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**Abstract**
The authors use the British Workplace Employment Relations Survey to assess whether the combination of employee stock ownership (ESO) plans and participation in decision-making positively affect productivity or whether ESO alone affects employee productivity. By assessing the extent to which employees participate in ESOs and the quality of their decision-making, the authors provide a clearer and more nuanced picture of this relationship with productivity. On the one hand, results show that stock plans seem to need other forms of employee involvement and "voice" in the firm to be effective, especially when there is minority participation in the ESO plan. On the other hand, results indicate that a majority participation in the plan has an independent effect on productivity. Overall, the authors' research challenges prevailing views about the complementarity regarding stock ownership and employee involvement practices.

**Keywords**
STOCK OWNERSHIP PLANS, EMPLOYEE INVOLVEMENT, PRODUCTIVITY

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# EMPLOYEE STOCK OWNERSHIP, INVOLVEMENT, AND PRODUCTIVITY: AN INTERACTION-BASED APPROACH

ANDREW PENDLETON AND ANDREW ROBINSON*

The authors use the British Workplace Employment Relations Survey to assess whether the combination of employee stock ownership (ESO) plans and participation in decision-making positively affect productivity or whether ESO alone affects employee productivity. By assessing the extent to which employees participate in ESOs and the quality of their decision-making, the authors provide a clearer and more nuanced picture of this relationship with productivity. On the one hand, results show that stock plans seem to need other forms of employee involvement and "voice" in the firm to be effective, especially when there is minority participation in the ESO plan. On the other hand, results indicate that majority participation in the plan has an independent effect on productivity. Overall, the authors' research challenges prevailing views about the complementarity of stock ownership and employee involvement practices.

It has been widely claimed that employee stock ownership (ESO) plans have beneficial effects on company productivity. Researchers have argued that the linkage of employee rewards to corporate performance will align employees' interests with those of their employer, thereby encouraging them to exert effort and to promote the success of the company. The empirical evidence of this relationship, however, has not been compelling (Doucouliagos 1995; Blasi et al. 1996; Prendergast 1999), even though the observed effects are usually positive (Perotin and Robinson 2003; Sesil et al. 2002). The limited effectiveness of stock plans has been attributed to several factors, of which the most commonly mentioned is the "free-rider" effect. Some researchers have maintained that the potentially beneficial effects of stock plans are more likely to be realized when they are operated in conjunction with institutions and practices that overcome the free-rider problem (see Blair et al. 2000: 247). Foremost among

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these are measures to facilitate employee involvement in decision-making, insofar as encouraging information-sharing, mutual monitoring, and cooperation will counter shirking and free-riding (Weitzman and Kruse 1990). Despite this oft-repeated claim, there is surprisingly little empirical analysis or support for this complementarity.

An alternative, though less commonly asserted, claim in the literature holds that "too much" employee involvement has had an adverse impact on productivity because involving ill-qualified participants affects the quality and speed of decision-making. Further, this practice potentially introduces diverse and conflicting interests into the management process and may provide an opportunity for workers to raise morale-damaging grievances and complaints. The conjunction of stock ownership plans and employee involvement in decisions could be a "toxic combination" because employees with ownership rights may assert them to influence decisions to the extent that efficiency is compromised (Hansmann 1996; Pendleton 2001).

Initially, we expected that our research would support the complementarity claim discussed in the literature. As our research progressed, however, it became clear to us that the evidence in the literature was not compelling, and that our results provided support for each of the claims outlined above. Various features of stock plans and employee involvement mechanisms are likely to affect productivity in some way: the overall level of employee stock ownership, the extent of employee participation in the stock plan, and the extent and "quality" of that employee involvement. Taking the level of employee stock ownership as a given,[1] we examine the productivity effects of the presence of stock plans and varying rates of employee participation in them, both singly and in conjunction with employee involvement. The latter is measured according to the number of employee involvement practices and the amount of voice employees have within them, thereby capturing both the extent and quality of employee involvement.

This paper, therefore, has both substantive and methodological aspects. Substantively, we assesses whether complementarities between stock plans and employee involvement differ among various levels of employee participation in the stock plan. In so doing, we elaborate empirically on the nature of the alignment between reward and control rights identified by Ben-Ner and Jones (1995). Methodologically, we highlight how the choice of variables and measurement for a given concept affects results. In addition to the substance and methodology, a key feature of our paper is its emphasis on the correct interpretation of multiplicative interaction models with limited dependent variables. We use visual representations to provide an economical but highly illuminating portrayal of how the sign, size, and significance of the relationship between stock plan participation and labor productivity can vary with the extent and quality of employee involvement.

The data source for our analysis is the British Workplace Employment Relations Survey (WERS) 2004. This nationally representative survey of British workplaces has been carried out periodically since 1980 and comprises extensive information on a wide range of labor management practices. It has been widely used for the analysis of British industrial relations in general[2] and employee stock ownership and participation in particular (see Pendleton 2007; Robinson and Zhang 2005).

## Background

Many of the empirical investigations of employee stock ownership over the years have investigated effects on productivity. Much of the research has been U.S.–based (Blasi et al. 1996; Sesil et al. 2002), but studies have examined Japan (Jones

[1] Most of the observations refer to employee stock ownership in workplaces belonging to large PLC companies where the employee stake typically amounts to a small minority of the overall value of the firms' equity.

[2] Recent papers in this journal using WERS have examined HRM and unions (Machin and Wood 2005), the union wage premium (Booth and Bryan 2004), and "family-friendly" workplace policies (Budd and Mumford 2004).

and Kato 1993; Kato and Morishima 2002) and various European countries including Britain, Germany, Finland, and the Netherlands (Perotin and Robinson 2003; Kalmi et al 2005; Robinson and Wilson 2006a, 2006b). There has been a substantial stream of research particularly in Britain, drawing mostly on WERS (Fernie and Metcalfe 1995; McNabb and Whitfield 1998; Addison and Belfield 2001; Conyon and Freeman 2004; Bryson and Freeman 2007). A common theme explored in these studies has been the potential complementarity between stock ownership plans and other forms of employee involvement, though empirical support for this relationship tends to be either absent, weak, or inconsistent.

The theoretical basis for this complementarity is rooted in principal-agent perspectives. Agency theory is the most common theoretical underpinning for discussions of stock ownership plans and contingent rewards in general (Bloom and Milkovitch 1998). Alignment of agents with principals' interests may ameliorate moral hazard and effort aversion and thus substitute for or complement other forms of managerial monitoring of worker performance (Pendleton 2006). The agency-based literature has emphasized the complementarity of stock ownership and other forms of employee involvement (Levine and Tyson 1990). If employees' remuneration is to be aligned with principals' desired outcomes, it makes sense to let employees influence how work is performed, especially if employees asymmetrically possess production-relevant information. Equally, employees may require a pay-off for sharing information and cooperating with managers and their peers (Ben-Ner and Jones 1995). Governance theory reinforces this posited complementarity: if remuneration of risk-averse employees is put at risk, control rights (secured via ownership) should supplement return rights in order to control risk exposure (Hart 1995).

Another reason for anticipating complementarity between share ownership plans and employee involvement is that any group-incentive system is likely to be subject to the free-rider or "1/N problem" (Blair et al. 2000). As the size of the performance unit (N) grows, the link between an individual's effort and reward becomes more tenuous and the incentive to shirk or free-ride becomes more tempting. This problem appears to be particularly acute in the case of minority ownership stock plans because they are typically found in large companies (Pendleton 1997). Given that stock plans are based on corporate-level performance, free-rider effects are likely to occur even where the observed workplace may be small. A growing body of research therefore questions whether stock ownership plans *per se* have any direct incentive effects (Prendergast 1999). The stock ownership literature has typically resolved this contradiction by pointing to the role of employee involvement. This provides the setting for "repeated games," whereby employees will come to see that cooperation and high levels of personal performance will pay off in stock plan outcomes (Weitzman and Kruse 1990). Involvement may help satisfy employees' higher order needs (influence, respect, and self worth), which will help foster greater trust, cooperation, and identification with the firm (Kim 2005). It also provides an institutional setting for peer pressure and "mutual monitoring" (Kruse et al. 2004; Conyon and Freeman 2004: 120; Blair et al. 2000; Blasi et al. 2006) and may help to develop a culture which deters "shirking" and cultivates the relevant cognitive potential of employees (Kim 2005).

Employee involvement in decisions is thus integral to the agency-based case that stock ownership plans can enhance productivity. How much evidence, though, exists to support this contention? When we surveyed the literature we were surprised to find that the answer is not much. Many studies of stock ownership (e.g. Jones and Kato 1993; Sesil et al. 2002) cannot fully evaluate this relationship because their data is taken from company accounts, which rarely contain information on employee involvement arrangements. In one of the few studies to combine accounting data on company performance, stock plans, and employee involvement, Kato and Morishima (2002) found productivity effects of some

nine percent in which both stock plans and several forms of employee involvement are present. Productivity gains are insignificant when just one of the two is present or if just one form of involvement co-exists with stock ownership. The potential for complementarity rises, therefore, with the number of participatory practices. Further, papers by Robinson and Wilson (2006a; 2006b) revealed share plans to have both independent and joint productivity effects with representative and consultative clusters of employee involvement. However, these studies, as with others, used *de jure* rather than *de facto* measures of involvement, the result being that the impact of the "quality" of involvement could not be evaluated. But the quality of involvement is likely to be important given that the capacity of involvement to engender cooperation, information-sharing, and mutual monitoring is integral to resolving the free-rider problem. "Shell" institutions, where little real or effective employee voice takes place, seem unlikely to be sufficient to bring these about. In other studies using a production function methodology based on accounting data, interactions between stock plans and involvement have been insignificant or model fit affected little by the insertion of interaction terms (e.g. Ohkusa and Ohtake 1997).

Likewise, evidence from the British Workplace Employment Relations Survey, although relevant, generally does not support the complementarity thesis. Conyon and Freeman (2004) reported, for example, that interaction terms between stock plans and employee involvement do not "affect results substantively," and that "there is no evidence that both shared compensation and more communication raised productivity more than did the separate impact of each" (p. 139). Some other WERS-based studies (e.g. Fernie and Metcalf 1995; Addison and Belfield 2001) have reported positive interactions between stock plan presence and employee communications, but unfortunately they do not present the detailed results, so it is difficult to evaluate the extent of the complementarity.

