

How Does Innovation Affect Worker Well-being?

By

Alex Bryson* Harald Dale-Olsen** and Erling Barth**

*National Institute of Economic and Social Research and Centre for Economic Performance, London, UK

**Institute for Social Research, Oslo, Norway

Abstract

We explore the effects of management innovations on employee well-being using private sector linked employer-employee data for Britain. We find management innovations are associated with lower employee well-being measured on an anxiety-contentment scale. This is the case for three different count measures of innovation – a global measure of innovation and measures for labour innovations and capital innovations. Innovation is also associated with lower job satisfaction but, in this case, the effect is confined to labour innovations. The negative effects of innovation on employee wellbeing are ameliorated when they work in a unionised workplace and are involved in the introduction of the innovation

Key-words: innovation; well-being; job satisfaction; trade unions

JEL-codes: J28; J51; J81; L23; 031

Acknowledgement: We are grateful to participants at the European Association of Labour Economists 2009 Conference in Tallinn, and seminar participants at the Paris School of Economics, the University of Lancaster and the Centre for Economic Performance at LSE for comments. We thank the Norwegian Research Council for funding (grant No. 173591/S20). This work is also part of the research activity at ESOP, University of Oslo, funded by the Norwegian Research Council. Erling Barth thanks the Labor and Worklife Programme at Harvard University and NBER for their hospitality during the work with this project. Alex Bryson thanks the sponsors of the Workplace Employment Relations Survey 2004 (Department for Business Innovation and Skills, Acas, ESRC and PSI) and the UK Data Archive for access to the WERS data. Corresponding author: Alex Bryson, e-mail: a.bryson@niesr.ac.uk.

1. Introduction

Innovation may take many forms, including process innovations in labour deployment and capital investment, and innovations in products and services, but it is commonplace to assume that firms must be innovative in order to survive and prosper. There is empirical evidence to support this claim. For example, the success of Wal-Mart in the United States is attributed, in part, to innovations in its supply chain and distribution networks (Holmes, 2008). Movement towards flexible specialisation in the Italian textiles industry allowed it to produce high value-added goods which sustained it in the face of global competition from low-cost producers (Piore and Sabel, 1982). Innovations in lean production, total quality management and 'high-involvement management practices' have been cited as the reasons for the commercial success of Japanese car manufacturers (Wood, 1989), US steel producers (Ichniowski et al. 1997) and in manufacturing more generally (Bloom and Van Reenen, 2007). On the other hand, a failure or inability to innovate can be to the detriment of firms, especially in highly competitive markets. Thus, in a recent survey of CEO's conducted by the Economist Intelligence Unit one-third of those questioned identified 'failure to innovate' as one of the top three risks facing their companies over the next three years (EIU, 2005).

Although change is known to have adverse effects on well-being relatively little attention has been devoted to the effects of managerial innovations on worker well-being. Most of the research has concentrated on the effects of innovation on job creation and destruction. Recent firm-level evidence indicates process innovations lead to job destruction, particularly in the short-term, but that these are often compensated for by employment growth arising from product and service innovation (Harrison et al., 2008). This innovation-induced job shake-out may be met with some trepidation by incumbent workers, potentially leading to stress and anxiety. In addition innovations in work practices arising from the introduction of new work methods or processes associated with the deployment of new technologies may have positive or negative effects on worker well-being depending on whether they are job enriching or a source of labour intensification.

Few studies are able to assess the links between workplace innovations and employee well-being because they lack the necessary information. In this paper we use linked employer-employee data for British private sector workplaces to explore the effects of managerial innovations on employees' well-being. We consider innovations in products and services, and process

innovations in relation to both labour organization and capital investment, exploring their effects on fourteen measures of employee subjective well-being (SWB).

Managers are rarely free to innovate at will. Innovation can be met with resistance or hostility by employees who are either fearful of change or believe it will be to their detriment. Where employees have sufficient bargaining power, they may even be able to block management attempts to innovate. Some unions were notorious for enforcing restrictive labour practices in Britain during the 1960s and 1970s leading to lower labour productivity in unionised workplaces compared with their non-union counterparts (Metcalf, 1989). This, coupled with the union wage premium, meant unions had a negative impact on profitability. However, these productivity and profitability deficits began to decline in the 1980s and had largely disappeared by the 1990s (Blanchflower and Bryson, 2009; Menezes-Filho, 1997). One possible reason for this might be differential rates of managerial innovation over that period in the union and non-union sectors. Certainly, by the beginning of the 21st Century new labour working practices were just as evident in the union sector as they were in the non-union sector and, in some cases, more widespread (Wood and Bryson, 2009). We therefore devote particular attention to the role of trade unions in mediating the effects of innovation on worker well-being.

Employee involvement in the introduction of innovations may take many forms. In this paper we are able to distinguish between effects of involvement through consultative committees etc. in a non-unionized environment versus involvement in a unionized environment. One possible hypothesis is that only involvement backed by formal bargaining institutions really matters for the outcomes, whereas the alternative hypothesis is that what matters is consultation and involvement, rather than the formal involvement of a union.

We have three main findings. First, managerial innovations are associated with lower worker well-being measured on an anxiety-contentment scale, *ceteris paribus*. Second, innovations in labour usage are also associated with lower job satisfaction, but this is not the case for other forms of innovation. Third, the negative influence of innovation on worker well-being is ameliorated when workers are employed in a unionised workplace, where both employee involvement in the innovation process and the presence of a union are necessary to overcome the negative wellbeing effects of innovation.

