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Do Higher Wages Come at a Price?

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Abstract

Using linked employer-employee data for Britain we find job satisfaction and job anxiety are negatively correlated but higher wages are associated with higher job satisfaction *and* higher job anxiety. However, we observe a positive association between higher wages and non-pecuniary job satisfaction, which disappears with the inclusion of our effort measures. Thus high effort levels provide high levels of non-pecuniary job satisfaction and higher wages, in contrast to what compensating wage differentials predicts. On the other hand, the positive association between wages and pay satisfaction and the positive association between wages and job anxiety are both robust to the inclusion of our effort measures and rich job controls. Mean wages of co-workers are positively associated with pay satisfaction but there is no significant association with non-pecuniary job satisfaction or job anxiety. Thus there is a positive spill-over to workers from being in a high-wage workplace and there is no support for the proposition that within-workplace wage differentials are a source of job anxiety.

Key-words: worker wellbeing; job stress; job anxiety; job satisfaction; wages; compensating differentials
JEL-codes: J28; J31; J81

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1. Introduction

If people prefer leisure to work they will seek wages to compensate for the disutility of employment. It seems natural to assume that the higher the compensation, the better the employee will feel when undertaking the work. Higher wages may foster greater wellbeing in other ways too, for instance through spending power or social status. However, there is an emerging literature questioning the link between income growth and happiness. There are diminishing wellbeing returns to higher income and habituation effects mean positive income shocks tend to have temporary effects on wellbeing. We contribute to the literature using linked employer-employee data to establish the relationship between wages and three dimensions of employee wellbeing, namely pay satisfaction (PJS), non-pecuniary job satisfaction (NPJS) and job anxiety (JA) as captured by Warr's contentment-anxiety scale (Warr, 2007). This proves to be highly informative. Although job satisfaction (JS) and job anxiety (JA) are negatively correlated, their unconditional and conditional relationships with wages are different from one another. In keeping with the literature, wages and satisfaction are positively correlated. However, higher wages are also associated with greater anxiety and stress. The effect is robust to the inclusion of rich job controls (3-digit occupation, a job autonomy scale), effort measures and workplace fixed effects. These results are hard to reconcile with a simple compensating wage differentials story. Mean wages of co-workers are positively associated with pay satisfaction, as others have noted, but they are not significantly associated with non-pecuniary job satisfaction or job anxiety.

The remainder of the paper is structured as follows. Section Two reviews the theoretical and empirical literatures linking wages to employee JS and JA. Section Three introduces our data. Section Four outlines the empirical strategy. Section Five reports our results and Section Six concludes.

2. Theoretical and Empirical Literatures

If higher pay comes as part of a wage-effort bargain the employee may be expected to take on more onerous responsibilities or exert greater effort in return for the higher wage. Alternatively, she may work in poorer working conditions, a point emphasised in the compensating wage differential literature (Rosen, 1986). Either way, the higher wage is paid in recognition of the disutility engendered by the work. For this reason, intrinsically satisfying jobs may attract lower wages than other, less intrinsically satisfying jobs. If higher wages simply compensate for greater disutility from work and the analyst is able to account for all aspects of the job, one might imagine a relatively weak effect of wages on wellbeing. On the other hand, to the extent that it is not possible to control for all aspects of the job, a negative wage effect on wellbeing may be picking up that otherwise unobservable component of job quality or worker effort.

There are indications of labour intensification in the post-War period which have arisen, in part, as a response to growing product market competition and technological advances which have reduced the costs of capital-intensive production processes and monitoring procedures geared to maximising the effort that employees can expend in pursuit of productivity gains. Survey research indicates substantial increases in reported stress and anxiety among British employees in the 1980s and the first half of the 1990s, after which time it appears to have stabilised at this relatively high level (Green, 2006, 2009). This has been attributed to increases in work effort, at both the extensive and intensive margins, required by employers

and by the sorts of jobs that have become more numerous in the economy (Green, 2009). This matters because anxiety and stress are sources of ill-health and disease (Gardner and Oswald, 2004) and individuals report lower levels of happiness when they exhibit stress and anxiety (Blanchflower and Oswald, 2008). Other things equal, one might expect employers to compensate employees for increasing stress and anxiety occasioned by employment. This is precisely what survey research indicates since, over the decade to 2001, British employees experienced declining satisfaction with intrinsic aspects of their jobs – notably work effort and job autonomy – but rising satisfaction with extrinsic aspects of their jobs like pay (Green and Tsitsianis, 2004).

Higher wages may foster greater wellbeing in a variety of ways. For example, they imply higher spending power, increasing employees' capacity to consume goods and services and to provide for their families. However, there is an emerging literature questioning the link between income growth and happiness. Recent empirical evidence indicates that, at least in the case of citizens in advanced Western economies, GDP growth is not associated with greater happiness (Easterlin, 2001). Although Easterlin's Paradox has not gone unchallenged (Stevenson and Wolfers, 2008) there is also evidence at a micro-level of a less clear-cut relationship between income and wellbeing. Those receiving a random positive income shock, such as lottery winners, do indeed report higher levels of happiness than they had hitherto (Gardner and Oswald, 2007), but the effect often diminishes over time as they experience their new, richer environment. This is not simply because they must contend with previously unforseen problems (solicitations from others etc.) but also because they become habituated to their new improved circumstances. Kahneman and Deaton (2010) argue that emotional well-being rises with log income, but not by much beyond $75,000.