Two alternative explanations to the notion of complementarity between stock plans and other forms of involvement are that it is unnecessary and that employees' involvement in decision-making may compromise the productivity effects of ESO plans. Regarding the first, researchers have argued the empirical evidence suggests that stock plans work independently of involvement (Conyon and Freeman 2004). The explanation might be that free-rider effects are not as damaging as agency theory implies because stock plans (and other forms of contingent rewards) affect productivity in ways other than those assumed in the incentives literature. A growing literature has indicated that ESO plans' contributions to human capital may be important, either through alignment of the value of remuneration with the state of the labor market (Oyer 2004) or through support for employer-provided training (Robinson and Zhang 2005). The latter claim has been based on the notion that stock plans may provide credible signals that worker interests and human capital investments will be protected and advanced by management (Blair 1995), thereby encouraging synergies between retention and training. These signaling effects imply that the presence of a stock plan may positively affect productivity even if few employees actually participate in it. Involvement in decisions may be unnecessary if these effects are sufficiently potent.

The second alternative explanation is that involvement in decision-making may detract from the productivity effects of stock ownership plans. For a start, greater employee involvement in decisions can be costly. Beyond the expense of implementing participatory arrangements (Kim 2005), potential costs include the entry of inexperienced or unqualified personnel to decision-making, delays to decision-making, an "excessive" focus on grievances and complaints, and the difficulties of reconciling competing employee interests (Hansmann 1996). These costs might be amplified where there are stock ownership plans. Employees included in involvement arrangements may claim rights to challenge management decisions based on part-ownership, which may further impede

managerial decision-making (see Pendleton 2001). Note that this can occur even if employees' formal ownership rights are not extensive—the important consideration is employees' perceptions of ownership. Employees may develop "feelings of ownership" at the low levels of combined employee stock ownership typically found in large-firm stock plans (Wagner et al. 2003), if certain conditions are met such as employee involvement in decisions (see Pierce and Rodgers 2004; Wagner et al 2003). As for empirical support, there is some evidence that employee involvement can detract from the effects of stock ownership. Jones and Kato (1993) found that a proxy for employee control where stock plans are present is negatively associated with productivity while Addison and Belfield (2001) found that stock plans are positively associated with productivity in workplaces *without* upwards involvement, but not where upward involvement is present.

To summarize so far, there are three broad possibilities concerning the relationship between stock ownership plans and employee involvement as far as effects on productivity are concerned: stock plans have independent effects, they require conjunction with employee involvement to affect productivity, and employee involvement can detract from the positive effects of stock plans. These three potential relationships tend to be presented in the literature as absolute alternatives, possibly because simple dichotomous measures of presence/absence are often used to proxy each phenomenon. But these practices are far more complex and multi-dimensional, and their effects are likely to depend on the characteristics of the practice, which has been increasingly pointed out in the literature on high involvement work practices (Cox et al. 2006; Wall and Wood 2005). Two implications follow from this, one methodological , one more substantive. The first is that the way phenomena are measured will influence results, and the second is that the balance between independent and complementary effects will depend on the characteristics of the practices under investigation. It is possible that the two practices could be complementary when they possess some characteristics but not others. If this is so, it is important to use analytical techniques that allow this variety of effects to become transparent.

Based on the preceding discussion, we can advance several predictions regarding the relationship between ESO plans and employee involvement. First, stock ownership plans may have independent effects on productivity though these are more likely to be observed or will be larger when employee membership of the plan is high. A high participation rate may proxy for a more-developed ownership culture, and hence employees may have a greater propensity for deterring free-riding among their colleagues. High participation may also encourage the development of human capital within the workplace (Robinson and Zhang 2005). Alternatively, the second prediction is that where employee participation rates are low, the independent effects of stock plans will be muted, and that further forms of employee involvement will be necessary to achieve favorable productivity effects. Clearly, where there is low participation a correspondingly low proportion of employees will be directly motivated by the stock plan to exert effort. In these instances, those participating may require additional incentives, safeguards, and signs of management commitment in the form of employee involvement in order to commit to enhanced effort and engagement. The third prediction is that employee involvement can detract from the independent effects of stock plans when participation rates are high because a strong ownership culture may lead employees to exert more influence over decisions than is efficient. We further refine our predictions to hypothesize that the combined effects of stock plans and employee involvement will vary according to the extent and quality of the latter. The greater the number of employee involvement practices, or the greater the employee voice within these, the more accentuated these combined effects.

## Data

The data used to assess our predictions come from the British Workplace

Employment Relations Survey 2004 (WERS04). This is the fifth in a series of surveys dating back to 1980 providing information on a broad range of employment relations and practices across all sectors of the British economy. Information for this study was taken from the Management Questionnaire that comprises information gathered from workplaces via interviews with the senior manager responsible for employment relations on a day-to-day basis. Because public sector workplaces cannot usually offer ESO plans, the sample is restricted to establishments in the private sector. It is also the case that not all private sector workplaces are able to offer ESO plans. Partnerships, trusts and charities, and bodies established by Royal Charter are thus also removed from the sample. With these exclusions, coupled with a small number of missing values, the total number of workplaces included in the analysis is 1086. With the use of survey weights to compensate for sample-selection biases and identified non-response biases (for more information see Kersley et al. 2006: 334–335), and the use of the complex survey procedures in STATA, our results are nationally representative of private sector workplaces with 5 or more employees in Britain.

**Dependent Variable**

WERS asks management respondents about the relative productivity performance of the workplace. The relevant question asks, "Compared with other establishments in the same industry, how would you assess your workplace's labor productivity?" Answers are ordered along five categories from "a lot below average" to "a lot above average." Overall, 53 percent of workplaces report "above" or "a lot above average" productivity, with most of the remainder reporting average productivity (40 percent in total). Much of our attention in the empirical analysis focuses on the 10 percent of workplaces whose labor productivity performance is "a lot above average" (i.e., the best performing workplaces). The merits of subjective measures of performance such as this have been the subject of much debate (for an overview see Kersley et al. 2006: 287–289), with the obvious criticism that subjective measures will be prone to perceptual and normative biases (Forth and McNabb 2008). Empirical investigations, however, have found clear positive associations between subjective and objective measures of performance (Wall et al. 2004; Haskel 2005), with both measurement types demonstrating similar associations with a range of independent variables (Wall et al. 2004). Earlier work has also established the predictive validity of the subjective measures of performance in WERS (Machin and Stewart 1996).[3]

**Independent Variables**

*Employee Share Ownership (ESO)*

It is reasonable to assume that any productivity effects of employee stock ownership are only likely to materialize where schemes are open to non-managerial employees and where they choose to participate (Perotin and Robinson 2003). Recognizing this, we use three measures of ESO in our analysis. Our broadest measure of ESO (*ESO Presence*) deals with the availability of a plan according to whether any non-managerial employee is eligible to join a scheme. The WERS data indicates that 19.5 percent of workplaces offer broad-based share ownership schemes that match this definition, with the vast majority of these (85 percent) being open to all non-managerial employees. Eligibility, however, does not always equate with participation since some employees may choose not to

[3] In the 2004 survey, WERS also collected objective financial data using a Financial Performance Questionnaire, but a range of technical problems with this data would have meant unacceptable reductions in the size of the sample (and associated biases). Use of this data has been hampered by technical difficulties, notably because of the "substantial sample attrition arising from non-response to the FPQ and missing data" and because data referred to entities other than the workplace (for further comparative analysis see Kersley et al. 2006: 294–301 and Forth and McNabb 2008). Only 45 percent of trading workplaces in the survey completed the FPQ, and only 79 percent of these based their answers on the workplace (Forth and McNabb 2008). The survey also attempted to link to performance records collected by the Office of National Statistics' Annual Business Inquiry but matched cases covered only 19 percent of workplaces in the survey (ibid.).

participate. Therefore, our second and third measures (*ESO Coverage*) record the level of employee participation in ESO schemes.[4] ESOMAJ captures widespread participation in the share schemes based on whether a majority (60 percent or more) of non-managerial employees participate in the scheme, which is the case in 53 percent of schemes. Conversely, ESOMIN represents "minority" participation in the ESO schemes (less than 60 percent participation).[5]This division of categories is based on the structure and distribution of the categorical measure in the survey: the middle category covers 40–59 percent participation and hence membership of this does not necessarily reflect majority participation. Although the expectation is that higher plan coverage will have stronger productivity effects, plan presence may affect productivity because signaling effects may be important even when participation is low.

*Measures of Employee Involvement*

Our analysis uses two different measures of employee involvement to assess its moderating effect on the link between ESO and productivity. These measures capture differences between types and quality of involvement; differences in effects are predicted. Our measures are designed to mitigate two common problems found in the empirical involvement and high performance work systems literature—that measures record single participative practices in isolation and that measures of presence do not take account of the depth or quality of involvement (Cox et al. 2006).

The first measure of employee involvement (*involvement practices*) records the extent of direct involvement arrangements in each workplace. This is a straightforward summative scale of the number of direct communication mechanisms operating in each workplace including quality circles, systematic cascading of information, suggestion schemes, newsletters, and so on, ranging from 0 to a maximum of 8. The assumption behind this type of measure is that a higher score indicates more involvement. If this is so, the conditioning effect of this on share ownership's productivity effects may be positive (in the way predicted in much of the literature) or negative (too much involvement inhibits management decision-making, thereby detracting from the share plan).

In common with other literature on this subject, we prefer this summative measure to indicators of the presence/absence of individual practices (Macduffie 1995; Cox et al. 2006), which are rarely operated singly or in isolation (16 percent of our workplaces have just one or zero practices). The implication of this is that single practice dummies will also capture other, unobserved practices, providing either misleading results if a single dummy is used or unstable results if several are used. A further argument in favor of an additive scale is that, as Cox et al. (2006) have shown, a "volume" measure of participation helps to differentiate the embeddedness of participation between workplaces in a way that single practice dummies cannot. It is worth noting, in this respect, that the additive scale is highly normal in its distribution (mean = 3.78; median = 4).

A more difficult issue with this scale concerns the relative significance of the practices contained within it. Are quality circles a more significant form of participation than suggestion schemes, for instance? Unfortunately, we have no reliable or valid *a priori* means of assessing this, given the nature of the data. Quality circles may be more substantial or more widespread in some workplaces than others, but we have little way of knowing this. As we have noted above, however, the number of practices can provide a reasonably reliable proxy for the overall significance of participation in a workplace. A related issue concerns

[4] Both measures of ESO eligibility and participation are categorical, comprising seven categories from zero percent up to 100 percent.