The remainder of the paper is structured as follows. Section Two reviews the theoretical and empirical literatures linking innovation to worker well-being and the mediating role played by

unionization. Section Three introduces our data. Section Four outlines the empirical strategy. Section Five reports our results and Section Six concludes.

2. Theoretical and Empirical Literature

Theory suggests innovation may have either positive or negative effects on worker well-being. Worker well-being may be adversely affected where managerial innovations are to workers' detriment (or perceived as such), where they generate uncertainty associated with future loss, and where they are introduced in a way that is perceived to be unfair. However, not all innovations will be perceived in the same fashion by workers because some are more likely to impinge on their working conditions and work arrangements than others. For example, changes to working hours or work organization may have a greater direct effect on workers than, say, the introduction of a new product or service that requires no major change to working arrangements.

Those innovations to which researchers have devoted the most attention are what are sometimes referred to as innovative working practices (IWPs) and are akin to the practices that are also sometimes described as 'new', 'high-involvement', 'high commitment' or 'high performance'. There are, broadly speaking, two schools of thought on whether IWPs are to the detriment of worker well-being. The first holds that IWPs may offer employees opportunities to improve the quality of their working lives, via devolved decision-making powers and responsibilities. Since workers often demand greater decision-making power at the workplace, more control over how they do their work, and more input into managerial decision-making (Freeman and Rogers, 1999) it seems reasonable to assume that IWPs may increase job satisfaction and well-being. Writers in this school recognise that not all workers benefit, for example because of job cuts and associated insecurity (Black et al., 2004); and not all workers prefer greater decision-making. The second school of thought is that IWPs may entail labour intensification: more is being demanded of workers in terms of their commitment and effort; and, because of market rigidities, workers have little choice but to engage with them. IWPs are often associated with high levels of work intensity and worker stress, even when they are also associated with higher work commitment (Ramsay et al., 2000) or higher job control (Gallie, 2005).

A number of studies have looked at the impact of IWPs on job quality and find mixed evidence (Godard, 2004). Some (e.g. Barker, 1993; Godard 2001) support the pessimistic school of thought finding that some practices are associated with work overload. Others (e.g. Appelbaum

et al., 2000) have found no adverse effects of some IWPs on stress levels; while Doeringer et al (2002) found that manufacturing start-ups which adopt IWPs offer jobs with relatively high pay, good training, job security and opportunities for participation. Of particular note is Wood's (2008) study since he uses the Workplace Employment Relations Survey 2004, the data used in this paper. Wood (2008) confirms Karasek's (1979) theory that worker well-being is negatively related to job demands and positively related to job control, and that high job controls reduce the negative association between job demands and well-being.¹

IWPs are often introduced as part of broader structural and organizational changes such as the introduction of new plant or technology, changes in management structure, or the introduction or redesign of products and services. Such innovation may also bring with it the threat of job loss, resulting in job insecurity which, in turn, is associated with negative worker affect (De Witte, 1999). Job insecurity may be engendered by innovations such as product innovations, regardless of whether they entail IWPs. For instance, they may entail shifts in productive capacity either within or across plants, leading to the closure of particular plants or production lines. Even if a worker's job is not at risk, her wellbeing may suffer from the knowledge that her work colleagues may be at risk.

It is not simply the nature of a managerial innovation that may affect worker well-being. How it is introduced can also matter. Employees' perceptions of fairness or equity are associated with SWB (Warr, 2007: 135-140). Innovations may result in perceptions of distributive (in)justice depending upon the allocations of rights and rewards accruing to workers and they may result in perceptions of procedural (in)justice depending upon the process that governed the introduction of the innovation. As Warr (2007: 137) notes unjust outcomes and procedures are themselves experienced as negative, thus directly affecting SWB, as well as influencing perceptions of environmental features that also affect SWB, such as perceptions of supervisors or the organization in general. The empirical research reviewed by Warr finds links between perceptions of unfairness at the workplace and emotional exhaustion, distress, and lower job satisfaction (op. cit.).

Trade unions may play an important role in mitigating or exacerbating the negative effects of managerial innovation on worker well-being for a number of reasons. First, unions may

¹ In a similar vein, Bordia et al's (2004) case study links organizational change to psychological stress through perceived loss of control. Pollard (2001) shows that workplace reorganization caused significant increases in distress and in systolic blood pressure and that uncertainty was a key factor.

negotiate on behalf of their members over the nature of a workplace innovation. Worker well-being may be viewed as a public good, that is, a good affecting the well-being of everyone in such a way that one individual's partaking of the good does not preclude others from doing so. Without a union, individuals will lack the incentive to pursue public goods since, as Freeman and Medoff (1984:8–9) argue: “Without a collective organization, the incentive for the individual to take into account the effects of his or her actions on others, or to express his or her preferences, or invest time and money in changing conditions, is likely to be too small to spur action”. Unions with a strong bargaining position may be able to block innovations which appear particularly detrimental to workers. Where management innovations proceed they may be significantly modified by the union such that they are more acceptable to employees than might have been the case in the absence of trade union representation.

Via their union representatives employees have the opportunity to refashion innovations to their advantage, either in response to union-oriented consultations or through the union's role as negotiator with the employer. Consultation and negotiation with union representatives gives employees a ‘say’ in the innovation process which can enhance worker well-being, irrespective of the final shape of the innovation, simply because workers feel they have had some meaningful involvement in the process. This can lead to heightened perceptions of procedural fairness and the sense that employees have some control over how their working environment is being reshaped.