Warr (2007: 116) identifies a number of studies establishing a positive independent correlation between wages and job satisfaction. The association is robust across time and place. It is stronger with respect to pay satisfaction, but it is also statistically significant with respect to non-pecuniary aspects of the job. The studies include longitudinal studies finding increases in pay leading to increases in job satisfaction, *ceteris paribus* (op. cit.: 228). The emergent behavioural economics literature exploring the underlying reasons for this empirical regularity focuses largely on perceptions of fairness and reciprocity. Employees' sense of self-worth may be enhanced if they feel well-paid for the job they do, if it confers social status or if it heightens perceptions of fairness in the wage-effort bargain (Fehr and Schmidt, 1999). Higher wages can also induce greater feelings of wellbeing when employees reflect with satisfaction on their rank in the wage distribution relative to their peers (Brown et al., 2008), where they were in the past, or where they had hoped to be by this point in their career. Conversely, a wage hike may be associated with lower worker wellbeing if the worker was anticipating a larger hike, or if her peers received larger increases. A positive association between wages and satisfaction may also be observed if happiness increases productivity, as Oswald et al. (2009) show in a laboratory setting.

The empirical literature investigating the links between wages and job-related anxiety and stress is in its infancy. The literature on the association between wages and context-free anxiety is mixed, with some studies finding a link between low pay and high anxiety (eg. Gardell, 1971) while others report no statistically significant *ceteris paribus* association (Clark et al., 1996). There are at least four reasons to anticipate a systematic relationship between job anxiety and wages. First, as noted above, higher wages may be part of a wage-effort bargain which is only partially observed by the analyst. The wage is, in effect, compensating employees for taking on additional tasks or responsibilities which induce stress

and anxiety. Thus, although some people may be more satisfied in a job which requires them to work hard, it may nevertheless entail greater anxiety and stress than a job requiring lower levels of effort. In this setting, what is driving the relationship between JS, JA and wages is the unobservable heterogeneous preferences of employees that lead individuals to take high and low effort jobs with commensurately different rewards. Second, an unobservable productivity-enhancing trait may induce anxiety *and* affect wages.[1] For example, we know that job performance is wage enhancing and is positively correlated with the mental arousal (Kahneman, 1973) which is picked up in Warr's anxiety/contentment scale (our JA measure) but not in job satisfaction. The psychology literature distinguishes between "challenge" stressors, which are positively correlated with job performance, and "hindrance" stressors which are negatively related to job performance (Lepine et al., 2005). If anxiety inhibits learning and skill acquisition, for instance, this will lower earnings. Third, even though employees prefer higher wages, as indicated by their higher job satisfaction, higher wages may nevertheless generate anxiety and worry in employees who wish to justify their higher pay. This may be viewed as a true causal impact of higher wages on JA. Fourth, an employee's health may be affected by how much she earns relative to others. Comparisons can be stressful for the individual, adversely affecting their health (Leigh and Jencks, 2006).

We contribute to the literature by extending analyses of the link between wages and wellbeing to a new dimension of worker wellbeing – job anxiety - hitherto unexplored in the economic literature.

3. Data

Our data are the linked employer-employee Workplace Employment Relations Survey (WERS) 2004. The survey covers all sectors of the British economy with the exception of mining and quarrying; agriculture, hunting and forestry; fishing; private households with employed persons; and extraterritorial bodies. However, we confine our analyses to the private sector. Workplaces with at least 5 employees were sampled from the Inter-Departmental Business Register with a view to conducting a face-to-face interview with the manager at the workplace responsible for employment relations. The response rate was 64%. The respondent's permission was sought to distribute an eight page self-completion questionnaire to a randomly selected set of employees at the workplace or, in the case of workplaces with fewer than 26 employees, all of them. This permission was granted in 86% of cases. A further 10% of workplaces did not return any questionnaires. The overall response rate for the employee questionnaire was 61%.[2]

The data are particularly well-suited for the analysis of employee wellbeing for four reasons. First, we can control for workplace fixed effects and a broad array of job characteristics, as well as the standard controls for demographic and human capital attributes. This permits us to compare and contrast the wellbeing of workers with different wages in the same workplace, the same occupation, with the same amount of job autonomy. Second, we have a variety of measures capturing worker effort which we can control for, namely supervisory status, overtime hours worked, and employee (dis)agreement with the statement "my job requires that I work very hard". Third, we can construct mean workplace wages from

[1] Similarly, it has been argued that good performance leads to higher rewards which, in turn, lead to satisfaction (Lawler and Porter, 1967: 23).

[2] For more information about the survey see Kersley et al. (2006).

employee observations, thus permitting us to investigate relative wage effects on workers' wellbeing. Fourth, we have 14 measures of employee wellbeing capturing two broad measures of employee affect: 8 are measures of job satisfaction (JS) and 6 are measures of job anxiety and stress capturing Warr's contentment-anxiety scale (Warr, 2007).