[5] Forty-four workplaces report figures on ESO eligibility but not participation. We also omit from our analysis 6 workplaces where the ESO participation rate among employees is higher than that allowed for, given the reported eligibility criterion. Hence the sum of workplaces with majority and minority participation does not add up to the total number of share plans with broad-based eligibility (see the Appendix).

differences in the type of participation. Our scale contains both a "downwards" and an "upwards" form of participation, and it might be argued that these should be differentiated. We experimented with two separate scales but found these were both highly correlated with each other ($r > 0.8$) and with the overall scale ($r >. 0.5$). As might be expected, the results were substantially similar. For these reasons we felt it best to rely on the single scale.

Though this measure provides an indicator of the volume of (and management commitment to) participation, it does not directly capture the "quality" of involvement, in terms of effective worker voice. Our second measure (*employee voice*) attempts to rectify this. It uses the questions in WERS asking about the amount of time devoted to employee questions and views in workplace meetings and team briefings and is a reasonably objective and grounded evaluation of voice (compared, say, to a question seeking agreement or disagreement about whether employees have a lot of voice). We felt that this degree of objectivity compensates somewhat for the reliance on a managerial respondent. A five-point scale captured their response (1 = no consultative arrangement in operation; 2 = arrangement but no voice (0%); 3 = arrangement and a small proportion of time (less than 10%); 4 = arrangement and up to a quarter of the time (10–24%); and 5 = arrangement and over a quarter or more (25% or more) of time is allocated to employees. Though the responses to these questions imply some fixed order, we cannot assume *a priori* that the distances between the categories of each variable are equal. This feature of the data obviously determines how scales should be created from these questions.

To create involvement scales from these data, we use the categorical principal components analysis (CATPCA) data reduction technique to transform the qualitative values that underpin these concepts into quantitative ones. CATPCA is the non-linear equivalent of standard principal components analysis in that it endeavors to identify common factors underlying a group of variables. Unlike standard principal components, however, CATPCA can deal with different types of data—ordinal, nominal and numeric—which may not be scaled linearly and model the non-linear relationship between such variables. This is achieved by assigning optimal scale values (quantifications) to the categorical variables, which are then transformed into numeric-valued component variables (see Meulman and Heiser 2005 for a fuller discussion). A clear benefit of this approach is that the continuous measurement level derived from this is better suited to the statistical analysis of conditional hypotheses.

Looking at the quantifications applied to the categories within these variables in Figure 1, we can see that the categories of both variables were not clearly separated by the CATPCA as cleanly as would have been expected if the level had been truly ordered. In other words, the variables do not obtain a linear transformation and as such are correctly treated at the ordinal scale level. This visual approach also reveals something about the nature of employee voice in British workplaces. Both diagrams emphasize that differences between the categories are much more important at the top end of the "scale" than at the bottom. In the case of workplace briefings the equal quantification values for categories 1 to 4 indicates that the main distinguishing feature of employee voice in this setting is whether or not firms set aside a quarter or more of the time for employee views and questions. Middle to low levels of employee voice is indistinguishable from workplaces with no team briefing arrangements. In the case of meetings between senior management and the whole workforce, there is more differentiation between the different communication levels, although again most importance is placed on giving employees the maximum (measured) say, but even here the lowest levels of voice (categories 2 and 3 in the data) are indistinguishable from workplaces with no workplace meetings (category 1).[6]

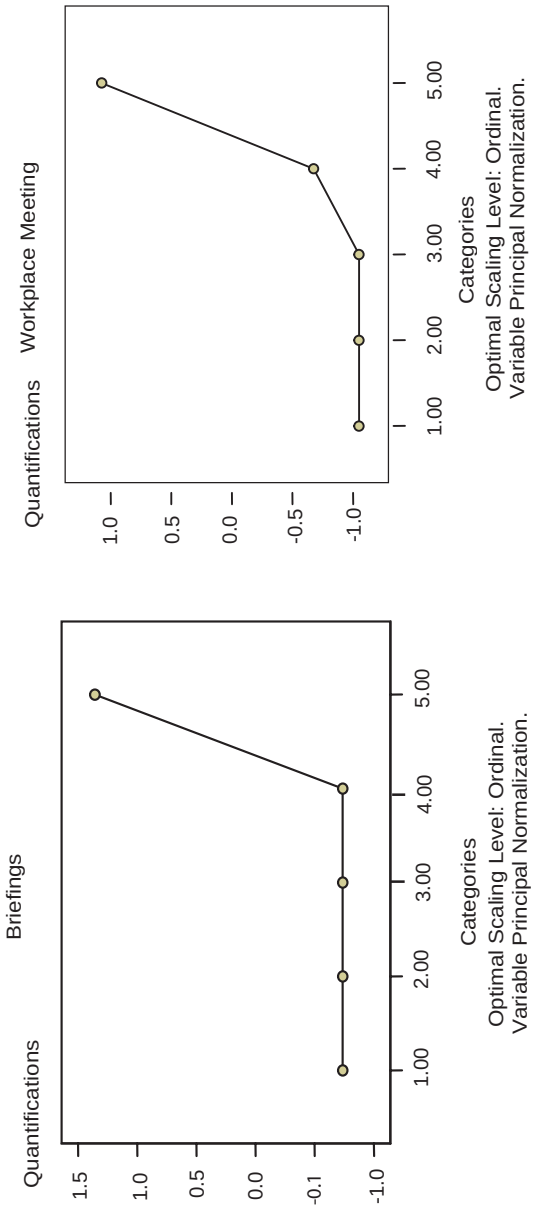
The output from applying the PCA

[6] Where equal quantifications arise, the involvement variables were recoded to recognize the lack of distinction between the categories.

*Figure 1*. Employee Voice: Workplace Meetings and Briefings
*Categorical Principal Components Analysis* (CATPCA)

Model Summary

| | | Variance Accounted For | |
|---|---|---|---|
| *Dimension* | *Cronbach's Alpha* | *Total (Eigenvalue)* | *% of Variance* |
| 1 | 0.537 | 1.367 | 68.344 |
| Total | 0.537 | 1.367 | 68.344 |



algorithm to these quantification values indicated that these variables captured one component (employee voice) which accounted for 68% of the total variance.[7] A solution is perceived as good (Meulman and Heiser: p167) by the extent to which the component scores are correlated with each of the qualitative variables. In each case large statistically significant correlations were evident, pointing to the strength of this measure.

This approach has important implications for our analysis of involvement: it means that we can differentiate involvement in which employees have substantial input from that which delivers little voice to employees. The validity of this measure therefore seems superior to the standard approach in much of the empirical literature of simply recording whether an institution is present.

*Control Variables*

Beyond the variables that are central to our analysis of the conditional hypotheses, all models include a range of control variables that might be expected to affect labor productivity independently. The choice of control variables using the WERS series is firmly established in a number of papers (e.g. Perotin and Robinson 2000; Addison and Belfield 2001) and covers a range of work, institutional, and organizational variables. These include workforce composition, the extent and coverage of employee training, whether or not management formally recognizes a trade union for negotiating pay and conditions, the product market environment (extent of competition), and workplace and organizational size and sector controls. Fuller definitions and descriptive statistics of these variables are provided in the Appendix.[8]

[7] We experimented with two dimensions, but eigenvalues indicated that one dimension was the optimal solution.

[8] Note that WERS is stratified by establishment size and sector, so the mean for establishment size is substantially affected by the recommended weighting procedures (see Kersley et al. 2006. Though the "raw" sample mean is 275, the weighted mean is 29. Note also that, since analysis is restricted to private sector workplaces, the mean for union bargaining coverage is lower than the national average for Great Britain

**Model Specification**

There are two stages to the analysis conducted here. We first estimate a set of ordered probit models, some with the inclusion of interaction terms, in the conventional way. These are reported in tabular form. In order to improve the interpretation of the interaction models, we then use the methodology suggested by Brambor, Clark, and Golder (2008) to generate a set of visual representations of the marginal effect of stock plans on labor productivity at different values of our conditioning variables. This provides a highly illuminating but economical method for demonstrating how the impact of ESO on labor productivity is affected by the level of involvement and employee voice and enables us to make a far more fine-grained evaluation of complementarities than is possible from scrutiny of coefficients.

Our model of labor productivity takes the following form:

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

where $LP_i^*$ is a latent continuous measure of labor productivity; $\beta$ is a vector of estimated parameters; $X_i$ is the vector of explanatory variables including the aforementioned measures of employee stock ownership, employee involvement, and a host of control variables; and $\varepsilon_i$ is the error term which has a standard normal distribution. Since $LP_i^*$ is not observed, we estimate the coefficients in (1) using an ordered probit model in which our observed ordinal measure of labor productivity offers a discrete conceptualization of the underlying latent variable.

There are difficulties, however, in the estimation and interpretation of conditional hypotheses in non-linear models, as highlighted recently in Strategic Management (Hoetker 2007) and in Economics (Ai and Norton 2003; Norton et al. 2004), and in linear models in Political Science (Brambor, Clark, and Golder 2005). In each field or discipline, a majority of papers in their "leading journals" had either estimated or interpreted conditional hypotheses incorrectly. A similar observation might be made in the literature on stock

ownership. Many papers on this topic discuss complementarity effects (or the lack of them) when they neither fully test for these effects nor consider the consequences of estimating non-linear models.

Brambor et al. (2005) set out a number of guiding principles for improving the analysis and interpretation of interaction models, of which an important one for our purposes is the necessity to provide "a meaningful description of the marginal effects of the independent variables and the uncertainty with which they are estimated" (p. 73). Indeed, reported on their own, the coefficients and standard errors from interaction models offer little to aid the reader in their interpretation. In our specification neither of the coefficients involving ESO offers a meaningful picture of the impact of ESO on labor productivity. The coefficient on the individual ESO term does not represent an unconditional or average effect. Similarly the magnitude and significance of the interaction term says little about whether ESO has a conditional effect on the dependent variable. Indeed, it is perfectly possible for the marginal effect of ESO on labor productivity to be "statistically significant for substantively relevant values of the modifying variable even if the coefficient term on the interaction term is insignificant" (p. 74).

So, even though the reporting of coefficients and significance levels is frequently the finishing point for papers investigating conditional hypotheses, "it is extremely difficult and often impossible to evaluate conditional hypotheses using only the information provided in traditional results tables" (Brambor et al. p. 76). The analysis needs to go further. The challenge of interpretation is to find a summary means of presenting the conditioning process "without overwhelming the reader with an array of information" (Long and Freese 2006; p. 131). In this regard, graphical representation of the interaction model becomes a powerful tool.

