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LAYOFFS AND WORKER EFFORT: THEORY AND EVIDENCE FROM THE NORTH AMERICAN AUTOMOTIVE SUPPLIER INDUSTRY

by

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1. Introduction[1]

In this paper we examine the effect of layoffs and layoff policies on three measures of worker effort[2]. More specifically, we use data on first-tier automotive suppliers in the U.S. and Canada to test the proposition that greater employment security interacts with other human resource policies to increase worker effort.

For the past twenty years the U.S. and Canadian automotive sectors have faced increasing competitive pressures. Many firms in the industry have attempted to respond to these pressures by implementing more or less substantive forms of employee involvement. Hence firms are attempting to increase worker effort.

Although participation sometimes has a beneficial impact on firm performance, many U.S. participation programs do not lead to sustained improvements (Levine and Tyson, 1990). A possible reason for the failure of many such programs is the lack of supporting human resource policies. Hence Casey Ichniowski (1992) argues that there is an interaction among human resource policies in creating productive labor-management relations. One such

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[2]. We define "effort" as any activity which is costly for workers to provide, and raises firm profits, *ceteris paribus*.

supportive human resource policy is employment security.

Robert Drago and Mark Wooden (1991) report (but do not further investigate) a positive correlation between employment security and worker participation. There are five reasons why this correlation may exist (Levine and Parkin, 1994). First, workers are unlikely to cooperate in raising productivity if they fear that productivity gains may translate into the loss of their jobs (Schuster, 1983; Kochan, Katz and Mower, 1985). Second, workers with employment security have longer time horizons and are more likely to forgo short-term gains to build a more effective organization. Participation only improves firm performance if workers share their ideas. In the short run the dominant strategy for workers is to disguise any productivity improving technique they have discovered and lower their effort intensity. Similarly, for firms the dominant strategy is to deny that productivity has increased and avoid paying performance related bonuses. As the repeated games literature suggests, long time horizons can convince both players to cooperate, thus raising the total payoff available to the parties. Third, to the extent that participation relies upon work group cooperation, group based rewards and sanctions are more effective as motivators the longer an employee expects to be in the group. If this reason is valid, employment security will interact with performance-contingent compensation mechanisms to increase employee effort. Fourth, layoffs may be inconsistent with the sense of membership and community on which employee involvement efforts are based. Finally, long-term employment arrangements help a firm to recover the higher investment in selection, socialization and training which often accompany participation. This reason suggests an interaction with the training policies adopted by the firm. Ichniowski (1992) points out that firms' investments in worker training signify their commitment to employment security by making layoffs more costly in terms of the loss of human capital.

2. The model[3]

We model the employment security decision of the firm as an agency problem in which the firm makes a labor contract offer specifying employment security provisions, taking account of the worker's known best response function. As first mover, the firm is analyzed as a Stackelberg leader. Our formalization draws attention to employment security, wages, the intensity of supervision, unemployment duration and benefits, and worker discount rates as determinants of employee effort. In the model we therefore abstract from other variables whose role we propose to consider in our econometric analysis.

Consider a labor market made up of homogeneous workers, receiving a uniform wage, w. For simplicity we abstract from the determination of the wage. Workers may initially be considered as expending a level of effort, e[4]. Following Bowles (1985), and Herbert Gintis and Tsuneo Ishikawa (1987), we assume an informational asymmetry between workers and employers, such that workers costlessly know their own level of effort, while the information available to employers is costly. Renewal of the labor contract is contingent upon the employer's perception of satisfactory effort on the part of the employee. The contract will

[3]. This model is drawn from Parkin (1994).

[4]. This statement will be clarified in footnote 7 below.

therefore be terminated on effort grounds with probability $f^e(e)$ in each period, where $f^e_e < 0$, and $f^e_{ee} > 0$. The contract may also be terminated because of a cyclical reduction in demand, with probability f^d. We may therefore write

$$f = f^e + f^d \tag{1}$$

$$s = 1 - f^d \tag{2}$$

where f represents the combined probability of not being re-hired in any period, and s is a measure of employment security[5]. In the event of termination of employment, the worker has a fallback position Z, which is the weighted average of the worker's non-wage income if not re-employed, and the expected income from a job obtained elsewhere (Bowles, 1985, p. 21).

Adopting a discrete time framework, with a discount rate, i, the value of the job to a worker, V, is

$$V = [U(w,s,e) + (1 - f)V + fZ]/(1 + i), \tag{3}$$

where U(.) is the utility derived from the job (a function of the wage, effort, and employment security). From equations (1), (2) and (3), the worker's maximization problem is therefore

[5]. Hence s = 1 in firms which offer complete employment security against cyclical downturns. However, these firms retain the option of firing a "shirking" worker.

$$\underset{(e)}{\text{Max}}\ V = Z + [U(w,s,e) - iZ]/(i + f^e + 1 - s) \qquad (4)$$

with $U_w > 0$, $U_{ww} < 0$, $U_s > 0$, $U_{ss} < 0$, $U_e < 0$, $U_{ee} > 0$. Graphically, we may depict iso-V lines (with slope $-V_s/V_e$) in employment security-effort space. The worker attempts to maximize V by choosing the optimal effort level for given s, thereby tracing out a locus of points at which $V_e = 0$, to produce the worker's best response function, e = e(s), illustrated in Figure 1 below. Algebraically, this locus of points at which $V_e = 0$ satisfies the equation:

$$(i + f^e + 1 - s)U_e = [U(w,s,e) - iZ]f^e_e \qquad (5)$$

Firms maximize profits by setting the level of employment security which maximizes worker effort per unit of wage payment. For ease of exposition, we shall concentrate on a single firm competing with a large number of identical firms. When considering the profit maximizing level of employment security, the firm takes account not only of the direct effect of increased employment security on worker effort, but also of the possibility that this increase will impose labor hoarding costs during cyclical downturns. If the firm is hoarding no labor, then all of the effort expended by workers (which we refer to as "potential effort") will be utilized. However, as labor hoarding increases, the firm will be unable to take advantage of some fraction, τ, of potential labor effort, where

$$\tau = \tau(s) \qquad (6)$$

Hence $d\tau/ds > 0$[6]. The firm's maximization problem is therefore

$$\underset{(s)}{\text{Max}}\ E = [e(s).(1 - \tau(s))]/w \tag{7}$$

where E, the amount of effort utilized for a given wage, is equal to the product of the potential effort expended by workers for a given wage, and the percentage of that effort which the firm is able to utilize given its level of labor hoarding[7]. We may therefore draw a map of iso-profit (iso-E) curves in employment security-effort space, and combine these with the iso-V curves which generate the worker's best response function, as shown in Figure 1.

We assume that the firm makes a "take-it-or-leave-it" labor contract offer to the worker including employment security provisions. Thus the firm acts as a Stackelberg leader. The Stackelberg equilibrium is found at the tangency of the worker's best response function and the relevant iso-profit curve[8]. Equating the slopes of these two curves yields

$$2[1 - \tau(s^*)].\partial e/\partial s = e.\partial\tau/\partial s \tag{8}$$

This yields an expression for the Stackelberg equilibrium, K, in Figure 1. This equilibrium is

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[6]. For simplicity, the second derivative of this function is assumed equal to zero.

[7]. Hence workers expend $e(s).(1 - \tau(s))$ units of effort per hour. It is this observation, coupled with the marginal disutility of effort, which gives rise to $U_s > 0$ in equation (3).

[8]. The slope of the iso-profit curves is: $-(\partial E/\partial s)/(\partial E/\partial e) = \{[e(s)(\partial\tau/\partial s)]/[1 - \tau(s)]\} - \partial e/\partial s$.

not a Pareto optimum, as indicated by the presence of the shaded lens in the diagram. The lens indicates all the employment security-effort combinations which increase both V and profits, and are therefore Pareto-superior to the Stackelberg outcome.

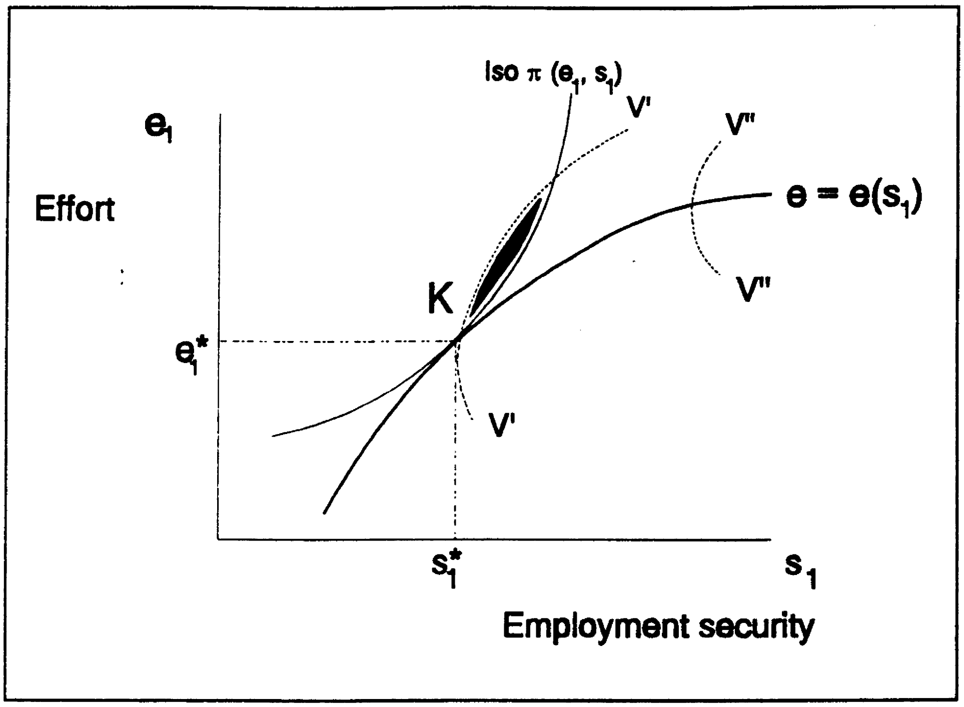

Figure 1. The Stackelberg equilibrium employment security decision for firm 1

This formulation shows a positive relationship between employment security (s) and effort (e) around the optimum[9]. The intuition behind this result is that if workers expect to be fired for reasons unrelated to their job performance, this will lead to lower effort. If, for example, workers expected to be laid off at the beginning of the next week with 50% probability

[9]. Investigation of the slope of the e(s) function yields indeterminate results. However, the function will possess positive first derivatives and negative second derivatives in the equilibrium range because of the second order conditions arising from profit maximization on the part of the firm. Drago (1986) presents a similar result. The model presented here differs from Drago's in that it includes a continuous effort variable, and investigates the welfare properties of the equilibrium combination of employment security and effort.

dependent on the toss of a coin, there would be reduced incentive to perform their jobs diligently, since these efforts may be wasted.

In this model worker effort is therefore an increasing function of the wage, employment security against cyclical dismissal, and the probability of being fired for shirking, and a decreasing function of the worker's fallback position and discount rate.

For estimation purposes, we combine the wage and fallback variables into a single measure of employment rents, or the cost of job loss (CJL)[10]. As suggested above, we also incorporate human resource (HR) policies (such as training and performance contingent compensation) and their interaction with employment security. Hence the equation to be estimated takes the general form:

$$e = e(s, sxHR, HR, f^e, CJL, f^exCJL, i, \text{control variables}) \quad (9)$$

Additional control variables used in the econometric analysis are discussed in the Section 3 below.

3. Description of data

(i) Source of the data

The survey data were collected by Helper in Fall 1993 under the sponsorship of the

[10]. The construction of this variable is discussed in some detail in the Appendix.

International Motor Vehicle Program at the Massachusetts Institute of Technology. Questionnaires were sent to 1609 plant managers at firms located in the U.S. and Canada which directly supply automakers in these countries. While the responses are based on the views of one individual at each firm, the plant manager is the single individual possessing sufficient information to answer a survey of this depth, and having sufficient responsibility within the firm that his/her views are translated into company policy. The respondents are experts in their field, with a median of 10 years experience in their company, and 19 years in the automotive industry.

