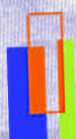


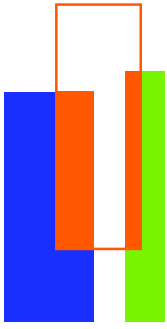
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Job  
satisfaction  
and wage  
dispersion

Mari Kangasniemi





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# 278

## Job satisfaction and wage dispersion

Mari Kangasniemi\*

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## **TIIVISTELMÄ**

Tutkimuksessa tarkastellaan toimipaikkojen palkkahajonnan yhteyttä erilaisiin työntekijöiden subjektiivisen hyvinvoinnin mittareihin. Analyysissä hyödynnetään työolotutkimusta yhdistettynä rekisteripohjaiseen toimipaikka-työntekijäaineistoon, mikä mahdollistaa toimipaikkojen palkkaerojen mittaamisen luotettavasti. Käytettyjä hyvinvoinnin mittareita ovat työtyytyväisyys, palkkatyytyväisyys, halukkuus vaihtaa työpaikkaa, näkemys syrjinnästä työpaikalla ja se, kuinka usein saa tukea ja kannustusta työtovereilta. Subjektiivinen hyvinvointi ja palkkaerot voivat olla yhteydessä toisiinsa joko siksi, että palkkaerot vaikuttavat työntekijän tulkintaan oman palkkansa tai tulevan palkkansa suuruudesta tai siksi, että he välittävät yleisesti oikeudenmukaisesta palkkauksesta ja hajonta kertoo tästä jotain. Tulosten mukaan ei ole yksiselitteistä yhteyttä hajonnan ja hyvinvointimittareiden välillä, mutta kun kiinnitetään palkkausjärjestelmä erityyppisiksi tulospalkkausjärjestelmiksi, joitakin merkittäviä vaikutuksia on havaittavissa. Näyttäisi myös siltä, että palkkauksen läpinäkyvyydellä on merkitystä.

## **ABSTRACT**

This paper investigates the links between a number of subjective measures of worker wellbeing and within establishment wage dispersion. These may be linked either because wage dispersion influences the way in which individuals perceive their own relative and prospective income or because they are concerned about fairness in general. The analysis is based on a data set where the Quality of Work Survey is matched with register-based information on individuals and establishments. The results show that there is no significant overall association. Some significant relationships, however, can be found if the method of pay is assumed to be performance pay that is based on individual or group performance. The results also suggest that the question as to whether wages are public knowledge can be of importance.

## **INTRODUCTION**

There has been an upsurge of interest in using subjective measures of welfare in empirical economics. Usually the aim is to get a better hold of the actual level of utility that in the more traditional approach has been considered as implicit. In labour economics, this has given rise to an increasing number of studies on job satisfaction. As job satisfaction is often considered as a

predictor of quits and early retirement, studies relating to job satisfaction are also policy-relevant, especially in the European countries that are struggling with an ageing labour force. Though it is fairly well known that performance-related incentive schemes that increase wage dispersion may improve productivity (Lazear 2000), it is also often assumed, in public discussion on welfare at work, that a “too competitive” work environment may also have a direct negative impact on employees’ welfare, for example through increased stress. Theoretical arguments have also been presented on why wage structures rewarding individual performance may be detrimental for effort, for example through the lack of co-operation or a negative impact on intrinsic motivation (see e.g. Benabou and Tirole 2003, Frey and Jegen 2001).

Empirical evidence, however, is not clear about the total impact of wage structures on welfare. Clark et al. (2009) have shown in the spirit of income comparison literature that the signal effect of co-worker earnings may be larger than the envy effect. The literature on reciprocity and intrinsic motivation suggests that there may also be other channels of influence. The main aim of this paper is to explore whether wage dispersion within establishments is related to various measures of employee welfare and behaviour. I attempt to complement a traditional study of job satisfaction with considerations regarding fairness and co-operation as well as the joint effects of methods of pay and wage dispersion. The aim is to explicitly test the hypothesis whether within establishment wage dispersion has, on average, an impact on self-reported job satisfaction. Job satisfaction is a very general measure, and there is little variation in the responses: most respondents are either satisfied or very satisfied with their job. Therefore, in addition to job satisfaction, I investigate the relationship between wage dispersion and wage satisfaction, the willingness to change jobs, perceived fairness and a subjective measure of co-worker support.

The main contribution of the paper is an empirical analysis of a matched data set that allows me to take advantage of both a comprehensive survey of employees with a number of subjective assessments of different aspects of working life and reliable register-based data on wages and personal characteristics. The latter is used to calculate the measures of within-establishment wage dispersion. I ease the problems arising from the lack of a panel dimension by including a large set of explanatory variables which are likely to control for a significant part of the individual- and firm-specific fixed effects and reduce the bias arising from endogeneity.

The main findings suggest that wage dispersion in general has no significant average marginal effect on the levels of job or wage satisfaction, intentions to change jobs or the degree of perceived discrimination or help and support received from colleagues. However, when I assume a certain

method of pay or split the sample according to whether wages are common knowledge, a few statistically significant associations can be found. When performance pay based on the performance of a group of workers is assumed, a higher level of wage dispersion implies a lower probability to be very satisfied with the job. The probability of always receiving help and support from one's colleagues increases with wage dispersion in the subsample where wages are public knowledge, and I assume individual performance pay for all individuals. In the subsample where wages are not public knowledge the opposite holds. A lower probability of intention to change jobs to a different field is associated with higher pay dispersion if individual performance pay is assumed for all individuals. The average impacts on wage satisfaction and the index of perceived discrimination are not significant, and whether wages are public knowledge makes little difference. I find some evidence of the role of the individual location in the wage distribution: for people higher in the distribution higher dispersion is associated with a higher probability of them considering their pay as "fair" or "high". Similarly, a high position in the distribution will decrease the amount of perceived discrimination in the subsample where wages are public knowledge.

My interpretation of the results is that the impact of wage dispersion is dependent, among other things, on methods of pay and the factors underlying these, such as the nature of production. Selection of individuals into jobs probably further reinforces these associations. The people who work in jobs where individual performance is emphasised are more risk-tolerant and may assume their chances of upward mobility are high. Due to selection, the results do not allow firm conclusions about how job satisfaction would change for a given establishment if wage dispersion suddenly changed. This would require a study using a data set with a panel dimension or the use of an instrumental variable. We also have only a few or often just one observation per establishment, which does not allow for controlling for establishment-fixed effects.

Another significant determinant of the association between wage dispersion and subjective welfare is how people perceive other individuals' wages. The results mentioned above regarding an individual's location in the wage distribution indicate that people do indeed compare their incomes with those of their colleagues. In the light of this, it seems plausible that a degree of transparency is required for attaining a supportive environment when rewards depend on performance. Further research, however, is required to study the role of organisations and transparency.

The paper is structured as follows: in section 2 I outline theories explaining the possible relationship between wage dispersion and job satisfaction and discuss the existing literature on related topics, in section 3 I describe the data and the methods and in section 4 I report the results. Section 5 concludes.

## **THEORETICAL BACKGROUND AND PREVIOUS RESEARCH**

The theory of job satisfaction in economics, on the one hand, is less well developed than that of wage formation. Despite its shortcomings, self-reported job satisfaction, however, has been found to be a relatively consistent measure of underlying utility (Kristensen and Westergaard-Nielsen 2007). The approach I apply in this paper is to assume that job satisfaction is a reliable composite measure of overall utility that reflects many aspects of the job: satisfaction with pay as well as future prospects at work and overall working conditions. On the other hand, as such it is very general and it is often difficult to point out the exact reasons why certain features of the workplace or the individual increase or decrease job satisfaction. I therefore complement it with several other measures of subjective perceptions of the “goodness” of the workplace. These measures will help to disentangle what role, if any, satisfaction with one’s wage, non-wage characteristics, perceptions of fairness and equality at work and co-worker relationships and expressions of reciprocity play in explaining the possible impact of wage dispersion.

There is a fair amount of existing work on job satisfaction. It has been shown that one’s own wage or a relative wage that is higher usually implies higher job satisfaction: this is also the result when the endogeneity of wage is controlled for (Lydon and Chevalier 2002). Furthermore, Clark et al. (2009) have shown that prospects of a higher wage in the future increase job satisfaction. On the other hand, Card et al. (2011) have shown that revelations about an individual’s position in the distribution may have a significant negative impact on job satisfaction for those whose wage is below the median.

If wage dispersion implies something about the individual’s future pay, it may have an impact on the observed levels of satisfaction. If high dispersion is combined with wage mobility it may imply higher expected pay growth for those who assume they are capable of improving their position in the pay hierarchy. On the other hand, even with a reasonable degree of wage mobility, more dispersion may mean a higher income risk unless it is certain the person will improve their pay. Thus, the implications for individual welfare depend on the individual level of risk aversion as well as assumptions about one’s ability to climb the job ladder within the establishment. In the light of Card et al.’s (2011) results it has to be emphasised that the impact of wage dispersion may be highly dependent on what individuals know or assume to know about other people’s wages. Naturally, knowledge of their effort or contents of their jobs may also be significant.