3.1. Wellbeing measures

Our data contain two sets of wellbeing measures. The first set is employee responses to the following question: "Thinking of the past few weeks how much of the time has your job made you feel each of the following.. tense, calm, relaxed, worried, uneasy, content?" Responses are coded on a 5-point scale: "all of the time", "most of the time", "some of the time", "occasionally", "never". These measures have their origins in Warr's (2007: 19-49) anxiety-contentment axis. Warr distinguishes between the two ends of this axis along the two dimensions of pleasure and mental arousal. Anxiety, as measured by feeling tense, worried or uneasy, is associated with negative affect but entails a high level of arousal. Contentment, on the other hand, as measured by feeling calm, contented or relaxed, is associated with positive affect and entails low levels of arousal.[3] Principal components factor analysis[4] of the six JA measures revealed two factors, one containing the measures of negative affect and the other containing the measures of positive affect. This confirms Wood's (2007: 159) analysis which also used WERS 2004 but for the whole economy. However, as explained by Wood (op. cit.), there are good reasons to treat the items as forming a one-dimensional scale. Thus, following Wood, we combine the six items into a single scale. Taken together these six anxiety-contentment items have a Cronbach's alpha of 0.85. Our single summative JA score rescales the five-point scores for each measure into (-2, 2) scales where '-2' is "never" and '2' is "all of the time" having reverse-coded the positive affect items such that higher scores indicate higher job anxiety. The scale thus runs from (-12, 12). Just over one-third (35%) of the sample score above zero; one-tenth (10%) score zero; and the remaining 55% have negative scores.

Our second set of wellbeing measures relate to job satisfaction. Job satisfaction captures the pleasure-displeasure axis in Warr's concept of subjective wellbeing. We use all eight facets of job satisfaction available in the data. Employees are asked: "How satisfied are you with the following aspects of your job?... achievement you get from your work; the scope for using your own initiative; the amount of influence you have over your job; the training you receive; the amount of pay you receive; your job security; the work itself; the amount of involvement you have in decision-making at this workplace?" Responses are coded along a 5-point Likert scale ranging from "very satisfied" to "very dissatisfied". Principal component analysis identifies a single factor with an eigenvalue above 1 (4.04) explaining 51% of the variance in the items. Factor loadings ranged from 0.52 (pay) to 0.82 (influence).[5] The empirical literature indicates that the relationship between wages and satisfaction is stronger with respect to pecuniary aspects of the job and that the correlates of pecuniary and non-pecuniary job satisfaction differ. We therefore estimated the effect of wages on non-pecuniary job satisfaction (NPJS) and pay satisfaction (PS) separately. The NPJS scale, which has a Cronbach's alpha of 0.85, incorporates all the satisfaction items excluding pay, thus running from (-14, 14). One-sixth (17%) of the sample score below zero; one-fifth (22%) score zero;

[3] Our data contain no information relating to Warr's other key axis for measuring JA, namely depression-enthusiasm (depression being low affect and low arousal, while enthusiasm is high affect and high arousal). Since some of the predictors of depression-enthusiasm are known to differ from those for anxiety-contentment (Warr, 2007: 23) we cannot be sure how these other aspects of wellbeing may be associated with wages.

[4] We use orthogonal varimax principal components analysis with rotation.

[5] These results are similar to Wood's (2008: 160) even though his analysis relates to the whole economy.

and the remaining 61% score above zero. The relationship between wages and NPJS, on the one hand, and PJS on the other, were markedly different in some instances so we mainly focus on results based on these two job satisfaction scales rather than the GJS scale.[6] The pay satisfaction scale PJS runs from (1,5) with higher scores denoting higher satisfaction. Thirty-seven percent of the sample were either 'satisfied' or 'very satisfied' with their pay; 39% were either 'dissatisfied' or 'very dissatisfied'; the remainder were 'neither'.

3.2: Wages

Employees are asked: "How much do you get paid for your job here, *before* tax and other deductions are taken out? If your pay before tax changes from week to week because of overtime, or because you work different hours each week, think about what you earn on average." Responses are recorded in fourteen bands ranging from "£50 or less per week (£2,600 per year or less)" through to "£871 or more per week (£45,241 or more per year)". Employees are also asked: "How many hours, including overtime or extra hours, do you usually work in your job each week? *Exclude meal breaks and time taken to travel to work.*" To obtain hourly wages we obtain lower and upper bounds for the wage by dividing through by continuous hours and take the mid-point from each band (top-coding the open-ended upper band by multiplying the lower band by 1.5). We drop the 155 cases whose hourly wage falls four standard deviations or more away from the mean hourly wage. We test the sensitivity of the hourly wage results to a log transformation and we test non-linear wage effects by introducing quadratic terms and by entering dummies capturing low pay (bottom quartile of the hourly wage distribution), mid-level pay (the two middle quartiles) and high pay (the top quartile). We also construct a measure of workplace mean wages by summing the individual wages of survey respondents and dividing by the number of observations at the workplace. The individual's own wage is excluded from this mean wage so that when we incorporate it alongside the individual's own wage we are comparing the effects of own wage relative to the average wage of the worker's co-workers.

3.3: Control variables

All models contain hourly wages, hours worked and a quadratic hours term. In parsimonious models we control age (9 dummies); academic qualifications (8 dummies); single-digit occupation (9 dummies); single-digit industry (11 dummies); log workplace employment size and a quadratic term; and dummies for disability, gender, ethnicity and low travel-to-work-area unemployment (below 1.2%). We test the sensitivity of results to a 'full' model specification which also incorporates vocational qualifications (3 dummies); region (10 dummies); and dummies for union membership, coverage by a collective bargaining agreement, marital status, having any dependent children, carer status[7], single independent workplace, and urban location. The full model also replaces single-digit occupation with three-digit occupation dummies and includes proxies for effort described in the next paragraph. The workplace-level controls are replaced by workplace dummies in workplace fixed effects equations.