The sample was selected in two ways. The first group (676 questionnaires) were plants which had been identified by respondents to a companion questionnaire sent to supplier marketing managers in Spring 1993. The second group (933 questionnaires) were additional plants randomly selected from the Elm Guide to automotive sourcing. In both cases the respondents provided data about their production of a typical product for their most important customer who is an automaker. A total of 456 surveys were returned. Taking into account plants that were either not applicable (they were not first-tier auto suppliers), unreachable (mail sent to them was returned unopened) or out of business, this represents a response rate of 30.6%, well above the standard for business surveys. Previous surveys administered to this population by Helper have revealed no systematic response bias. For descriptive statistics on these surveys, see Susan Helper (1991 and 1994).

(ii) Description of variables

Summary statistics on all the variables discussed here are presented in Table 8.

(a) Effort

Worker effort is notoriously difficult to measure. Were it not for this fact efficiency wage models would be of no interest, because employers could directly tie pay to measured effort. We report regressions involving three proxies for worker effort: absence rates, suggestions per worker, and employee "goal congruence" with management. A theoretically perfect measure of effort would require honest reporting by workers about their work intensity. While we do not possess such a measure, all three of our proxies conform to our definition of effort as an activity which is costly for workers to provide, and raises firm profits, *ceteris paribus*. However, these measures vary across two dimensions:

(i) cost of measurement for the firm; and

(ii) extent to which each measure of effort can be used as a criterion either for firing or in selecting workers for layoffs.

Absence rates are easily measured by supervisors, and can be used as a criterion for both firing and layoffs. We therefore expect both the real post-tax cost of job loss and layoffs to increase this type of worker effort. In contrast, both goal congruence and suggestions/worker are more qualitative measures of worker effort, and less easily measured. We suspect, for example, that workers are rarely fired for making too few suggestions, partly because it is difficult for managers to know the potential for improvement within a given work area. Hence we expect the cost of job loss to be less important as a determinant of both suggestions per worker and goal congruence, while layoff policies and broader human resource practices will be more important in determining both suggestions per worker and goal congruence.

ABSENCE. The rate of unscheduled absences (average percent per day).

SUGG. The number of suggestions made for improvements in 1992, divided by non-temporary shop workers ("unskilled/semiskilled production workers" + "inspectors" + "skilled trades people/technicians" + "team leaders").

CONGRUENCE. The survey asks for responses to the following two questions, with responses coded on a scale of 1-5 (1 = strongly agree, 5 = strongly disagree):

"Given the chance, workers at our plant might try to take unfair advantage of management."

"Workers sometimes feel reluctant to share their ideas about improved work methods with management."

The sum of the responses to these two questions gives a variable ranging from 2-10. A higher value indicates greater compatibility between the goals of managers and workers, so that worker effort is compatible with managerial objectives. We have normalized this variable with standard deviation of 1 and mean of zero to facilitate interpretation of the regression results.

(b) Employment security

We consider four different measures of employment security:

LAYOFFS. This variable is coded 1 if the plant laid off more than 10% of the workforce between 1988 and 1992, and 0 otherwise. To the extent that workers form their expectations adaptively, this is also a proxy for workers' views about future layoffs.

POLICY1. This variable is coded 1 if plant managers say they have "made a commitment to [their] regular workforce that no layoffs will result from productivity increases", and 0 otherwise. It is particularly likely to be important in encouraging suggestions from employees, so long as the manager's promise is credible.

POLICY2. This variable is coded 1 if plant managers claim to have "made a commitment to [their] regular workforce that there will be no layoffs unless there have also been pay cuts for management", and 0 otherwise.

POLICY3. This variable is coded 1 if plant managers agree that "layoffs are an unfortunate but necessary tool for business uncertainty", and 0 otherwise.

By using layoff policy measures we partially address the issue of the direction of causation between firm performance and employment security which is inherent in a cross-sectional study. That is, employment security may *result* from good firm performance rather than *causing* it. However, while a deterioration in firm performance may lead to layoffs, it is less likely to lead to a change in the policy response to a worsening in performance. For example, a *policy* of "If performance declines by x% we shall reduce the workforce by y%"

would be unaffected by a sales decline, although a measure of layoff *practices* would be affected. Additional tests for the direction of causation are reported in Section 4.

(c) Human resource policies

TRAIN. The average number of hours of formal training completed by workers with at least one year of experience[11].

GROUPPAY. Coded 1 if unskilled/semi-skilled employees receive contingent work group or team incentives, 0 otherwise.

FIRMPAY. Coded 1 if unskilled/semi-skilled workers are part of a company-wide profit-sharing plan, and 0 otherwise.

HELP. The response to the following statement on a 5 point scale (1 = strongly agree, 5 = strongly disagree):

"We often go the extra mile to help workers at our plant."

EI. Coded 1 if the plant has either work groups/quality circles/autonomous teams, or labor-management committees. Coded 0 otherwise.

SUGGIMP. The percentage of shop workers' suggestions that are implemented. We would expect this to be positively related to "SUGG", since workers are likely to lose interest in a suggestions plan if their ideas are not acted upon.

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[11]. Data are also available on formal training for new hires. However, this question was only answered if firms had hired new workers in 1992, leading to a prohibitively small sample size when using this variable. We propose to examine the characteristics of these firms relative to the entire sample in future research.

(d) Cost of job loss for unskilled/semiskilled workers

This is a measure of the present value of real post-tax wages and benefits, less expected post-tax income (unemployment benefits, wages in alternative employment, and benefits in alternative employment) for workers in each plant. We describe the methods used to calculate this variable in the Appendix.

(e) Probability of being fired for shirking

For a given level of effort, the probability of being fired depends upon the probability of detection (Bowles, 1985; Gintis and Ishikawa, 1987), and the type of action taken by supervisors.

SUPERVIS. The ratio of first-line supervisors to unskilled/semiskilled production workers.

COACH. The response of plant managers to the following statement on a 1-5 scale:

"Most supervisors at our plant act more like coaches than disciplinarians." (1 = strongly agree, 5 = strongly disagree)

Hence, as supervisors become more disciplinarian, this variable increases.

(f) Worker discount rates

I. A proxy for this variable is provided by plant managers' responses to the following statement on a 5 point scale (1 = strongly agree, 5 = strongly disagree):

"We prefer to hire workers who wish to stay with our company until retirement."

We are not confident that this is an accurate measure of worker discount rates, but it is the best measure available on a plant level. To the extent that the preferences of plant managers are reflected in hiring practices, this variable will be positively correlated with worker discount rates. We therefore expect a negative coefficient on this variable.

(g) Additional control variables

We include additional controls which may affect our measures of worker effort in ways which are correlated with layoff policies and experience.

AGE. Average age of shop workforce.

AGESQR. The square of "AGE".

EDUC. Percentage of employees with high school diploma or Graduate Equivalency Degree.

EMPS. Total plant employees.

EMPSQR. The square of "EMPS".

MALE. Percentage of shop workforce that is male.

UNION. Coded 1 if the shop workers are unionized, and 0 otherwise.

U-UAW. Coded 1 if plant workers are represented by the U.A.W., and 0 otherwise.

U-URW. Coded 1 if plant workers are represented by the United Rubber Workers, and 0 otherwise.

U-NAT. Coded 1 if plant workers are represented by a U.S. national union other than the

U.A.W. or the U.R.W.. Coded 0 otherwise.

U-INDEP. Coded 1 if plant workers are represented by an independent union, and 0 otherwise.

U-CAW. Coded 1 if plant workers are represented by the Canadian Auto Workers union, and 0 otherwise.

U-OTHER. Coded 1 if plant workers are unionized, but no information is available on the name of the union. Coded 0 otherwise.

UNIONINF. The number of the following six policies over which any union has influence: work methods and task assignments; changes in product design; purchasing new tools; safety and health policies; subcontracting work to suppliers; and selecting supervisors or team leaders.

JAPAN. Coded 1 if the plant is Japanese owned, 0 otherwise.

JAPCUST. Coded 1 if the product for which the plant manager answered the survey is sold to a Japanese owned customer, and 0 otherwise.

PLANTAGE. The age of the plant in years.

CONTRCT92. Coded 1 if the state in which the plant is situated had adopted the "implied contract" exception to the doctrine of "employment-at-will" by 1992. Coded 0 otherwise.

PUBLIC92. Coded 1 if the state in which the plant is situated had adopted the "public policy" exception to the doctrine of "employment-at-will" by 1992. Coded 0 otherwise.

COVNT92. Coded 1 if the state in which the plant is situated had adopted the "implied covenant" exception to the doctrine of "employment-at-will" by 1992[12].

CANADA. Coded 1 if the plant is located in Canada, and 0 if it is located in the U.S..

K-L. Total number of machines divided by all employees (non-temporary and temporary).

COST-DEF. Coded 1 if defects are costly and 0 otherwise. We consider defects to be particularly costly in products which are safety critical (e.g., brake parts, airbags), electrical and computer-related products (because defects are expensive to find), and glass products (because defects lead to scrap rather than re-work).

TRIM-BOD. Coded 1 if the product is automotive trim or an automotive body part, and 0 otherwise.

HOT-DANG. Coded 1 if the production process is either hot or dangerous. Processes of this type include casting, forging, heat-treating, molding, and welding. Coded 0 otherwise.

MECH. Coded 1 if the product is mechanical, and 0 otherwise.

MACHINE. Coded 1 if the production process includes machining, and 0 otherwise.

COMPLEX. The number of components assembled inside the surveyed plant.

(h) Additional variables used in Heckman correction procedure

PROCESS. The response of plant managers to the following statement on a five point scale (1 = strongly agree, 5 = strongly disagree):

"We provide our customer with a very detailed breakdown of our process steps."

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12. See Andrew Morriss (forthcoming) for a full discussion of the construction of these three legal dummy variables. We are indebted to him for making these data available to us.

DEFECTS. The response of plant managers to the following statement on a 5 point scale (1 = strongly agree, 5 = strongly disagree):

"We rarely use data regarding sources of defects in past production to modify our process."

IMPROVE. Coded 1 if at least one group of plant workers has completed a full cycle of a formalized improvement process; e.g., "Seven Step Improvement Process", or "Plan Do Check Act". Coded 0 otherwise.

FRQPSS. Coded 1 if skilled workers engage in group problem solving on at least a weekly basis. Coded 0 if this occurs once a month or less frequently.

COOP. The response of plant managers to the following statement on a 5 point scale (1 = strongly agree, 5 = strongly disagree):

"Our plant's performance depends critically on the active cooperation of our unskilled and semi-skilled workers."

4. Description of research methods and results

Effort as the dependent variable

We present regression results for each of the three measures of effort discussed above. For each dependent variable we present seven regressions: the base model of equation (9) with demographic controls and "UNION"; the base model excluding interactions and controls; the model including interactions; and the base model with four different combinations of control variables. Our controls fall into four categories:

(a) "demographic controls" (the demographics of the plant workforce and EMPS);

(b) union controls which we term:

(i) "single union"; i.e., UNION and UNIONINF; and

(ii) "multiple union"; i.e., U-UAW, U-URW, U-NAT, U-INDEP, U-CAW, U-OTHER.

(c) product controls. These control for the activities undertaken in the production process, the product's material, function, and complexity.

(d) all other controls.

The four combinations of control variables reported are (b)(i) and (d); (b)(ii) and (d), (b)(i), (c) and (d); and (b)(ii), (c) and (d). Given our sample size and the number of potential controls, the regression with all possible controls suffers from insufficient degrees of freedom. By presenting subsets of the controls we test the robustness of the parameters in the base model, and the degree (if any) to which the base model is prone to omitted variables bias.

CONGRUENCE (goal congruence)

The independent variable, CONGRUENCE, has been normalized with mean of zero and standard deviation of unity for ease of interpretation of the results. We include two measures of employment security in this regression: LAYOFFS and POLICY2 (no layoffs without a management pay cut). We consider POLICY2 to be the most theoretically appropriate measure of layoff policies. I.e., since the independent variable is inversely related to the intensity of conflict between managers and workers, we would expect conflict to be reduced by greater equality of sacrifice. While pay cuts are less severe than layoffs, they do increase the equality of treatment between managers and workers. We therefore expect a positive coefficient on POLICY2 and a negative coefficient on LAYOFFS (since this is the reverse of employment security).

The base model includes CJL and SUPERVIS, together with their interaction[13]. We expect positive coefficients on all these variables. As discussed above, we expect a negative coefficient on I to the extent it is a proxy for worker discount rates. However, we are ambivalent about whether or not this variable is picking up this effect, and suspect it may also be inversely related to a broader long-term orientation in human resource policy on the part of management.