To facilitate this we adapt the methodology of Brambor, Clark, and Golder (2008) to the case of an ordered dependent variable. The approach uses simulation methodology to obtain marginal effects and confidence intervals over the range of the moderating variable. The benefit of this approach, as opposed to standard tabular presentations of marginal effects, is that it enables complex results to be clearly presented in graphical form.

The initial phase of the procedure is to draw[9] simulations of the main and ancillary parameters from the estimated coefficient vector and variance-covariance matrix of the ordered probit model (Brambor et al. 2008). Next, we utilize the programming facility within STATA to convert the simulation parameters into estimates of the probability of reporting each level of labor productivity for different values of stock ownership and employee involvement. Predicted probabilities are first calculated for the scenario where ESO=0 across all values of the modifying variable, with all other independent variables held at their weighted mean. This is then repeated for the scenario where ESO=1. By comparing the respective probabilities from both scenarios, we can calculate the "marginal effect"[10]of ESO across the range of our modifying variable (solid line) and associated measures of uncertainty (95% confidence intervals—dotted lines) for each category of the dependent variable. We then graph each effect to show the changing impact of stock plans on labor productivity as the degree of employee involvement changes. Effects are statistically significant when both confidence intervals are above or below the zero *y* axis

Two versions of this procedure are estimated. In order to test whether our hypotheses hold generally for all stock plans, the procedure is first used with our broadest measure of employee stock ownership (*ESO Presence*) and repeated twice, once for each

[9] Although 1,000 draws should be sufficient for most analyses (see Tomz, Wittenberg, King, 2003: 19) we follow Brambor et al. (2008) in using 10,000 draws in order to improve the accuracy of our results.

[10] Strictly speaking, we are calculating a discrete change. That is, we are looking at the effect of ESO on labor productivity as the value of ESO changes from 0 to 1 for different levels of employee participation or voice.

of our measures of employee involvement. This approach is then repeated with the two measures of *ESO Coverage*.

## Results

As a first step, we report a number of baseline models of labor productivity in which we estimate the independent effects of stock ownership and employee involvement. The estimated coefficients and standard errors from the ordered probit model of labor productivity based on weighted data are reported in Table 1 for *Employee Stock Ownership (ESO) Presence* and in Table 2 for *ESO Coverage*. In each table the results are presented for involvement practices (on the left) and employee voice (on the right). Although an association between stock plans and employee involvement might be expected to generate unstable coefficients, the evidence indicates that all independent effects, whether estimated singularly (models 1 and 2) or together (model 3), are stable and consistent across specifications in both tables and are not prone to multicollinearity.[11] Across these specifications it is evident that the presence of an ESO has a positive, independent and statistically significant effect (at 5 percent) on labor productivity. Findings in Table 2 on ESO coverage indicate that the ESO effects are driven by the level of worker participation in the schemes. Calculation of marginal effects (not shown) indicates that the presence of stock plans increases the probability of reporting "a lot better than average labor productivity" by 8.3 percentage points with all other values held at their weighted mean, with this increasing to 11.4 percentage points when a majority of employees participate in the scheme.[12] Positive independent effects are also apparent for our *involvement practices* and *employee voice* measures of employee involvement in decisions, but these are not significant at the 10-percent level.

The findings also highlight a range of other factors that shape the reported productivity outcomes independently. Notable among these are the negative influences of organizational size (especially the dummy for very large organizations), union recognition, and the positive impact of training. At the highest levels (employees who receive 5 to 9 days or 10 or more days of training per year), relative to the lowest levels ("no training"), the probability of reporting the top level of labor productivity increases by nearly 8 percentage points in each case.

We now turn to the central feature of our analysis—how the effect of stock plans on labor productivity is moderated by the amount of involvement or voice. The results of four specifications of our interaction model are reported in Tables 1 and 2 for ESO "presence" and "coverage," respectively. As in previous analyses of this type, these estimates provide limited and conflicting evidence of the effect of ESO and involvement on labor productivity. The estimates suggest no uniform pattern of results with the sign and significance of both ESO terms in the interaction model varying across models and between measures. In all but one model (Table 2: Employee Voice), there are no statistically significant interaction terms, and even here, the interaction terms have different signs. At first glance, the case for our conditional hypothesis might not be strong.

Presented in this way, the results are somewhat inconclusive and difficult to interpret. If we then apply the simulation methodology to the properties of these models, the results become far clearer and consequently more straightforward to interpret. In contrast to the reported coefficients and significance levels in Table 2, the graphical representation of these estimates in Figures 2 and 3 reveal a host of statistically significant findings that provide a richer and fuller picture of how, when, and to what extent the impact of employee stock plans on labor productivity is affected by the amount and quality of employee involvement practices. In all instances, statistically significant ESO effects are revealed, but the size, direction, and significance of these effects vary over the range of the involvement measure and according to the measure of

[11] Correlation coefficients between ESO presence and participatory practices (0.46) and employee voice (0.096) support this contention.

[12] Based on the results of model 3 (Employee Voice) in Tables 1 and 2 respectively.

*Table 1.* The Effects of Employee Stock Ownership Presence on Labor Productivity: The Conditioning Effects of Involvement Practices and Employee Voice (ordered probit)

| | *ESO Presence* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Involvement Practices (IP)* | | | | | *Employee Voice (EV)* | | | |
| *Model* | *1* | *2* | *3* | *4* | *Model* | *1* | *2* | *3* | *4* |
| *Variables* | *Independent Effects ESO only* | *Independent Effects IP only* | *Independent Effects ESO & IP* | *Interaction Model* | *Variables* | *Independent Effects ESO only* | *Independent Effects EV only* | *Independent Effects ESO & EV* | *Interaction Model* |
| | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* | | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* |
| *ESO* | 0.4532** (0.1814) | | 0.4338** (0.1829) | 0.1998 (0.6287) | *ESO* | 0.4398** (0.1826) | | 0.4412** (0.1821) | 0.4957* (0.2676) |
| *Involvement Practices* | | 0.0452 (0.0336) | 0.0371 (0.0340) | 0.0299 (0.0342) | *Employee Voice* | | 0.0274 (0.0606) | 0.0295 (0.0607) | 0.0390 (0.0685) |
| *ESO x Involvement Practices* | | | | 0.0460 (0.1050) | *ESO x Employee Voice* | | | | -0.0496 (0.1381) |
| *Trade Union Recognition* | -0.2762** (0.1400) | -0.2459* (0.1361) | -0.2872 (0.1382) | -0.2932** (0.1364) | *Trade Union Recognition* | -0.2796** (0.1422) | -0.2248 (0.1428) | -0.2721* (0.1453) | -0.2734* (0.1453) |
| *Workforce Composition* | 0.0038* (0.0022) | 0.0039* (0.0022) | 0.0038* (0.0022) | 0.0038* (0.0022) | *Workforce Composition* | 0.0043** (0.0021) | 0.0045** (0.0022) | 0.0044** (0.0022) | 0.0045** (0.0022) |
| *Product Market Competition* | 0.08863 (0.1103) | 0.0766 (0.1110) | 0.0869 (0.1106) | 0.0891 (0.1104) | *Product Market Competition* | 0.0875 (0.1110) | 0.0771 (0.1113) | 0.0890 (0.1109) | 0.0881 (0.1107) |
| *Training (0- 4 days)* | | | | | *Training (0- 4 days)* | | | | |
| *Training (5 - 9 days)* | 0.3619** (0.1586) | 0.3716** (0.1599) | 0.3411** (0.1581) | 0.3399** (0.1581) | *Training (5 - 9 days)* | 0.4001** (0.1597) | 0.4249*** (0.1638) | 0.3915** (0.1612) | 0.3920** (0.1614) |
| *Training (10 or more days)* | 0.4129*** (0.1563) | 0.3857** (0.1668) | 0.3733** (0.1632) | 0.3799** (0.1641) | *Training (10 or more days)* | 0.4319*** (0.1563) | 0.4373*** (0.1669) | 0.4164** (0.1638) | 0.4143** (0.1631) |
| *Workplace Size* | -0.0002 (0.0002) | -0.0002 (0.0002) | -0.0002 (0.0002) | -0.0002 (0.0002) | *Workplace Size* | -0.0001 (0.0002) | -0.0001 (0.0002) | -0.0001 (0.0002) | -0.0001 (0.0002) |

*Continued*

*Table 1.* The Effects of Employee Stock Ownership Presence on Labor Productivity: The Conditioning Effects of Involvement Practices and Employee Voice (ordered probit) Continued

| | *Involvement Practices (IP)* | | | | *ESO Presence* | *Employee Voice (EV)* | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Model* | *1* | *2* | *3* | *4* | *Model* | *1* | *2* | *3* | *4* |
| *Variables* | *Independent Effects ESO only* | *Independent Effects IP only* | *Independent Effects ESO & IP* | *Interaction Model* | *Variables* | *Independent Effects ESO only* | *Independent Effects EV only* | *Independent Effects ESO & EV* | *Interaction Model* |
| | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* | | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* |
| *[Small Org]* | | | | | *[Small Org]* | | | | |
| *Medium Organization* | -0.2314 | -0.2692 | -0.2741 | -0.2587 | *Medium Organization* | -0.2426 | -0.2297 | -0.2416 | -0.2426 |
| | (0.1733) | (0.1788) | (0.1789) | (0.1802) | | (0.1706) | (0.1697) | (0.1710) | (0.1712) |
| *Large Organization* | -0.2945* | -0.3082 | -0.3605 | -0.3460* | *Large Organization* | -0.3249* | -0.2610 | -0.3273* | -0.3299* |
| | (0.1783) | (0.1952) | (0.1857) | (0.1875) | | (0.1778) | (0.1867) | (0.1774) | (0.1779) |
| *Very Large Organization* | -0.6141*** | -0.4974** | -0.6845*** | -0.6717*** | *Very Large Organization* | -0.6294*** | -0.4298** | -0.6359*** | -0.6385*** |
| | (0.1770) | (0.1940) | (0.1913) | (0.1903) | | (0.1773) | (0.1711) | (0.1780) | (0.1776) |
| *Industry Dummies* | Yes | Yes | Yes | Yes | *Industry Dummies* | Yes | Yes | Yes | Yes |
| *Cut1/* | -2.45*** | -2.31*** | -2.35*** | -2.38*** | *Cut1/* | -2.45*** | -2.38*** | -2.39*** | -2.37*** |
| *Cut2/* | -1.33*** | -1.17*** | -1.22*** | -1.24*** | *Cut2/* | -1.32*** | -1.24*** | -1.27*** | -1.25*** |
| *Cut3/* | 0.17 | 0.33 | 0.28 | 0.26 | *Cut3/* | 0.17 | 0.24 | 0.23 | 0.24 |
| *Cut4/* | 1.61*** | 1.76*** | 1.73*** | 1.71*** | *Cut4/* | 1.61*** | 1.67*** | 1.67*** | 1.69*** |
| *F* | 2.82*** | 2.64*** | 2.86*** | 2.73*** | *F* | 2.88*** | 2.65*** | 2.85*** | 2.72*** |
| *N* | 1086 | 1086 | 1086 | 1086 | *N* | 1078 | 1078 | 1078 | 1078 |

