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Abstract: Using both survey data and field research, we investigate the effects of employee involvement practices on outcomes for blue-collar workers in the auto supply industry. Using a variety of measures, we find consistent evidence that these practices raise wages by 3-5%. The causal mechanism linking involvement and wages appears most consistent with efficiency wage theories, and least consistent with compensating differences. With respect to employment stability, we find that employee involvement has a knife-edge character. Plants with intensive programs have larger employment gains, but are also slightly more likely to go out of business. These results are consistent with employee involvement raising quality and productivity, but also increasing fixed costs for liquidity-constrained firms.

New workplace practices such as employee involvement have become relatively common in American organizations (Osterman 1995). Many studies show that employee involvement can greatly increase productivity and quality (Ichniowski, et al., 1996). While there is a growing consensus that employee involvement can improve outcomes for firms, few studies have examined the question of whether new work practices can improve outcomes for employees. Some authors claim employee involvement helps workers by providing them with higher skills, pay and quality of work life (Womack, Jones, and Roos, 1990). Others fear that employee involvement leads to speed-ups, lower wages, less safety, and more job loss (Drago, 1996; Parker and Slaughter, 1988).

By plants with employee involvement we mean plants in which blue-collar workers not only perform manual labor, but use abstract reasoning skills as well. Activities using these skills include meeting with a group to research solutions to quality or safety problems, providing suggestions for improvement, and setting up machines to make different parts. These activities can occur in formal institutions (such as a suggestion system or pay-for-knowledge plan), or informally.(See table 1.)

Our study examines data from U.S. and Canadian auto suppliers to investigate whether workplaces with employee involvement have measurable effects on employees' pay, and on the survival of the plants in which they work. In addition to quantitative analysis, we report on a number of visits to plants with and without employee involvement.

In the first section below, we briefly discuss hypotheses about the effects of employee involvement on compensation derived from five standard theories from labor economics: human capital, compensating differences, incentives and complementarity, efficiency wages, and rent-sharing. To aid intuition and to provide existence proofs for the theoretical causality, we provide examples from our field research. Our field research also led us to generate several hypotheses that we did not derive from standard economic theories. These are presented in the second section. The third section describes the methods used to test the hypotheses: survey data and case studies. The fourth section provides results, and the fifth concludes.

1. Theories relating workplace practices and employees' outcomes

A. Summary of theories

We first summarize five theories of why workplaces with employee involvement might have different outcomes for employees than workplaces without employee involvement: human

capital, compensating differences, efficiency wages, incentives and complementarity, and rent-sharing. We also look at a type of rent-sharing theory called "management by stress." For each theory, we draw on our field research to give examples of how employee involvement operates in practice. The following section elaborates the hypotheses we can test with the survey data that may help untangle some of the implications of the theories.

Human capital theory argues that workers with higher skill levels receive higher compensation than do others. If firms' returns to employee involvement are higher when employees have greater skill (i.e., if employee involvement is an 'ability-sensitive technology' (Groshen, 1991)), then its introduction should cause wages to rise. Other forms of employee compensation, such as safety or bonuses, would also be expected to rise.

Our plant visits turned up a vivid example of a capability required for successful employee involvement: the ability to speak the same language as one's co-workers and managers. We visited two plants (one in California, one in Massachusetts) that hired immigrant workers who spoke a variety of languages other than English. Managers at both plants reported that while this strategy allowed them to pay lower wages ($6-7 per hour rather than the $8-12 that prevailed for nearby plants with native-born workforces), it complicated employee involvement. Workers had difficulty sharing ideas with management and with co-workers, and training was more expensive. In the Massachusetts plant in 1995, we observed an engineer trying to explain in English to a Vietnamese worker how to overcome a problem with a machine. The engineer at first misunderstood the problem the operator was having; once he did understand, it took a lot of repetition and sign language to explain the solution.

Some plants have institutionalized "pay-for-skill," a pay system that closely mimics the predictions of specific human capital theory (Ledford, 1991). The case study in the qualitative results section discusses one such plan in some detail, so we leave that example for later. In pay-for-skill plans, employees receive additional pay for each new skill they learn.

Compensating differences theory argues that workers who face undesirable working conditions will receive higher wages. If employee involvement requires extra effort, then plants with employee involvement should also offer better compensation, in the form of higher wages, more bonuses, or increased safety. Conversely, if employees regard employee involvement as a benefit, then plants that have it would offer lower wages.