Methods of pay are naturally important determinants of both productivity and wage dispersion. But they may also influence job satisfaction both directly and indirectly. Performance-related pay typically increases productivity, and also wage dispersion (Lazear 2000, Lemieux et al. 2009). The adoption of performance pay is, however, only sensible and efficient if the nature of the work is such that it is possible to observe and measure either effort or the real objective of work precisely enough. Even when it is possible, there may be significant costs of making a contract complex enough to cover all aspects of a worker's performance. Firm heterogeneity and characteristics of the job clearly have an impact on the optimal compensation scheme, see e.g. Parent (2001).

Generally, people who voluntarily select into performance pay jobs are more productive than those who prefer to work on a fixed pay scheme. They are also likely to be more risk-loving (Cornelissen et al. 2011). This has also been shown in experiments (Dohmen and Falk, 2011). Therefore, they may not suffer from the wage uncertainty that performance-related methods of pay involve. It is clear, however, that even in the presence of performance-related pay, if wage differentials are not well grounded, "too" large or random dispersion may lead to dissatisfaction. Optimally, firms would only use performance-related pay when it was efficient to do so, but in reality it is possible that the methods of pay that are used are not always fully optimal at each point in time.

In addition to the simple fact that people care about the utility they will derive from their own income or the expectations regarding their future income, they may well be concerned about other things, too. Similarly, their behaviour at work may be driven not just by maximisation of their own current income; their motives may also include, for example, punishing and rewarding either their employer or their co-workers in order to enforce certain norms.

"Psychological" approaches to job satisfaction emphasise the fact that not all facets of an employment relationship are formally contractible; the relationship also includes reciprocity, or behaviour whereby in response to benevolent acts individuals behave in a friendly way and vice versa, and they may engage in this type of behaviour even when it is actually costly for them (Fehr and Gächter 2000). Akerlof (1982) brought up the notion in the economic literature that employment is a "gift relationship" based on mutual reciprocity, and Akerlof and Yellen (1990) formalised the idea that fair pay increases effort.

Co-operation between workers is another element of production where reciprocity plays a role. If the work involves working in a group, rewarding the group together may lead to the so-called 1/n problem, where individual incentives are not strong enough to induce enough effort, as each



individual only receives a reward that is proportional to  $1/n$  of the product of their incremental effort. Therefore, in order to attain optimal productivity there should be an element of reciprocity among workers, whereby the group forces everybody to comply with norms and participate in production by suitably punishing and rewarding its members (Cornelissen et al. 2010). For example, if wage structures within the group reflect rewards that are perceived as unjust the group may punish individual employees by refusing co-operation or support.

Yet another aspect of job satisfaction and worker behaviour that may be relevant for the implications of wage structures for individual welfare is intrinsic motivation. According to the theory, paying for performance in certain circumstances may mean that people lose intrinsic motivation, which thus reduces their effort and makes them feel less happy with the job (see e.g. Benabou and Tirole, 2003 and Frey and Jegen, 2001).

There are relatively few empirical studies that study the linkages between wage dispersion and subjective job satisfaction directly. Pfeffer and Langton (1993) found that increases in wage dispersion lower job satisfaction and reduce co-operation within academic departments. A number of studies have explored the links between methods of pay and job satisfaction. McCausland et al. (2005) show that performance pay increases job satisfaction for highly paid individuals. Green and Heywood's results (2008) indicate that performance pay increases job satisfaction and they find no evidence of it crowding out intrinsic motivation.

A related strain of work concerns links between productivity and wage dispersion. A study by Winter Ebmer and Zweimuller (1999) shows that the relationship between wage dispersion and productivity is hump-shaped, especially for white-collar workers. They explain the result by incentives together with a fairness constraint. Lallemand, Plasman and Rycz (2004) find a positive relationship between wage dispersion and firm performance. Grund and Westergard-Nielsen (2008), on the other hand, find that the relationship between the dispersion of wage increases and firm performance is U-shaped.

A few studies have been conducted on job satisfaction and its relationship with various outcomes in Finland, but to my knowledge the issue of wage inequality has not been touched upon in the existing work. A few studies have concerned related topics: Böckerman et al. (2012) show that there is a weak causal link between job satisfaction and productivity in Finnish manufacturing and Böckerman et al. (2011) examine the relationship between job security and job satisfaction, finding that job insecurity has no effect on job satisfaction.

## DATA

A matched data set consisting of the Quality of Work Survey and a one-third random sample from FLEED (the Finnish Longitudinal Employer–Employee Data) were used for the econometric analysis. The Quality of Work Life Survey (QWLS) is an extensive personal interview survey conducted every 5-7 years to monitor employees' working conditions. The data are collected with personal face-to-face interviews using a standardised questionnaire. The sample is obtained from the labour force survey by drawing it from either employed persons or wage and salary earners. Between 3,000 and 6,500 persons have been interviewed in each round of surveys. The non-response rate in the Quality of Work Life Survey has varied between 8 and 22 per cent<sup>1</sup>. FLEED, on the other hand, contains background information on the population of working age combined with enterprise and establishment level data for those who are in employment.

QWLS has a large number of variables that measure various aspects of working life and an individual's subjective perceptions thereof. In principle, many of these could be used as explanatory variables for the more general measures of subjective utility or wellbeing that are the focus of the paper. However, as pointed out by, for example, Hamermesh (2004), using subjective variables to explain subjective outcomes may be problematic. The responses are often correlated because of the general "mood" or "spill over" of satisfaction or dissatisfaction. Rather than genuinely explaining the dependent variable, other subjective measures may just be different aspects of the same phenomenon and therefore the resulting coefficients do not have a policy-relevant interpretation, though in some instances, for example changes in the strength of correlation may be of interest. I do use some responses from the survey as right-hand-side variables: however, I try to limit this to responses to concrete questions rather than use assessments of the "goodness" or "fairness" of working conditions.

I use the waves of QWLS from 2003 and 2008 merged with FLEED from the same years and, for some of the robustness checks, appended with the FLEED observations from the preceding year for each wave. FLEED is essentially a panel where the whole working history of each sampled individual is included in the data, but unfortunately QWLS does not have a panel dimension.

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<sup>1</sup> According to Anna-Maija Lehto (Statistics Finland) researchers at Statistics Finland have made experiments by calibrating weights to QWLS 2008 to account for non-response in the survey. However, the use of weights to account for non-response proved to have only a minor effect on the estimation results. This supports the thinking that non-response does not seriously undermine the representativeness of the data.

Job satisfaction is measured by the response to the standard question “How satisfied are you with your job?”. The corresponding question on wage satisfaction reads “In your opinion, is your pay fair in comparison with the remuneration paid in other occupations?”. Intentions to change job are measured by responses to the question “If you could change jobs with the same pay, 1) would you change to a different occupational field? 2) would you change to the same occupational field? 3) would you not change at all?”.

Though the wage satisfaction variables specifically define the “relative” wage as remuneration relative to other occupations, it is reasonable to assume that the respondents’ observations of their co-workers’ pay influence the responses. People may be better informed about their colleagues’ pay than the overall wage distribution in the economy. However, when we interpret the results it needs to be borne in mind that the underlying occupations (which I do not control for) may influence the responses, as occupations often have the reputation of being “high” and “low” wage occupations. These labels may have a significant effect on an individual’s perception of the fairness of their pay, even when they lack detailed information on how their wage compares with the others.

In order to further explore the relationship between wage dispersion and subjective perceptions of fairness at work, we rate the subjective perceptions of fairness at the workplace by calculating an index that is based on the responses to the question: “Do you reckon that unequal treatment occurs at your own workplace on the basis of ...”. The question lists a number of types of discrimination (age, sex etc.) and the index is calculated as:  $100 \times (1 - (\text{no of positive responses} / \text{total number of responses}))$ . Value 100 of the index denotes a workplace where the respondent has observed none of the forms of discrimination and value 0 means that the respondent reckons that all the listed forms of discrimination occur there.

The work atmosphere and the availability of co-worker support are graded by responses to the question “When work seems difficult, do you receive support and encouragement from your colleagues?” for which the response options are 1) never 2) sometimes 3) often and 4) always. There are various other questions on teamwork in the questionnaire, but this question is broader and is also put to those who do not work in formal teams. Other related questions on atmosphere are also included in the survey. However, this question best matches the aim to disentangle the impact of wage structures on co-worker attitudes. The other questions mainly concern the attitudes and behaviour of the management, the impact of work pressure on the atmosphere or the organisation of work.