*Notes*: Standard errors in parentheses. Estimates based on survey ordered probit using weighted data.
*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

*Table 2.* The Effects of Employee Stock Ownership Coverage on Labor Productivity: The Conditioning Effects of Involvement Practices and Employee Voice (ordered probit)

| | *ESO Coverage* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Involvement Practices (IP)* | | | | | *Employee Voice (EV)* | | | |
| *Model* | *1* | *2* | *3* | *4* | *Model* | *1* | *2* | *3* | *4* |
| *Variables* | *Independent Effects ESO only* | *Independent Effects IP only* | *Independent Effects ESO & IP* | *Interaction Model* | *Variables* | *Independent Effects ESO only* | *Independent Effects EV only* | *Independent Effects ESO & EV* | *Interaction Model* |
| | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* | | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* |
| ESOMAJ | 0.5575** (0.2278) | | 0.5496** (0.2276) | 1.3238** (0.5843) | *ESOMAJ* | 0.5472** (0.2256) | | 0.5471** (0.2270) | 0.9610*** (0.2958) |
| ESOMIN | 0.2411 (0.2554) | | 0.2155 (0.2580) | -1.4092 (1.1469) | *ESOMIN* | 0.2380 (0.2560) | | 0.2419 (0.2542) | -0.1373 (0.3566) |
| Involvement Practices | | 0.0416 (0.0336) | 0.0382 (0.0342) | 0.0316 (0.0344) | *Employee Voice* | | 0.0353 (0.0614) | 0.0360 (0.0616) | 0.0399 (0.0691 ) |
| ESOMAJ x Involvement Practices | | | | -0.1400 (0.1034) | *ESOMAJ x Employee Voice* | | | | -0.3308** (0.1633) |
| ESOMIN x Involvement Practices | | | | 0.3020 (0.1876) | *ESOMIN x Employee Voice* | | | | 0.3745* (0.2136) |
| Trade union *recognition* | -0.2833** (0.1431) | -0.2433* (0.1399) | -0.2978** (0.1403) | -0.3382** (0.1344) | *Trade union recognition* | -0.2933** (0.1434) | -0.2293 (0.1457) | -0.2848* (0.1461) | -0.2519* (0.1490) |
| Workforce composition | 0.0031 (0.0022) | 0.0030 (0.0022) | 0.0031 (0.0022) | 0.0033 (0.0023) | *Workforce composition* | 0.0036 (0.0022) | 0.0036 (0.0022) | 0.0036* (0.0021) | 0.0034 (0.0022) |
| Product Market Competition | 0.0934 (0.1122) | 0.0883 (0.1131) | 0.0909 (0.1125) | 0.0893 (0.1134) | *Product Market Competition* | 0.0943 (0.1129) | 0.0933 (0.1135) | 0.0965 (0.1130) | -0.0706 (0.1140 ) |
| [Training 0-4 days] | | | | | *[Training 0-4 days]* | | | | |
| Training (5 9 days) | 0.3590** (0.1622) | 0.3816** (0.1638) | 0.3367** (0.1620) | 0.3132* (0.1639) | *Training (5-9 days)* | 0.4033** (0.1626) | 0.4412*** (0.1667) | 0.3937** (0.1644) | 0.4003** (0.1659) |
| Training (10 or more days) | 0.4031** (0.1595) | 0.3873** (0.1707) | 0.3616** (0.1662) | 0.3362** (0.1621) | *Training (10 or more days)* | 0.4233*** (0.1598) | 0.4326** (0.1717) | 0.4040** (0.1675) | 0.3799** (0.1602) |

*Continued*

*Table 2.* The Effects of Employee Stock Ownership Coverage on Labor Productivity: The Conditioning Effects of Involvement Practices and Employee Voice (ordered probit), Continued

| | *ESO Coverage* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Involvement Practices (IP)* | | | | | *Employee Voice (EV)* | | | |
| *Model* | *1* | *2* | *3* | *4* | *Model* | *1* | *2* | *3* | *4* |
| *Variables* | *Independent Effects ESO only* | *Independent Effects IP only* | *Independent Effects ESO & IP* | *Interaction Model* | *Variables* | *Independent Effects ESO only* | *Independent Effects EV only* | *Independent Effects ESO & EV* | *Interaction Model* |
| | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* | | *Coefficient* | *Coefficient* | *Coefficient* | *Coefficient* |
| *Workplace Size* | -0.0001 | -0.0001 | -0.0002 | -0.0002 | *Workplace size* | -0.0001 | -0.0001 | -0.0001 | -0.0001 |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| *Small Organization* | | | | | *Small Organization* | | | | |
| *Medium Organization* | -0.2193 | -0.2635 | -0.2629 | -0.2388 | *Medium Organization* | -0.2301 | -0.2263 | -0.2288 | -0.2324 |
| | (0.1723) | (0.1774) | (0.1774) | (0.1800) | | (0.1699) | (0.1688) | (0.1703) | (0.1717) |
| *Large Organization* | -0.3184* | -0.3741* | -0.3839** | -0.3583* | *Large Organization* | -0.3496* | -0.3356* | -0.3540* | -0.3535* |
| | (0.1841) | (0.1963) | (0.1910) | (0.1958) | | (0.1838) | (0.1867) | (0.1832) | (0.1820) |
| *Very Large Organization* | -0.6031*** | -0.5277*** | -0.6747*** | -0.6587*** | *Very Large Organization* | -0.6184*** | -0.4657*** | -0.6258*** | -0.6388*** |
| | (0.1797) | (0.1996) | (0.1939) | (0.1947) | | (0.1802) | (0.1771) | (0.1809) | (0.1822) |
| *Industry Dummies* | Yes | Yes | Yes | Yes | *Industry Dummies* | Yes | Yes | Yes | Yes |
| *Cut1/* | -2.44*** | -2.30*** | -2.34*** | -2.47*** | *Cut1/* | -2.44*** | -2.34*** | -2.37***. | -2.41*** |
| *Cut2/* | -1.31*** | -1.16*** | -1.20*** | -1.24*** | *Cut2/* | -1.30 *** | -1.20*** | -1.23*** | -1.24*** |
| *Cut3/* | 0.19 | 0.34 | 0.30 | 0.28 | *Cut3/* | 0.19 | 0.28 | 0.26 | 0.27 |
| *Cut4/* | 1.62*** | 1.76*** | 1.74*** | 1.72*** | *Cut4/* | 1.63*** | 1.70*** | 1.70*** | 1.72*** |
| *F* | 2.66*** | 2.56*** | 2.68*** | 2.66*** | *F* | 2.77*** | 2.62*** | 2.75*** | 2.80*** |
| *N* | 1036 | 1036 | 1036 | 1036 | *N* | 1029 | 1029 | 1029 | 1029 |

*Notes*: Standard errors in parentheses. Estimates based on survey ordered probit using weighted data.
*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

ESO under consideration.[13]

In the analysis and discussion that follows, the graphs illustrate how a discrete change in the measure of ESO changes the probability of reporting "a lot better than average" labor productivity (the highest category) at different values of our involvement measures when all other values are held at their weighted mean. On the graphs, significant marginal effects are observed where the upper and lower bounds of the confidence intervals are above (or below) zero. Across the different specifications, the results of this analysis provide support for all three predictions regarding the likely impact of ESO on labor productivity at different levels of involvement—positive effect, no effect, and negative effect. The graphs also reveal the persistence of independent ESO effects (where there are no direct involvement schemes or where employee voice is recorded as "zero"), but only when the measure of stock ownership has high employee coverage. Finally, whereas the graphs reveal no evidence of a statistically significant negative ESO effect over the range of involvement measures (in which both confidence intervals are non-positive and below zero), they do indicate that the size of the ESO effect diminishes as the extent of employee voice increases. This effect is clearest when the stock ownership measure is majority participation in the plan. We discuss the results more systematically in the next section.

[13] While it may be true that including interaction terms increases multicollinearity, there are strong grounds to believe that these effects have been overstated (see Friedrich 1982 for a rigorous defense of the use of multiplicative terms; see also Brambor et al. 2005). Our analysis bears this out. The change in model parameters from the inclusion of an interaction term (model 4 versus 3) is not a signal of multicollinearity as is commonly claimed because the coefficients now reflect conditional "effects" rather than general effects. In line with our methodological approach the impact of multicollinearity can only be assesed by calculating the relevant marginal effects and measure of uncertainty. If multicollinearity is large then this will be captured by the standard error of the marginal effect and this term will not be statistically significant. Our findings indicate that, although multicollinearity may be present, the effects are not detrimental to our overall findings.

*The Presence of Employee Stock Ownership*

Figure 2a shows how the marginal effects of ESO Presence on the probability of reporting "a lot better than average" labor productivity alter as the number of participatory arrangements increases from zero to 8 when all other variables are held at their mean value. The effect of a stock plan on labor productivity is positive but not statistically significant when the number of participatory schemes is zero (4 percent of workplaces). However, as predicted, the positive effect of stock plans increases in magnitude as the number of involvement schemes increases and becomes statistically significant when the number of schemes reaches 5. Once the number of involvement schemes is 5 or more, having a share plan increases the probability of labor productivity being a lot better than average by between 9 to 14 percentage points over those with no share plan.

In this scenario, in which the provision of a plan does not necessarily mean that employees involve themselves in it, the effect of ESO on productivity may not be achieved primarily via feelings of ownership or perceptions of interest alignment. Instead, the signaling effects of plan provision might be most important (i.e., management show that they respect and care about employees). In this instance, these signals from management may become more credible with the number of other forms of involvement offered by management.