Our plant visits provided examples of where employees regarded employee involvement as a benefit. Employees often desired implementation of suggestions that made life on the shop floor better. For example, at Capitol Plastics in Bowling Green, Ohio, workers on one line suggested floor mats as a means to reduce the discomfort of standing on a cement floor all day. Management implemented this idea, raising that line's quality of work life (MacDuffie and Helper, 1997).

Many employees also considered it an improvement in their working conditions when management implemented suggestions that permitted a conscientious worker to do their job better, for example by improving the quality of parts. We saw a counter-example at a (now-closed) GM seat-parts plant in Trenton that we visited in 1990, a plant that lacked an effective mechanism for workers to make suggestions. One younger worker was near tears because she was spending so much time trying to bend poorly-made parts into place that she fell behind, and her hands hurt. One of us overheard an older worker counseling her in the restroom not to try so hard to do a good job, if she wasn't given the correct tools to do it. The younger worker protested that this wasn't right, that she didn't want to make bad parts.

Compensating differences theory also predicts that if employee involvement requires extra effort, workers will be compensated for it. Our qualitative results here depended on the type of employee involvement. On one hand, when employee involvement meant that workers had to do more tasks in the same amount of time (e.g., check quality as well as make parts), they usually believed they should be compensated . (However, wages rarely rose when such tasks were added.) On the other hand, when employee involvement meant a substitution of problem-solving for production tasks, we did not find examples of employees saying that participating in programs such as quality circles required extra effort. In many cases, employees were glad to have time away from the tedium of the line. Employees cared a great deal about what happened to their input; they resented their ideas being ignored or used to transfer work to other plants.[1]

Efficiency wage theories predict that paying higher wages can sometimes increase workers' productivity. There are three main channels by which wages can raise productivity. (Katz (1987) and Levine (1991) review this literature.) The first story assumes that the harder workers work the higher is the cost of being caught shirking and the higher is the probability of being caught shirking. A higher wage increases worker effort due to the greater cost to workers of losing the job (meaning workers want to reduce the chances that they are caught shirking). Second, a higher wage

increases effort by increasing workers' loyalty to the firm (Akerlof, 1984). Third, a higher wage reduces firms' turnover and recruitment costs. If introducing employee involvement increases monitoring costs (plausible since it is harder to observe whether a worker produced a good suggestion than whether she met her production quota), increases the return to costly-to-measure effort, and/or increases employers' return to worker skills and retention, then plants with employee involvement should pay higher wages.

Our field research did not turn up any firms that would fire a worker for failure to be involved enough. Several firms we visited (such as Foamade, in Auburn, MI) implemented a pay-for-knowledge scheme in which workers who did not achieve certification in their job skills by a certain date would be let go, but this was a one-time test, not an on-going monitoring of work effort.

In contrast, loyalty and gift exchange appeared to motivate employees in several cases. For example at Industrial Strainer, workers contributed on average half a suggestion per year each, even though there was no explicit reward for doing so. When asked why, several workers said, "It's a good place to work," because of above average wages ($12 per hour rather than the $10 prevailing in the area). One worker added that an additional motivation was, "Management--at least some of them--cares about you."

Conversely, when workers felt that management did not reciprocate their 'gifts' of suggestions, they became quite angry. For example in the Trenton plant mentioned above, management did not make use of quality-control data which employees had collected for several months, and did not allow the employees time to analyze the data themselves. Several employees made comments like, “They’re wasting our time,” or “They’re making fools of us,” and resorted to reporting obviously bogus quality data.

Finally, we came across many plants in which employee involvement increased management's returns to worker skills and retention. A useful comparison is between two plants making wiring harnesses, both visited in 1992. One, located in Mexico, paid the minimum wage in its city and had 100% annual turnover. Apparently an informal cartel of employers restricted management from raising wages during the employees' first year on the job. Management there had designed a four-step training process for employee involvement, including training on working in groups, problem-solving, elementary statistics, and basic quality control. However, even after

[1] We discuss these views under gift-exchange and rent-sharing theories, below.

two years, 90% of the training they were offering was the first stage, which had been repeated many times to a constantly changing cast of characters. Minutes of quality-circle meetings were in most cases only one or two lines, such as, "We all resolved to work harder to avoid defects." Workers did not know enough about the process to suggest “ir-reversible countermeasures”[2].

In contrast, a plant in Kentucky provided extensive training to workers in statistical process control and problem-solving techniques. At this plant, quality circles did research and experiments on issues such as different types of tape that would eliminate a problem of tape slippage that exposed a wire underneath. The plant’s turnover rate was well below average for the area because of its promote-from-within policy (even though it paid below-average starting wages).