We include four human resource policy variables in the base model: TRAIN, FIRMPAY, HELP, and COACH. We expect positive coefficients on TRAIN and FIRMPAY; i.e., formal training and performance based compensation should increase goal congruence. Both COACH and HELP are reverse coded, so we expect negative coefficients. The purpose of COACH is to control for the nature of supervisory activity. While disciplinarian supervisors may provide an incentive for workers to comply with written rules, they are more likely to breed resentment than goal congruence.

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[13]. This interaction is part of the base model since the expected cost of shirking is the cost of job loss multiplied by the probability of being caught and fired for shirking. SUPERVIS is a proxy for this probability.

In addition to the interaction of SUPERVIS and CJL, we test the degree to which layoffs and layoff policies interact with training and the compensation mechanism. We therefore interact TRAIN with both measures of employment security (expected negative coefficient on TRAIN*LAYOFFS, and positive coefficient on TRAIN*POLICY2), and FIRMPAY with LAYOFFS (expected negative coefficient). Finally, we expect a negative coefficient on SUPERVIS*COACH.

As Table 1 shows, the overall ordinary least squares regression results provide broad support to our theory. In reporting these results we focus on the first regression ("policy, interactions, single union control and demographic controls") unless otherwise stated. The adjusted R^2 for this regression is 0.1752, with 300 observations. Since CONGRUENCE has been normalized with a standard deviation of 1, these results suggest that the absence of actual layoffs (LAYOFFS = 0) in the past four years is associated with a 0.307 standard deviation increase in goal congruence as its main effect. The coefficient on LAYOFFS is statistically significant at the 10% level in five of the reported regressions. In the regression without interactions LAYOFFS is significant at the 1% level. The decline in significance occurs when the interaction between formal training schemes and layoffs is introduced. This result supports our argument about the interaction between training policies and layoffs. While a lack of layoff history may lead workers to expect no layoffs in the future, this expectations effect is stronger if firms have invested in their workers through formal training schemes, as noted above. While our theory leads to a similar expectation about the interaction between POLICY2 and TRAIN, the coefficient on this variable is negative and significant in two of the reported regressions, therefore tempering this conclusion. A policy that there will be no layoffs without management paycuts (POLICY2) is associated with a 0.528 standard deviation increase in goal congruence as its main effect, consistent with our theoretical discussion.

However, none of the coefficients on the variables measuring the incentive not to "shirk" are significantly different from zero (SUPERVIS, CJL and their interaction). Given the intangible nature of worker effort measured by the dependent variable, we suspect that more is required to motivate workers to support management's goals than fear of losing their jobs. This interpretation receives support from the interaction between SUPERVIS and COACH, which suggests that authoritarian supervisors are associated with lower goal congruence, and also by the negative (and statistically significant) coefficient on HELP; i.e., if firms "help" their workers, there is greater goal congruence.

Our proxy for worker discount rates (I) has the anticipated sign, though it is statistically significant in only two of the seven regressions. Firm level performance related pay is not, however, associated with greater goal congruence. The coefficient on this variable has the opposite of the expected sign, though it is not statistically significant. One possible interpretation of this result is that performance related pay is introduced in response to a conflict prone industrial relations environment, though a strong union may be able to block such initiatives. However, our data do not allow us to further test this hypothesis.

Of the control variables, unionized workplaces are associated with 0.32 standard deviations less goal congruence, though the union may be a response to conflict, rather than a source of that conflict. In addition, a 1 standard deviation increase in the male percentage of the labor force is associated with 0.130 standard deviations less goal congruence.

The other regressions show that these results (most notably those on LAYOFFS and POLICY2) are largely unaffected by additional controls. Of the additional controls, the most interesting result is that on CONTRCT92 (whether the state had adopted the implied contract exception to the doctrine of employment-at will in 1992). The coefficient on this variable is negative and statistically significant in all regressions. We interpret this result as support for the argument that an implied contract clause on communication between firms and workers may actually make such communication less likely, thereby increasing conflict. Finally, neither controlling for Japanese ownership nor a Japanese customer affects our results. While the coefficients on these variables are positive, they are not significantly different from zero.

SUGG (suggestions per worker)

We include two measures of employment security in this regression: LAYOFFS and POLICY1. POLICY1 is coded 1 if managers have made a commitment to workers that there will be no layoffs as a result of productivity improvements. Since an important goal of suggestions schemes is to produce productivity improvements, this is the theoretically appropriate measure of firm layoff policies. We again predict a negative coefficient on LAYOFFS, and a positive coefficient on POLICY1. The model differs from that for

CONGRUENCE only with respect to the human resource variables; i.e., we do not include COACH (and therefore the interaction between SUPERVIS and COACH); we do not include HELP; and we do include SUGGIMP. We expect a positive sign on SUGGIMP, since workers are more likely to make suggestions if they see them being acted upon.

Our interaction terms follow the same general principles as the CONGRUENCE regression, with POLICY1 replacing POLICY2. Our theoretical predictions about the signs are the same as those described above.

While our data set consists of 456 observations, only 246 firms provided data on suggestions per worker. We were concerned that those firms reporting data on suggestions differed from the remainder of the sample. We therefore corrected for sample selection bias using the Heckman (1974) procedure. The results of Probit estimation of the first stage of this procedure, in which we developed a model of whether or not firms knew how many suggestions they received, are presented in Table 2. The results of the second stage (OLS regression) are reported in Table 3.

We focus on the regression in the left hand column of Table 3 (with an adjusted R^2 of 0.2933) unless otherwise stated. The signs on all the independent variables (excluding controls) are as predicted by theory, with the exception of SUPERVIS, the interaction of SUPERVIS and CJL, FIRMPAY, and LAYOFFS with none of these four coefficients being statistically significant. For SUPERVIS, one possible explanation is that a highly supervised workplace may reduce worker autonomy and therefore stifle the resulting suggestions. The coefficient on LAYOFFS is positive but highly insignificant in this regression. There is therefore no discernible effect of past layoffs on current suggestions per worker.

FIRMPAY is positive and significant at the 1% level in the regression without interactions. However, when the interaction of FIRMPAY and POLICY1 is included, this is significant at the 1% level in all regressions, and FIRMPAY becomes insignificant (and negative). These results are consistent with the view that performance related pay only succeeds in raising suggestions per worker when accompanied by a job security pledge[14]. Performance related pay and a no-layoff pledge together are associated with a minimum 220.0% increase in suggestions per worker, and a maximum 249.6% increase (evaluated at mean suggestions per worker). The low variation in this result across our six formulations which include interactions increases our confidence in the robustness of this estimate.

The layoff policy variable (POLICY1) is significant in all seven regressions, with such a policy being associated with an increase of between 0.310 and 0.604 standard deviations in suggestion per worker as its main effect. At the mean of 0.687 suggestions per worker this represents an increase of between 92.4% and 179.8%. Training alone is also significant at the 1% level in all seven regressions, indicating that training does have an independent effect on

[14]. If this result is duplicated in other studies it has considerable implications for the profit-sharing literature, since it suggests that any measured association between firm level performance pay and work effort may be attributable to omitted variable bias. The omitted variable is the interaction of the compensation mechanism and a no-layoff pledge.

the number of suggestions per worker. At the mean a 1 standard deviation increase in annual formal training for experienced workers is associated with a 257.9% increase in suggestions per worker as its main effect. Moreover, the interaction of TRAIN and LAYOFFS is significant at the 1% level in all regressions. At the mean for formal training and suggestions per worker, past layoffs are associated with between a minimum 60.0% reduction in suggestions per worker and a maximum of 63.6% in the six regressions which include interaction terms. Taken together with the results on LAYOFFS, this is consistent with the view that the absence of layoff experience alone has little effect on suggestions in the absence of formal training; i.e., workers need training to make suggestions. This contrasts with the independent effect of LAYOFFS in the CONGRUENCE regression.

SUGGIMP (the percentage of suggestions implemented) has the expected sign and is significant at the 5% and 10% levels in all regressions. This result is consistent with our hypothesis that workers are more likely to make suggestions if they see them being acted upon. However, it is also consistent with the hypothesis that plants which elicit a high rate of suggestions per worker, also tend to receive high quality suggestions which are more likely to be implemented. Since we have no independent information on the quality of suggestions besides their acceptance rate, we are unable to distinguish between these two hypotheses.

Addition of various controls has little effect on the variables of interest. Of the controls, only AGESQR is significant in any of the regressions, indicating that suggestions per worker decline over some range as the age of the median plant worker increases.

ABSENCE (absence rate)

We include two measures of employment security: LAYOFFS and POLICY3 (layoffs as an unfortunate but necessary tool for responding to business uncertainty). We chose POLICY3 as the appropriate measure of layoff policies because it is the most "all purpose" measure available, whereas POLICY1 and POLICY2 are appropriate for specific effort activities which occur once employees are in the workplace. Since an increased absence rate is a proxy for less effort, we expect the opposite signs to the two previous regressions on our independent variables. The exception to this is POLICY3, which is inversely related to employment security against layoffs, and therefore coded in the opposite way to the other two layoff policy variables. We therefore expect a positive coefficient on POLICY3. However, since ABSENCE is relatively easily measured by supervisors, we are less confident about applying the elements of our model which hinge on the costly monitoring of worker effort to this case.

For our human resource variables we include COACH, GROUPPAY, HELP, and EI. We include these additional human resource variables in an attempt to avoid omitted variable bias. However, our focus is on the effect of layoffs and layoff policies on absence rates, rather than a full theory of absence rates *per se*[15]. Our interaction terms follow the same general principles as the SUGG regression, with GROUPPAY replacing FIRMPAY, and POLICY3 replacing POLICY1.

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[15]. See Helper and Leete (1995) for an analysis of the effect of over twenty human resource variables on absence rates using this data set.

We model the absence rate as a logistic function (the appropriate specification for a rate varying between 0 and 1). The results of the regressions are reported in Table 4. We report unit coefficients at the mean and their level of statistical significance[16]. We focus on the regression shown in the left hand column of Table 4 unless otherwise stated, and all results are evaluated at the mean.

The regressions in Table 4 have a large number of statistically significant variables (the number of possible absences among all workers in the sample is large), but relatively low explanatory power (the highest c statistic is 0.632); i.e., while many variables are significant, their effect on absence rates is relatively small. The signs on all the independent variables (excluding controls) are as predicted by our theory, with the exception of our proxy for worker discount rates (I), LAYOFFS, and the interaction of LAYOFFS with GROUPPAY, and TRAIN. Hence, if a plant had experienced greater than 10% layoffs in the past four years, this was associated with a 0.125 standard deviation decrease in the absence rate at the mean of ABSENCE as its main effect. As we noted above, one possible explanation for this stems from the relatively costless measurement of ABSENCE for the firm. If workers form their expectation of future layoffs on the basis of past experience, and if they expect absence rates to be used as a criterion in selecting those workers to be laid off, absence rates will tend to fall following layoffs. This differs from our model since whether or not layoffs affect a particular worker depends on that individual's work effort (as measured by ABSENCE).

[16]. We are grateful to Laura Leete for providing a computer program to convert the coefficients from the logistic regression into unit coefficients at the mean.

This assumption of the model (layoffs fall randomly on the workforce and are unrelated to individual worker effort) is more likely to hold the more difficult it is to measure effort.

Our theory receives considerable support. POLICY3 has the anticipated sign, and is significant in all regressions. Hence the main effect of a plant policy of seeing layoffs as an unfortunate but necessary response to business uncertainty is to raise absence rates by between 0.235 and 0.421 standard deviations in the seven regressions. The interaction of the real post-tax cost of job loss (CJL) and SUPERVIS is significant in all regressions, with the expected negative sign. At the mean (mean absence rate = 0.0329 per day, mean supervisors per production worker = 0.078) a one standard deviation increase in CJL ($15,716.17) is associated with between a 0.147 and a 0.343 standard deviation reduction in the absence rate from this interaction effect. The coefficients on COACH is also statistically significant with the expected sign (positive) in all regressions.