The distributions of the dependent variables in the data are presented in Figure 1. The distribution of job satisfaction is highly skewed, the majority of respondents being satisfied or very satisfied with their job. A large share of respondents say that their wage is “fair”, a much larger share, however, consider it low rather than high. About half of the respondents would not change their job for the same pay, and about 45% say they “often” get support and encouragement from their co-workers. The discrimination index obtains an average value of 91%: thus, on average only a few forms of discrimination are perceived.

**Figure 1 about here**

I apply the ordered probit estimation method where the underlying index variable is determined as a linear combination of the explanatory variables:

$$(1) \quad y_i^* = X_i\beta + \varepsilon_i$$

but we only observe n categories of y:

$$(2) \quad y = \begin{cases} 1 & \text{if } y^* \in ]-\infty, \eta_1] \\ 2 & \text{if } y^* \in ]\eta_1, \eta_2] \\ 3 & \text{if } y^* \in ]\eta_2, \eta_3] \\ \cdot & \\ \cdot & \\ n & \text{if } y^* \in ]\eta_{n-1}, \eta_n] \end{cases}$$

The explanatory variables include gender, age, age squared, dummies for year 2008 and education levels, log of the individual’s monthly pay, log of the average monthly pay in the establishment, dummies for having attended training in the past 12 months and having held several occupations during one’s working life, the number of job changes in the past 5 years, the share of highly educated within the establishment and the number of observations from the establishment in the FLEED sample<sup>2</sup>. The last variable serves as a proxy for establishment size: the actual size is approximately three times the number of observations in the FLEED sample. The number of job changes and the dummy for a change of occupation control for individual fixed effects. They can indicate a permanently higher tendency to be dissatisfied with any job or even the contrary, or a lack of desire to change after having changed several times. A positive association may also emerge as a result from higher levels of satisfaction resulting from an intensive search for a better

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<sup>2</sup> The means for the explanatory variables are presented in the Appendix.

match. The share of the highly educated and access to training serve as proxies for “good” workplaces where the company makes significant investments in human capital.

In addition to these, measures of within establishment wage dispersion and individual positions in the wage distribution are included in the regression. Overall, within establishment wage dispersion is measured by the difference between the 90th and 10th percentile of the residual from a wage regression within the establishment. In this regression, the explanatory variables used are education levels, gender, age and age squared. The regression is run for each year separately. In addition to the measure of overall wage dispersion I try to control for the wage differential between tasks with different skills content by including a variable measuring the difference of the log of the average wage between high and low educated individuals in the establishment<sup>3</sup>. This difference is zero if all the employees are from the same skill group: an extra dummy is introduced for these establishments to control for a possibly unusual organisation or perception of wage differentials by skill.

The dummy variables indicating performance pay are based on questions on whether there is a performance-related pay system in place and to whom the bonuses are paid: individuals, teams or departments or the whole organisation. I only consider the response positive if the person also says that they are covered themselves. This is due to reliability issues: individuals themselves are unlikely to be perfectly aware of pay systems they are not covered by, so trying to control for the general presence of performance-related pay systems in the establishment might simply lead to a larger measurement error. On the other hand, the direct impact of different methods of pay on job satisfaction is most probably only relevant for those who are covered by them. The most common form of performance pay in these data is a system where bonuses are paid for the whole organisation, and this occurs in about 22% of the observations in these data. The systems where performance pay is paid to groups or individuals are less common, covering 10% and 11% of the observations respectively.

I include various interaction effects in addition to these. Most importantly, the measure of wage dispersion is interacted with gender, different methods of pay and the individual’s percentile in the within establishment wage distribution. The latter should capture the effect of people higher in the wage distribution gaining more or less (if the coefficient is negative) from wage dispersion in terms of the aspects of individual utility measured by the dependent variables.

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<sup>3</sup> There is no occupational variable that would cover both years, and using more than two classes of skills would be feasible and sensible only for establishments with a very large number of observations. Thus, I only use two classes in order to prevent a further reduction in the sample size.

As the data lacks a panel dimension, endogeneity is likely to be a problem for several reasons. Establishments have individual levels of “natural” wage dispersion which relate to the nature of their production and organisation. These are probably related to the method of pay and the share of highly educated individuals but are not completely explained by them. The remaining correlation with the underlying establishment-specific fixed effect may be partly responsible for any associations that I find.

Another source of bias is selection into jobs. As pointed out in the theoretical section, individuals select into jobs that maximise their utility, given their preferences and characteristics. For example, we may never observe risk-averse individuals who suffer from wage dispersion in jobs where individual performance pay is applied and wage dispersion is unusually high. Therefore, the results should be interpreted as describing individuals who are actually covered by certain methods of pay rather than as the expected effect of wage dispersion and the method of pay for an average person.

Simultaneity is another potential source of endogeneity. However, it does not seem plausible that satisfaction with job or wages should impact on wage dispersion or the methods of pay. It is possible to argue that it may be easier for a company to adopt new methods of pay or increase (or decrease, if dispersion is desirable for the employees) the level of pay dispersion if the level of job satisfaction is initially high within the company. It is not obvious, however, how this process would bias the association between satisfaction and dispersion in a cross section after the adoption of a new method of pay, as satisfaction would naturally adjust to the new pay structures.

## **RESULTS**

The actual coefficient values are difficult to interpret: therefore most of the conclusions are based on average marginal effects which have been calculated for given regressor values and/or subsamples. There are obviously numerous combinations of possible values of regressors as well as subsamples: in addition to the overall average marginal effects, my conclusions are mainly based on the average marginal effects of dispersion, assuming that all individuals in the sample are covered by a certain method of pay. In addition to these, I have run the regressions on subsamples formed on the basis of whether wages within the establishment are public knowledge<sup>4</sup>.

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<sup>4</sup> The full regression results are presented in the Appendix.

The average marginal effects of p9010 on job satisfaction are presented in Table 1. The average effect is not significant for any of the values without further restrictions on the values of the regressors (Columns 1, 5 and 9). Similarly, for wage satisfaction (Table 2, Columns 1, 5 and 9) the overall average marginal effect is not significantly different from zero at the 5% level for any of the outcomes.

**Table 1 about here**

However, the strong coefficient for the interaction with individual percentiles suggests that there may be a different effect of wage dispersion in different parts of the wage distribution. Indeed, when I calculate the marginal effects separately for the individuals above and below the median, it turns out that the impact of wage dispersion on wage satisfaction differs between these two groups. For those above the median, a higher wage dispersion implies a significantly higher probability of considering their wage as “fair” or “high”.

I further constrain the values of the dummies for different methods of pay, setting each of them to one at a time, and calculating the average marginal effects of wage dispersion as if everybody was covered by each of these schemes. This, including the initial estimation of the parameters, is also done separately for subsamples formed on the basis of the responses to the question as to whether wages are public knowledge.

The results for job satisfaction (Table 1, Columns 2-4, 6-8 and 9-12) are largely insignificant. However, when a group performance pay scheme is assumed, a higher level of wage dispersion is associated with a lower probability of being “very satisfied” with one’s job. The results from the subsamples are of similar signs, but when wages are public knowledge they are not statistically significant. When an individual performance pay scheme is assumed, wage dispersion seems to have an opposite impact on job satisfaction, but the result is not equally strong.

**Table 2 about here**

There are no clear patterns in the average marginal effects for different outcomes of wage satisfaction (Table 2 Columns 2-4, 6-8 and 9-12). The marginal effect on the probability of considering one’s wage “fair” is significantly negative when a group performance pay scheme is assumed and wages are common knowledge. There are no significant effects for the other outcomes, but the average marginal effect for the outcomes above “fair” and for considering the wage “somewhat lower than it should be” is also negative.

Table 3 presents the average marginal effects of wage dispersion on willingness to change jobs for the same pay. Again, there are no significant overall marginal effects either for the complete dataset or for the subsamples. But when I set the method of pay to individual performance pay, the average marginal effect on the probability of willingness to change to a different field becomes significantly negative. Thus, for jobs with individual performance-related pay, wage dispersion seems, if anything, to increase the attractiveness of the job.

### **Table 3 about here**

For the discrimination index, the coefficients from an OLS estimation presented in the Appendix are equivalent to the effects on the index keeping everything else constant. Neither the coefficient of wage dispersion alone nor any of the interactions including dispersion is statistically significant. Interestingly, the higher the individual percentile the higher the perceived “fairness” of the workplace, but only when wages are public knowledge. This is consistent with, for example, a view that people who know they are high up in the pay hierarchy like to think that people are treated fairly at the workplace, as this would imply that they have deserved their position.