Incentives and Complementarities.[3] To use somewhat different language, we can say that efficiency wage theories posit that employee involvement and high wages are complementary policies (Ichniowski, Shaw, and Prennushi, 1997; Milgrom and Roberts, 1995). If workers care about fairness, then it is more cost-effective to pay a fairness efficiency wage. This motivation is increased if workers' ideas create rents, and workers perceive it fair to share rents. As described below, at least some managers believed the complementarity story; we describe below a firm that raised wages to enhance the effectiveness of employee invovlement.

Causality can run either way. In the Foamade case above, management’s desire to increase employee involvement led them to implement a pay-for-knowledge plan. We also observed firms that paid high wages for exogenous reasons and found employee involvement to be relatively easy to implement. For example, one company (Industrial Strainer) had a prolonged strike during the 1970s, caused by management's refusal to increase wages by 5 cents per hour, according to the firm’s current manufacturing vice president. Ever since then the firm has paid above-average wages to avoid another costly strike. The high wages made training relatively less costly because turnover was low and because workers were loyal (gift exchange). Both of these factors meant that the plant achieved higher levels of employee involvement (as measured by numbers of suggestions and extent of worker contributions to process improvement) for lower training cost than did other firms we observed implementing employee involvement in the early 1990s.

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[2] This term is used at Honda to describe changes in the process that lead to improvements that do not depend on increased attentiveness (MacDuffie and Helper, 1996).

[3] These arguments are elaborated in Levine and Shaw, 1999.

Rent-sharing theories and related theories of conflict, bargaining (Dow, 1989) and insider-outsider relationships (Lindbeck and Snower, 1986) posit that worker bargaining power and the size of the rents and quasi-rents to be divided affect compensation. These theories overlap efficiency wage theories when the employer's benefit of high wages is avoiding unions (Dickens, 1986) or if high profits increase the level of wages that workers perceive to be fair (Akerlof, 1984).

If employee involvement is productive, then it will increase the profits of firms that adopt it. Then wages will increase if firms share these gains with workers, either because it seems fair to do so or because workers' bargaining power either stays constant or increases as a result of employee involvement.

Employee involvement can increase worker bargaining power by increasing workers' feeling of solidarity due to increased interaction. Involvement might also increase workers' firm-specific knowledge, which can make it difficult to replace workers and makes firms rely upon senior workers to train new employees. Involvement might also make it more difficult to monitor workers' actions, so that high productivity increasingly relies on worker cooperation. Finally, involvement might make it easier for employees to disrupt the production process, so that worker non-cooperation or other reactions to perceived unfairness is more costly to the firm.

In addition to these channels, we saw in our field work an example of employee involvement facilitating union-organizing efforts. At a Japanese-owned stamping plant near Detroit, pro-union workers used fishbone diagrams and other tools they had learned in their problem-solving training to prioritize issues and brainstorm solutions to problems that arose during their ultimately successful 1995 organizing drive and subsequent strike. Workers from the nearby Mazda plant who had received similar training assisted employees at the supplier plant. This increased cohesiveness came largely from increased skills—a different argument (though complementary) to that made by many sociologists, who emphasize how increased feelings of solidarity can increase workers' bargaining power.

Our fieldwork provided cases where employee involvement had both positive and negative effects on employer monitoring and turnover costs. On the one hand, employee involvement added higher-level problem solving to workers' jobs, which is harder to monitor and more skill-intensive than working on an assembly line (as noted in the Industrial Strainer and Foamade examples above).

Management by stress. However, in some cases (often the same cases), employee involvement also reduced employees' bargaining power by codifying workers' tacit knowledge and by reducing unions' power (Parker and Slaughter, 1985, 1988; Sheahan 1996).

One of the goals of many employee involvement programs was often to codify workers' tacit knowledge. Creating "standardized work sheets" (sometimes referred to as ISO 9000 worksheets) could increase productivity by diffusing best practice across employees and by making the production practices susceptible to systematic improvement (Adler, 1993). However, these "scab sheets" (as some union activists refer to them), also made it easier to replace trained workers with relatively unskilled ones, to move work to lower-wage locations, and to replace workers who struck. For example, in several instances workers reported being videotaped or writing detailed descriptions of how they did their jobs; management then transferred work to other plants that paid lower wages. One instance was a wiring-harness maker in Ohio transferring knowledge to plants in China and Mexico; another was a company, aptly named Federal Screw Works, which used ISO 9000 work instruction sheets generated by its Detroit work force to start a new, lower-wage plant in rural Michigan.