The third way in which unions may ameliorate the negative impact of innovations on employee well-being is as a guarantor of job security to employees in the face of potentially productivity-enhancing labour reorganisation. Unions often link the acceptance of innovations to job security commitments, thus increasing the credibility of managerial assurances that innovations do not come at the expense of jobs. These agreements often take the form of job security guarantees (JSG's) which seek to avoid compulsory redundancies if at all possible. JSG's are more prevalent in union than in non-union workplaces and, although job cuts are just as likely where JSG's are present, the probability of compulsory redundancy is lower. As a consequence, JSG's reduce employee perceptions of job insecurity (Bryson et al., 2009) and may thus facilitate managerial innovation.²

² Black and Lynch (2004: footnote 5) make the point that, because worker-management agreements are rarely legally enforced unions can help overcome the incentive incompatibility problems discussed by Malcolmson (1983).

Fourth, social psychologists argue that social supports can help people cope with high demands under conditions of low control (Payne, 1979), as in the case of workers facing managerial innovations. Wood (2008: 157) argues that trade unions can be regarded as a source of social support which, under Karasek and Theorell's (1990: 75) model, helps to limit the impact of work strain on worker well-being. However, in his empirical analysis he finds union membership is not correlated with well-being or job satisfaction.

A fifth means by which unions may mediate the link between managerial innovations and worker well-being is through their efforts to secure higher wages in return for productivity-enhancing innovations. This may be seen as a form of rent-sharing on the part of unions, or the negotiation of compensatory wage differentials in return for what might be regarded as the disamenities associated with managerial innovation. If unions are particularly adept at capturing innovation-generated rents this may act as a disincentive for firms to innovate in the first place.³ In fact, innovative practices are at least as prevalent in unionized workplaces as they are in non-unionized workplaces in Britain (Wood and Bryson, 2009). However, *ceteris paribus* wages are higher in innovative unionised workplaces than they are in innovative non-unionized workplaces, a finding consistent with unions extracting a wage premium in return for managerial innovations (Bryson et al., 2005). Thus, even if workers do not like innovation they may be more sanguine about it if their wages rise as a consequence.

For all these reasons it seems that unions may be able to assuage employees' worst feelings about managerial innovations, potentially contributing to the higher productivity of innovations in unionized plants compared to non-unionized plants (Bryson et al., 2005). Similarly in the manufacturing sector in the United States unions are associated with a higher rate of innovation and with higher labour productivity in the presence of innovative practices (Black and Lynch, 2004).

On the other hand, there are reasons why unionization may exacerbate negative effects of innovation on worker well-being. First, by increasing the flow of information between unions and management, unions can heighten employees' awareness of problems and short-comings

³ Unions can lower the incentive to invest in new capital if they expropriate a portion of the rents arising from investment, thus lowering the returns to investment relative to non-union firms (Hirsch, 1992). Grout (1984) makes a similar point with respect to R&D investments. Lower profitability in union firms will also mean there is less internal capital available for reinvestment than in non-union firms. The counter-argument is that unions increase the cost of labour relative to capital thus leading to capital intensification. Empirical studies for the United States (Hirsch, 1990, 1992) and Britain (Denny and Nickell, 1991) suggest that unionised firms invest less in capital than non-union firms.

with management and their innovations, thus increasing employee dissatisfaction (Freeman and Medoff, 1984:142; Gallie et al., 1998:113–4). Second, unions increase the stock of dissatisfied workers because dissatisfied workers are less likely to quit in unionized workplaces than they are in nonunionized workplaces. This is so because the union offers a voice outlet for worker dissatisfaction that is less costly than quitting (Freeman and Medoff 1994:141). In doing so, unions raise average workplace tenure, which is associated with greater dissatisfaction (Bryson and McKay 1997). Third, where management does not involve unions in the innovation process, worker discontent arising from unmet expectations and perceptions of procedural unfairness may result in lower well-being than in circumstances where the absence of a union is associated with lower worker expectations of involvement.

It is difficult establishing the causal relationship between managerial innovation and employee well-being because innovations are not randomly assigned to workplaces and their employees. First, managerial innovation may be a response to worker well-being. It is conceivable that some management innovations are introduced to combat low morale and job dissatisfaction, in which case treating innovation as exogenous will overstate any negative effects of innovation on well-being. Alternatively, managers may wish to capitalise on times when employees are ‘feeling good’ by introducing innovations, thus potentially minimising opposition to change. If so, this could result in an understatement of any negative effects of innovation on well-being.

Second, workers may select into or out of workplaces according to their preferences such that a non-random group of employees will be subject to managerial innovations. If this worker selection cannot be accounted for by observable characteristics entering our models, and if it is also correlated with individuals’ propensity for well-being or satisfaction, it will bias our estimates of innovation’s effect on well-being. For example, naturally optimistic and resilient workers may be more prepared to join workplaces which innovate. It is also plausible that employers intent on innovating seek to recruit and retain these sorts of workers. Either way, if unaccounted for this will induce an upward bias in our estimates of innovation’s effects on well-being. It is also plausible that those whose wellbeing is most adversely affected by workplace innovations will quit innovating workplaces leading us to understate the negative effects of innovation on wellbeing. We have no instrumental variables to assist us in identifying the causal impact of innovation. However, we explore the role of worker selection by testing the robustness of our results for those with short and long tenure and investigating the role of worker quit rates at the establishment.

Similarly, union coverage is not randomly assigned to workplaces or to workers. Indeed, there is a substantial literature which seeks to account for the endogeneity of unionisation in isolating the causal impact of unionization on job satisfaction.⁴ Union organizing is often assisted by a sense of grievance on the part of workers since it can trigger greater desire for union assistance and increases the net benefits of unionizing. This can help explain the negative effects of unionization on job satisfaction found in the literature (Bryson et al., 2005). We have no instrument to isolate the true causal impact of unions in mediating the effects of innovation. However, our interest is in employment in a workplace where unions bargain over terms and conditions, as opposed to union membership. By introducing union membership as a control variable we are able to capture worker preferences for unionisation which might be correlated with employees' wellbeing, thus permitting us to estimate the effects of union coverage net of preferences for joining a union.