Turning to those specifications that attempt to measure more explicitly the "quality" of involvement (Figure 2b), we find that the effect of ESO Presence is again positive at higher levels of voice but the marginal effect declines slightly (from approximately 10 to 8 percent) as employee voice increases. Evaluating the effectiveness of ESO at different levels of employee voice requires a slight modification in our interpretation approach. We cannot ascertain whether there is a "true" independent ESO effect in this diagram (when voice equals zero) because in developing the voice measure we found that firms with low levels of employee voice were indistinguishable from those with no

*Figure 2a.* Marginal Effects of ESO Presence on Labor Productivity Across the Observed Range of Involvement Practices

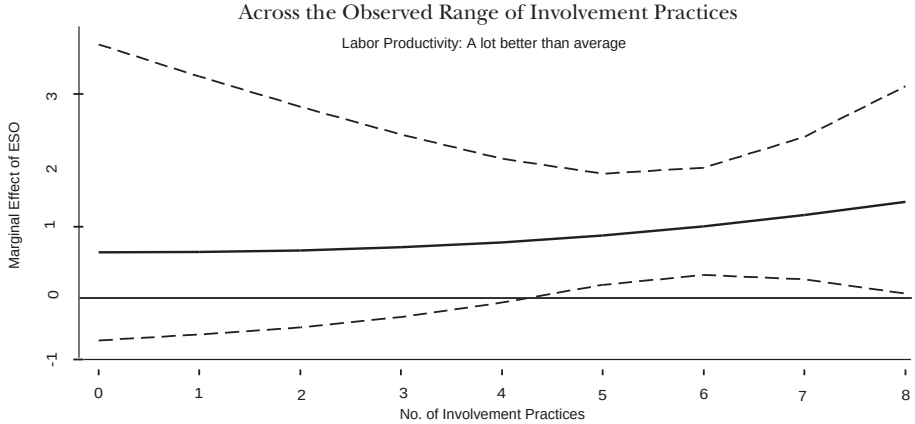



*Figure 2b.* Marginal Effects of ESO Presence on Labor Productivity Across the Observed Range of Employee Voice

——— Marginal effect of ESO on the probability of reporting "a lot better than average" labor productivity at different levels of involvement/employee voice.
- - - - - - 95% Confidence Interval.

voice. Consequently, when voice equals zero, it is capturing the marginal effect of ESO on productivity when firms have no or low levels of employee voice. Nonetheless, at these levels, ESO has no statistically significant effect on labor productivity, but anything over and above this across a large expanse of values, we find a statistically significant ESO effect on labor productivity. Only when we reach the highest levels of employee voice does this significant ESO effect disappear.[14]

[14] We also re-ran the simulations with the "above average" measure of labor productivity. The shape of the marginal effects and the significance of the ESO effects across the range of the involvement measures remained broadly the same though the marginal effects are somewhat smaller at around 80 percent of those shown in Figures 2a and 2b. Further, we substituted downward and upward communication scales for the employee involvement practices scale. The shape of the graphs is very similar, as would be expected given the high correlations between these two scales and the main scale. The effects become significant at a lower value of the involvement scale in each case, while the marginal effects for stock ownership across different levels

To summarize, using a simple measure of stock plan presence (as is commonly found in the literature), the marginal effects of ESO on labor productivity become positive when there are several forms of employee involvement. This is consistent with the notions of free-rider effects and complementarity found in the literature. However, if employees have substantial voice in employee involvement institutions, this detracts somewhat from the effects of ESO, though they remain positive. These results give a more nuanced picture of complementarities that is typically found in the stock ownership literature. It becomes more nuanced still when we turn to measures of stock ownership plans that capture the level of employee participation within them.

*The Coverage of Employee Share Ownership*

When we decompose the measure of ESO Presence according to the take-up of stock ownership among employees, the results are striking and provide a clearer profile of the effects of share plans and involvement on labor productivity (see Figures 3a–d). The results relating to majority (Figures 3a and 3b) and minority participation (Figures 3c and 3d) in stock plans are diametrically opposed. This highlights the centrality of ESO coverage to understanding the workings of stock ownership and involvement on labor productivity. High participation in the plan appears able to counter the posited free-rider effects, and, rather than being necessary to secure the benefits of stock plans, other forms of employee involvement can detract from it.

When there is majority participation in the scheme (Figures 3a and 3b), the stock ownership plan has a strong "independent" effect on productivity,[15] but as employee involvement increases, the marginal effect of stock plans, while remaining positive, decline up to the highest levels of involvement in which the productivity effects of stock plans become small and statistically insignificant. This overall trend is evident across both measures of employee involvement in a broadly similar fashion.

As we discuss above, there are several possible explanations for this profile. To the extent that majority ESO coverage reflects wider and stronger feelings of ownership, the results imply that a strong ownership culture is sufficient in its own right to bring about productivity-enhancing change (free-rider effects notwithstanding) without recourse to significant levels of employee involvement. Indeed, in this scenario it is possible that too many forms of involvement or too much voice impedes effective management decision-making and outweighs any positive effects of information sharing and cooperation. More specifically for stock ownership, the conjunction of widespread ownership rights with involvement opportunities could detract from the productivity effects of stock ownership by leading employees to believe they have a greater right to influence management decisions than is efficient or to raise time-consuming grievances. This could impede effective managerial decision-making by delaying decisions and involving too many, possibly inexpert, workers in the decision process. It could also be the case that a discrepancy between worker and managerial perceptions of the appropriate level of employee voice and decision rights within participative institutions leads to productivity-diminishing conflict.

Contrast these results with those for the case in which a minority of workers participate in the stock plan (Figures 3c and 3d). This profile of results more strongly supports the prevailing view that employee involvement and communication are necessary to counter free-rider effects. At zero or low levels of involvement, the marginal effects of ESO on labor productivity are negative although not statistically significant; these effects become positive and statistically significant only where there are six or more forms of

of upwards communication are slightly larger than when it is combined with downward communication (approximately one percentage point). Copies of these results are available on request from the authors.

[15] "Independent" stock ownership effects (when the respective participation measure is zero) increase the probability of reporting "a lot better than average" productivity by 36 percentage points in the participatory practices model as against 24 percentage points in the employee voice model.

*Figure 3a.* Marginal Effects of Majority ESO on Labor Productivity Across the Observed Range of Involvement Practices

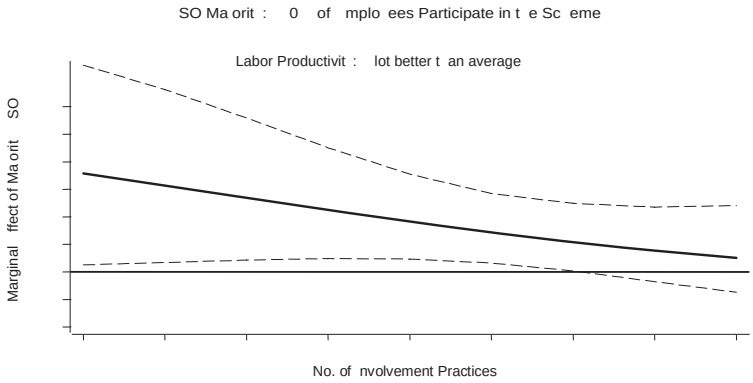
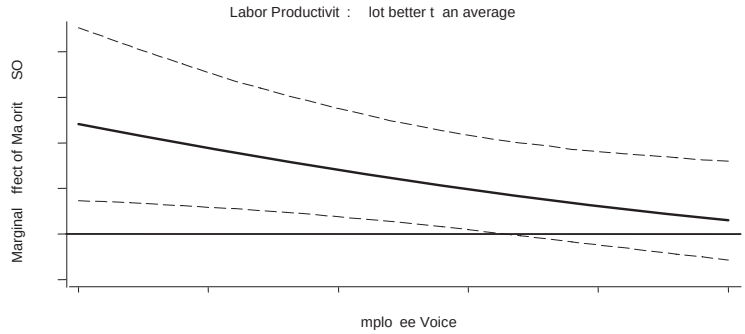



*Figure 3b.* Marginal Effects of Majority ESO on Labor Productivity Across the Observed Range of Employee Voice




——— Marginal effect of ESO on the probability of reporting "a lot better than average" labor productivity at different levels of employee involvement/voice.
- - - - - - 95% Confidence Interval.

employee involvement. From this point, the sizes of marginal effects rise steeply, suggesting a strong complementarity. As far as employee voice within employee involvement is concerned, the marginal effects of ESO become significant only when this is substantial. Once again, the sizes of the marginal effects rise steeply from then on.

The mapping of this scenario lends some credence to the view that when ownership is "weak" or not widespread, employee involvement is necessary for stock ownership to enhance performance. Employee involvement practices and voice can signal management's commitment to the stock plan and instill in employees feelings of empowerment and respect in a context where low membership in the stock plan may otherwise tend to diminish the role and status of the plan (thereby potentially encouraging free-riding). Employee involvement practices and voice may overcome any inclination to free-ride among plan members. Our results suggest that for stock ownership plans and involvement to be properly aligned, "weak" ownership needs to be accompanied by

substantial voice and an extensive array of participatory arrangements. Perhaps only then does the institutional and cultural setting provide sufficient safeguards and the impetus for employees to realize that releasing private information and performing better will pay-off.[16]

## Conclusions

Our results provide empirical support for each of the three predictions outlined above. Consistent with the widespread prediction in the literature, we find that the combination of stock plans and involvement can have positive productivity effects over a wide range of values for involvement. Our results are more complex than this, however, and they provide a set of challenges to the prevailing view. First, there is clear evidence that stock plans have independent effects on productivity, despite the claim in the literature about the impact of free-riding. Second, there are instances when the effect of stock plans decline as involvement increase. What emerges as central to understanding these effects and to explaining when they arise is the extent to which employees participate in the stock ownership plan. When a large proportion of employees participate in the plan, the influence of ownership transcends the need for further involvement in other practices. However, if the take-up of ownership is less widespread, and presumably less central to the functioning of the workplace, other forms of involvement are required if the benefits of shared ownership are to be realized.