GROUPPAY behaves similarly to FIRMPAY in the SUGG regression; i.e., in the regression excluding its interaction with POLICY3 it has the anticipated negative sign and significance at the 1% level, such that team based incentives are associated with *lower* absence rates. However, once the interaction term is entered group based compensation alone is associated with significantly *higher* absence rates. It is only in plants where layoffs are not seen as a necessary tool for responding to business uncertainty that group or team based compensation is associated with lower absence rates. The coefficient on this interaction term is significant at the 1% level in all the regressions. At the mean of ABSENCE, if there is a group based compensation mechanism, the policy that layoffs may be necessary is associated with between a minimum 29.8% and a maximum 60.1% increase in absence rates. Hence this result is again consistent with our theoretical argument that worker effort is a function of job security and the interaction between job security against non-shirking layoffs and other human resource policies. In the case of performance-based pay, workers need to be sure that they are going to receive it. The risk of losing one's job before receiving such pay does not provide a positive effort incentive.

Formal training (TRAIN) is associated with lower absence rates in all regressions which include the interactions. However, TRAIN alone does not have a statistically significant effect on absence rates. It is only when combined with employment security that formal training is associated with a statistically significant reduction in absence rates. At the mean of both TRAIN and ABSENCE, the policy that layoffs may be necessary is associated with between a minimum 4.98%, and a maximum 43.9% increase in absence rates from the interaction effect alone.

Of the control variables, AGE and AGESQR taken together suggest that absence rates fall across plants as the average age of the plant workforce increases, and then rise beyond some "critical age". This critical age ranges between 38.36 and 38.65 in the four regressions which include both these variables, with a mean of 38.53 years. Older plants (PLANTAGE) also experience higher absence rates, while absence rates are lower when product defects are more costly, the production process is more complex, and the production process is hot or dangerous. Finally, absence rates are also significantly higher when plants are unionized. This effect ranges from a 0.090 standard deviation increase in the rate of unscheduled absences, to a 0.155 standard deviation increase. However, both union representation and higher absence rates may be a function of the industrial relations environment, rather than cause and effect. In the regressions which distinguish between different unions the absence rate is higher where there is UAW representation (by between 0.378 and 0.395 standard deviations), and lower where there is representation by a national union other than the UAW or the URW (by between 0.084 and 0.086 standard deviations) or an independent union (by between 0.274 and 0.283 standard deviations).

5. Causation

As noted in our discussion of layoff policy variables, statistical association between layoffs and firm performance does not establish causation. We partially address this issue by using measures of layoff *policies* as well as layoff *practices*. In addition, our measure of layoff practices refers to the past four years, and not to the survey year alone. In this section we describe additional tests for the direction of causation. Thus we attempt to distinguish between the following three sets of hypotheses, where the term "layoffs" refers to all of the variables measuring layoff policies and practices in each regression.

(A) "Layoffs" ---> low goal congruence; or

(B) low goal congruence ---> "layoffs".

(A) "Layoffs" ---> low suggestions/worker; or

(B) low suggestions/worker ---> "layoffs".

(A) "Layoffs" ---> high absence rates; or

(B) high absence rates ---> "layoffs".

This is not to say that the two hypotheses for each variable are mutually exclusive. We would be surprised to find that performance did not affect layoff experience (though we expect this relationship to be much weaker in the case of layoff policies).

In the case of all six possible relationships outlined above, if causation takes place in real (as well as logical) time[17], we can seek to distinguish between the (A) and (B) hypotheses by analyzing the following six regressions:

	Dependent variable	Independent variables
(1)	1992 GOAL CONGRUENCE	1988 LAYOFFS, POLICY2, ETC..
(2)	1988 GOAL CONGRUENCE	1992 LAYOFFS, POLICY2, ETC..
(3)	1992 SUGG	1988 LAYOFFS, POLICY1, ETC..
(4)	1988 SUGG	1992 LAYOFFS, POLICY1, ETC..
(5)	1992 ABSENCE	1988 LAYOFFS, POLICY3, ETC..

[17]. This assumption is reasonable in both cases. If performance deteriorates, firms are unlikely to lay off workers immediately. Similarly, if the absence of layoffs lead to an improvement in performance this is likely to take time for both layoff practices and layoff policies. In the case of layoff practices, it will take time for workers to discount past layoff episodes. In the case of a change in layoff policies, it will take time before workers consider such promises to be credible.

(6) 1988 ABSENCE 1992 LAYOFFS, POLICY3, ETC..

If the results of regressions (1) and (2) are equally strong, then this would be consistent with mutual causation. The same applies to regressions (3) and (4) taken together, and to regressions (5) and (6) taken together. Moreover, if the results of regression (1) are stronger than those of regression (2), this would be consistent with causation running more strongly from layoffs to performance. The same reasoning applies if (3) is stronger than (4), and (5) is stronger than (6). Conversely, if (2) is stronger than (1), (4) is stronger than (3), and (6) is stronger than (5), this would be consistent with causation running more strongly from performance to layoffs.

The full regressions reported in Section 4 show that our findings are robust to alternative specifications. For each variable we therefore run only one of the seven regressions presented above: that with policies, interactions, a single union dummy, and demographic controls. However, we use a slightly different specification of the cost of job loss variable; i.e., we replace the real post-tax cost of job loss (with unemployment duration based on MSA level data) with the real pre-tax cost of job loss (with unemployment duration based on state data). The calculation of this replacement variable is described in the Appendix.

The results of the causation test are presented in Tables 5 (CONGRUENCE), 6 (SUGG), and 7 (ABSENCE). In each table the first column repeats the results for 1992 that we have already presented (for ease of comparison). The 1992 results with the pre-tax cost of job loss variable are presented in column 2 for comparison with column 1. To the extent that these results are similar, the implications of the causation tests can reasonably be applied to the 1992 regressions in column 1. Regressions (1), (3), and (5) are presented in the third columns of their respective tables, and regressions (4) and (6) in the fourth columns. We were unable to run regression (2) (with 1988 CONGRUENCE as the dependent variable) because data on goal congruence are unavailable for 1988. Data for 1988 were also unavailable for some independent variables; i.e., LAYOFFS, HELP, I, FIRMPAY, GROUPPAY, TRAIN, COACH and EI. Where 1988 data were unavailable, we assumed that 1988 data were the same as 1992. The variables names are unchanged, with the exception that all 1988 data are so indicated. In reporting these regressions we focus on those variables which are both statistically significantly different from zero, and part of our core theoretical model.

CONGRUENCE (goal congruence)

Columns 1 and 2 of Table 5 show that the results are essentially unchanged by substitution of the pre-tax cost of job loss variable. Because we were unable to run 1988 CONGRUENCE as a function of 1992 independent variables, we rely only on the 1992 CONGRUENCE regression with 1988 independent variables (reported in column 3).

The explanatory power of this regression is greater than that in column 2 (an adjusted R^2 of 0.2142 compared with 0.1763). The coefficient on LAYOFFS has the predicted negative sign, and is statistically significant at the 10% (rather than the 5%) level. While

LAYOFFS_88 is not available, the LAYOFFS variable remains interesting because it refers to the 1988-92 period. POLICY2_88 retains a positive coefficient, though this is no longer statistically different from zero. However, the weaker result on POLICY2_88 is offset by the increased significance of its interaction with TRAIN. This coefficient is now significant at the 5% level, while it was not significantly different from zero in the regression in column 2. This result may reflect the fact that workers are more likely to believe management promises now because no layoff pledges made before 1988 were rendered credible by training in the past. Of the remaining variables, SUPERVIS_88 is no longer statistically significant, while its interaction with COACH is now significant at the 10% rather than the 5% level.

In summary, the results of this test are relatively neutral. If we focus on the layoff policy and experience variables, together with their interactions, there are two statistically significant variables in both regressions. Given the lower sample size (and consequent reduced degrees of freedom) in the regression with 1988 independent variables (228 versus 319), these results are consistent with mutual causation.

SUGG (suggestions per worker)

Comparison of columns (1) and (2) again reveals little change from the substitution of the pre-tax cost of job loss variable. Recall that our theory that there is at least mutual causation requires regression (3) (in column 3) to be no weaker than regression (4) (in column 4). We should also note that we performed the Heckman correction procedure in all reported regressions, and recalculated the intermediate Probit regression for regression (4) with 1988 suggestions per worker as the dependent variable (results reported in Table 2).

Perhaps the most striking result is the drop in explanatory power between regressions (3) and (4); i.e., the adjusted R^2 falls from 0.2892 to 0.1580. With the exception of the correction coefficient ("lambda") there is only one variable in each regression which is significantly different from zero at the 1% level: LAYOFFS interacted with FIRMPAY. The sole criterion on which to choose between these two regressions is therefore the explanatory power. These regressions are therefore consistent with mutual causation, and provide weak evidence that causation is stronger from layoffs to suggestions than from suggestions to layoffs.

ABSENCE (absence rates)

Comparison of columns 1 and 2 shows that the results are essentially unchanged by substitution of the pre-tax cost of job loss measure. Recall that our theory that there is at least mutual causation requires regression (5) (in column 3) to be no weaker than regression (6) (in column 4).

The explanatory power of the regressions is virtually identical: a c statistic of 0.616 for regression (5), and 0.617 for regression (6). There are six layoff variables and their interactions in each regression. In regression (5), five of these are significantly different from zero at the 1% level. In regression (6) four are significant at the 1% level, and two at the 5% level, with the signs on all significant variables being unchanged across regressions. The only notable difference, therefore, is that the interaction between POLICY3 and TRAIN is significant in regression (6) but not in regression (5).

Of the remaining non-control variables, the coefficient on TRAIN is significantly negative at the 1% level in both regressions, while CJL is significant in (6) but not in (5), and SUPERVIS is significant in (5) but not in (6). Hence there is virtually no difference between the regressions. This result is again consistent with the hypothesis of mutual causation.

6. Conclusions

While a single study is never conclusive, our specification and the richness of the data set permitted the identification of the effect of individual human resource policies, and their interaction with layoffs and layoff policies on three measures of worker effort: goal congruence, suggestions per worker, and absence rates. We derive two major conclusions.

First, our approach of separating dismissal due to layoffs and dismissal due to shirking has received strong empirical support. In the case of goal congruence, recent layoffs, and firm policies which suggest that layoffs may occur in the future, significantly dampen the incentives for workers to identify with the goals of managers. At the same time, fear of job loss for "shirking" provides a positive incentive. This same conclusion applies in the case of suggestions/worker. The effect of the cost of job loss is strongest in the case of absence rates, although layoff experience also tends to reduce absence rates. Simply stated, the data analyzed in this report suggest that the widely held belief that layoffs encourage work effort is wrong. Layoffs *may* encourage workers to arrive at the workplace (reduced absence rates), but they tend to lower the extent to which workers expend effort while they are actually there. As noted above, the intuition behind this result is that if workers expect to be fired for reasons unrelated to their job performance, this will lead to lower effort. If, for example, workers expected to be laid off at the beginning of the next week with 50% probability dependent on the toss of a coin, there would be reduced incentive to perform their jobs diligently, since these efforts may be wasted.

If firms wish to encourage worker suggestions and create a less conflict-ridden workplace environment, security against layoffs is an important element of an overall human resource strategy. While we present no data on the costs (e.g., in terms of labor hoarding) of a no-layoff pledge, we suspect that there is scope for individual firms and unions to benefit from knowledge of the results presented in this report. In addition, economic theory suggests a number of reasons why individual profit maximizing action in markets may generate too little employment security, even if all relevant agents are informed of all relevant costs and benefits (Levine, 1993; Levine and Parkin, 1994). Under these conditions there is scope for public policy to encourage increased employment security. However, precise policy recommendations are beyond the scope of this paper.

Our second major conclusion concerns the interaction of various human resource policies. In particular, we find that both contingent performance pay and formal training schemes interact with employment security in determining worker effort (as measured by goal congruence, suggestions/worker, and absence rates). Hence individual human resource policies which appear ineffective in isolation, and may therefore be abandoned, are more successful when combined with complementary policies. Employment security is one such complementary policy. We are again wary of making a specific public policy recommendation. However, our general conclusion is that public policy should not focus on individual elements of "high performance workplaces". While a policy to subsidize training, for example, may improve firm performance in its own right, it will be more effective if combined with measures to increase employment security. Hence the focus of public policy should be on the totality of human resource practices associated with "high performance workplaces" including job security against layoffs.

APPENDIX

This appendix explains the sources of data and methods used to calculate the measures of the "cost of job loss" used in the report.