3. Data

Our data are the linked employer-employee Workplace Employment Relations Survey 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 private sector workplaces. 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%.⁵

3.1: Well-being measures

Our data contain two sets of well-being 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",

⁴ For a review of this literature see Bryson et al. (2005).

⁵ For more information about the survey see Kersley et al. (2006).

“occasionally”, “never”. These measures have their origins in Warr’s (2007: 19-49) anxiety-contentment axis for measuring subjective well being (SWB). 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.⁶ Principal components factor analysis⁷ of the six SWB 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-commitment items have a Cronbach’s alpha of 0.85. Our single summative SWB 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 negative affect items such that higher scores indicate higher positive affect. The scale thus runs from (-12, 12). Just over one-third (35%) of the sample score below zero; one-tenth (10%) score zero; and the remaining 55% have positive scores.

Our second dependent variable is job satisfaction. Job satisfaction captures the pleasure-displeasure axis in Warr’s concept of subjective well-being. 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 (2.74) explaining 78% of the variance in the items. Factor loadings ranged from 0.26 (pay) to 0.80 (initiative). The Cronbach’s alpha for all eight job satisfaction items is 0.85.⁸ Our single summative job satisfaction score rescales the five-point scores for each measure into (-2, 2) scales where ‘-2’ is “very dissatisfied” and ‘2’ is “very

⁶ Our data contain no information relating to Warr’s other key axis for measuring SWB, 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 well-being may be associated with managerial innovations.

⁷ We use orthogonal varimax principal components analysis with rotation.

⁸ These results are similar to Wood’s (2008: 160) even though his analysis relates to the whole economy.

satisfied⁹. The scale thus runs from (-16, 16). One fifth (20%) of the sample score below zero; 30% score between 0 and 4; and the remaining 50% score 5 or more.⁹ As a sensitivity check we also run analyses on non-pecuniary job satisfaction using the same scale but excluding the scores for pay satisfaction.

3.2: Innovation measures

It is common in the literature to characterise workplace practices as ‘innovative’ or ‘new’ when, in fact, it is unclear whether they are indeed innovations or new. We overcome that problem in this paper by focusing our attention on changes in practices in the two years prior to the survey. Our innovation variables are based on managerial responses to the following question:

“Over the past two years has management here introduced any of the changes listed on this card? PROBE: Which others? UNTIL 'None':

- 1) Introduction of performance related pay
- 2) Introduction or upgrading of computers
- 3) Introduction or upgrading of other types of new technology
- 4) Changes in working time arrangements
- 5) Changes in the organisation of work
- 6) Changes in work techniques or procedures
- 7) Introduction of initiatives to involve employees
- 8) Introduction of technologically new or significantly improved product or service
- 9) *NONE None of these*

All eight innovations are positively correlated with correlations ranging between 0.19 (introduction of incentive pay and the introduction of new technology) and 0.65 (changes in work techniques and procedures and changes in work organization). Principal components analysis revealed two factors with eigenvalues above one.¹⁰ The first factor (eigenvalue 1.90), accounting for 59% of the variance in innovation, contains the four labour-oriented innovations,

⁹ The correlation between the SWB and job satisfaction scales is 0.45. If one regresses them against one another they account for 20% of the variance in the other.

¹⁰ The factor analysis reported in this paragraph uses STATA's `factormat` command which is intended for use with dummy variables. We report on the workplace-level data but results are virtually identical when run on employee-level data.

namely items 4, 5, 6 and 7 above.¹¹ The Cronbach's alpha for these items is 0.65. The second factor (eigenvalue 1.59), contains the three capital-oriented innovations, that is, items 2, 3, and 8.¹² The introduction of performance-related pay is positively correlated with both factors, but its factor loadings are not high (0.32 and 0.18 respectively) indicating that this particular managerial innovation does not belong to either factor. This is consistent with the literature in which incentive payments are often introduced as a means of supporting labour innovations such as the introduction of employee involvement practices (Huselid, 1995). We construct three count variables, one which sums all eight innovations (NCHANGE); a second for labour innovations based on items 4, 5, 6, and 7 with a maximum value of 4 (NLABCHG), and a third for capital innovations based on items 2, 3, and 8 with a maximum value of 3 (NCAPCHG). One-quarter (25%) of workplaces had introduced no labour innovations in the previous two years; one-fifth had introduced one innovation (21%), another fifth (22%) had introduced two, a further fifth (19%) had introduced three, and 13% had introduced all four. One-fifth (20%) of workplaces had introduced none of the three capital innovations; one-quarter (24%) had introduced one; 29% had introduced two; and one-quarter (26%) had introduced all three. Twelve percent of workplaces had introduced performance related pay in the previous two years.

3.3: Unionization variables

Our measure of union coverage is the presence at the workplace of one or more unions recognised by the employer for bargaining over pay and conditions of employment, whether the bargaining occurs at the workplace, organization or sectoral-level. These data are derived from the management questionnaire. We control for individual-level union membership which is taken from the employee self-completion questionnaire.

3.4: Control variables

In addition to individual union membership and workplace-level union recognition status, we control for age (9 dummies); academic qualifications (8 dummies); single-digit occupation (9 dummies); and dummies for disability and gender. Our workplace-level controls are single-digit industry (11 dummies); log workplace employment size and a quadratic term; and a dummy for low travel-to-work-area unemployment (below 1.2%)

¹¹ The factor loadings range between 0.50 for employee involvement initiatives and 0.72 for changes in work techniques or procedures.