Our results have both methodological and conceptual implications. Methodologically, graphical representations of the effects of share plans at different levels of involvement provide not only a more nuanced but also clearer picture of posited complementarities than can be obtained by reliance on coefficients. It is clear too that the measurement of key phenomena affects empirical findings. When stock plans and involvement are recorded in a fairly simplistic way (presence), the findings support the notion of synergy found in the literature: stock plans do not have a significant impact on productivity unless there are several forms of involvement present. However, higher quality measures provide a rather different picture. These findings reinforce claims in the literature on high performance work practices that more sophisticated measures than mere presence of practices and institutions are desirable (e.g., Cox et al. 2006). We are conscious that our measures of employee involvement have their limitations. Ideally, we would have indicators of the proportion of workers participating in involvement mechanisms and the amount of influence they possess within them, as well as multiple respondents. Nevertheless, both our voice measure and the measure for stock plan participation are an improvement on what is widely found in the literature.

Likewise, we are mindful that the potential for reverse causality is a persistent difficulty in cross-sectional studies. Although this problem can never be dismissed, we believe it might be less of a problem in this particular study because it seems unlikely that managers will consistently choose particular levels of involvement to accompany their stock plans at given levels of productivity. Other selection effects may also be relevant. For instance, it may be that some workplaces have some underlying features that lead both to high levels of participation in the stock plan and to high productivity. Unfortunately, we cannot systematically explore this possibility using this data source. To do so, we would need linked employer–employee data with

[16] As with the results in Figures 2a and 2b, we also experimented with three sets of alternative specifications (available on request). We re-ran our results with the "above average" measure of labor productivity. The shape of the resulting graphs was broadly similar though marginal effects were smaller and significant over a smaller area. In the case of minority stock plan participation where there are employee involvement practices, the marginal effects are not significant at any point. We also divided the employee involvement practice scale into downward and upward communication scales. Here again, the results were similar in shape and magnitude but with one exception. The marginal effects of stock plans with minority participation are not significant at any point when only downward communication is present. This suggests that there needs to be some opportunity for employees to feed views upwards (as is suggested by the equivalent employee voice results).

*Figure 3c.* Marginal Effects of Minority ESO on Labor Productivity Across the Observed Range of Involvement Practices

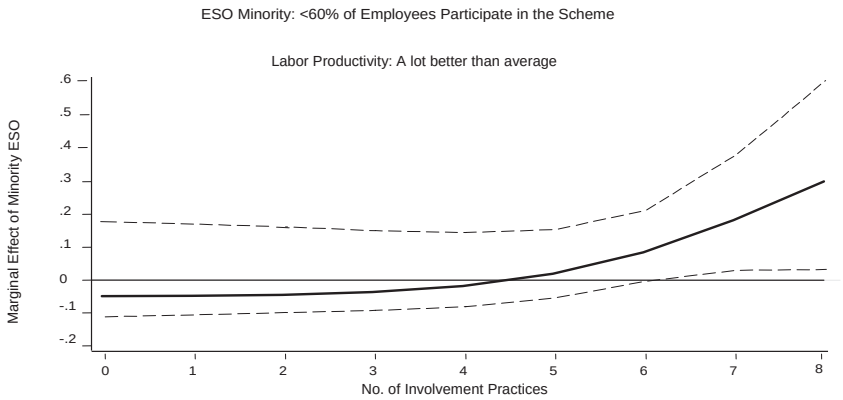
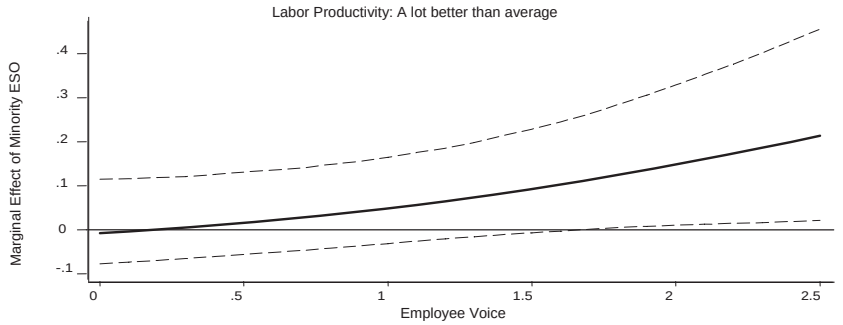



*Figure 3d.* Marginal Effects of Minority ESO on Labor Productivity Across the Observed Range of Employee Voice




——— Marginal effect of ESO on the probability of reporting "a lot better than average" labor productivity at different levels of involvement/employee voice.
- - - - - - 95% Confidence Interval.

extensive information on employee wealth and on employer management of their stock plans. A further possibility is that stock plans and other forms of employee involvement act as substitutes for each other. It might be argued that the impact of stock plans on the probability of reporting high productivity declines at high levels of participation because the latter renders stock plans unnecessary. Although this is possible in principle, our results do not support this interpretation. The coefficients on stock plan presence and participation tend to be large and significant; however, those for employee involvement and voice are very small and insignificant.

Conceptually, our results question the prevailing view in the literature that involvement is necessary to overcome the free-rider problems typically associated with stock ownership plans. As it happens, the empirical evidence for this has not been that strong; nevertheless, this view has persisted in the literature. Our results illustrate that stock plans can have independent effects on productivity, thereby implying that free-riding is not necessarily such a major problem in practice. This is less surprising than it might at first seem to be. Many stock plans require employees formally to opt into

the scheme. In fact, all of the cases observed in this study take this form. Where an explicit decision to participate is required, it seems reasonable to infer that many of those making this decision will "buy into" the purpose of the plan. This will be especially so if the stock plans are contributory (as in most British plans and in U.S. Section 423 plans). We suspect that the centrality granted to free-rider effects in much of the literature arises from a tendency to extrapolate from the highly specific case of ESOPs (where employees "passively" receive "free" shares) to employee stock plans in general. A broader inference arising from our study, therefore, is the desirability of paying due accord to the institutional specificities of the plans under investigation.

Our findings are also consistent with the increasingly widespread view that stock plans work via means other than the provision of direct incentives, such as development and protection of human capital by encouraging employee retention (Robinson and Zhang 2005). If this is so, other forms of involvement may not be necessary to make stock plans work. Indeed, the results indicate that other forms of involvement can detract from the effects of stock ownership in certain circumstances (e.g., when participation in the stock plan is high). This could be because highly motivated employee part-owners attempt to influence management decisions to a greater extent than is efficient. In general, our findings support the view that stock plans and other forms of employee involvement need to be aligned (Ben-Ner and Jones 1995). Our results suggest that in typical stock ownership plans where employees have a minority stake, high employee participation rates in the plan result in return rights and control rights being aligned best when there is little of the latter. When participation in the stock plan is lower, more extensive involvement seems to be necessary to achieve alignment, presumably to counter free-rider effects. These situations might be contrasted with majority worker ownership (e.g., workers' cooperatives), in which extensive employee involvement in governance appears to be consistent with extensive ownership. In sum, our research suggests that alignment is a complex phenomenon that requires careful attention to the specific features of the practices under investigation. The challenge of future research in this area will be to examine these possibilities more comprehensively.

## Appendix 1
## Variable Definitions and Descriptive Statistics

| *Variable Name* | *Descriptor* | *Mean* |
|---|---|---|
| Lab Prod | Compared with other establishments in the same industry, how would you assess your workplace's labor productivity?: 1–a lot below average; 2 – below average; 3 – average; 4 – above average; 5 – a lot better than average. | 3.54 |
| ESO Presence | Workplace has an ESO scheme in which non-management employees are eligible to participate (1/0) | 0.19 |
| ESO Coverage (Majority) | Workplace has an ESO scheme in which a majority (60% or more) of non–management employees participate (1/0) | 0.09 |
| ESO Coverage (Minority) | Workplace has an ESO scheme in which a minority (less than 60%) of non–management employees participate (1/0) | 0.08 |
| Involvement Practices | Additive scale of the number of direct involvement schemes in operation in each workplace (meetings between senior management and entire workforce + team briefings + quality circles + surveys + suggestion schemes + management chain (systematic cascading of information) + notice board + newsletter). | 3.78 |
| Employee Voice | Component score from CATPCA analysis based the extent to which time is set aside for employees to ask questions in meetings and briefings | 1.01 |
| Trade Union Recognition | Trade union is recognized by management for negotiating pay and conditions (1/0) | 0.16 |
| Workforce Composition | Proportion of the workforce who are "blue-collar" workers. | 0.21 |
| Product Market Competition | Workplace faces a very high degree of product market competition (1/0) | 0.43 |

*Continued*

**Appendix 1**
**Variable Definitions and Descriptive Statistics** Continued

| *Variable Name* | *Descriptor* | *Mean* |
|---|---|---|
| Training 0–4 days | Majority of the largest occupational group receive 4 or less days' training per year | 0.72 |
| Training (5–9 days) | Majority of the largest occupational group receive between 5 and 9 days' training per year | 0.17 |
| Training (10 or more days) | Majority of the largest occupational group receive 10 or more days' training per year | 0.11 |
| Workplace Size | Number of employees in the workplace | 29.01 |
| Small Organization | Organization as a whole has up to 249 employees | 0.55 |
| Medium Organization | Organization as a whole has between 250 and 999 employees | 0.07 |
| Large Organization | Organization as a whole has between 1000 and 4999 employees | 0.13 |
| Very Large Organization | Organization as a whole has more than 5000 employees | 0.25 |
| Industry Dummies | Industry dummies capturing manufacturing, electricity–gas–water, construction, wholesale & retail, hotels & restaurants, transport & communication, financial services, other business services, health, other community services. | |

*Note:* Based on weighted data.

**REFERENCES**


Addison, John, and Clive Belfield. 2001. "Updating the Determinants of Firm Performance. Estimation Using the 1998 UK Workplace Employee Relations Survey." *British Journal of Industrial Relations*, Vol. 39, No.3, pp. 341–66.

Ai, Chunrong, and Edward Norton. 2003. "Interaction Terms in Logit and Probit Models." *Economic Letters*, Vol. 80, pp. 123–29.

Ben-Ner, Avner, and Derek Jones. 1995. "Employee Participation, Ownership, and Productivity: A Theoretical Framework." *Industrial Relations*, Vol. 34, No. 4, pp. 532–54.

Blair, Margaret. 1995. *Ownership and Control*. Washington DC: Brookings Institution.

____, Douglas L. Kruse, and Joseph R. Blasi. 2000. "Employee Ownership: An Unstable Form or a Stabilizing Force?" In Margaret Blair and Thomas Kochan, eds. *The New Relationship: Human Capital in the American Corporation*, pp. 241–98. Washington DC: Brookings Institution.

Blasi, Joseph, Michael Conte, and Douglas Kruse. 1996. "Employee Stock Ownership and Corporate Performance Among Public Companies." *Industrial and Labor Relations Review*, Vol. 50, No.1, pp. 60–80.