An accurate portrayal of the relationship between wages, JS and JA relies upon the analysts' ability to control for potentially confounding influences, such as aspects of the job which may be correlated with wages and wellbeing. One such job characteristic is occupation: we

[6] The correlation between the JA and NPJS is -0.45. If one regresses them against one another they account for 20% of the variance in the other.

[7] The dummy identifies those answering 'yes' to the question: "Do you look after or give help or support to any family members or friends who have a long-term physical or mental illness or disability, or who have problems related to old age?" Carer responsibilities may affect employees' wellbeing directly, as well as their earnings potential.

therefore control for occupation. Another is job discretion. Those with opportunities to exercise discretion in their jobs are often rewarded for the additional responsibilities this entails, but discretion can also act as a buffer against stress and anxiety because it provides employees with what Warr (2007: 107) refers to as "opportunity for personal control". When this is low it is "expected to generate anxiety as people are unable to act on their negative environment to avoid danger and potentially harmful events" (op. cit.). Thus it is important to control for job autonomy when seeking to identify the relationship between wages and wellbeing. We capture job autonomy with responses to the following question: "In general, how much influence do you have over the following….What tasks you do in your job, the pace at which you work, how you do your work, the order in which you carry out tasks, the time you start or finish your working day?" The responses have a four point scale ("a lot, some, a little, none"), from which we formed a summated rating that went from 0 ("none" on all five items) to 15 ("a lot" on all five items).

In an attempt to isolate the link between wages and wellbeing net of effort we use three measures of worker effort: the number of overtime or extra hours the employee usually works each week, whether paid or unpaid; a dummy for supervisory status[8]; and a dummy variable identifying those employees who agree with the statement "My job requires that I work very hard".

4. Estimation

We analyse the relationship between wages and employee wellbeing using the additive scales for job anxiety (JA), and job satisfaction (NPJS and PJS) described in Section 3.1. We argue that the rescaling makes simple linear models appropriate. We undertake five sets of analyses.

First we estimate the relationship between wages and wellbeing using OLS. The wellbeing of worker i employed in workplace f can be expressed by Equation 1:

$$1) \qquad J_{if} = \beta_1 Wage_{if} + \beta'_x X_{if} + \beta'_y X_f + \varepsilon_{if}$$

where J_{if} expresses job satisfaction (or job anxiety) for individual i in workplace f, $Wage_{if}$ expresses the wage of individual i in workplace f (different measures), the X_{if}'s express our vector of individual-level demographic and job characteristics, the X_f's express our vector of workplace-level controls shared by all sampled in the same workplace, and ε_{if} represents a standard normal distributed error term. β_1 gives the effect of wages on wellbeing on the assumption that wages are independent of wellbeing conditional on the other X's we include in the model. Since the labour supply of women is less wage elastic than men's it is possible that wages are a less important influence on women's wellbeing than men's. We explore this possibility by estimating separate analyses for men and women (tables not reported).

Second, we estimate the association between wages and JA and JS simultaneously to identify the independent association between wages and these two measures of wellbeing having accounted for the possibility that JA and JS are jointly determined by factors that are not accounted for in our model, such as unobservable fixed characteristics of individual

[8] The question is: "Do you supervise any other employees? A supervisor, foreman or line manager is responsible for overseeing the work of other employees on a day to day basis."

employees. We therefore collapse our measures of JA and JS into dummy variables[9] and run a set of bivariate probit models estimated under the assumption that the errors have a joint normal distribution (Greene 2003). The bivariate probit model estimates one additional parameter representing the correlation between errors, relative to estimating two separate probits. The functional form assumptions identify the model when the same regressors are used for each dependent variable; no exclusion restriction is required. We present Wald test statistics for the null hypothesis that the correlation is equal to zero. We find that our two measures of wellbeing are indeed jointly affected by unobserved variables. The correlations are large and the Wald test is always statistically significant at a 1 per cent level.

Third we present models which replace the vector of workplace controls with workplace dummies. These workplace fixed effects models allow us to examine the effects of employees' wages on their JA and JS having controlled for fixed unobserved workplace characteristics.

Fourth, we introduce the mean wages of the individual's co-workers at the workplace to establish the importance of wage relativities in the workplace as a factor in employee wellbeing using the following specification for wellbeing:

$$2) \qquad J_{if} = \beta_1 wage_{if} + \beta_2 (wage_{if} - Wage_f) + \beta'_x X_{if} + \beta'_y X_f + \varepsilon_{if}$$

where β_1 measures the effect of individual own wage on wellbeing, and β_2 measures the effect of relative wage within the workplace. By the standard omitted variable formulae, the bias term of an OLS estimate of J_{if} on individual wage only is then β_2 (1-b), where b is the regression coefficient of $Wage_f$ with respect to $wage_{if}$. A fixed establishment effect model provides a consistent estimator for $(\beta_1 + \beta_2)$, since $E(W_{if} - W_{.f}) = (\beta_1 + \beta_2)(wage_{if} - Wage_f)$, and a model including the average wage of the establishment $W_{if} = A + (\beta_1 + \beta_2)\, wage_{if} - \beta_2\, Wage_f + u_i$ may provide an estimator for β_2.