Second, managers can use employee involvement to reduce union power. For example, managers can respond more quickly to problems raised through employee involvement channels rather than through union channels, thus decreasing workers' perceptions of union effectiveness. Management can create new positions for line workers, such as team leader or quality coordinator, that offer highly motivated individuals an opportunity to advance and to feel that they are helping fellow workers without the hassle faced by union officers of having to win election and re-election.

In nonunion workplaces, the presence of management-sponsored problem-solving channels can reduce employees' dissatisfaction. To the extent the lower dissatisfaction reduces the need for compensating differences and/or reduces the threat of unionization, wages can also decline at nonunion workplaces. These effects are harder for researchers to observe, since it is usually difficult to gain permission from management to visit plants with undesirable working conditions

B. Basic Hypotheses

The first four theories discussed above provide a justification for our first hypothesis:

H1A: Wages will be higher for workplaces with substantial employee involvement than for traditional workplaces.

Theories of firm-specific training, efficiency wages, and rentsharing, but not compensating differences, also imply that high-involvement workplaces should have lower levels of voluntary turnover (quits).

H1B: Turnover will be lower in workplaces with high levels of employee involvement or training.

The management by stress theory, by contrast, suggests[4]:

H1C: Wages will be lower and turnover higher for workplaces with employee involvement than for traditional workplaces.

C. Disentangling the Theories

In the theories above, the effects of employee involvement work through several different channels. We can attempt to disentangle the relative importance of the effects predicted by the several theories by controlling for the intervening variables. We can also investigate the possibility that the effects of employee involvement might be different for different types of plants (those with different work organizations, management strategies, etc.).

Human capital theory suggests that any link between wages and employee involvement is largely due to the increased returns to skill when employee involvement is present. Particularly if the firm has not hired new workers since it started employee involvement, the increased skill will largely be obtained through training. This logic leads to:

HumanCapitalA: Training should be correlated with high levels of employee involvement.

and

HumanCapitalB: Controlling for training should largely eliminate the relation between employee involvement and wages.

Human capital theory also implies that lower turnover should accompany high levels of firm-specific training (and the accompanying high wages). Thus, if H1B holds and turnover is lower in workplaces with high levels of employee involvement or training, human capital theory suggests:

HumanCapitalC: Controlling for training should largely eliminate the relation between employee involvement and turnover.

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[4] When employee involvement is a benefit to employees rather than a cost, the theory of compensating differences suggests the same hypothesis about wages, but for almost opposite reasons. That is, rather than being a management innovation which shifts worker bargaining power down, employee involvement is seen as a factor which improves working conditions.

Compensating differences suggests that firms which introduce new forms of employee benefits along with employee involvement will have a smaller increase in wages than firms that do not provide such benefits. That is:

CompensatingDifferencesA: Including performance pay and no-layoff policies in the wage equation will significantly reduce the coefficient on employee involvement.

Efficiency Wages. Each of the efficiency-wage variants leads to different views of the links between employee involvement and wages. If the relationship between work organization and turnover is due to efficiency wages, then we have

EfficiencyWagesA: Wages relative to the local price level and wages relative to the region should correlate negatively with turnover.

and

EfficiencyWagesB: Controlling for wages should largely eliminate the relation between employee involvement or training and turnover.

If the link between involvement and wages is largely due to gift exchange, then employee loyalty should be higher at workplaces with high levels of employee involvement. This loyalty should lead managers to perceive that employees would be more willing to take actions beyond mechanically producing parts. This leads to:

GiftExchangeA: Managers at workplaces with more employee involvement should report that employees help out in ways not specified in their job description, sharing ideas with management, and less likely to take advantage of management and are less reluctant to share ideas with management

and

GiftExchangeB: Controlling for these proxies for employee loyalty largely eliminates the relation between employee involvement and wages.

The turnover cost version of the efficiency wage theory implies:

TurnoverCostA: Including measures of turnover cost such as training reduces the coefficient on employee involvement in the wage equation.

This hypothesis is the same as *HumanCapitalB*.

Incentives and Complementarity. The prescriptive literature on organizational design typically emphasizes the importance of aligning the rights to make decisions with incentives to

make good decisions. This premise reappears in the prescriptive compensation and employee involvement literatures (e.g., Lawler, et al, 1995), expectancy theory in psychology, exchange and work design models of sociology and organizational behavior (e.g., Pfeffer, 1994), and the rational models of economics, agency theory, and transaction cost economics (e.g., Wruck and Jensen, 1994).