____, Douglas Kruse, and Richard Freeman. 2006. "Shared Capitalism at Work: Impacts and Policy Options." In Edward Lawler, and James O'Toole, eds., *America at Work*, pp. 275–96. New York: Palgrave Macmillan.

Bloom, Matt and Milkovitch, George. 1998. "Relationships among Risk, Incentive Pay, and Organizational Performance." *Academy of Management Journal*, Vol. 41, No. 3, pp. 283–97.

Booth, Alison and M. Bryan. 2004. "The Union Membership Wage Premium Puzzle: Is there a Free Rider Problem?" *Industrial and Labor Relations Review*, Vol. 57, No. 3, pp. 402–21.

Brambor, Thomas, William Clark, and Matt Golder. 2005. "Understanding Interaction Models: Improving Empirical Analyses." *Political Analysis*, Vol. 14, No. 1, pp. 63–82.

____, William Clark, and Matt Golder. 2008. "Multiplicative Interaction Models." Available at http://homepages.nyu.edu/%7 Emrg217/interaction.html#code. (Retrieved 12th June 2008).

Bryson, Alex and Richard Freeman. 2007. *Doing the Right Thing? Does Fair Share Capitalism Improve Workplace Performance?* London: Department of Trade and Industry, Employment Relations Research Series No. 81.

Budd, John, and Karen Mumford. 2004. "Trade Unions and Family-Friendly Policies in Britain." *Industrial and Labor Relations Review*, Vol. 57, No. 2, pp. 204–22.

Conyon, Martin, and Richard Freeman. 2004. "Shared Modes of Compensation and Firm Performance: UK Evidence." In David Card, Richard Blundell, and Richard B. Freeman, eds., *Seeking a Premier League Economy*, pp. 109–46. Chicago: University of Chicago Press.

Cox, Annette, Stefan Zagelmeyer, and Mick Marchington. 2006. "Embedding Employee Involvement and Participation at Work." *Human Resource Management Journal*, Vol. 16, No.3, pp. 250–68.

Doucouliagos, Chris. 1995. "Worker Participation and Productivity in Labor-Managed and Participatory Capitalist Firms: a Meta-Analysis." *Industrial and Labor Relations Review*, Vol. 49, No.1, pp. 58–77

Fernie, Sue, and David Metcalfe. 1995. "Participation, Contingent Pay, Representation, and Workplace Performance: Evidence from Great Britain." *British Journal of Industrial Relations*, Vol. 33, No. 3, pp. 379–415.

Forth, John, and Robert McNabb. 2008. *Innovations in WERS2004: The Collection of Objective Data on Workplace Performance*. London: National Institute for Economic and Social Research, WERS2004 Information and Advice Service

Friedrich, Robert, J. 1982. "In Defense of Multiplicative Terms in Multiple Regression Models." *American Journal of Political Science*, Vol. 26, No. 4, pp.797–833.

Hansmann, Henry. 1996. *The Ownership of Enterprise*. Cambridge, MA: Belknap.

Hart, Oliver. 1995. *Firms, Contracts, and Financial Structure*. Oxford: Oxford University Press.

Haskel Jonathan. 2005 "Unions and Productivity Again: New Evidence from Matched WERS and Business Census Data." Queen Mary College, University of London, mimeo. Presented at the Annual Conference of the Work Pensions and Labour Economics Study Group, 18th–20th July, University of York.

Hoetker, Glenn. 2007. "The Use of Logit and Probit Models in Strategic Management Research: Critical Issues." *Strategic Management Journal*, Vol. 28, pp. 331–43.

Jones, Derek, and Takao Kato. 1993. "The Scope, Nature, and Effects of Employee Stock Ownership Plans in Japan." *Industrial and Labor Relations Review*, Vol. 46, No.2, pp. 352–67.

Kalmi, Panu, Andrew Pendleton, and Erik Poutsma. 2005. "Financial Participation and Performance in Europe" *Human Resource Management Journal*, Vol. 15, No. 4, pp.54–67.

Kato, Takao and Motohiro Morishima. 2002. "The Productivity Effects of Participatory Employment Practices: Evidence from Japanese Panel Data." *Industrial Relations*, Vol. 41, No. 4, pp. 487–520.

Kersley, Barbara, Carmen Alpin, John Forth, Alex Bryson, Helen Bewley, Gill Dix, and Sarah Oxenbridge. 2006. *Inside the Workplace: Findings From the 2004 Workplace Employment Relations Survey*. London: Routledge.

Kim Dong-One. 2005. "The Benefits and Costs of Employee Suggestions Under Gainsharing." *Industrial and Labor Relations Review*, Vol. 58, No.4, pp.631–52.

Lazear, Edward. 2000. "Performance Pay and Productivity." *American Economic Review*, Vol. 90, No.2, pp. 1346–361.

Lee, Eun Sul, Ronald Forthofer, and Ronald Lorimor. 1989. *Analysing Complex Survey Data*. London: Sage.

Levine, David. I. and Laura D'Andrea Tyson 1990. "Participation, Productivity and the Firm's Environment." In Alan. S. Blinder, ed., *Paying for Productivity*, pp. 183–244. Washington D.C, The Brookings Institute.

Long, J. Scott and Jeremy Freese 2006. *Regression Models for Categorical Dependent Variables Using Stata*,

2nd Edition, Stata Press, Texas, U.S.A.

Macduffie, John Paul. 1995. "Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry." *Industrial and Labor Relations Review*, vol. 48, No.2, pp. 197–221.

Machin, Stephen and Mark Stewart 1996. "Trade Unions and Financial Performance." *Oxford Economic Papers*, Vol. 48, No. 2, pp. 213–241.

____, and Stephen Wood. 2005. "Human Resource Management as a Substitute for Trade Unions in British Workplaces." *Industrial and Labor Relations Review*, Vol. 58, No. 2, pp. 201–218.

McNabb, Robert and Keith Whitfield 1998. "The Impact of Financial Participation and Employee Involvement on Financial Performance." *Scottish Journal of Political Economy*, Vol. 42, pp. 171–87.

Meulman, Jacqueline.J. and Willem.J. Heiser 2005. *SPSS Categories Manual version 14*. SPSS Inc, Chicago, IL, U.S.A.

Norton, Edward, Hua Wang, Chunrong Ai. 2004. "Computing Interaction Effects and Standard Errors in Logit and Probit Models." *Stata Journal*, Vol. 4, No.2, pp. 154–67.

Ohkusa, Yasushi, and Fumio Ohtake. 1997. "The Productivity Effects of Information Sharing, Profit Sharing, and ESOPs." *Journal of the Japanese and International Economies*, Vol. 11, pp. 385–402.

Oyer, Paul 2004. "Why Do Firms Use Incentives That Have No Incentive Effects?" *Journal of Finance*, Vol. 59, No. 4, pp.1619–649.

Pendleton, Andrew 1997. "Characteristics of Workplaces with Financial Participation: Evidence From the Workplace Industrial Relations Survey." *Industrial Relations Journal*, Vol. 28, pp. 103–19.

____. 2001. *Employee Ownership, Participation, and Governance: A Study of ESOPs in the UK*. London: Routledge.

____. 2006. "Incentives, Monitoring, and Employee Stock Ownership Plans: New Evidence and Interpretations." *Industrial Relations*, Vol. 45, No. 4, pp. 753–78.

____. 2007. "The Study of Employee Share Ownership using WERS: An Evaluation and Analysis of the 2004 Survey" in Keith Whitfield and Katy Huxley, eds., *Innovations in the 2004 Workplace Employment Relations Survey*, Cardiff: Cardiff University.

Perotin, Virginie and Andrew Robinson. 2000. "Employee Participation and Equal Opportunities Practices: Productivity Effects and Potential Complementarities" *British Journal of Industrial Relations*, Vol. 38, No 4, pp.557–84.

____, and Andrew Robinson. 2003. "Employee Participation in Profit and Ownership: A Review of the Issues and Evidence." European Parliament Working Paper No. SOCI109EN, Social Affairs Series, Directorate General for Research.

Pierce, Jon and Loren Rodgers. 2004. "The Psychology of Ownership and Worker-Owner Productivity." *Group and Organization Management*, Vol. 29, pp. 588–613.

Prendergast, C. 1999 " The Provision of Incentives in Firms" *Journal of Economic Literature*, Vol. 37, pp. 7–63

Robinson, Andrew and Nicholas Wilson. 2006a. "Employee Financial Participation and Productivity: an Empirical Reappraisal." *British Journal of Industrial Relations*, Vol. 44, No. 1, pp. 31–50.

____, and Nicholas Wilson. 2006b. "Financial Participation and Productivity: Insights from Stochastic Frontier Estimation." *Economic and Industrial Democracy*, Vol. 27, No.4, pp. 609–35.

____, and Hao Zhang 2005. "Employee Share Ownership: Safeguarding Investments in Human Capital." *British Journal of Industrial Relations*, Vol. 43, No. 3, pp. 469–88.

Sesil, James, Maya Kroumova, Joseph Blasi, and Douglas Kruse. 2002. "Broad-based Employee Stock Options in US 'New Economy' Firms." *British Journal of Industrial Relations*, Vol. 40, No. 2, pp. 273–94.

Tomz, Michael, Jason Wittenberg, Gary King. 2003. "Clarify: Software for Interpreting and Presenting Statistical Results." *Journal of Statistical Software*, Vol. 8, No. 1, pp. 1–29.

Wagner, Stephen, Christopher Parker, and Neil Christiansen. 2003. "Employees That Think and Act like Owners: Effects of Ownership Beliefs and Behaviors on Organizational Effectiveness." *Personnel Psychology*, Vol. 56, No. 4, pp. 847–71.

Wall, Toby, and Stephen Wood. 2005. "The Romance of Human Resource Management and Business Performance, and the Case for Big Science." *Human Relations*. Vol. 58, No. 4, pp. 429–62.

____, Jonathan Michie, Malcolm Patterson, Stephen Wood, Maura Sheehan, Chris Clegg and Michael West. 2004. "On the Validity of Subjective Measures of Company Performance." *Personnel Psychology*. Vol. 57, pp. 95–118.

Weitzman, Martin and Douglas Kruse 1990. "Profit Sharing and Productivity." In Alan Blinder, ed., *Paying for Productivity: A Look at the Evidence*, pp. 95–142. Washington DC: Brookings Institution.