1992 REAL POST-TAX COST OF JOB LOSS

This variable is defined as the present value of real post-tax compensation if the worker keeps his/her job, less the present value of expected real post-tax compensation if the worker loses his/her job. We carried out this calculation using a two year time horizon[18]. That is, for the representative worker[19] in each plant, this is:

$$\{\sum_{t=1}^{104} (W+B-T)/(1+r)^t - [\sum_{t=1}^{52} (C_t-(T1))/(1+r)^t + \sum_{t=53}^{104} (C_t-(T2))/(1+r)^t]\}/P \qquad (A1)$$

18. We have adopted the two year time horizon for two reasons. First, it is sufficiently long to exceed the maximum expected unemployment duration used in our calculations; i.e., even among those workers who are unemployed for more than 52 weeks, expected duration in no case exceeds 104 weeks. Second, the costs of displacement literature (e.g., Jacobson *et al.*, 1993; Podgursky and Swaim, 1987) suggests that post job-loss earnings exhibit disparate time trends after separation, with the rate of wage recovery varying widely with age, job tenure, race, and gender. By restricting our attention to the two years following job loss we limit the effect of differences across workers (particularly the individual worker's firm-specific human capital) for which we are unable to control in this data set. In summary, the two year time horizon is sufficiently long to include all unemployment experiences, but sufficiently short to limit bias due to differences between workers.

19. While we do not have data on individual workers, the survey provides data on the average age of plant workers, the percentage of workers who are male, and the percentage who graduated from high school or hold a GED. The "representative worker" is therefore the mean age for that plant, some combination of male and female, and holds some fraction of a high school diploma.

where

W = hourly wage x hours/per week;

B = weekly benefits (not including retirement benefits);

T = 1/52 x annual tax bill for worker employed in plant;

r = discount rate;

t = time period in weeks, ranging from 0 to 104 (2 years);

C_t = expected weekly pre-tax income of a worker if s/he were to lose his/her job;

T1 = 1/52 x expected tax bill of worker in the first year following job loss;

T2 = 1/52 x expected tax bill of worker in the second year following job loss;

P = price index.

The construction of each of these variables is discussed below.

(1) W

The average hourly wage (not including benefits) of "unskilled and semiskilled" plant workers is available in the survey. For U.S. plants, we assumed that the representative worker worked the average number of hours worked by production workers in their four-digit SIC code (3714 = automotive parts and accessories, 3465 = automotive stampings). (Source: BLS *Employment and Earnings Tape File*).

All data were converted into U.S dollars for Canadian plants, assuming U.S. \$1 = CAN \$1.26 (source: *The Economist*, average of weekly data). Canadian hours are unavailable by comparable

SIC code, and were proxied by assuming that the ratio of hours worked in industries 3714 and 3465 to average national manufacturing hours were the same in the U.S. and Canada (Sources for national manufacturing hours: BLS *Employment and Earnings Tape File*; Statistics Canada *Labour Force Survey*).

(2) B

Data on benefits as a percentage of total compensation by plant are available in the survey, allowing us to calculate weekly benefits.

(3) T

We estimated annual Federal income tax, social security taxes (or Canadian equivalent), state/province income tax, and local income taxes for the wage income (excluding benefits) of the representative worker in each plant. (Sources for tax laws: U.S. Advisory Commission on Intergovernmental Relations; Commerce Clearing House *State Tax Guide*; Ministère du Revenu, Gouvernement du Québec; Revenue Canada, Taxation). For all tax calculations we estimated the number of dependents of the representative plant worker by state, age, and education level. (Source: U.S. Department of Commerce, Bureau of the Census, *Public Use Micro Data Samples (PUMS), 1990*). Data on age and education are available in the survey. Hence if the plant was in state S, the average worker was age y, and z% of workers held a high school diploma or GED, then:

Dependents = 0.01z(average dependents if state = S, age = y, high school = 1) +
0.01(100-z)(average dependents if state = S, age = y, high school = 0). (A2)

Canadian dependents for each age and education level were proxied by averaging the *PUMS* data for all U.S states in our sample (35 states). We assumed that the first dependent was a spouse, and that, when a spouse was present, the tax status of the representative worker was "married filing jointly" with standard deductions. This procedure was followed for both Federal and state/province returns, with the representative worker's income assumed to be the only income in the household. Any dependents above 1 were assumed to be dependent children. The resulting annual tax numbers were converted to a weekly amount.

(5) r

The discount rate was set equal to 5% per annum; i.e., $r = (1.05)^{1/52}$ per week in all reported results. We also tried annual discount rates ranging from 1% to 10%, with negligible effect on the results.

(6) C_i

We write the present value of the pre-tax expected income stream following job loss as

$$\{[\sum_{t=1}^{d} U_t/(1+r)^t] + [\sum_{t=d+1}^{104} (Wa+Ba)/(1+r)^t]\}/P \qquad \text{(A3)}$$

where:

d = expected unemployment duration;

U_t = unemployment benefits paid in week t;

Wa = weekly wage in alternative employment;

Ba = weekly employee benefits in alternative employment.

However, mean unemployment duration is not suitable for our purposes since for most MSAs and states the mean duration is within the maximum permissible unemployment eligibility period. Hence above average and below average unemployment durations have different effects on the cost of job loss. We therefore consider the entire distribution of unemployment duration, constructing probabilities that the "representative worker" will be unemployed for 0-4 weeks (probability = u2), 5-14 weeks (probability = u9.5), 15-26 weeks (probability = u20.5), 27-51 weeks (probability = u39), and over 52 weeks (probability = u52)[20]. Hence, using the mean of each bracket as the expected duration within that bracket, the pre-tax expected income stream is estimated as:

$$\{u2[U_1/(1+r) + U_2/(1+r)^2 + [\sum_{t=3}^{104}(Wa+Ba)/(1+r)^t]]$$

$$+ u9.5\{[\sum_{t=1}^{9} U_t/(1+r)^t] + 0.5(U_{10}+Wa+Ba)/(1+r)^{10} + [\sum_{t=11}^{104} (Wa+Ba)/(1+r)^t]\}$$

$$+ u20.5\{[\sum_{t=1}^{20} U_t/(1+r)^t] + 0.5(U_{21}+Wa+Ba)/(1+r)^{21} + [\sum_{t=22}^{104} (Wa+Ba)/(1+r)^t]\}$$

$$+ u39\{[\sum_{t=1}^{39} U_t/(1+r)^t] + [\sum_{t=40}^{104} (Wa+Ba)/(1+r)^t]\}$$

$$+ u52\{[\sum_{t=1}^{j} U_t/(1+r)^t] + [\sum_{t=j}^{104} (Wa+Ba)/(1+r)^t]\}\}/P \qquad (A4)$$

[20]. The classes for Canadian data are 0-4 weeks, 5-13 weeks, 14-26 weeks, 27-52 weeks, and 53 weeks and over. Equation (A4) and all related equations are modified accordingly.

where j is the expected unemployment duration given that unemployment lasts for more than 52 weeks. While this number (j) is not published, we were able to derive it from information in the published sources.

For the U.S. we calculated the distribution of unemployment duration at the MSA level (source: Bureau of Labor Statistics, unpublished data) for those plants in MSAs, and derived the non-MSA data for each state from the MSA and state data. (Source: *Geographic Profile of Employment and Unemployment*). For each Canadian province (with the exception of Manitoba) the distribution is available by gender, and by age class (though not by both gender and age class)(source: Statistics Canada, *Duration of Unemployment by Age and Sex, Canada and Provinces, Annual Averages*). These data were used to construct distributions for each province simultaneously by both age (rather than age class; e.g., 25-44) and gender. We employed three assumptions in constructing these distributions:

(i) that the age class distribution is correct for the middle of the class; e.g., the distribution for age 25-44 was correct for age 35;

(ii) that the rate of change of each component in the distribution is linear between ages;

(iii) that the relationship between each component of the male and female distributions in the "all age groups" data holds for each individual age distribution.

We estimated a distribution for each individual plant on the basis of the age and gender characteristics of the representative worker.

Unemployment benefits, waiting periods, and maximum benefit periods are calculated by state (source: U.S. Department of Labor, Employment and Training Service, Unemployment Insurance Service, *Significant Provisions of State Unemployment Laws*; Ohio Bureau of Employment Services) and Canadian provinces[21]. We assume that all workers have satisfied the eligibility criteria, and that wages are paid uniformly over the year[22]. Where benefits are based on the number of dependents we incorporate the dependents data discussed above.

Hourly wages and benefits in alternative employment are calculated on the basis of survey data on plant level total compensation (wages and benefits) relative to that which would be received by equivalent workers in all industries in the area. We assume that the percentages of hourly compensation in alternative employment accounted for by wages and benefits are equal to the national averages for the companies in the survey. Hence benefits make up a lower percentage of alternative compensation for Canadian workers (23.8% versus 30.5%), primarily because of differences in health care provision. Weekly hours are averages for each state (or Canada) in all manufacturing industries (sources: BLS *Employment and Earnings Tape File*: Statistics Canada *Labour Force Survey*).

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[21]. While the benefit laws are uniform across Canada (source: Employment and Immigration Canada, *Unemployment Insurance, Regular Benefits*), the eligibility period is a function of the provincial unemployment rate (source: Statistics Canada).

[22]. Many states calculate unemployment benefits as a percentage of high quarter wages. We therefore assume that wages do not vary across quarters.

(7) T1 and T2

All taxes are calculated as described in (3) above. For each plant there are 10 tax scenarios; i.e., two different tax years for each of the five possible unemployment durations. Our calculations take account of the differential tax treatment of unemployment benefits by state. For simplicity we split the tax payments into 52 equal installments over the year.

(8) P

Finally, we adjusted the cost of job loss for local price differences by city (source: American Chamber of Commerce Researchers Association, *ACCRA Cost of Living Index*), such that the real post-tax cost of job loss is measured in terms of the purchasing power of a 1992 U.S. dollar. The ACCRA index suffers from the disadvantage that the weighting scheme assumes the expenditure patters of "mid-management households", which differ from those of unskilled and semiskilled workers in the automotive supplier industry. However, to our knowledge it is the only such index available. The index is published quarterly, but the coverage varies by quarter. We assumed that if data were missing for any quarters, they were equal to the average of all other data reported for that region for 1992. Where no data were available for 1992, we averaged all available data points going back to the second quarter of 1989, implicitly assuming that prices in these regions held a constant relation to the national average over the 1989-1992 period. We were unable to obtain data in this way for two cities (Portland (ME), and Stockton (CA)). For Stockton, we developed an estimate based on similar Californian cities, and for

Portland, we assumed the U.S. average, since no data were available for similar cities. For non-metropolitan areas with no price index, we assumed the mean for all non-metropolitan areas in that state. If no such data were available, we assumed the U.S. mean. Estimates based on other cities or the U.S average apply to only nine plants in the sample (approximately 2% of the sample).

We know of no comparable regional price index for Canada. However, we estimate that the purchasing power of a U.S. dollar is 9.2986% higher at mean U.S. prices than at mean Canadian prices. This calculation is based on comparing IMF 1992 GDP estimates assuming purchasing power parity, with the traditional (non-purchasing power parity) estimates[23].

1988 AND 1992 REAL PRE-TAX COST OF JOB LOSS

We constructed pre-tax indices for both 1988 and 1992 using common procedures. These indices were used in the causation tests discussed in the report. The variables used to construct these indices differ from the 1992 post-tax variables as described below.

(1) W

The survey provides data on changes in the nominal average hourly wage since 1988. We constructed 1988 wage data on this basis. Sources and methods for 1988 hours data were

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[23]. We are grateful to Frank Sader of the World Bank for providing unpublished IMF purchasing power parity GDP estimates for Canada.

unchanged. Data for Canadian plants were converted into U.S. dollars assuming U.S. $1 = CAN $1.225 (source: *The Economist*, average of weekly data).

<u>(2) B</u>

1988 benefits data are derived from the survey. 1992 benefits data are the same as described above.

<u>(3) T, T1 and T2</u>

These variables are not calculated for the pre-tax measures.

<u>(6) C</u>

U.S. unemployment duration is based on state data (source: *Geographic Profile of Employment and Unemployment*), rather than MSA data. While this allows a less detailed examination of local labor market conditions, there are two advantages. First, the state data are less subject to error than the MSA data. As such the 1992 measure using state data provides a check on the accuracy of the 1992 measure based on MSA data. Second, the state data provide separate distributions by gender. We have accounted for the gender of the representative worker in creating distributions for each plant. Where unemployment benefits are a function of the number of dependents, the dependents number is based on a 1988 representative worker constructed from survey data on changes in average age, male/female composition, and educational attainment of the workforce (source: U.S. Department of Commerce, Bureau of the Census, *PUMS*, 1990). Since the state data do not provide information on the average duration of unemployment, we were unable to calculate the U.S average duration of unemployment for those workers unemployed for more than one year. For 1992 we proxied this number with the U.S. average, and for 1988 we assumed the U.S. average bore the same relation to the Canadian average as it had in 1992.