¹² The factor loadings range between 0.59 for the introduction of new or improved products or services and 0.73 for the upgrading or introduction of new technology.

In sensitivity analyses we split our samples according to their tenure at the workplace to investigate whether employees who have been at the workplace for some time are affected differently by innovations compared to new-comers. We also split the sample according to whether the workplace had a high voluntary quit rate in the previous 12 months, something which might occur if those employees most adversely affected by innovation chose to leave.¹³

In exploring mechanisms by which unions might mediate the link between innovation and employee wellbeing we concentrate on two issues. The first is employee involvement in the introduction of innovations. Where managers had innovated they were asked what type of involvement trade unions, joint committees and the employees affected had in “introducing and implementing this change”. The pre-coded responses were: “they decided; they negotiated; they were consulted; they were informed; no involvement”. Among employees who had experienced innovations in the last two years, 20% were in workplaces where there had been no employee involvement in the introduction of the innovation. Twelve per cent worked at workplaces where it had been subject to negotiation or was actually decided by employees; 56% were in workplaces where there had been consultation over innovation; and 38% were in workplaces where they had been informed about innovation. (The figures for negotiation, consultation and information sum to over 100% because in some cases workplaces took different approaches with respect to unions, joint committees and employees). In the analysis we create a dummy variable which simply identifies those workplaces where the union, a joint committee or employees had either decided on the innovation, had negotiated over it, or were consulted about it.

Second, we control for a more detailed set of job characteristics which the literature suggests could be bargaining objectives for unions as well as being important in understanding the effects of innovation on employees. These are job autonomy which is captured 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). We also consider the effects of worker effort since innovations may lead to labour intensification, thus influencing wellbeing. If unions are strong enough they can limit intensification. We introduce three measures of worker

¹³ The manager is asked how many of those employees working at the workplace a year ago had left voluntarily or resigned. We produce a quit rate with the number of employees a year ago as the denominator. We define those with a quit rate of over 13% as having a high quit rate: they constitute two-fifths of the workplace sample.

effort: the number of overtime or extra hours the employee usually works each week, whether paid or unpaid; a dummy for supervisory status¹⁴; and a dummy variable identifying those employees who agree with the statement "My job requires that I work very hard".

4. Empirical Approach

We analyse the effects of innovation on worker well-being using the additive scales for SWB and job satisfaction described in Section 3.1. We argue that the rescaling makes simple linear models appropriate. The relationship between the well-being of worker i employed in workplace f can be expressed by Equation 1:

$$1) \quad W_{if} = \beta_1 \text{Innovations}_f + \beta_2 \text{Union}_{if} + \beta_3 \text{Innovations}_f \times \text{Union}_{if} + \beta' X_{if} + \varepsilon_{if}$$

where W_{if} expresses well-being (or job satisfaction) for individual i in workplace f , Innovations_f express the number of innovations introduced in workplace f (different measures), Union_{if} expresses a dummy for union coverage (which varies at the worker level), while the X 's represent our control vector and ε_{if} is the error term. β_1 gives the effect of innovation on the well being of non-unionized workers, whereas $(\beta_1 + \beta_3)$ gives the effect of innovation on the well being of unionized workers. As noted above, we vary the X vector in our sensitivity analyses.

The models are unweighted and so provide within-sample estimates, rather than population estimates. Individuals' probability of sample selection is not independent of one another since they are clustered within sampled workplaces. Standard errors are adjusted to account for this using clustering and we use the robust estimator to tackle remaining heteroskedasticity in the error terms. Sample sizes vary a little across the well-being and job satisfaction models. For the basic models the unweighted number of employee observations is 13,500 and they are clustered in 1,238 private sector workplaces (an average of nearly 11 employees per workplace).¹⁵ We also run Equation 1 (without the interaction term) for covered and uncovered employees separately.

5. Results

Table 1 presents estimates of the association between innovation and employee well-being as measured by the additive well-being scale. Panel A presents results using the additive innovation

¹⁴ 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."

¹⁵ We lose over 1,500 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.

scale. Panels B and C present identical models but replace the global innovation count measure with the additive scales for labour and capital innovations respectively. In each case four models are presented. Model (1) is run for the whole private sector and incorporates the dummy identifying a unionized workplace. Model (2) includes the interaction term between innovation and coverage. Models (3) and (4) are for uncovered and covered employees respectively. The pattern of results is identical in all three panels. Innovation is associated with lower employee well-being but, when the model is split by union coverage status, the association is only statistically significant in the case of uncovered employees. The difference between the innovation coefficients in the covered and uncovered sectors is statistically significant in the case of the global innovation and labour innovation models, but it is not statistically significant in the case of capital innovations.¹⁶

[INSERT TABLE 1]

Table 2 provides results for job satisfaction, using the same specifications. The negative association between innovation and job satisfaction is only significant in the case of uncovered employees and is only apparent for labour innovations (NLABCHG). Furthermore, the differences between effects on covered and uncovered employees are not statistically significant.

[INSERT TABLE 2]

If union coverage effects are due to the way in which unions negotiate over the wage-effort bargain one might think that the introduction of controls for effort and job autonomy may affect the union coefficients in the model. In fact, these variables operate as anticipated in that our proxies for effort tend to be associated with greater anxiety and stress, while job autonomy is associated lower anxiety, but their introduction does not affect the pattern of results already reported.