The models are unweighted and so provide within-sample estimates, rather than population estimates. Individuals' probability of sample selection are not independent of one another since they are clustered within sampled workplaces. Standard errors are adjusted to account for this using clustering[10] and we use the robust estimator to tackle remaining heteroskedasticity in the error terms. We drop all cases with missing data on any of the dependent or independent variables. The unweighted number of employee observations in the estimation sample is therefore 11,467 and they are clustered in 1,218 private sector workplaces (an average of around 10 employees per workplace).[11]

5. Results

Figure 1 shows the coefficients for hourly wages from regressions of each wellbeing measure, job anxiety (JA), job satisfaction (NPJS) and pay satisfaction (PJS), on wages. The

[9] We construct the dummies such that roughly half the sample score '1' on the dummy variables. The thresholds are >=0 in the case of the 24-point JA measure, >3 in the case of the NPJS 28-point measure and >2 in the case of the 5-point PS measure. Results are not sensitive to adjustments in the threshold.

[10] This procedure is recommended by Moulton (1990).

[11] We lose around 2,000 observations by excluding workers with missing data on items used in the analysis. This is another reason why we decide to estimate within-sample rather than population estimates.

coefficient may be interpreted as the increment in the average wellbeing index as we compare individuals earning one standard deviation higher hourly wages, conditional on hours worked. We note that while higher wages are associated with higher job satisfaction, they are also strongly associated with higher job anxiety.

Job anxiety is positively associated with higher wages. The most immediate explanation for this result seems to be one of compensating wage differentials. We explore this hypothesis below. On the other hand, non-pecuniary job satisfaction is also positively associated with higher wages. In light of a compensating wage differential story, this is a more surprising result. If high wages compensate for negative job attributes, we would expect the raw correlation between job satisfaction and wages to be negative, not positive, in the absence of any other job attributes. To find a positive relationship between wages and pay satisfaction is of course less surprising, but again we would expect this correlation to be affected by a host of other factors, and we thus proceed to a multivariate analysis.

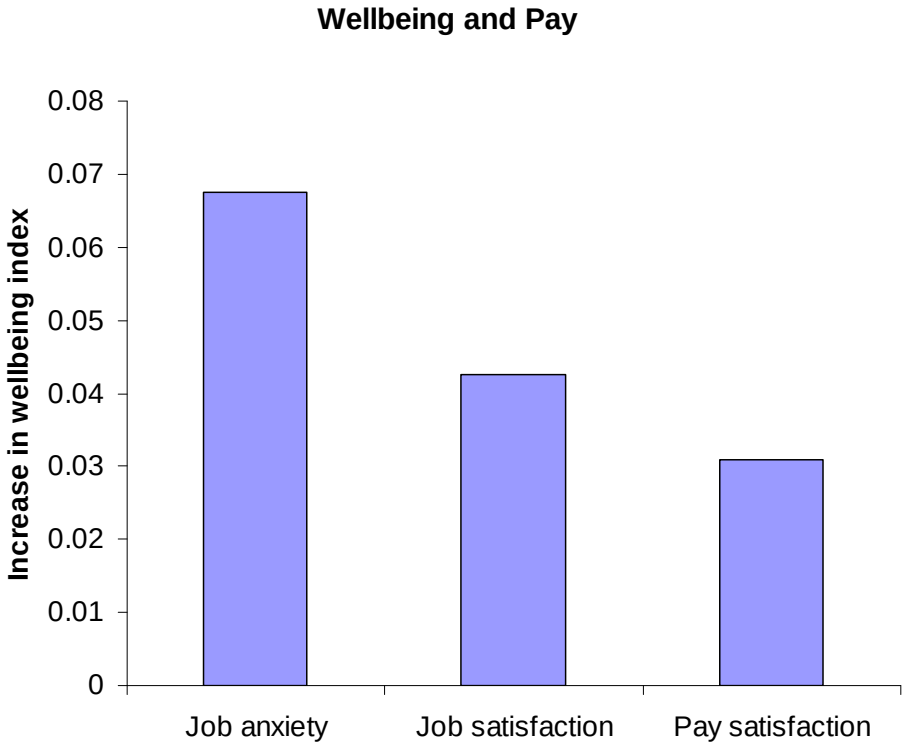

Table 1 presents OLS estimates of the association between wages and the three wellbeing measures, JA, NPJS and PJS. We run four model specifications. Column 1 contains a parsimonious set of controls, including age, education, industry, firm size, disability, gender, ethnicity and local unemployment. Column 2 adds a set of variables reflecting effort; overtime hours, supervisory responsibilities, hard work and work autonomy. Column 3 introduces a more extended set of controls, including marital status and children as well as 3 digit occupational codes, without the effort variables, what we term the 'full' model. Column 4 adds the set of effort variables to the full model.

Panel A indicates that higher hourly wages are associated with higher JA, even when we add the set of parsimonious controls. A one standard deviation increase in the hourly wage increases JA by 6 percent of the standard deviation in JA, or around .27 on the 24-point

index, which is roughly one-fifth of the average JA score of 1.32. The effect is strong and statistically robust.[12]

The hourly wage coefficient increases from .3 to almost .4 when we go from Model (1) to Model (2), that is, when we control for effort and job autonomy. Adding the full set of controls does very little to change this picture: the coefficient remains around .3 with the full controls, and .4 including controls for effort and autonomy.

These effort variables are themselves strong and significant in the JA equation. Column 1 in Table 2 shows the effect of effort on JA. The three effort controls (overtime hours, supervisory status, and agreeing that 'My job requires that I work very hard') are all positive and statistically significant, whereas job autonomy is negative and statistically significant.[13] [14] These effects are reasonable and suggest that efforts of this type may require some compensating wage differential. However, the fact that the effect of wages on JA increases rather than disappears when we control for effort and add detailed controls for jobs, individuals and workplaces, strongly suggests that compensating wage differentials is not the explanation for the relationship between wages and job anxiety. Higher wages seem to have an independent effect on subjective wellbeing, as measured by job anxiety, even when controlling for attributes of the individual, the workplace, occupation and various measures of effort.