Canadian unemployment duration distributions are estimated only by gender, not by both age and gender. We calculated 1988 wages and benefits in alternative employment from survey data using the method discussed above.

<u>(7) P</u>

We assume no change in local prices relative to the national average between 1988 and 1992. However, all price indices are adjusted downwards for 1988 to account for changes in the U.S consumer price index. Hence both 1992 and 1988 indices measure the cost of job loss in 1992 dollars.

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Table 1.

Dependent variable: CONGRUENCE

Independent Variables	Policy, interactions, single union control, and demographic controls	Policy	Policy & interactions	Policy, interactions, single union control, and all controls excluding product	Policy, interactions, multipl union controls, and all controls excluding product
LAYOFFS	-0.307193 **	-0.340771 ***	-0.318199 **	-0.275183 *	-0.263966 *
	(.144454)	(.104781)	(.137108)	(.153945)	(.155911)
POLICY2	0.439916 *	0.275396	0.57642 **	0.527993 *	0.48233 *
	(.266114)	(.195868)	(.266461)	(.271322)	(.273676)
CJL	3.147E-06	3.44E-07	-3.92E-08	3.181E-06	1.073E-06
	(.0000055)	(.00000332)	(.000005)	(.00000638)	(.00000639)
SUPERVIS	2.597242	0.073055	1.86117	2.15796 *	2.45211
	(1.60974)	(.509363)	(1.56955)	(1.63522)	(1.65041)
COACH	-0.097579	-0.177677 ***	-0.117903 *	-0.11906 *	-0.117613
	(.0699747)	(.055961)	(.0661557)	(.0720034)	(.0722226)
I	-0.082096	-0.122214 **	-0.114468 *	-0.062291	-0.079507
	(.0603636)	(.059907)	(.0596549)	(.0615554)	(.0619483)
TRAIN	0.00049	-0.000175	0.000454	0.000464	0.000469
	(.0004498)	(.0003188)	(.00046167)	(.00045297)	(.00045325)
FIRMPAY	-0.141552	-0.069676	-0.086683	-0.140438	-0.131286
	(.132794)	(.103707)	(.130443)	(.136150)	(.136574)
HELP	-0.214481 **	-0.323372 ***	-0.307973 ***	-0.205566 **	-0.218004 **
	(.0851529)	(.079627)	(.0798429)	(.0892954)	(.0903187)
SUPERVIS*COACH	-1.08921 *		-0.819935	-1.012269 *	-1.08119 *
	(.561187)		(.525285)	(0.564552)	(.566907)
POLICY2*TRAIN	-0.022367		-0.024645 *	-0.024955 *	-0.022508
	(.0142574)		(.014603)	(.0144151)	(.0146532)
SUPERVIS*CJL	1.0525E-05		0.000010947	0.00001533	1.1183E-05
	(.00006297)		(.00006341)	(.00006617)	(.00006824)
LAYOFFS*TRAIN	-0.001156 *		-0.001189 *	-0.000963	-0.00108 *
	(.00061828)		(.000633)	(.00062974)	(.00063446)
LAYOFFS*FIRMPAY	0.080494		0.082201	0.016612	-0.00563
	(.217368)		(.215780)	(.225861)	(.227766)
UNION	-0.31588 **			-0.20089	
	(.124350)			(.155758)	
AGE	0.007497			-0.054274	-0.063207
	(.008908)			(.0610061)	(.0612425)
MALE	-0.005483 **			-0.004805 **	-0.005036 **
	(.00223110)			(.00233138)	(.00234667)
EDUC	-0.001343			-0.000444	-0.000681
	(.00229712)			(.00267257)	(.00268667)
EMPS	0.000255 **			0.000195	0.000167
	(.000124)			(.00012964)	(.00013118)
AGESQR				0.000766	0.000877
				(.00085549)	(.00085910)
UNIONINF				-0.088692	-0.09681
				(.0597824)	(.0612384)
CONTRCT92				-0.533107 ***	-0.57143 ***
				(.193419)	(.194718)
JAPAN				0.022806	0.024994
				(.176788)	(.177716)
JAPCUST				0.0581	0.074296
				(.164782)	(.165531)
CANADA				-0.002331	0.185756
				(.198784)	(.220831)
PLANTAGE				0.004942	0.005031
				(.00315955)	(.00319683)
K-L				-0.032393	-0.021833
				(.122147)	(.123058)
U-UAW					0.061815
					(.205688)
U-URW					0.26903
					(.409154)
U-NAT					-0.19528
					(.182154)
U-INDEP					-0.545496
					(.405687)
U-GAW					-0.586467
					(.361065)
U-OTHER					-0.279047
					(.318755)
COST-DEF					
TRIM-BOD					
HOT-DANG					
MECH					
MACHINE					
COMPLEX					
N	300	342	320	287	287
R-SQR	0.2242	0.1774	0.2011	0.2527	0.2663
ADJ R-SQR	0.1752	0.1553	0.1671	0.1807	0.1809

Table 1.

Dependent variable: Independent Variables	CONGRUENCE Policy, interactions, single union control, and all other controls	Policy, interactions, multiple union controls, and all other controls
LAYOFFS	-0.207296	-0.192822
	(.158380)	(.160243)
POLICY2	0.404962	0.365576
	(.288712)	(.291082)
CJL	3.503E-06	0.000001
	(.00000725)	(.000007)
SUPERVIS	2.086183	2.39245
	(2.64149)	(2.67439)
COACH	-0.09995	-0.096237
	(.0956243)	(.0965177)
I	-0.08248	-0.097635
	(.063561)	(.0637346)
TRAIN	0.000482	0.00052
	(.00046513)	(.00046417)
FIRMPAY	-0.081842	-0.07376
	(.142968)	(.14320)
HELP	-0.157092 *	-0.174562 *
	(.092387)	(.0931342)
SUPERVIS*COACH	-1.0953	-1.18249
	(1.28387)	(1.29580)
POLICY2*TRAIN	-0.023443	-0.022435
	(.0148281)	(.0151492)
SUPERVIS*CJL	-2.83E-07	-1.325E-05
	(.00008456)	(.00008611)
LAYOFFS*TRAIN	-0.000993	-0.001168 *
	(.0006443)	(.00064774)
LAYOFFS*FIRMPAY	-0.098704	-0.119445
	(.234568)	(.235823)
UNION	-0.203099	
	(.160401)	
AGE	-0.064693	-0.07573
	(.0622589)	(.0624302)
MALE	-0.004815 **	-0.004942 **
	(.00241313)	(.00243464)
EDUC	-0.001052	-0.00135
	(.00277093)	(.00278810)
EMPS	0.000189	0.000163
	(.00013794)	(.00013978)
AGESQR	0.000997	0.00114
	(.000875)	(.00087751)
UNIONINF	-0.08068	-0.084434
	(.0611883)	(.062704)
CONTRCT92	-0.47486 **	-0.519103 ***
	(.197319)	(.198040)
JAPAN	0.087487	0.092551
	(.188500)	(.189179)
JAPCUST	0.04729	0.067356
	(.169761)	(.169947)
CANADA	-0.072767	0.147032
	(.215563)	(.237221)
PLANTAGE	0.002847	0.002741
	(.00330409)	(.00333442)
K-L	-0.01125	0.013562
	(.129097)	(.130186)
U-UAW		0.107754
		(.209765)
U-URW		0.257477
		(.414701)
U-NAT		-0.254932
		(.186108)
U-INDEP		-0.632601
		(.435064)
U-CAW		-0.591584
		(.363609)
U-OTHER		-0.108361
		(.345795)
COST-DEF	-0.028921	9.5023E-05
	(.185330)	(.186521)
TRIM-BOD	0.065372	0.087223
	(.172435)	(.175409)
HOT-DANG	0.121879	0.154159
	(.123983)	(.124345)
MECH	-0.28489	-0.325404
	(.230304)	(.234123)
MACHINE	-0.173339	-0.136894
	(.203291)	(.204430)
COMPLEX	0.000375	0.00042
	(.00035114)	(.000351)
N	270	270
R-SQR	0.2553	0.2736
ADJ R-SQR	0.1593	0.1637

Table 2.
Dependent Variable : SUGK
(Management knowledge of number of suggestions made)

Independent Variables	1992 DEP 1992 INDEP PROBIT	1992 DEP 1988 INDEP PROBIT	1988 DEP 1992 INDEP PROBIT
POLICY2	1.243500 ***		-0.55216 ***
	(.1558)		(.1683)
LAYOFFS	0.130830	0.083568	0.16579
	(.1339)	(.1283)	(.1435)
TRAIN	0.000204	0.000213	-0.0006624
	(.000391)	(.000345)	(.000546)
COOP	0.120380	0.15789 *	-0.25275 **
	(.09503)	(.08853)	(.1038)
PROCESS	0.000842		0.0015773
	(.001153)		(.00411)
IMPROVE	0.003318		-0.42169 **
	(.1620)		(.1680)
HELP	-0.285290 ***	-0.25262 ***	0.1853 *
	(.09124)	(.08941)	(.09623)
FRQPSS	0.039316	0.21223	-0.33158 **
	(.1430)	(.1322)	(.1492)
DEFECTS	-0.000533	-0.000613	0.0002795
	(.000814)	(.000624)	(.000794)
POLICY2_88		0.12478	
		(.1430)	
PROCESS_88		0.000252	
		(.000399)	
IMPROVE_88		0.012683	
		(.08843)	
UNION	-0.000702		0.22044 **
	(.000517)		(.1485)
EMPS	0.000142		0.0005171
	(.000208)		(.0003263)
EMPSQR	-2.5931E-08		-7.347E-07 **
	(.00000008)		(.0000003)
COST-DEF	-0.050043	0.049395	0.049061
	(.2063)	(.1931)	(.2266)
TRIM-BOD	-0.151830	-0.043701	0.096936
	(.2059)	(.1944)	(.2175)
HOT-DANG	-0.117810	0.020081	-0.038959
	(.1381)	(.1280)	(.1464)
MECH	-0.186170	-0.033235	0.36083
	(.2692)	(.2490)	(.2719)
MACHINE	-0.176520	-0.16948	-0.29116
	(.2342)	(.2281)	(.2622)
UNION_88		-0.000415	
		(.000394)	
EMPSQR_88		-3E-09	
		(.00000006)	
EMPS_88		0.000008	
		(.000122)	
N	451	451	451

Table 3.

Dependent variable: **SUGGESTION**

Independent Variables	Policy, interactions, single union control, and demographic controls	Policy	Policy and interactions	Policy, interactions, single union control, and all controls excluding product
LAYOFFS	0.027988	-0.341970	0.055529	0.294290
	(.2998)	(.3285)	(.2997)	(.3261)
SUGGIMP	0.001059 **	0.001303 **	0.001190 **	0.001025 **
	(.0005183)	(.0005779)	(.0005123)	(.0005151)
TRAIN	0.009261 ***	0.002980 ***	0.009331 ***	0.009058 ***
	(.001763)	(.0007010)	(.001770)	(.001846)
I	-0.001141	-0.001059	-0.000978	-0.001506
	(.0008277)	(.0008328)	(.0007464)	(.0009894)
CJL	-0.000011	0.000002	0.000011	0.000011
	(.00001164)	(.000009227)	(.00001167)	(.00001397)
SUPERVIS	-0.000444	-0.000325	0.000010	-0.000805
	(.0005928)	(.0005551)	(.0005298)	(.0006611)
POLICY1	0.634690 **	1.235100 ***	0.683170 **	1.109000 ***
	(.3025)	(.2843)	(.2986)	(.4041)
FIRMPAY	-0.203240	0.884550 ***	-0.089994	-0.246780
	(.3981)	(.3245)	(.3920)	(.3865)
POLICY1*FIRMPAY	1.048300 ***		1.511600 ***	1.665800 ***
	(.5789)		(.5753)	(.5764)
POLICY1*TRAIN	0.000452		0.000424	0.000825
	(.001462)		(.001469)	(0.001541)
SUPERVIS*CJL	-0.000214		-0.000199	-0.000176
	(.0001366)		(.0001371)	(.0001388)
LAYOFFS*TRAIN	-0.009639 ***		-0.009682 ***	-0.009560 ***
	(.001527)		(.001533)	(.001609)
UNION	0.000063			-0.000166
	(.0007571)			(.0008783)
AGE	0.000937			0.002025
	(.002137)			(.002267)
MALE	0.000564			0.000874
	(.0009641)			(.0009750)
EDUC	0.000344			0.000178
	(.0008157)			(.0008075)
AGESQR				-0.000649 **
				(.0003246)
UNIONINF				-0.136560
				(.1347)
JAPAN				0.191080
				(.4973)
JAPCUST				-0.002152
				(.4298)
CANADA				0.572360
				(.4735)
PLANTAGE				-0.000614
				(.001045)
K-L				0.000633
				(.0006386)
U-NAT				
U-CAW				
U-UAW				
U-URW				
U-INDEP				
U-OTHER				
COST-DEF				
TRIM-BOD				
HOT-DANG				
MECH				
MACHINE				
COMPLEX				
LAMBDA	0.932430 ***	0.657990 *	0.891890 ***	1.650700 ***
	(.3399)	(.3385)	(.3284)	(.5081)
N	246	246	246	246
R-SQR	0.3395	0.1469	0.3315	0.3651
ADJ R-SQR	0.2933	0.1181	0.2970	0.2993

Table 3.