If the way in which innovation is introduced affects worker well-being one might expect systematic differences in well-being according to whether or not employees have some say in their introduction. We tested this proposition by splitting the sample according to whether the

¹⁶ We tested the sensitivity of these results to the introduction of performance-related pay in the previous two years. This was not statistically significant and it did not affect the results.

employer had involved the union, a joint consultative committee or employees directly when introducing innovation, either by consulting them, negotiating with them or allowing them to make the decision. This distinction proves important, but only in the case of covered employees (Table 3). Among uncovered employees, involvement in the introduction of the innovation makes no difference to their wellbeing: innovation is negatively correlated with their SWB whether the employer engaged with employees in introducing it or not. In the case of covered employees, on the other hand, the employer is able to innovate without it adversely affecting employee subjective wellbeing if the employer engages with employees when implementing the innovation. If they or their union are not involved their SWB is negatively associated with innovation in much the same way as uncovered employees.¹⁷ This evidence is consistent with the idea that employee involvement in the innovation process can ameliorate its negative effect on their wellbeing, but only in a unionized environment, suggesting that employee involvement only has ‘bite’ when backed by formal bargaining institutions.

[INSERT TABLE 3 ABOUT HERE]

Worker selection into or out of more and less innovative workplaces may have affected the results we have reported. We split our analyses into employees with under two years tenure and those with tenure of two years or more, corresponding with the period over which management were asked to identify innovations¹⁸. This made little difference to our results: the negative association between wellbeing and innovation was confined to uncovered employees, regardless of whether they were short- or long-tenure employees. The implication is that the sorting of employees in response to innovation played little or no role in the analysis we have undertaken.

Finally, if workplaces begin to innovate, this may result in the departure of some employees concerned about the implications for their own welfare. We find that the proportion of employees voluntarily quitting the establishment is positively associated with the degree of innovation, but quit rates at the workplace in the previous year are not significant for existing employees’ wellbeing and they do not impinge on the results presented above.

6. Conclusions

Using private sector linked employer-employee data for Britain we explore the effects of management innovations on job satisfaction and an alternative measure of subjective well-being

¹⁷ Among unionised employees the differences between involvement and no involvement are statistically significant at a 95 percent confidence level for all three innovation measures.

¹⁸ These results are available from the authors on request.

capturing employees' feelings of work-induced contentment versus stress and anxiety. We distinguish between effects among employees who are covered by collective bargaining and those who are not.

We find management innovations are associated with lower employee subjective well-being. This is the case for three different count measures of innovation – a global measure of innovation and measures for labour innovations and capital innovations. However, the effects are confined to uncovered employees. Statistical tests indicate that these differences between covered and uncovered employees are statistically significant for the 'global' measure of innovation and for labour innovations, but not for capital innovations. This may be because unions have a greater ability to influence labour innovations than capital innovations.

The OLS estimates are weaker in the case of job satisfaction: only labour innovations are associated with lower employee job satisfaction, perhaps because these innovations often have a more direct impact on employees' working lives than capital innovations. Again, the effect is confined to uncovered employees.

Workers often look to trade unions to negotiate with management over change at the workplace to ensure that any changes that do take place take account of employee interests. We find evidence to suggest that in fulfilling this role, unions ameliorate the negative effects of innovation on employee well-being, but only when the employer involves employees in the introduction of the innovation. Furthermore, negotiation and consultation in the absence of a union has no effect, suggesting that consultation without formal bargaining institutions does not provide employees with sufficient bargaining power to change the outcome in a more favourable way. These results control for employee preferences for unionisation by conditioning on union membership, and they appear robust to estimates which try to account for worker selection.

References

- Barker J.R. (1993) 'Tightening the Iron Cage: Concertive Control in Self-Managing Teams' *Administrative Science Quarterly*, Vol. 38, No. 3 (September), pp. 408-37.
- Black, S. E. and L. M. Lynch (2001). 'How to compete: the impact of workplace practices and information technology on productivity' *Review of Economics and Statistics* 83 (3): 434-445.
- Black, S. E., Lynch, L. M. and Krivelyova, A. (2004) 'How Workers Fare When Employers Innovate', *Industrial Relations*, Vol. 43, 1: 44-66
- Blanchflower, D. G. and Bryson, A. (2009) 'Trade union decline and the economics of the workplace', Chapter 3 in W. Brown, A. Bryson, J. Forth and K. Whitfield (eds.) *The Evolution of the Modern Workplace*, pp. 48-73, Cambridge University Press
- Bloom, N. and Van Reenen, J. (2007) 'Measuring and Explaining Management Practices Across Firms and Countries', *The Quarterly Journal of Economics*, CXXII, 1351-1408
- Bordia, P., Hunt, E., Paulsen, N., Tourish, D., DiFonzo, N. (2004) 'Uncertainty during organizational change: is it all about control?', *European Journal of Work and Organizational Psychology*, 13 (3), 345-365
- Bryson, A., Cappellari, L. and Lucifora, C. (2009) 'Workers' Perceptions of Job Insecurity: Do Job Security Guarantees Work?', *Labour: Review of Labour Economics and Industrial Relations*, Vol. 23, s1, 177-196
- Bryson, A., Cappellari, L. and Lucifora, C. (2005) *Why So Unhappy? The Effects of Unionisation on Job Satisfaction*, IZA Discussion Paper No. 1498, IZA, Bonn
- Bryson, A., Forth, J. and Kirby, S. (2005) 'High-performance practices, trade union representation and workplace performance in Britain', *Scottish Journal of Political Economy*, 53, 3: 451-491
- Bryson, A. and McKay, S. (1997) 'What about the workers?', in Jowell, R., Curtice, J., Park, A., Brook, L., Thomson, K., and Bryson, C. *British Social Attitudes: the 14th Report*, pp23-48

Denny, K. and Nickell, S. (1991) 'Unions and investment in British manufacturing industry', *British Journal of Industrial Relations*, 29, 1, pp. 113–21

De Witte, H. (1999) 'Job insecurity and psychological well-being: review of the literature and exploration of some unresolved issues', *European Journal of Work and Organizational Psychology*, 8, 155-177

Doeringer, Peter B., Christine Evans-Klock, David G. Terkla. (2002) *Start-up Factories—High-Performance Management, Job Quality and Regional Advantage*, Oxford University Press and W.E. Upjohn Institute for Employment Research, New York, 273 pp.