As for receiving help and support, the estimation using the full sample does not reveal any clear patterns for the association with wage dispersion (table 4, columns 1-4), even when we assume different types of performance-related methods of pay. However, when the sample is split (table 4 columns 5-12), the results indicate that when wages are public knowledge, wage dispersion is associated with a higher probability to “always” receive support and encouragement from co-workers. When wages are not public knowledge, the opposite result is obtained. Clearly, the transparency of wages and the methods of pay may be a factor in determining how supportive the atmosphere amongst co-workers is or a proxy thereof. A natural interpretation of this is that people covered by an individual performance pay scheme are more willing to co-operate if they have a clear idea of how much each employee is rewarded for their efforts. This can also be seen as a form of reciprocity.

### **Table 4 here**

As pointed out in the theoretical discussion, gender is a characteristic that may be related to risk aversion and lower levels of competitive behaviour. The coefficients of the interaction of gender and wage dispersion in the job satisfaction regression give an indication that gender might be a significant determinant of the impact of wage dispersion. They suggest that wage dispersion might have a different association with job satisfaction for women or in workplaces where the majority of



women work. The actual average marginal effects of wage dispersion on different outcomes are, however, significant neither for women nor for men.

The results reported above describe the association of overall wage dispersion with job satisfaction and other measures of welfare at work. I measure “between” group wage differential by using the difference in average log wages between high and low skilled (skill measured by education). The average marginal effects on the probabilities of different outcomes, however, are not significant in any of the regressions.

### *Robustness checks*

Wage dispersion may naturally be measured by using different statistics: in addition to the difference between the 90<sup>th</sup> and 10<sup>th</sup> percentile the standard deviation of the wage variable is an obvious measure of wage dispersion. Unlike the percentile difference, standard deviation is influenced by extreme observations. Another obvious extension is to use establishment-fixed effects in the regression from which the residuals are calculated. The residuals obtained in this way indicate more precisely how wages vary within establishments, assuming there are differences in average wage levels between establishments that are due to some factors or abilities that are observed by the employees but not the researcher. However, it is not inconceivable that people just observe the returns to observable characteristics (and therefore, the residuals) in the labour market rather than assume fixed (and justifiable) establishment effects. Thus, this procedure may end up removing some of the variation that the employees would consider as residual variation.

I ran the basic model of the five outcome variables by using two alternative measures of wage dispersion: the percentile difference for the residuals obtained from an estimation that includes establishment-fixed effects and the standard deviation of the residuals from the basic regression. The results do not essentially differ from those obtained by using the 90<sup>th</sup> and 10<sup>th</sup> percentile difference of the residuals from the most basic regression. The patterns are largely the same in the regressions using the original measure: in some cases the marginal effects are actually statistically more significant when we use an alternative measure.

It may be that the expectations regarding the distribution of wages, as well as the systems by which they are set within establishments vary between the private and the public sectors. Wages are also more often public knowledge in the public sector. Therefore, I also conducted the estimations limiting the sample to the private sector. This reduces the total number of observations to

approximately 900. The results regarding different methods of pay, however, are not fundamentally different and are thus obviously not driven by pay practices in public sector organisations.

Ordered probit is a logical choice for the method to be used but, as pointed out above, the interpretation of coefficients is complicated and the average marginal effects need to be calculated for set values of the regressors, which obviously limits their generality. Therefore, I also ran an OLS regression on the variables of interest, assuming they were continuous interval variables. The results indicate effects of the same direction as those obtained by using average marginal effects calculations based on the ordered probit estimation. The significance levels of the relevant coefficients (for example, those of the interactions of wage dispersion and the method of pay in the cases pointed out in the previous section) and total marginal effects are often lower than 10% and generally at least around 10-15%<sup>5</sup>. Therefore, I find that the OLS results at least do not contradict the results obtained from the ordered probit estimations, but rather support them.

As pointed out in the literature review, future prospects can be the underlying cause of a relationship between overall wage structures and individual utility. Given this, instead of the prevailing wage levels and the dispersion thereof, the more significant and interesting indicator of one's own chances of a high wage might be the variation in pay changes over time. I ran the regressions using a measure of the dispersion of changes of the residual instead of a dispersion measure of the actual residual, and also added a measure of the individual change of the residual. The number of observations is naturally reduced, as only those who have worked in the same establishment in the previous year and have a sensible wage observation from both years are included. The total number of observations is about 1220.

Most of the statistically significant effects occur in the job satisfaction and wage satisfaction regressions. For job satisfaction, when wages are common knowledge, higher dispersion implies a higher probability of being very satisfied, and a similar pattern emerges when individual performance pay is assumed. For wage satisfaction the results indicate that when wages are common knowledge and individual performance pay is assumed, wage dispersion is associated with less wage dissatisfaction. When a performance pay scheme for the whole organisation is assumed, the pattern seems to be the opposite but less significant. When wages are not common knowledge the overall effect of dispersion on wage dissatisfaction is also negative.

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<sup>5</sup> The full results are available on request.

A natural interpretation of the results obtained in this study is that the features of production and different reward systems have implications for the links between wage dispersion and the measures of self-reported worker wellbeing I use. The results also suggest that transparency of wages may have implications for the co-operativeness of workers. This may be a sign of reciprocal behaviour: when the pay structures are perceived to be transparent, people are more willing to be supportive of their co-workers as they feel they know what people are rewarded for. The result may also be due to underlying factors, such as a generally encouraging work atmosphere which may correlate with the method of pay and the transparency of pay structures.

Selection of people into jobs is also likely to play a role. Possibly the results regarding the impact of different pay mechanisms are partly due to the preferences of individuals in different types of jobs. Those who end up in jobs where competition in individual performance is encouraged and rewarded (either through a performance-related pay scheme or, for example, promotion opportunities) find high dispersion either a sign of their own advancement opportunities or a natural outcome of competition. On the other hand, those who value equality are more likely to work in jobs with a performance pay scheme aimed at groups or the whole organisation or without a performance pay scheme. This implies that if we had quasi-experimental data on a random sample of individuals before and after the introduction of a performance pay scheme and/or a major change in wage dispersion, the results could be significantly different. From a policy perspective, however, it is more relevant to know which characteristics of pay systems, such as transparency, could possibly improve people's welfare in their chosen workplace.

The results also complement the existing international evidence on income and wage comparisons. The perception of one's own value is clearly related to the wages of one's colleagues. Even though the question on wage satisfaction is posed so that the point of comparison should be earnings in other occupations, the marginal effect of wage dispersion for the individuals in high percentiles is to increase the probability to consider their wages high or fair when the level of log wages is controlled for. This suggests that people are aware of wages below them. Similarly, when wages are public knowledge, those who have a high position in the wage distribution consider the workplace less discriminatory. Both observations are consistent with the view that those who have managed to attain a high wage within the organisation are likely to consider this as justified rather than assess the workplace objectively. On the other hand, the results do not strongly support the view that wage dispersion is generally meaningful, irrespective of one's own performance and the other characteristics of the workplace.

## CONCLUSIONS

The aim of this paper is to examine whether within establishment wage differentials have a significant impact on worker welfare and where these impacts, if we find any, arise from. The results suggest that methods of pay or the characteristics of production (which will ultimately impact on the former) are associated with the welfare impacts of wage dispersion, probably partly because of selection of people into different types of jobs. The results also support the conclusions from the existing literature on income comparisons, whereby one's colleagues' pay is important when one is assessing one's own pay.

Future research should further investigate the role of transparency and the knowledge of wages both within the workplace and in general in determining satisfaction and co-operativeness at work. A thorough analysis would also require measures of both levels of wage dispersion as well as long-term wage mobility within establishments and that of individuals. This would further shed light on the role played by the perceptions and expectations of one's own future prospects within the establishment and outside it. Further empirical evidence is also needed to establish whether wage differentials and wage mobility are associated with the aspects of welfare at work not discussed here, for example with experiencing stress.