Dependent variable: Independent Variables	Policy, interactions, multiple union controls, and all controls excluding product	**SUGGESTION** Policy, interactions, single union control, and all other controls	Policy, interactions, multiple union controls, and all other controls
LAYOFFS	0.308990	0.292150	0.305220
	(.3277)	(.3265)	(.3280)
SUGGIMP	0.001033 **	0.000972 **	0.000969 *
	(.0005169)	(.0005153)	(.0005181)
TRAIN	0.009283 ***	0.009209 ***	0.009306 ***
	(.001885)	(.001862)	(.001897)
I	-0.001528	-0.001583	-0.001626
	(.0009988)	(.000999)	(.001011)
CJL	0.000010	0.000012	0.000012
	(.00001419)	(.00001405)	(.0000143)
SUPERVIS	-0.000757	-0.000755	-0.000703
	(.0006702)	(.0006723)	(.0006799)
POLICY1	1.186600 ***	1.069200 **	1.136000 **
	(.4103)	(.4425)	(.4473)
FIRMPAY	-0.264390	-0.201490	-0.215900
	(.3940)	(.3879)	(.3956)
POLICY1*FIRMPAY	1.655800 ***	1.668000 ***	1.662800 ***
	(.5771)	(.5761)	(.5769)
POLICY1*TRAIN	0.000665	0.000761	0.000729
	(.001584)	(.001561)	(.001601)
SUPERVIS*CJL	-0.000206	-0.000203	-0.000235
	(0.0001405)	(.000141)	(.0001434)
LAYOFFS*TRAIN	-0.009977 ***	-0.009727 ***	-0.010096 ***
	(.001649)	(.001614)	(.001651)
UNION		-0.000247	
		(.000885)	
AGE	0.001992	0.002189	0.002203
	(.002271)	(.002255)	(.002257)
MALE	0.000717	0.001012	0.000908
	(.0009886)	(.000992)	(.001007)
EDUC	0.000277	0.000116	0.000201
	(.0008155)	(.0008149)	(.000823)
AGESQR	-0.000717 **	-0.000697 *	-0.000758 **
	(.0003276)	(.0003367)	(.0003391)
UNIONINF	-0.112060	-0.116360	-0.088638
	(.1384)	(.1371)	(.1408)
JAPAN	0.149900	0.234250	0.184390
	(.5055)	(.5152)	(.5239)
JAPCUST	-0.056190	-0.063230	-0.012647
	(.4313)	(.4440)	(.4451)
CANADA	0.739230	0.651540	0.794870
	(.5208)	(.4868)	(.5340)
PLANTAGE	-0.000635	-0.000659	-0.000676
	(.001049)	(.001067)	(.001071)
K-L	0.000627	0.000478	0.000495
	(.0006453)	(.0006519)	(.0006574)
U-NAT	-0.175030		-0.171120
	(.3979)		(.3999)
U-CAW	-0.125570		-0.173310
	(.8021)		(.8070)
U-UAW	0.397820		0.299020
	(.4346)		(.4378)
U-URW	-0.201560		-0.240930
	(.9090)		(.9161)
U-INDEP	-0.502870		-0.534170
	(.8030)		(.8031)
U-OTHER	0.602540		0.820270
	(.9042)		(.9137)
COST-DEF		-0.066221	-0.054967
		(.4573)	(.4602)
TRIM-BOD		-0.007680	-0.018595
		(.5139)	(.5175)
HOT-DANG		0.141030	0.169300
		(.3308)	(.3327)
MECH		0.474310	0.419910
		(.6526)	(.6611)
MACHINE		-0.273810	-0.317100
		(.5872)	(.5941)
COMPLEX		-0.000370	0.000377
		(.0005396)	(.0005411)
LAMBDA	1.708800 ***	1.613500 **	1.665000 ***
	(.5205)	(.5660)	(.5789)
N	246	246	246
R-SQR	0.3696	0.3690	0.3733
ADJ R-SQR	0.2882	0.2843	0.2723

Table 4.

Dependent variable: Independent Variables	**ABSENCE** Policy, interactions, single union control, and demographic controls	Policy	Policy and interactions	Policy, interactions, single union control, and all controls excluding product
LAYOFFS	-0.006240 ***	-0.001520	-0.001858	-0.012420 ***
POLICY3	0.014464 ***	0.011733 ***	0.019756 ***	0.021084 ***
CJL	0.000000130	-0.000000024	0.000001000 ***	0.000000057
SUPERVIS	0.049615 ***	-0.058522 ***	0.086066 ***	0.032443
TRAIN	-0.000010	0.000009 ***	-0.000006	-0.000006
I	-0.002838 ***	-0.001322 *	-0.002040 ***	-0.003587 ***
COACH	0.002691 ***	0.005990 ***	0.005944 ***	0.003183 ***
GROUPPAY	0.006834 **	-0.008079 ***	0.010484 ***	0.004198
HELP	0.003294 ***	-0.001134	-0.001495	0.004361 ***
EI	-0.001230	-0.002303	-0.005106 **	0.006870
LAYOFFS*GROUPPAY	0.006227		0.003666	0.009642 *
CJL*SUPERVIS	-0.000007 ***		-0.000014 ***	-0.000006 ***
LAYOFFS*TRAIN	0.000036 ***		0.000040 ***	0.000335 ***
POLICY3*TRAIN	-0.000038 ***		-0.000044 ***	-0.000335 ***
POLICY3*GROUPPAY	-0.015707 ***		-0.019775 ***	-0.010918 ***
AGE	-0.000049			-0.005932 ***
MALE	-0.000044			-0.000029
EDUC	0.000029			-0.000032
EMPS	-0.000002 *			0.000000
UNION	0.007764 ***			0.005338 ***
AGESQR				0.000077 ***
EMPSQR				0.000000
JAPAN				-0.002043
JAPCUST				-0.004896 **
PLANTAGE				0.000028 ***
CNTRCT92				0.001911
PUBLIC92				0.003552
COVNT92				0.009407 **
CANADA				-0.003851
K-L				-0.006409 ***
U-UAW				
U-URW				
U-NAT				
U-INDEP				
U-CAW				
U-OTHER				
COST-DEF				
TRIM-BOD				
HOT-DANG				
MECH				
MACHINE				
COMPLEX				-0.000019 ***
N	289	309	293	265
c	0.500	0.585	0.610	0.622

Table 4.

Dependent variable: **ABSENCE**

Independent Variables	Policy, interactions, multiple union controls, and all controls excluding product	Policy, interactions, single union control, and all other controls	Policy, interactions, multiple union controls, and all other controls
LAYOFFS	-0.011465 ***	-0.011563 ***	-0.011476 ***
POLICY3	0.019174 ***	0.018766 ***	0.018851 ***
CJL	-0.000000051	0.000000085	0.000000000
SUPERVIS	0.028858	0.025515	0.027906
TRAIN	-0.000006	-0.000010	-0.000008
I	-0.004337 ***	-0.003750 ***	-0.004138 ***
COACH	0.003429 ***	0.002842 ***	0.003157 ***
GROUPPAY	0.003180	0.002672	0.001538
HELP	0.003141 **	0.002867 **	0.001968
EI	0.002878	0.006721	0.004254
LAYOFFS*GROUPPAY	0.012198 **	0.008345 *	0.012456 **
CJL*SUPERVIS	-0.000006 ***	-0.000006 ***	-0.000006 **
LAYOFFS*TRAIN	0.000264 ***	0.000319 ***	0.000267 ***
POLICY3*TRAIN	-0.000267 ***	-0.000314 ***	-0.000265 ***
POLICY3*GROUPPAY	-0.010612 ***	-0.009789 ***	-0.010287 ***
AGE	-0.006250 ***	-0.005024 ***	-0.005677 ***
MALE	-0.000087 **	-0.000068 *	-0.000099 **
EDUC	-0.000071 *	-0.000089 **	-0.000108 **
EMPS	-0.000003	0.000000	-4.05E-7
UNION		0.004487 **	
AGESQR	0.000081 ***	0.000065 ***	0.000074 ***
EMPSQR	0.000000	0.000000	-1.77E-10
JAPAN	-0.002052	-0.001246	-0.000737
JAPCUST	-0.003253	-0.003094	-0.002388
PLANTAGE	0.000022 ***	0.000025 ***	0.000021 **
CNTRCT92	-0.000551	0.004772	0.001972
PUBLIC92	0.003900	0.002808	0.004362
COVNT92	0.014617 ***	0.008355 **	0.013024 ***
CANADA	-0.000416	-0.007238 *	-0.003558
K-L	-0.002271	-0.006194 ***	-0.001713
U-UAW	0.019763 ***		0.018908 ***
U-URW	0.010626 **		0.006087
U-NAT	-0.004303 *		-0.004211 *
U-INDEP	-0.014127 **		-0.013707 *
U-CAW	0.002431		0.001982
U-OTHER	0.006816		0.006180
COST-DEF		-0.005731 ***	-0.005561 ***
TRIM-BOD		-0.002126	-0.001045
HOT-DANG		-0.005933 ***	-0.004284 ***
MECH		0.003033	-0.002820
MACHINE		-0.004806	-0.004558
COMPLEX	-0.000018 ***	-0.000020 ***	-0.000019 ***
N	265	249	249
[illegible]	0.630	0.625	0.632

Table 5.
Dependent variable: CONGRUENCE

Independent Variables	Policy, interactions, single union control, and demographic controls	1992 NEW	1992 DEP 1988 INDEP
LAYOFFS	-0.307193 **	-0.3136 **	-0.3438 *
	(.144454)	(.144382)	(.185260)
POLICY2	0.439916 *	0.44496 *	
	(.266114)	(.266133)	
CJL	3.1E-06	5E-06	
	(.0000055)	(.000007)	
SUPERVIS	2.597242	2.40311	
	(1.609743)	(1.514845)	
COACH	-0.097579	-0.0947	-0.1837 **
	(.069975)	(.070688)	(.073516)
I	-0.082096	-0.0815	-0.1384 **
	(.060364)	(.060336)	(.068182)
TRAIN	0.00049	0.00049	0.00026
	(.000450)	(.000450)	(.001550)
FIRMPAY	-0.141552	-0.1462	-0.2173
	(.132794)	(.132936)	(.156685)
HELP	-0.214481 **	-0.2157 **	-0.1961 **
	(.085153)	(.084897)	(.091261)
POLICY2_88			0.28523
			(.392202)
SUPERVIS_88			2.23892
			(1.655990)
CJL_88			1E-06
			(.000012)
SUPERVIS*COACH	-1.089208 *	-1.0525 *	
	(.561187)	(.555750)	
POLICY2*TRAIN	-0.022367	-0.0229	
	(.014257)	(.014278)	
SUPERVIS*CJL	-0.000011	-2E-05	
	(.000063)	(.000044)	
LAYOFFS*TRAIN	-0.001156 *	-0.0011 *	0.00302
	(.000618)	(.000618)	(.003953)
LAYOFFS*FIRMPAY	0.080494	0.08281	0.1012
	(.217368)	(.217431)	(.255461)
SUPERVIS_88*COACH			-0.8583 *
			(.506266)
POLICY2_88*TRAIN			-0.044 **
			(.022102)
SUPERVIS_88*CJL_88			1.2E-05
			(.000161)
UNION	-0.31588 **	-0.3162 **	
	(.124350)	(.122419)	
AGE	0.007497	0.00654	
	(.008908)	(.009061)	
MALE	-0.005483 **	-0.0056 **	
	(.002231)	(.002246)	
EDUC	-0.001343	-0.0017	
	(.002297)	(.002346)	
EMPS	0.000255 **	0.00024 *	
	(.000124)	(.000127)	
UNION_88			-0.3488 **
			(.137829)
AGE_88			0.0054
			(.005803)
MALE_88			-0.0006
			(.002198)
EDUC_88			-0.0031
			(.002291)
EMPS_88			0.00029 **
			(.000123)
N	300	319	227
R-SQR	0.2242	0.2252	0.28
ADJ R-SQR	0.1752	0.1763	0.2142

Table 6.