Panel B in Table 1 reports the results from the same models, but this time using non-pecuniary job satisfaction (NPJS) as the dependent variable. Hourly wages are positive and statistically significant when effort is not in the equation. This may seem surprising, since we would expect that higher wages, which are associated with more effort, should have a negative effect on job satisfaction. However, when we look at the effect of effort indicators such as supervisory responsibilities and hard work, effort appears to be positively correlated with job satisfaction. Having a more challenging job is rewarding in itself, and what we pick up in models (1) and (3) may be the effect of a more challenging job on non-pecuniary job satisfaction. The coefficient drops between both models (1) and (2), and between models (3) and (4) with the addition of effort and job autonomy. The non-significance of the wage effect having controlled more fully for the nature of the job is consistent with what we would expect to find if higher wages are just a reflection of more challenging jobs.

Panel C presents identical models but for pay satisfaction (PJS). The coefficient is positive and statistically significant throughout. Even with the addition of a full set of job controls and effort, the coefficient changes little. In Table 2 we find that hard work has a negative effect on pay satisfaction, which is reasonable given a compensating wage story, whereas job autonomy has a positive effect, conditional on wages, suggesting that job autonomy is regarded as a positive attribute of a job.

The effort controls in the Model (3) are informative in their own right since their associations with the three well-being measures are at odds with simple propositions regarding compensating wage differentials. The coefficients are presented in Table 2. The perception that one's job requires hard work is associated with higher job anxiety and is negatively

[12] Results are similar when using log hourly wages. These are available from the authors on request.

[13] Full models are available on request.

[14] In sensitivity tests we introduced a quadratic term for hourly wages or dummies for quartiles of the hourly wage distribution. Although they occasionally proved statistically significant there was no compelling evidence of non-linear wage effects.

associated with pay satisfaction, suggesting the need for higher pay to achieve the same level of pay satisfaction. However, hard work is also positively associated with non-pecuniary job satisfaction, a finding that runs counter to the need for compensating wage differentials. Similarly, supervisory responsibilities engender greater job anxiety, but they are also positively associated with non-pecuniary job satisfaction. Overtime hours are correlated with more job anxiety but are not related to job satisfaction. Longer working hours are associated with higher job anxiety, but the relationship follows an inverted u-shape, with job anxiety declining with very long hours. Similarly, both pay and non-pecuniary job satisfaction fall initially with longer hours, only to rise with much longer hours. These models suggest worker preferences for harder work or greater responsibility may not always require a compensating wage differential.

Since the labour supply of women is less wage elastic than men's it is possible that wages have less influence on women's wellbeing than men's. We therefore run separate regressions for men and women. Although the hourly wage coefficients are a little lower in the case of women, the pattern of results is very similar to that for men and the differences in the male-female coefficients on hourly wages are not statistically significant.[15]

Table 3 presents estimates of the association between wages and JA and JS simultaneously to identify the independent association between wages and these measures of wellbeing having accounted for the possibility that JA and JS are jointly determined by factors that are not accounted for in our model. Although there is a strong, statistically significant negative correlation between the unobservables in the two equations the results are in line with those already reported. Hourly wages are positively associated with JA in all models. They are positively associated with PJS for all four model specifications (Panel B) but the association with NPJS becomes statistically non-significant in Model (2) and Model (4) when the effort controls are added.

Table 4 presents workplace fixed effects models to examine the effects of employees' wages on their JA having controlled for fixed unobserved workplace characteristics. Workplace dummies replace the workplace characteristics entering the previous models. In doing so they increase the total amount of variance accounted for by the model compared to the equivalent OLS models in Table 1, though the differences are not dramatic. The within workplace effects of hourly wages are remarkably similar to the OLS estimates presented in Table 1. Panel A shows JA rises with higher hourly wages, the coefficients being very similar to those presented in Table 1. Panels B and C show a positive correlation between wages and NPJS and PJS respectively which are similar in magnitude as well as statistical significance to the OLS estimates..

Effects of co-worker wages

We have found a positive association between an individual's wages and her job anxiety, and a positive association between wages and pecuniary job satisfaction. A key question is to what extent these effects arise from relative comparisons within the establishment or not. If relative wages matter, the OLS estimator of Table 1 is biased, whereas the fixed effect estimator of Table 4 provides the effect of increasing one's wage, conditional on co-workers' average wage, and is thus a sum of the relative and absolute wage effect. In Table 5 we thus

[15] Women's JA is higher than men's whereas their wages are lower, which could induce a positive correlation between JA and wages. These results confirm that this is not what is driving the results. Full results are available on request.

present models that are similar to the OLS estimates in Table 1 but they include an additional term capturing the mean wage of the individual's workplace colleagues.

If relative wages positively affect well-being, an increase in co-workers' wages should lower one's own well being. The coefficient of this variable is thus the negative of the relative wage effect, i.e. - β_2 in equation 2 as outlined in Section 3.

In the case of JA, the positive coefficients for hourly wages are very similar to those presented in Tables 1 and 4, while mean workplace wages are not statistically significant (Panel A), in particular when controlling for individual effort and job autonomy. This shows that the positive association between JA and hourly wage is due to the absolute wage level of the individual rather than wage comparisons within the establishment. The preferred model is thus the fixed effect model, providing an estimate of 0.45 (taken from Model (3) in Table 4).