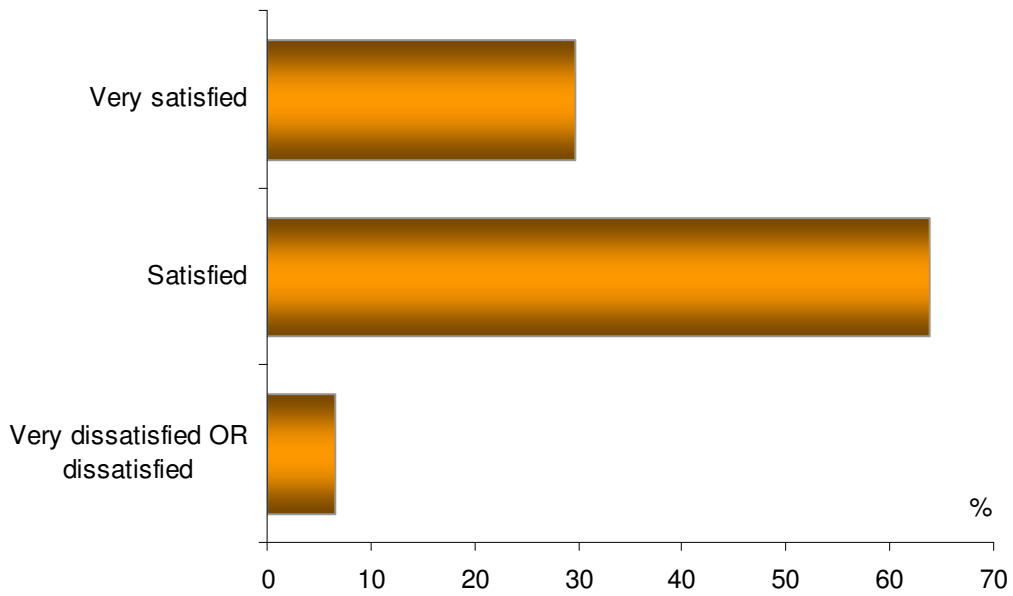
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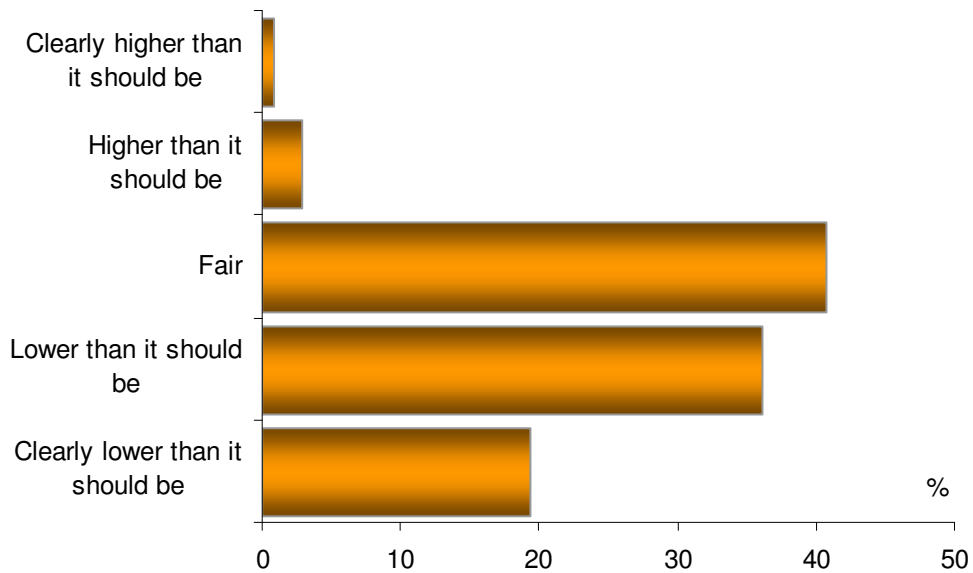
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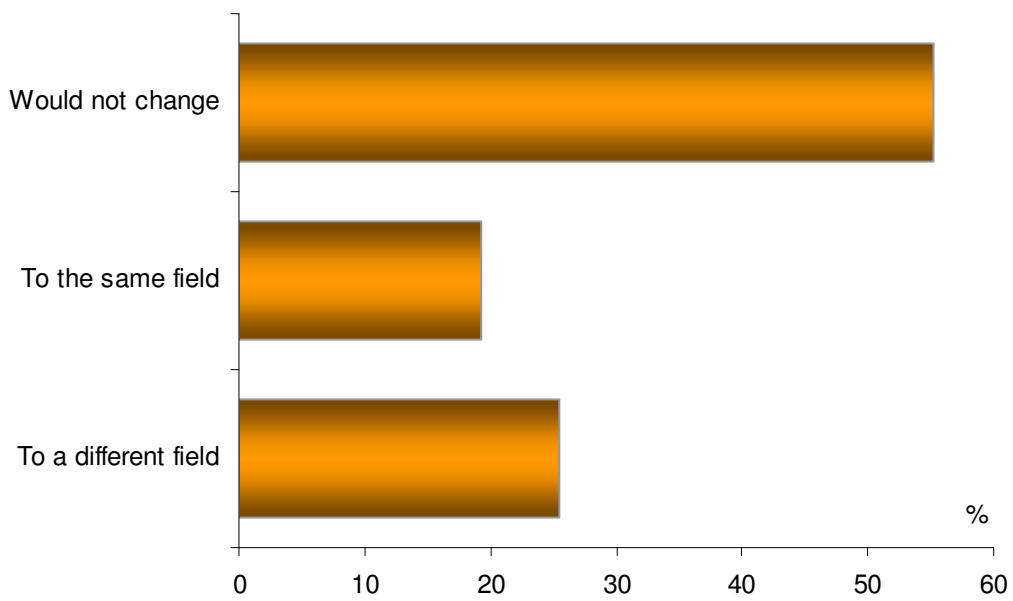
**Figure 1. “How satisfied are you with your job?”**



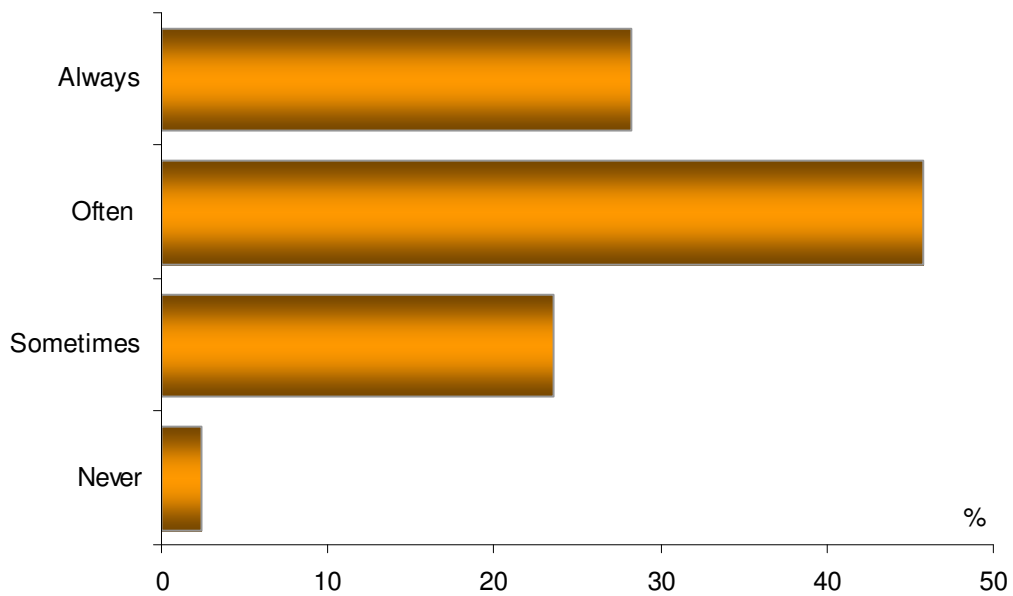
**Figure 2. “In your opinion, is your pay fair in comparison with the remuneration paid in other occupations?”**



**Figure 3. “If you could change jobs with the same pay, would you change?”**



**Figure 4. “When work seems difficult, do you receive support and encouragement from your colleagues?”**





**Table 1.**

Average marginal effects of p9010 on job satisfaction												
Outcome	All				Wages common knowledge				Wages not common knowledge			
	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay
Very dissatisfied	-0.0007 (0.0016)	0.0493 (0.0665)	-0.0027* (0.0016)	-0.0009 (0.003)	-0.0026 (0.003)	0.0324 (0.0864)	-0.0041 (0.0034)	0.0106 (0.0206)	0.0006 (0.002)	0.0573 (0.0898)	-0.0021 (0.0013)	-0.0019 (0.0018)
Dissatisfied	-0.0048 (0.0126)	0.1524 (0.1137)	-0.0277 (0.0175)	-0.0064 (0.026)	-0.0161 (0.0183)	0.1031 (0.1802)	-0.0328 (0.0379)	0.0468 (0.0705)	0.0087 (0.018)	0.1905 (0.1509)	-0.0301** (0.0133)	-0.0207 (0.0218)
Satisfied	-0.001 (0.0245)	-0.0451 (0.1385)	-0.0903 (0.1115)	-0.0043 (0.0541)	-0.024 (0.0419)	0.0053 (0.145)	-0.1019 (0.2693)	0.0352 (0.0225)	0.0301 (0.0302)	-0.0758 (0.2103)	-0.14 (0.1332)	-0.0502 (0.097)
Very satisfied	0.0065 (0.0381)	-0.1566*** (0.0452)	0.1207 (0.1292)	0.0116 (0.0828)	0.0427 (0.0617)	-0.1408 (0.1257)	0.1389 (0.3083)	-0.0925 (0.0957)	-0.0394 (0.0486)	-0.172*** (0.0388)	0.1721 (0.1442)	0.0728 (0.1194)
N	1586	1586	1586	1586	584	584	584	584	992	992	992	992