Economist Intelligence Unit (2005) 'CEO Briefing White Paper',
http://www.oracle.com/global/hk/corporate/press_050221.html

Freeman, R. B. and Rogers, J. (1999) *What Workers Want*, Cornell, Ithaca, NY

Gallie, D. (2005) "Work Pressure in Europe 1996-2001: Trends and Determinants", *British Journal of Industrial Relations*, Vol. 43, 3: 351-375

Gallie, D., M. White, Y. Cheng and M. Tomlinson (1998). *Restructuring The Employment Relationship*. Oxford, Clarendon Press.

Godard, J. (2001). "The transformation of work and high performance? The implications of alternative work practices for the experience and outcomes of work." *Industrial and Labor Relations Review* 54 (4): 776-805.

Godard, J. (2004) "A Critical Assessment of the High-Performance Paradigm", *British Journal of Industrial Relations*, Vol. 42, 2: 349-378

Green, F. (2006). *Demanding Work. The Paradox of Job Quality in the Affluent Economy*. Woodstock, Princeton University Press

Harrison, R., Jaumandreu, J., Mairesse, J. and Peters, B. (2008) 'Does Innovation Stimulate Employment? A Firm-level Analysis Using Comparable Micro-data from Four European Countries', NBER Working Paper #14216

Hirsch, B. T. (1990) 'Innovative Activity, Productivity Growth and Firm Performance: Are Unions a Spur or Deterrent?' in Albert N. Link and V. Kerry Smith (eds.) *Advances in Applied Microeconometrics*, Greenwich, Connecticut, JAI Press

Hirsch, B. T. (1992) 'Firm investment behaviour and collective bargaining strategy', *Industrial Relations*, 31, 1, pp. 95–121

Holmes, T. (2008) 'The Diffusion of Wal-Mart and Economies of Density', *NBER Working Paper #13783*, Cambridge, Mass.

Huselid, M. A. (1995), 'The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance', *Academy of Management Journal*, 38, 635-672

Ichniowski, C., Shaw, K. and Prennushi, G. (1997) 'The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines', *American Economic Review*, 87: 291-313

Karasek, R. A. (1979) 'Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign', *Administrative Science Quarterly*, 24: 2, 285-308

Karasek, R. and T. Theorell (1990), *Healthy Work*, New York: Basic Books

Lokshin, M. and Sajaia, Z. (2004) 'Maximum Likelihood Estimation of Endogenous Switching Regression Models', *The Stata Journal*, Vol. 4, No. 3, 282-289

Machin, S. and Wadhvani, S. (1991) 'The effects of unions on organisational change and Employment' *The Economic Journal*, 101, pp. 835–54

Malcomson, J. (1983). 'Trade unions and economic efficiency', *The Economic Journal*, 93, pp. 50–65

- Menezes-Filho, N. A. (1997) 'Unions and profitability over the 1980s: Some Evidence On Union-firm Bargaining in the United Kingdom', *The Economic Journal*, 107, 651-670
- Metcalf, D. (1989) 'Water Notes Dry Up: The Impact of the Donovan Reform Proposals and Thatcherism At Work on Labour Productivity in British Manufacturing Industry', *British Journal of Industrial Relations*, 27, 1: 1-31
- Nickell, S. J. and Wadhvani, S. (1991). 'Employment determination in British industry: investigations using micro data' *Review of Economic Studies*, 55, 5, pp. 955–70
- Osterman, P. (2000) 'Work reorganization in an era of restructuring: Trends in diffusion and effects on employee welfare' *Industrial and Labor Relations Review* 53 (2): 179-196.
- Payne, R. L. (1979), 'Demands, Supports, Constraints and Psychological Health', in C. J. Mackay and T. Cox (eds), *In Response to Stress: Occupational Aspects* (London, IPC Business Press) pp. 85–105
- Piore, M. J. And Sabel, C. F. (1984) *The Second Industrial Divide: Possibilities for Prosperity*, Basic Books: New York
- Pollard, T. M. (2001) 'Changes in mental well-being, blood pressure and total cholesterol levels during workplace reorganization: the impact of uncertainty', *Work and Stress*, 15, 1: 14-28
- Rasmay, H., Scholarios, D. and Harley, B. (2000) 'Employees and high- performance work systems', *British Journal of Industrial Relations*, 39: 501-532
- Vroman, S. B. (1990). "The union-nonunion wage differential and monitoring costs." *Economics Letters*, 32(4): 405-409
- Warr, P. (2007) *Work, Happiness, and Unhappiness*, Mahwah: New Jersey
- Willman, P., Gomez, R. and Bryson, A. (2008) *Trading Places: Employers, Unions and the Manufacture of Voice*, CEP Discussion Paper No. 884

Wood, S. (1989) (ed.) *The Transformation of Work?* London: Unwin Hyman

Wood, S. (2008) 'Job characteristics, employee voice and well-being in Britain', *Industrial Relations Journal*, 39: 2, 153-168