The move to higher employee involvement involves substantial changes in decision-making rights, as frontline employees collect more data, analyze it, and suggest and implement improvements. Thus, we expect incentives in workplaces with higher levels of employee involvement to align frontline workers' goals with their new authority -- that is, to reward quality and improvement. (Milgrom and Roberts 1992; Levine 1995).

One prediction of the theory of complementarities is:

> *IncentiveA*: Pay practices such as gainsharing and profitsharing will be more common in plants with higher levels of employee involvement.

When employees provide ideas that increase productivity, companies are sometimes left with excess employment. They have, thus, an incentive to lay off excess labor. These layoffs, in turn, will lower employees' incentives to generate new ideas. Thus, we expect employee involvement to be most successful when it is coupled with policies that limit layoffs due to new ideas (Levine and Parkin, 1996). This complementarity, in turn, yields the hypothesis:

> *IncentivesB*: Policies limiting layoffs due to employee suggestions will be more common in plants with higher levels of employee involvement.[5]

2. Inductively based hypotheses

In addition to providing intuition for the theoretically generated hypotheses above, our fieldwork also helped us generate some hypotheses that are not highlighted in the general economics literature. Here we emphasize two issues that we can study in our dataset: employment stability, and threshold effects in involvement programs.

Our respondents repeatedly emphasized that when they perceived that employee involvement increased (decreased) employment security, they found this a major incentive (disincentive) to participate. As mentioned above in the discussion of compensating differentials, policies such as promote-from-within (Sumitomo) and job security in the face of productivity

[5] The theory of compensating differences predicts that plants with policies limiting layoffs would have lower wages.

improvements (ISC) can provide incentives for participation in employee involvement[6]. Job security was a particularly important motivator for these workers, for several reasons: most plants paid above-market wages, many workers had painful memories of the high unemployment of the early 1980s, and they often valued friendships with co-workers. Thus, employment stability is an important component of the welfare of semiskilled workers as a whole, a component that is missed if we look only at wages. For example, employee involvement would be good for workers in general even if it lowered wages slightly if it raised employment in a high-wage sector. For these reasons we analyzed another set of dependent variables: plant survival to 1999 and employment growth between 1992 and 1999.

Employee involvement might increase a plant's employment and its probability of survival for several reasons. To the extent that employee involvement improves the plant's performance, it should lead to increased profits and market share for the plant. If the management by stress theorists are correct and employee involvement lowers workers' bargaining power and wages, then the rules of profit maximization imply that employee involvement would raise labor demand. Thus, we have:

> *SurvivalA*: Plants with more employee involvement in 1992 have increased employment growth and increased probability of survival from 1992 to 1998.

It is also possible that we would observe a spurious positive correlation if employee involvement is introduced when companies are feeling flush, and want to do something nice for workers, to reduce their alienation, etc. However, we did not find any examples of programs being introduced for these reasons; our respondents indicated that their introduction of the programs was generated by the profit motive: "We do this to increase quality", or "to help us compete with the Japanese". (For similar findings , see Kochan, Katz, and McKersie (1986).)

Alternatively, employee involvement may *lower* a plant's employment and probability of survival. If employee involvement helps managers extract high-wage workers' knowledge, then it increases the ability of the firm to establish a new, lower-wage plant. If employee involvement increases productivity without increasing demand for the product, workers may be made redundant. This effect reduces employment, but raises the probability of survival. These arguments lead to:

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[6] Conversely, a guarantee of lifetime employment regardless of what happens to sales removes the incentive to participate to keep one's plant open. Only one firm we visited had such a policy.

SurvivalB: Plants with more employee involvement in 1992 have decreased employment growth and (according to the former causality) decreased probability of survival from 1992 to 1998.

We could have a spurious negative correlation between involvement and employment changes if employee involvement is introduced when survival is threatened.

A second inductively-based observation is that not all employee-involvement plans are created equal. Some plants that we visited seemed merely to be going through the motions of having an employee involvement program. Recall the Trenton plant that introduced a Total Quality Management Program, but did not create a mechanism to allow the data collected to be analyzed. This lack of follow-through led to widespread dissatisfaction; eventually the plant was closed. In some other plants, we saw suggestion boxes covered in a thick layer of dust, implying that they weren't often used. Managers at one plant told us that they had a statistical process control (SPC) program only because their customer (Honda) demanded it; they didn't believe that this technique would help them given their technology. Not surprisingly, human resource managers at the plant did not seek to recruit or compensate workers based on their participation in this quality program.