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 2.**

Average marginal effects of p9010 on wage satisfaction												
Outcome	All				Wages common knowledge				Wages not common knowledge			
	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay
Clearly lower than it should be	-0.0485* (0.0259)	0.1922 (0.1607)	-0.0588 (0.0638)	-0.0403 (0.0534)	-0.0334 (0.0421)	0.3393 (0.2236)	-0.082 (0.1281)	0.0376 (0.1063)	-0.0626* (0.034)	0.1503 (0.1987)	-0.0652 (0.07)	-0.0828 (0.0551)
Somewhat lower than it should be	-0.0193 (0.0157)	-0.0405 (0.0718)	-0.0261 (0.0486)	-0.0155 (0.0296)	-0.0156 (0.0246)	-0.1256 (0.1526)	-0.0475 (0.1229)	-0.0082 (0.0199)	-0.0252 (0.021)	-0.0244 (0.0751)	-0.0272 (0.0593)	-0.0421 (0.0583)
Fair	0.0544* (0.0287)	-0.1362 (0.0834)	0.0673 (0.0812)	0.0447 (0.0631)	0.0408 (0.0473)	-0.2011** (0.0735)	0.1046 (0.182)	-0.0296 (0.0995)	0.0687* (0.0372)	-0.1095 (0.1126)	0.072 (0.0885)	0.0955 (0.0748)
Somewhat higher than it should be	0.0096 (0.0071)	-0.0117* (0.0064)	0.0125 (0.0209)	0.0079 (0.0132)	0.0045 (0.0072)	-0.0078* (0.0042)	0.0136 (0.0356)	-0.0002 (0.0089)	0.0145 (0.0111)	-0.0129 (0.0115)	0.0154 (0.0287)	0.0222 (0.027)
Clearly higher than it should be	0.0039 (0.0036)	-0.0038 (0.0026)	0.0051 (0.0097)	0.0032 (0.0058)	0.0037 (0.0065)	-0.0048 (0.0035)	0.0113 (0.0331)	0.0005 (0.0068)	0.0046 (0.0048)	-0.0035 (0.0037)	0.0049 (0.0111)	0.0073 (0.0108)
N	1628	1628	1628	1628	593	593	593	593	1025	1025	1025	1025

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3.**

Average marginal effects of p9010 on willingness to change jobs												
Outcome	All				Wages common knowledge				Wages not common knowledge			
	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay
Change to another field	-0.011 (0.0354)	0.1446 (0.1843)	-0.12** (0.0513)	-0.0069 (0.0734)	-0.0156 (0.0568)	0.2494 (0.2943)	-0.0587 (0.2074)	0.0624 (0.1411)	-0.0033 (0.0469)	0.0454 (0.2078)	-0.1214** (0.0546)	-0.032 (0.0848)
Change to another job in the same field	-0.0018 (0.008)	0.0053 (0.0207)	-0.0589 (0.0423)	-0.0007 (0.0172)	-0.0035 (0.0132)	-0.0175 (0.0742)	-0.0172 (0.0748)	0.0084 (0.011)	-0.0018 (0.0107)	0.0064 (0.0204)	-0.068 (0.0511)	-0.0112 (0.029)
No change	0.0129 (0.0432)	-0.1499 (0.1648)	0.1789* (0.0925)	0.0076 (0.0905)	0.0192 (0.0685)	-0.2319 (0.2221)	0.0759 (0.282)	-0.0708 (0.1491)	0.005 (0.0573)	-0.0518 (0.2279)	0.1893* (0.1037)	0.0432 (0.1135)
N	1621	1621	1621	1621	590	590	590	590	1022	1022	1022	1022

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4.**

Average marginal effects of p9010 on receiving help and support from colleagues												
Outcome	All				Wages common knowledge				Wages not common knowledge			
	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay	Overall	Team performance pay	Individual performance pay	Company performance pay
Never	0.0036 (0.0063)	-0.0066 (0.0125)	0.0197 (0.0301)	0.0134 (0.0177)	0.0027 (0.0097)	0.0532 (0.1313)	-0.0084* (0.0045)	0.0368 (0.0465)	0.0035 (0.0087)	-0.0105 (0.0083)	0.0854 (0.0753)	0.0028 (0.0161)
Sometimes	0.0043 (0.027)	-0.0532 (0.0911)	0.0568 (0.0807)	0.0433 (0.059)	0.0108 (0.0439)	0.1334 (0.1729)	-0.1452*** (0.0365)	0.1062 (0.0868)	-0.0041 (0.0351)	-0.0895 (0.0788)	0.1327** (0.0595)	-0.0073 (0.0691)
Often	-0.0111 (0.0093)	-0.0326 (0.0645)	-0.0212 (0.0299)	-0.0129 (0.0154)	-0.013 (0.0175)	-0.0699 (0.1664)	-0.3012** (0.134)	-0.0451 (0.0556)	-0.0163 (0.0122)	-0.0826 (0.1284)	-0.1004 (0.0851)	-0.0171 (0.0165)
Always	0.0032 (0.0339)	0.0924 (0.1668)	-0.0553 (0.0823)	-0.0438 (0.064)	-0.0005 (0.0528)	-0.1167 (0.1396)	0.4549*** (0.1115)	-0.0978 (0.0809)	0.0169 (0.0452)	0.1825 (0.2125)	-0.1177** (0.0502)	0.0216 (0.0961)
N	1609	1609	1609	1609	585	585	585	585	1014	1014	1014	1014

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## APPENDIX

### Descriptive statistics

Variable	N	Mean
log(establishment mean monthly pay)	1635	7.923
Has attended training over the last 12 months	1635	0.634
Share of highly educated within establishment	1635	0.266
log(monthly pay)	1635	7.872
Fixed term contract	1635	0.114
Has worked in several occupations	1635	0.150
No. of job changes over the past 5 years	1635	0.702
Single education group within establishment	1635	0.074
Year 2008	1635	0.533
Female	1635	0.546
Age	1635	43.209
Age squared	1635	1994.794
Education level 3 (upper secondary education)	1635	0.417
Education level 5 (Lower level of first stage tertiary education, diplomas)	1635	0.181
Education level 6 (First stage tertiary, bachelor's degree)	1635	0.124
Education level 7 (First stage tertiary, master's degree)	1635	0.139
Education level 8 (Upper tertiary, PhD)	1635	0.014
Percentile of individual residual within establishment	1635	52.794
Difference of 90th and 10th percentiles of residuals within establishment	1635	0.786
Performance pay paid to groups or teams	1635	0.098
Performance pay paid to individuals	1635	0.114
Performance pay paid to the whole organisation	1635	0.228
No of observations from the establishment in the FLEED sample	1635	1254.527
Wages public knowledge	1625	0.366