Dependent variable: SUGGESTION

Independent Variables	Policy, interactions, single union control, and demographic controls		1992 NEW		1992 DEP 1988 INDEP		1988 DEP 1992 INDEP	
LAYOFFS	0.027988		0.065250		0.110450		0.065075	
	(.2998)		(.2979)		(.2910)		(.1115)	
SUGGIMP	0.001059	**	0.001017	*			0.000099	
	(.0005183)		(.0005193)				(.000143)	
TRAIN	0.009261	***	0.009291	***	0.004336		0.000015	
	(.001763)		(.001768)		(.004034)		(.001708)	
I	-0.001141		-0.001095		0.000231		-0.000150	
	(.0008277)		(.000830)		(.000725)		(.000535)	
CJL	0.000011		0.000011				-0.000003	
	(.00001164)		(.000019)				(.000006)	
SUPERVIS	-0.000444		-0.000516				0.000039	
	(.0005928)		(.000590)				(.000261)	
POLICY1	0.634690	**	0.642030	**			-0.174030	
	(.3025)		(.3157)				(.2148)	
FIRMPAY	-0.203240		-0.227420		-0.056516		0.033533	
	(.3981)		(.3950)		(.3569)		(.1102)	
CJL_88					0.000035			
					(.000023)			
POLICY1_88					-0.209510			
					(.3550)			
SUPERVIS_88					-0.000737			
					(.000452)			
SUGGIMP_88					0.000515			
					(.000363)			
POLICY1*FIRMPAY	1.648300	***	1.621600	***	1.774600	***	1.557700	***
	(.5789)		(.5776)		(.4982)		(.3285)	
POLICY1*TRAIN	0.000452		0.000414				0.004412	
	(.001462)		(.001466)				(.004426)	
SUPERVIS*CJL	-0.000214		-0.000166				0.000006	
	(.0001366)		(.000118)				(.000038)	
LAYOFFS*TRAIN	-0.009639	***	-0.009627	***	-0.004632		-0.000113	
	(.001527)		(.001531)		(.004124)		(.001737)	
POLICY1_88*TRAIN					0.005408			
					(.004198)			
SUPER_88*CJL_88					-0.000338			
					(.000246)			
UNION	0.000063		0.000048				0.003241	
	(.0007571)		(.000759)				(.1125)	
AGE	0.000937		0.001083				-0.006590	
	(.002137)		(.002156)				(.005531)	
MALE	0.000564		0.000597				-0.000031	
	(.0009641)		(.0009735)				(.000224)	
EDUC	0.000344		0.000324				0.000060	
	(.0008157)		(.0008201)				(.000164)	
UNION_88					0.000322			
					(.000678)			
AGE_88					0.001221			
					(.002089)			
MALE_88					0.001674			
					(.001661)			
EDUC_88					0.000207			
					(.001358)			
LAMBDA	0.932430	***	0.928920	***	0.613890	***	0.270510	*
	(.3399)		(.3371)		(.3451)		(.1543)	
N	246		246		246		109	
R-SQR	0.3395		0.3369		0.3357		0.2827	
ADJ R-SQR	0.2933		0.2905		0.2892		0.1580	

Table 7.
Dependent variable: ABSENCE

Independent Variables	Policy, interactions, single union control, and demographic controls	1992 NEW	1992 DEP 1988 INDEP	1988 DEP 1992 INDEP
LAYOFFS	-0.006240 ***	-0.0062 ***	-0.0097 ***	-0.0072 ***
POLICY3	0.014464 ***	0.01436 ***		0.01655 ***
CJL	-0.000000130	-1E-07		2.4E-08 ***
SUPERVIS	0.049615 ***	0.03618 **		0.08303
TRAIN	-0.000010	-1E-05	-0.0002 ***	-0.0002 **
I	-0.002838 ***	-0.0027 ***	-0.0038 ***	-0.0034 ***
COACH	0.002691 ***	0.00273 ***	0.00504 ***	0.00333 ***
GROUPPAY	0.006834 **	0.00713 **	0.00801 **	0.00087
HELP	0.003294 ***	0.00283 **	0.00144	0.00398 ***
EI	-0.001230	-0.0013	-0.0041	0.02722 *
POLICY3_88			0.01032 ***	
SUPERVIS_88			0.05055 **	
CJL_88			2.8E-08	
LAYOFFS*GROUPPAY	0.006227	0.00592 *	0.0221 ***	0.01425 **
CJL*SUPERVIS	-0.000007 ***	-5E-06 ***		-8E-06 ***
LAYOFFS*TRAIN	0.000036 ***	3.8E-05 ***	0.00021 ***	0.0002 ***
POLICY3*TRAIN	-0.000038 ***	-4E-05 ***		-0.0001 **
POLICY3*GROUPPAY	-0.015707 ***	-0.0158 ***		-0.0183 ***
SUPER_88*CJL88			-9E-06 ***	
POLICY3_88*TRAIN			5.6E-05	
POLICY3_88*GROUPPAY			-0.0197 ***	
AGE	-0.000049	-8E-05		0.00015
MALE	-0.000044	-5E-05		-1E-05
EDUC	0.000029	5E-06		-4E-05
EMPS	-0.000002 *	-2E-06 **		-2E-06 **
UNION	0.007764 ***	0.00824 ***		0.01083 ***
UNION_88			0.00258	
AGE_88			0.00008	
MALE_88			-5E-05 *	
EDUC_88			1.6E-05	
EMPS_88			-4E-06 ***	
N	289	294	208	183
c	0.599	0.6	0.616	0.617

Table 8.
Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	N
1992 Dependent variables					
CONGRUENCE	0.000	1.000	-3.025	1.939	432
SUGG	0.687	2.046	0.000	22.160	451
SUGK	0.546	0.499	0.000	1.000	451
ABSENCE	0.031	0.043	0.000	0.710	379
1988 Dependent variables					
SUGG_88	0.265	0.797	0.000	7.180	451
SUGK_88	1.519	0.608	0.000	2.000	451
ABSENCE_88	0.035	0.053	0.000	0.710	224
1992 Policy variables					
LAYOFFS	0.359	0.480	0.000	1.000	451
CJL (original)	17424.630	17110.290	-6162.540	87447.090	379
CJL (for causation analysis)	11436.310	9061.728	-6302.040	51578.790	379
SUPERVIS	0.078	0.108	0.000	1.000	407
SUGGIMP	29.955	31.988	0.000	100.000	397
COOP	1.546	0.998	1.000	5.000	451
TRAIN	43.096	191.360	0.000	1950.000	451
HELP	1.619	0.691	1.000	5.000	433
[	1.868	0.895	1.000	5.000	432
COACH	2.471	0.945	1.000	5.000	433
POLICY1	0.302	0.459	0.000	1.000	451
POLICY2	0.067	0.250	0.000	1.000	451
POLICY3	0.572	0.495	0.000	1.000	451
FIRMPAY	0.368	0.483	0.000	1.000	451
GROUPPAY	0.153	0.360	0.000	1.000	451
EI	0.941	0.237	0.000	1.000	420
PROCESS	1.864	1.066	1.000	5.000	441
IMPROVE	0.845	0.363	0.000	1.000	451
FRQPSS	0.734	0.442	0.000	1.000	451
DEFECTS	4.413	0.882	1.000	5.000	438
1988 Policy variables					
CJL_88	11029.490	9332.555	-5168.370	44828.680	332
POLICY1_88	0.242	0.429	0.000	1.000	451
POLICY2_88	0.040	0.196	0.000	1.000	451
SUPERVIS_88	0.085	0.111	0.000	1.000	349
SUGGIMP_88	29.949	29.953	0.000	100.000	332
PROCESS_88	2.646	1.236	1.000	5.000	429
IMPROVE_88	1.519	0.608	0.000	2.000	451
1992 Interactions					
POLICY1*TRAIN	16.841	138.150	0.000	1950.000	400
SUPERVIS*CJL	1142.911	1613.427	-362.538	16472.550	351
LAYOFFS*TRAIN	26.279	174.490	0.000	1950.000	400
LAYOFFS*GROUPPAY	0.060	0.238	0.000	1.000	451
POLICY3*TRAIN	22.568	129.994	0.000	1950.000	451
POLICY3*GROUPPAY	0.082	0.275	0.000	1.000	451
SUPERVIS*COACH	0.185	0.255	0.000	3.200	397
POLICY*TRAIN	1.018	5.118	0.000	50.000	400
LAYOFFS*FIRMPAY	0.115	0.320	0.000	1.000	451
POLICY1*FIRMPAY	0.106	0.309	0.000	1.000	451
1988 Interactions					
POLICY1_88*TRAIN	11.262	98.181	0.000	1950.000	451
SUPER_88*CJL_88	822.650	929.161	-329.431	5986.450	271
POLICY3_88*TRAIN	26.406	139.787	0.000	1950.000	451
POLICY3_88*GROUPPAY	0.093	0.291	0.000	1.000	451
SUPERVIS_88*COACH	0.201	0.273	0.000	3.520	343
POLICY2_88*TRAIN	0.561	3.765	0.000	40.000	451
1992 Control variables					
UNION	0.400	0.491	0.000	1.000	435
AGE	35.785	6.137	18.000	55.000	450

Table 8
Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	N
MALE	59.249	23.737	1.800	100.000	406
EDUC	78.107	23.281	1.100	100.000	391
EMPS	327.780	404.910	8.000	4500.000	427
EMPSQR	271000.000	1150400.000	64.000	20250000.000	427
AGESQR	1315.400	457.210	100.000	3025.000	451
UNIONINF	0.616	1.217	0.000	6.000	451
JAPAN	0.122	0.328	0.000	1.000	451
CANADA	0.135	0.343	0.000	1.000	451
PLANTAGE	26.366	22.522	1.000	128.000	437
K-L	0.442	0.474	0.000	3.704	409
JAPCUST	0.135	0.342	0.000	1.000	451
U-UAW	0.133	0.340	0.000	1.000	435
U-URW	0.021	0.143	0.000	1.000	435
U-NAT	0.161	0.368	0.000	1.000	435
U-INDEP	0.021	0.143	0.000	1.000	435
U-CAW	0.035	0.183	0.000	1.000	435
U-OTHER	0.032	0.177	0.000	1.000	435
COST-DEF	0.122	0.328	0.000	1.000	451
TRIM-BOD	0.109	0.312	0.000	1.000	451
HOT-DANG	0.388	0.488	0.000	1.000	451
MECH	0.062	0.242	0.000	1.000	451
MACHINE	0.089	0.285	0.000	1.000	451
COMPLEX	38.907	154.560	0.000	1700.000	416
CNTRCT92	0.921	0.270	0.000	1.000	443
PUBLIC92	0.944	0.231	0.000	1.000	433
COVNT92	0.185	0.389	0.000	1.000	443
1988 Control variables					
UNION_88	0.383	0.487	0.000	1.000	431
AGE_88	29.319	14.271	0.000	56.667	451
MALE_88	50.611	31.630	0.000	110.556	438
EDUC_88	61.487	36.344	0.000	108.889	434
EMPS_88	291.798	431.966	0.000	5000.000	360
EMPSQR_88	271220.000	1435300.000	0.000	25000000.000	360