1): 100–125.

Schaefer, D., and C. Singleton. 2022. "The Extent of Downward Nominal Wage Rigidity: New Evidence from Payroll Data." *Review of Economic Dynamics*, forthcoming.

Schaubroeck, J., D. R. May, and F. W. Brown. 1994. "Procedural justice explanations and employee reactions to economic hardship: A field experiment." *Journal of Applied Psychology*, 79(3): 455–460.

Schmitt-Grohé, S., and M. Uribe. 2016. "Downward Nominal Wage Rigidity, Currency Pegs, and Involuntary Unemployment." *Journal of Political Economy*, 124(5): 1466–1514.

Sliwka, D., and P. Werner. 2017. "Wage Increases and the Dynamics of Reciprocity." *Journal of Labor Economics*, 35(2): 293–344.

Timming, A. 2012. "Tracing the effects of employee involvement and participation on trust in managers: an analysis of covariance structures." *International Journal of Human Resource Management*, 23(15): 3243–3257.

Wang, W., and R. Seifert. 2017. "Pay reductions and work attitudes: the moderating effect of employee involvement practices." *Employee Relations*, 39(7): 935–950.

Williamson, O. E. 1985. *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. The Free Press.

Appendix A. Further details of the model

In this section, we provide 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:

$$u(e^d, W, R) = W - [0.5(e^d)^2 - be^d] + M(e^d, W, R). \tag{11}$$

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:

$$M(e^d, W, R) = e^d \mu(\ln W - \ln R)\,, \tag{12}$$

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 (12) 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 (11), 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 optimal wage-setting problem

We begin by studying the optimal wage-setting problem of the firm in (3), in which the employee reference wage is R. We then comment on how the resulting 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 in the form of information sharing), we obtain the results established by Proposition 2 as required.

Appendix B. Additional Tables and Figures

TABLE B1: Ordered probit estimates for the likelihood of a year-to-year wage freeze and cut compared to a wage rise

	Estimate
Panel A. 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)
Δ ln(FirmSize)	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 matched 3-digit occupations. Covariates given by Equation (9).
***, **, * indicate significance from one 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.