Job satisfaction, ordered probit estimation	(1) All	(2) Wages public knowledge	(3) Wages not public knowledge
log(establishment mean monthly pay)	-0.165 (0.186)	0.0928 (0.334)	-0.212 (0.237)
Has attended training over the last 12 months	0.113* (0.0660)	0.306*** (0.111)	0.0150 (0.0849)
Share of highly educated within establishment	0.294 (0.207)	0.876** (0.375)	0.0490 (0.261)
log(monthly pay)	0.339** (0.169)	-0.380 (0.325)	0.624*** (0.207)
Fixed term contract	0.277*** (0.105)	0.310* (0.167)	0.227 (0.140)
Has held several occupations	0.0273 (0.0847)	0.114 (0.151)	0.0185 (0.105)
No. of job changes over the past 5 years	0.0329 (0.0251)	0.0320 (0.0415)	0.0321 (0.0330)
low education#wage differential btw education groups	0.139 (0.123)	0.300 (0.206)	0.00520 (0.159)
high education#wage differential btw education groups	0.121 (0.251)	0.0699 (0.461)	0.0951 (0.312)
Single education group within establishment	0.0598 (0.126)	0.110 (0.193)	0.0551 (0.172)
Year 2008	-0.184*** (0.0624)	-0.0489 (0.107)	-0.258*** (0.0803)
Female	0.732*** (0.224)	0.653* (0.361)	0.856*** (0.298)
Age	-0.0168 (0.0260)	0.0632 (0.0461)	-0.0475 (0.0330)
Age squared	0.000281 (0.000295)	-0.000665 (0.000528)	0.000638* (0.000373)
Education level 3 (upper secondary education)	-0.0785 (0.0982)	-0.0205 (0.164)	-0.107 (0.127)
Education level 5 (Lower level of first stage tertiary education, diplomas)	-0.0685 (0.119)	-0.227 (0.209)	0.0438 (0.150)
Education level 6 (First stage tertiary, bachelor's degree)	-0.106 (0.166)	-0.0407 (0.315)	-0.0718 (0.203)
Education level 7 (First stage tertiary, master's degree)	-0.296 (0.193)	-0.0785 (0.364)	-0.362 (0.235)
Education level 8 (Upper tertiary, PhD)	-0.210 (0.321)	-0.299 (0.601)	-0.0991 (0.389)
Percentile of individual residual within establishment	-0.000480 (0.00359)	0.000869 (0.00585)	0.00268 (0.00482)
P9010 of residuals	0.222 (0.278)	0.192 (0.422)	0.294 (0.382)
Performance pay scheme based on the performance of a group or a team	0.776** (0.387)	0.919 (0.671)	0.705 (0.490)
Performance pay scheme based on the performance of an individual	-0.256 (0.306)	-0.192 (0.710)	-0.523 (0.357)
Performance pay scheme based on the performance of the whole company	0.0293 (0.218)	0.530 (0.346)	-0.324 (0.296)
Female# Percentile of individual residual within establishment	-0.00456** (0.00219)	-0.00480 (0.00367)	-0.00497* (0.00282)
Female # P9010 of residuals	-0.472** (0.220)	-0.553 (0.342)	-0.485 (0.299)
PPS based on group perf# P9010 of residuals	-0.895* (0.499)	-0.789 (0.854)	-0.948 (0.636)
PPS based on individual perf# P9010 of residuals	0.345 (0.351)	0.275 (0.841)	0.674* (0.409)
PPS based on company perf# P9010 of residuals	0.0192 (0.266)	-0.563 (0.420)	0.428 (0.364)
Percentile of individual residual within establishment # P9010 of residuals	0.00207 (0.00452)	0.00715 (0.00721)	-0.00418 (0.00611)
No of observations from the establishment in the FLEED sample	7.50e-06 (8.09e-06)	1.90e-06 (1.20e-05)	1.21e-05 (1.13e-05)
Observations	1586	584	992

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Wage satisfaction	(1) All	(2) Wages public knowledge	(3) Wages not public knowledge
log(establishment mean monthly pay)	1.264*** (0.174)	1.431*** (0.320)	1.212*** (0.216)
Has attended training over the last 12 months	-0.0503 (0.0606)	0.0852 (0.105)	-0.127* (0.0767)
Share of highly educated within establishment	-0.534*** (0.191)	-0.620* (0.352)	-0.472** (0.235)
log(monthly pay)	-0.0955 (0.158)	-0.337 (0.303)	-0.0142 (0.190)
Fixed term contract	-0.128 (0.0962)	-0.225 (0.156)	-0.0673 (0.126)
Has held several occupations	0.0156 (0.0784)	-0.0282 (0.143)	0.0467 (0.0958)
No. of job changes over the past 5 years	0.0572** (0.0230)	0.0513 (0.0384)	0.0520* (0.0296)
low education#wage differential btw education groups	-0.101 (0.114)	-0.00258 (0.196)	-0.214 (0.144)
high education#wage differential btw education groups	-0.0159 (0.231)	-0.260 (0.438)	0.0838 (0.279)
Single education group within establishment	-0.0614 (0.118)	0.0272 (0.183)	-0.130 (0.160)
Year 2008	0.00461 (0.0575)	-0.0564 (0.101)	0.0368 (0.0728)
Female	-0.0902 (0.206)	0.0110 (0.339)	-0.166 (0.270)
Age	-0.0330 (0.0240)	-0.0494 (0.0429)	-0.0192 (0.0299)
Age squared	0.000315 (0.000272)	0.000502 (0.000492)	0.000150 (0.000338)
Education level 3 (upper secondary education)	-0.136 (0.0915)	-0.332** (0.155)	0.0101 (0.117)
Education level 5 (Lower level of first stage tertiary education, diplomas)	-0.0906 (0.111)	-0.456** (0.198)	0.115 (0.138)
Education level 6 (First stage tertiary, bachelor's degree)	-0.130 (0.154)	-0.237 (0.300)	-0.00379 (0.186)
Education level 7 (First stage tertiary, master's degree)	0.112 (0.179)	0.268 (0.347)	0.119 (0.215)
Education level 8 (Upper tertiary, PhD)	0.0151 (0.297)	-0.377 (0.615)	0.187 (0.348)
Percentile of individual residual within establishment	9.69e-05 (0.00328)	-0.00138 (0.00541)	0.00255 (0.00434)
P9010 of residuals	-0.236 (0.254)	-0.250 (0.397)	-0.159 (0.343)
Performance pay scheme based on the performance of a group or a team	0.788** (0.366)	1.135* (0.671)	0.755* (0.448)
Performance pay scheme based on the performance of an individual	0.138 (0.282)	0.0385 (0.646)	0.127 (0.326)
Performance pay scheme based on the performance of the whole company	0.247 (0.202)	0.595* (0.326)	0.0298 (0.269)
Female# Percentile of individual residual within establishment	-0.00436** (0.00202)	-0.00396 (0.00349)	-0.00454* (0.00254)
Female # P9010 of residuals	-0.00736 (0.202)	-0.293 (0.325)	0.151 (0.271)
PPS based on group perf# P9010 of residuals	-0.844* (0.474)	-1.318 (0.864)	-0.783 (0.583)
PPS based on individual perf# P9010 of residuals	0.0525 (0.322)	0.249 (0.759)	0.0143 (0.372)
PPS based on company perf# P9010 of residuals	-0.0428 (0.247)	-0.304 (0.395)	0.130 (0.332)
Percentile of individual residual within establishment # P9010 of residuals	0.00979** (0.00414)	0.0130* (0.00687)	0.00701 (0.00548)
No of observations from the establishment in the FLEED sample	-2.81e-06 (7.54e-06)	-6.61e-06 (1.16e-05)	-1.52e-06 (1.02e-05)
Observations	1628	593	1025

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Willingness to change job for the same pay	(1) All	(2) Wages public knowledge	(3) Wages not public knowledge
log(establishment mean monthly pay)	-0.318* (0.183)	-0.0168 (0.339)	-0.448** (0.227)
Has attended training over the last 12 months	-0.0245 (0.0662)	-0.161 (0.114)	0.0444 (0.0835)
Share of highly educated within establishment	0.303 (0.206)	0.410 (0.386)	0.253 (0.253)
log(monthly pay)	0.105 (0.165)	-0.214 (0.321)	0.172 (0.198)
Fixed term contract	0.202* (0.105)	0.0605 (0.168)	0.260* (0.139)
Has held several occupations	-0.0939 (0.0864)	-0.0957 (0.154)	-0.0874 (0.106)
No. of job changes over the past 5 years	0.0718*** (0.0265)	0.113** (0.0457)	0.0451 (0.0334)
low education#wage differential btw education groups	0.147 (0.124)	0.155 (0.214)	0.185 (0.156)
high education#wage differential btw education groups	0.269 (0.256)	-0.00959 (0.480)	0.386 (0.310)
Single education group within establishment	0.114 (0.129)	0.323 (0.202)	-0.0356 (0.174)
Year 2008	-0.134** (0.0624)	-0.0278 (0.108)	-0.208*** (0.0796)
Female	0.115 (0.225)	0.229 (0.371)	-0.00228 (0.296)
Age	-0.0439* (0.0259)	0.0174 (0.0465)	-0.0728** (0.0325)
Age squared	0.000707** (0.000296)	-4.25e-05 (0.000535)	0.00106*** (0.000369)
Education level 3 (upper secondary education)	-0.181* (0.102)	0.0319 (0.168)	-0.322** (0.132)
Education level 5 (Lower level of first stage tertiary education, diplomas)	-0.125 (0.123)	-0.0158 (0.213)	-0.234 (0.155)
Education level 6 (First stage tertiary, bachelor's degree)	-0.0963 (0.168)	0.224 (0.321)	-0.206 (0.204)
Education level 7 (First stage tertiary, master's degree)	-0.182 (0.195)	0.246 (0.370)	-0.364 (0.236)
Education level 8 (Upper tertiary, PhD)	-0.583* (0.313)	0.275 (0.639)	-0.958*** (0.371)
Percentile of individual residual within establishment	0.00342 (0.00358)	0.00712 (0.00582)	0.00160 (0.00479)
P9010 of residuals	0.133 (0.279)	0.350 (0.440)	-0.0208 (0.383)
Performance pay scheme based on the performance of a group or a team	0.406 (0.380)	0.967 (0.677)	0.0467 (0.477)
Performance pay scheme based on the performance of an individual	-0.511 (0.322)	-0.638 (0.727)	-0.433 (0.376)
Performance pay scheme based on the performance of the whole company	-0.0602 (0.216)	0.0548 (0.349)	-0.106 (0.287)
Female# Percentile of individual residual within establishment	-0.00335 (0.00219)	-0.00401 (0.00376)	-0.00225 (0.00276)
Female # P9010 of residuals	0.0413 (0.223)	-0.295 (0.361)	0.208 (0.297)
PPS based on group perf# P9010 of residuals	-0.480 (0.486)	-0.787 (0.831)	-0.169 (0.622)
PPS based on individual perf# P9010 of residuals	0.575 (0.375)	0.171 (0.864)	0.663 (0.438)
PPS based on company perf# P9010 of residuals	-0.0181 (0.264)	-0.295 (0.422)	0.139 (0.354)
Percentile of individual residual within establishment # P9010 of residuals	-0.00258 (0.00450)	-0.000724 (0.00731)	-0.00362 (0.00604)
No of observations from the establishment in the FLEED sample	-2.08e-06 (8.21e-06)	-3.99e-06 (1.23e-05)	1.66e-07 (1.13e-05)
Observations	1621	590	1022