In the JS models presented in Panels B and C the hourly wage effects are akin to those presented in Table 1 and 4. However, mean workplace wages perform very differently in the case of NPJS and PJS. Workplace mean wages are negatively correlated with NPJS – significantly so only in model (1) – whereas they are significantly positively associated with PJS in all models. Our preferred model is the full model, where we find no significant effect of absolute wages nor relative wages on NPJS.

PJS is the only outcome that seems to be affected by relative wages. The coefficient of average wages of one's co-workers is, however, positive (0.019), indicating that pecuniary satisfaction does not arise from improvement of one's relative position in the establishment, but rather that it is enhanced if one's co-workers are paid better as well. These results relating to the correlations between both own wages and workplace mean wages and JS are very similar to Brown et al. (2008). Using the 1998 predecessor of the survey we use in this paper, they also found positive correlations between own wages and PJS and NPJS, whereas workplace mean wages were positively associated with PJS and negatively associated with NPJS.

Where our results differ is in showing a non-significant link between mean workplace wages and NPJS in our full model, a finding which is consistent with compensating wage differentials. The job anxiety scale was not included in the 1998 survey: ours are the first results exploring links between workplace mean wages and JA and, as we have shown, the finding of no significant relationship differs markedly from that found for JS.

6. Discussion and Conclusions

Job satisfaction and job anxiety are negatively correlated but still wages are positively associated with both . Our data lack suitable instruments for wages so we can not discount the possibility that some of the associations we find between wages and wellbeing are driven by unobservable features of employees. Still, the positive association between wages and job anxiety appear as a puzzle. A compensating wage mechanism would predict that this association should disappear once appropriate controls for effort are included. However, the effect is robust to the inclusion of rich individual, workplace and job controls in addition to several measures of effort. The positive association between wages and job anxiety actually become stronger when we control for effort, not weaker, and seems to reflect an independent negative relationship between pay and subjective wellbeing as measured by job anxiety.

The persistence of the wage effects on job anxiety may be because a certain amount of job anxiety actually enhances job performance and thus increases wages, reflecting for example mental arousal (Kahneman, 1973). Another possibility is that, even though employees prefer higher wages as indicated by their association with higher job satisfaction, higher wages may nevertheless generate anxiety and worry in employees who wish to justify their higher pay. Pay satisfaction is also positively associated with wages. This is not surprising. This relationship prevails even with extensive controls, even though the effect is slightly dampened when controls for effort are included.

On the other hand, the positive association between higher wages and non-pecuniary job satisfaction disappears with the inclusion of our effort measures. Thus high levels of effort really provide high levels of non-pecuniary job satisfaction and higher wages, in contrast to what a simple compensating wage differentials theory would predict; namely lower job satisfaction and higher wages or higher job satisfaction and lower wages.

The addition of the mean wage of other workers in the workplace reveals three important findings. First, its introduction does very little to the effects of one's own wage. Second, higher co-worker average wages are associated with higher pay satisfaction. This is an important finding, consistent with Clark et al. (2009) who find that individual job satisfaction is higher where co-workers' wages are higher. They suggest this is due to co-workers' wages providing a positive signal about the individual's own future earnings. In accordance with the findings of Brown et al. (2008), we find that higher mean workplace wages are associated with lower non-pecuniary job satisfaction, however, this effect ceases to be significant once we introduce a full set of controls. Third, we have shown for the first time that there is no significant relationship between workplace wages and job anxiety, suggesting that job-related stress and anxiety is associated with absolute levels of wages and not by wage comparisons within the workplace.

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Table 1: OLS for correlation between wages JA, NPJS and PJS

	Mode l (1) Parsimonious	*Model (2) Parsimonious incl. effort*	*Model (3) Full*	*Model (4) Full incl. effort*
Panel A: Job Anxiety (JA)				
Hourly wage	.032	.039	.034	.040
	(3.80)**	(4.77)**	(3.92)**	(4.91)**
Adj. r-squared	0.04	0.17	0.09	0.18
Panel B: Non-Pecuniary Job Satisfaction (NPJS)				
Hourly wage	.069	.003	.069	.003
	(6.69)**	(0.29)	(7.02) **	(0.35)
Adj. r-squared	0.01	0.30	0.12	0.31
Panel C: Pecuniary Job Satisfaction (PJS)				
Hourly wage	.031	.027	.031	.027
	(13.60)**	(9.98)**	(10.89)**	(9.80)**
Adj. r-squared	0.04	0.09	0.08	0.10

Notes:
(1) Unweighted OLS of wellbeing and job satisfaction scales. JA=job anxiety; NPJS=non-pecuniary job satisfaction; PJS=pay satisfaction. N=11,467 for all models.
(2) Robust estimator with clustered standard errors. T-stats in parentheses. *=significant at 95% confidence interval; **=significant at 99% confidence interval.
(3) Parsimonious model controls are: age (9 dummies); academic qualifications (8 dummies); hours (and squared), single digit occupation (9 dummies), single-digit industry (11 dummies); log workplace employment size and a quadratic term; and dummies for disability, gender, ethnicity, and low travel-to-work-area unemployment (below 1.2%). The full model adds the following controls to the parsimonious model: vocational qualifications (3 dummies); region (10 dummies); dummies for home carer status, married or living as married, having any dependent children, union member, covered by a collective bargaining agreement, single independent workplace, urban location. It also replaces single-digit occupation with 3-digit occupation dummies. Effort proxies include a supervisor status dummy, continuous overtime hours worked, agreement with the statement "My job requires that I work very hard", together with the job autonomy scale described in the text.