Wood, S. and Bryson, A. (2009) 'High involvement management', Chapter 7 in W. Brown, A. Bryson, J. Forth and K. Whitfield (eds.) *The Evolution of the Modern Workplace*, pp. 151-175, Cambridge University Press

Table 1: OLS for correlation between innovation and well-being

	Model (1) All Workers	Model (2) All workers with interaction	Model (3) Uncovered	Model (4) Covered	Difference between covered and uncovered
Panel A: Innovation = NCHANGE					
nchange	-0.086	-0.134	-0.132	-0.032	0.100
	(3.51)***	(4.22)***	(4.11)***	(0.84)	0.044**
covered	-0.066	-0.521			
	(0.52)	(2.31)**			
Nchange*covered		0.115			
		(2.40)**			
Constant	3.305	3.384	4.152	1.194	
	(0.48)***	(7.04)***	(7.31)***	(1.11)	
R-squared	0.07	0.07	0.08	0.06	
Panel B: Innovation = NLABCHG					
nlabchg	-0.150	-0.216	-0.219	-0.071	0.148
	(4.06)***	(4.59)***	(4.61)***	(1.24)	0.048**
covered	-0.040	-0.375			
	(0.31)	(1.97)**			
Nlabchg*covered		0.166			
		(2.29)**			
Constant	3.269	3.335	4.117	1.183	
	(6.86)***	(6.99)***	(7.35)***	(1.10)	
R-squared	0.07	0.07	0.08	0.06	
Panel C: Innovation = NCAPECHG					
ncapchg	-0.090	-0.164	-0.149	-0.012	0.137
	(1.82)*	(2.65)***	(2.36)**	(0.14)	0.175
covered	-0.068	-0.390			
	(0.54)	(1.78)*			
Ncapchg*covered		0.177			
		(1.77)*			
Constant	3.245	3.293	4.00	1.151	
	(6.71)***	(6.80)***	(6.97)***	(1.06)	
R-squared	0.07	0.07	0.08	0.06	

Notes:

(1) Unweighted OLS of EWELLSC well-being scale. Robust estimator with clustered standard errors. T-stats in parentheses. *=significant at 90% confidence interval; **=significant at 95% confidence interval; ***=significant at a 99% confidence level.

(2) Models (1) and (2): all employees, N=13,500. Model (3): uncovered employees. N=8,340. Model (4): covered employees. N=5,160. The final column presents the p-value for a Chow test which establishes whether the innovation coefficients are significantly different in the covered and uncovered regressions.

(3) All models contain the following individual-level controls: age (9 dummies); academic qualifications (8 dummies); single-digit occupation (9 dummies); and dummies for disability, gender and union membership. It also contains the following workplace-level controls: single-digit industry (11 dummies); log workplace employment size and a quadratic tem; and a dummy for low travel-to-work-area unemployment (below 1.2%).

Table 2: OLS for correlation between innovation and job satisfaction

	Model (1) All Workers	Model (2) All workers with interaction	Model (3) Uncovered	Model (4) Covered	Difference between covered and uncovered
Panel A: Innovation = NCHANGE					
nchange	-0.025 (0.77)	-0.043 (1.13)	-0.034 (0.86)	-0.020 (-0.35)	0.014 0.841
covered	-0.348 (2.18)**	-0.519 (1.73)*			
Nchange*covered		0.043 (0.65)			
Constant	10.481 (17.14)***	10.510 (17.14)***	10.89 (14.16)***	8.773 (7.25)***	
R-squared	0.10	0.10	0.09	0.09	
Panel B: Innovation = NLABCHG					
nlabchg	-0.100 (2.02)**	-0.137 (2.34)**	-0.125 (2.10)**	-0.078 (0.91)	0.047 0.647
covered	0.335 (2.10)**	-0.526 (2.04)**			
Nlabchg*covered		0.095 (0.92)			
Constant	10.506 (17.30)***	10.544 (17.31)***	10.965 (14.38)***	8.787 (7.27)***	
R-squared	0.10	0.10	0.09	0.09	
Panel C: Innovation = NCAPCHG					
ncapchg	0.052 (0.77)	0.026 (0.31)	0.044 (0.51)	0.059 (0.54)	0.015 0.910
covered	-0.335 (2.11)**	-0.045 (1.56)			
Ncapchg*covered		0.061 (0.45)			
Constant	10.399 (16.98)***	10.415 (16.99)***	10.764 (14.00)***	8.677 (7.16)***	
R-squared	0.10	0.10	0.09	0.09	

Notes:

- (1) Unweighted OLS of 'global' job satisfaction scale.
- (2) See footnotes to Table 1 for other details.

Table 3: The role of employee involvement in the introduction of innovation

	Uncovered employees		Covered employees	
	M(1) Not involved	M (2) Involved	M (3) Not involved	M (4) Involved
nchange	-0.149 (3.36)***	-0.124 (2.41)***	-0.141 (2.60)***	0.049 (0.87)
nlabchg	-0.249 (3.51)***	-0.203 (2.94)***	-0.237 (2.86)***	0.020 (0.23)
ncapchg	-0.219 (2.48)***	-0.097 (1.00)	-0.195 (1.70)*	0.119 (1.08)
Unweighted N	3753	4587	1835	3325

Notes:

(1) Unweighted OLS for EWELLSC. Sample split into four (uncovered not involved; uncovered, involved; covered, not involved; and covered, involved). Separate models run for each of the three innovation variables in the left-hand column. R-squareds are 0.08 for M (1) models and M (2) models, 0.07 for M (3) models and 0.05 for M (4) models.

(2) See footnotes to Table 1 for other details.