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Index of discrimination	(1) All	(2) Wages public knowledge	(3) Wages not public knowledge
log(establishment mean monthly pay)	-2.755 (2.113)	0.964 (3.704)	-3.572 (2.711)
Has attended training over the last 12 months	-0.925 (0.748)	-0.399 (1.234)	-1.283 (0.969)
Share of highly educated within establishment	6.642*** (2.349)	7.380* (4.128)	6.336** (2.971)
log(monthly pay)	-0.828 (1.944)	-7.291** (3.550)	1.203 (2.412)
Fixed term contract	3.440*** (1.189)	2.518 (1.841)	3.908** (1.601)
Has held several occupations	0.393 (0.970)	0.0655 (1.681)	0.611 (1.217)
No. of job changes over the past 5 years	-0.252 (0.283)	-0.521 (0.456)	-0.117 (0.374)
low education#wage differential btw education groups	1.314 (1.415)	0.939 (2.334)	1.101 (1.824)
high education#wage differential btw education groups	1.765 (2.850)	4.906 (5.121)	0.361 (3.547)
Single education group within establishment	0.466 (1.445)	2.430 (2.150)	-1.126 (2.018)
Year 2008	0.276 (0.708)	0.000849 (1.184)	0.525 (0.917)
Female	-1.570 (2.527)	-4.977 (3.937)	2.398 (3.426)
Age	-0.150 (0.295)	0.579 (0.505)	-0.440 (0.379)
Age squared	0.00288 (0.00336)	-0.00598 (0.00579)	0.00633 (0.00428)
Education level 3 (upper secondary education)	-1.819 (1.128)	-1.714 (1.809)	-1.892 (1.482)
Education level 5 (Lower level of first stage tertiary education, diplomas)	-2.000 (1.368)	-3.814 (2.318)	-1.025 (1.749)
Education level 6 (First stage tertiary, bachelor's degree)	-0.125 (1.898)	-0.620 (3.507)	0.163 (2.350)
Education level 7 (First stage tertiary, master's degree)	-1.816 (2.212)	-0.267 (4.058)	-2.258 (2.728)
Education level 8 (Upper tertiary, PhD)	-4.327 (3.647)	-7.757 (6.789)	-2.988 (4.436)
Percentile of individual residual within establishment	0.0618 (0.0405)	0.155** (0.0624)	0.00672 (0.0557)
P9010 of residuals	4.396 (3.111)	3.692 (4.564)	5.972 (4.367)
Performance pay scheme based on the performance of a group or a team	2.481 (4.404)	8.596 (7.386)	0.0504 (5.646)
Performance pay scheme based on the performance of an individual	-1.090 (3.482)	-2.124 (7.303)	-0.822 (4.143)
Performance pay scheme based on the performance of the whole company	2.665 (2.487)	4.951 (3.825)	2.347 (3.398)
Female# Percentile of individual residual within establishment	-0.0412* (0.0248)	-0.0371 (0.0410)	-0.0397 (0.0320)
Female # P9010 of residuals	1.067 (2.476)	3.202 (3.697)	-3.228 (3.461)
PPS based on group perf# P9010 of residuals	-2.036 (5.685)	-9.380 (9.383)	1.131 (7.343)
PPS based on individual perf# P9010 of residuals	1.910 (3.983)	0.297 (8.490)	2.509 (4.739)
PPS based on company perf# P9010 of residuals	-3.777 (3.043)	-5.184 (4.648)	-3.901 (4.188)
Percentile of individual residual within establishment # P9010 of residuals	-0.0458 (0.0510)	-0.0632 (0.0780)	-0.0184 (0.0706)
No of observations from the establishment in the FLEED sample	-1.37e-05 (9.30e-05)	3.05e-05 (0.000136)	-4.61e-05 (0.000130)
Constant	116.2*** (13.50)	120.7*** (21.42)	112.4*** (18.26)
Observations	1629	593	1026
R-squared	0.039	0.073	0.043

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Receives support and encouragement from colleagues	(1) All	(2) Wages public knowledge	(1) Wages not public knowledge
log(establishment mean monthly pay)	-0.127 (0.173)	-0.186 (0.313)	-0.0579 (0.218)
Has attended training over the last 12 months	0.132** (0.0608)	0.0915 (0.103)	0.155** (0.0773)
Share of highly educated within establishment	0.386** (0.191)	0.245 (0.349)	0.497** (0.237)
log(monthly pay)	0.332** (0.161)	0.479 (0.299)	0.233 (0.197)
Fixed term contract	0.155 (0.0973)	0.150 (0.156)	0.212 (0.129)
Has held several occupations	0.0647 (0.0796)	-0.0146 (0.143)	0.122 (0.0982)
No. of job changes over the past 5 years	0.00947 (0.0231)	0.0382 (0.0398)	-0.0222 (0.0297)
low education#wage differential btw education groups	0.0124 (0.114)	-0.142 (0.195)	0.0828 (0.145)
high education#wage differential btw education groups	0.0148 (0.232)	-0.492 (0.433)	0.216 (0.285)
Single education group within establishment	-0.0488 (0.117)	-0.186 (0.180)	0.113 (0.160)
Year 2008	0.0246 (0.0576)	0.00901 (0.0995)	0.0317 (0.0733)
Female	0.274 (0.205)	0.927*** (0.334)	-0.217 (0.274)
Age	-0.0630*** (0.0242)	-0.114*** (0.0425)	-0.0343 (0.0304)
Age squared	0.000650** (0.000274)	0.00130*** (0.000487)	0.000289 (0.000342)
Education level 3 (upper secondary education)	0.0312 (0.0919)	-0.0788 (0.152)	0.0653 (0.118)
Education level 5 (Lower level of first stage tertiary education, diplomas)	-0.110 (0.112)	-0.324* (0.195)	-0.0189 (0.140)
Education level 6 (First stage tertiary, bachelor's degree)	-0.206 (0.155)	0.0483 (0.297)	-0.236 (0.188)
Education level 7 (First stage tertiary, master's degree)	-0.266 (0.180)	-0.338 (0.340)	-0.177 (0.219)
Education level 8 (Upper tertiary, PhD)	-0.639** (0.294)	-0.700 (0.558)	-0.575 (0.353)
Percentile of individual residual within establishment	-0.000508 (0.00333)	0.00382 (0.00528)	-0.00252 (0.00453)
P9010 of residuals	0.305 (0.255)	0.498 (0.388)	0.157 (0.352)
Performance pay scheme based on the performance of a group or a team	-0.187 (0.358)	0.436 (0.652)	-0.356 (0.447)
Performance pay scheme based on the performance of an individual	0.427 (0.290)	-0.803 (0.783)	0.745** (0.340)
Performance pay scheme based on the performance of the whole company	0.0786 (0.201)	0.413 (0.323)	-0.144 (0.270)
Female# Percentile of individual residual within establishment	0.00136 (0.00202)	-0.00406 (0.00347)	0.00465* (0.00255)
Female # P9010 of residuals	0.227 (0.203)	0.0237 (0.314)	0.494* (0.280)
PPS based on group perf# P9010 of residuals	0.284 (0.464)	-0.535 (0.843)	0.519 (0.582)
PPS based on individual perf# P9010 of residuals	-0.230 (0.333)	1.694* (0.962)	-0.721* (0.389)
PPS based on company perf# P9010 of residuals	-0.198 (0.246)	-0.477 (0.392)	0.0192 (0.334)
Percentile of individual residual within establishment # P9010 of residuals	-0.00744* (0.00422)	-0.00940 (0.00673)	-0.00705 (0.00577)
No of observations from the establishment in the FLEED sample	4.63e-06 (7.55e-06)	1.29e-05 (1.14e-05)	-3.49e-06 (1.04e-05)
Observations	1609	585	1014

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1