Table 2: Effort Coefficients

	JA	*NPJS*	*PJS*
Overtime hours	.031	-.004	-.004
	(3.79)**	(0.55)	(1.70)
Supervisory responsibilities	.690	.648	.012
	(6.98)**	(6.66)**	(0.45)
Hard work	1.150	.296	-.069
	(21.74)**	(5.13)**	(4.90)**
Autonomy	-.301	.606	.054
	(23.47)**	(44.40)**	(16.20)**

Notes:
(1) Effort coefficients and t-statistics taken from Model (4) in Table 1. JA=job anxiety; NPJS=non-pecuniary job satisfaction; PJS=pay satisfaction. N=11,467 for all models.

Table 3: Bivariate Probit for correlation between hourly wages, JA and JS

	Job anxiety	*Satisfaction*	*athrho*	*Wald r=0*	*P for Wald*
Panel A: non-pecuniary job satisfaction					
M (1) Parsimonious	.007 (2.90)**	.016(5.74)**	-.519	838.05	0.0000
M (2) Parsimonious incl. effort	.009 (3.65)**	.001(0.36)	-.516	739.01	0.0000
M (3) Full	.006 (2.73)**	.016 (5.86)	-.521	845.74	0.0000
M (4) Full incl. effort	.008 (3.40)**	.001 (0.33)	-.512	734.12	0.0000
Panel B: pecuniary job satisfaction					
M (1) Parsimonious	.006 (2.84)**	.037 (7.71)**	-.293	327.06	0.0000
M (2) Parsimonious incl. effort	.009 (3.58)**	.033 (7.14)**	-.254	236.38	0.0000
M (3) Full	.006 (2.66)**	.036 (7.46)**	-.291	326.31	0.0000
M (4) Full incl. effort	.008 (3.32)**	.033 (6.89)**	-.251	234.62	0.0000

Notes:
(1) Unweighted bivariate probits. Panels A derives a satisfaction dummy based on the non-pecuniary job satisfaction scale (SATSC7) while Panel B uses the pecuniary job satisfaction scale.
(2) Robust estimator with clustered standard errors. T-stats in parentheses. **=significant at 99% confidence interval; *=significant at 95% confidence interval.
(2) See Table 1 for controls
(3) All models statistically significant with p>chi2 0.0000

Table 4: Workplace Fixed Effects Models for correlation between wages and JA, NPJS and PJS

	Model (1) Parsimonious	*Model (2) Parsimonious incl. effort*	*Model (3) Full*	*Model (4) Full incl. effort*
Panel A: JA				
Hourly wage	.045	.045	.045	.046
	(4.83)**	(5.01)**	(4.69)**	(5.06)**
Adj. r-squared	0.13	0.21	0.13	0.21
Panel B: NPJS				
Hourly wage	.088	.017	.086	.015
	(10.92)**	(2.02)*	(8.31)**	(1.77)
Adj. r-squared	0.19	0.36	0.36	0.36
Panel C: PJS				
Hourly wage	.026	.021	.025	.021
	(9.77)**	(8.30)**	(9.45)**	(8.06)**
Adj. r-squared	0.14	0.19	0.16	0.19

Notes:
(1) Unweighted estimates. N=11,467. Robust estimator with clustered standard errors. T-stats in parentheses. *=significant at 95% confidence interval; **=significant at 99% confidence interval.
(2) Parsimonious model controls are: age (9 dummies); academic qualifications (8 dummies); and dummies for disability, gender, ethnicity. The full model adds the following controls to the parsimonious model: vocational qualifications (3 dummies); dummies for home carer status, married or living as married, having any dependent children, union member, covered by a collective bargaining agreement. It also replaces single-digit occupation with 3-digit occupation dummies and includes proxies for effort, namely a supervisor status dummy, continuous overtime hours worked, agreement with the statement "My job requires that I work very hard", together with the job autonomy scale described in the text.

Table 5: OLS estimates of JA, NPJS and PJS incorporating mean workplace wages alongside individual hourly wages

	Model (1) *No controls*	*Model (2)* *Parsimonious* *incl effort*	*Model (3)* *Full*	*Model (4)* *Full* *incl effort*
Panel A: JA				
Hourly wage	.038	.041	.038	.041
	(4.41)**	(5.00)**	(4.23)**	(4.91)**
Mean workplace wage	-.036	-.011	-.031	-.011
	(1.83)	(0.57)	(1.67)	(0.63)
r-squared	0.09	0.17	0.09	0.19
Panel B: NPJS				
Hourly wage	.076	.008	.074	.006
	(7.61)**	(0.95)	(7.50)**	(0.74)
Mean workplace wage	-.044	-.029	-.032	-.021
	(2.11)*	(1.43)	(1.62)	(1.17)
r-squared	0.11	0.30	0.13	0.32
Panel C: PJS				
Hourly wage	.029	.024	.028	.024
	(10.68)**	(9.54)**	(10.51)**	(9.38)**
Mean workplace wage	.017	.017	.020	.019
	(3.73)**	(3.66)**	(4.20)**	(4.16)**
r-squared	.07	.10	0.08	0.12

Notes:
(1) N=11,415.

(2) Mean workplace wage excludes individual's wage. Derivation is described in the text.

(3) For other details of models see Table 1.

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