These cases suggested to us that there might be threshold effects in employee involvement programs; that initiatives that are implemented either in isolation from each other or without complementary policies may have small or even negative effects. This leads to:

ThresholdA: Plants that adopt a number of employee involvement programs together, or adopt them in concert with complementary human resource policies, should have a) higher wages and b) a higher probability of survival than plants which adopt fewer such programs.

3. Data and Methods

We first discuss our qualitative methods, and then the quantitative methods and data.

Qualitative Methods

We use evidence from plant visits in a variety of ways in this paper (Eisenhardt, 1989): to facilitate intuition in generating hypotheses, to test hypotheses, and to facilitate intuition in describing results. The cases used in generating the hypotheses above were drawn from approximately 60 auto supplier plants visited by Helper over the past 10 years. In most cases, plants were chosen based on convenience, or the needs of other research. The visits lasted from four hours to three days, and always included a plant tour. In these visits, we (at least two interviewers were always present) spoke with two to fifteen people, ranging from company president to line worker.

In about a dozen cases we had the opportunity to interview workers for at least 30 minutes without the presence of management. All but three of these cases were union plants. We took extensive notes, and cross-checked them with the other interviewers and (in about half of the cases), with the interviewees. All interviewees were promised confidentiality; where real names are used, it is with interviewees' permission. Some of the cases have been written up more extensively elsewhere; for the wiring harness case, see Helper (1998); for Foamade and Industrial Strainer see Sheahan, (1996) and Helper, (1999); for SEWS, see MacDuffie and Helper (1999).

In addition to the large convenience sample of plants, we conducted a case study as a quasi-natural experiment. (See below.)

Questionnaires. In 1993, Helper conducted two surveys of automotive suppliers. The first survey was sent to the divisional director of marketing at automotive suppliers in the United States and Canada. This questionnaire asked about relationships with customers and product characteristics. The second survey was sent to plant managers, and asked about operations policies and relationships with workers. Each answered the questionnaire for their most important customer regarding one product that was typical of their business unit's output.

A questionnaire was sent to every automotive supplier and automaker component division named in the Elm Guide to Automotive Sourcing (available from Elm, Inc. in East Lansing, Michigan). This guide lists the major first-tier suppliers to manufacturers of cars and light trucks in the United States and Canada. The response rate was 55% for the sales manager survey, and 30% for the plant manager survey.

Survey respondents were representative of the population in terms of firm size and location, as compared with data from the Elm Guide and from County Business Patterns for SICs 3714 (automotive parts) and 3465 (automotive stampings). However, vertically integrated business units of the automakers were under-represented. The respondents averaged 18 years in the automobile industry and 11 years with their company.

Employment growth and survival. Data on 1999 employment came from the *1999 Elm Guide*; we matched this information to the 1993 survey data. If we could not find a plant in the 1999 *Guide*, we called the plant to confirm that it was indeed out of business (that is, its phone was disconnected or had been assigned to another user). If a plant had been sold to another firm, we counted it as continuing to exist. We were able to account for all plants as either surviving or out of business.

Variable construction

Measuring employee outcomes

Our wage measure is the average wage (not including benefits) at the plant for unskilled and semi-skilled employees. We also used a measure of total compensation equal to this wage measure times 1 plus the percent of total payroll devoted to benefits (not including retiree benefits).

For robustness we compared results to a measure of compensation relative to the local labor market. Specifically, we asked how total compensation (including benefits) for unskilled and semi-skilled production workers compared with that received by equivalent workers in all industries in the respondent's area. This was a 7-point qualitative scale, ranging from 1 ("more than 20% lower") to 7 ("more than 20% higher).

The measure of turnover in the dataset combines quits and layoffs. Layoffs can avoid the need to fire low performers. Moreover, when employees can select to be laid off, layoffs reduce quits. The accompanying fear (if layoffs are general in the area / industry) can also reduce desire to quit. For all of these reasons, the analysis of turnover is most convincing only in workplaces where some hiring occurred last year; we emphasize results from this sample.

Identifying plants with employee involvement

The survey measured workplace practices ranging from union-management committees to employees providing their own maintenance to the presence of problem-solving groups. Given the large number of measures, the appropriate way to measure "employee involvement" is not obvious. We used four techniques, some based extensively on theory, and others driven by the data. Each procedure has advantages and disadvantages, so we emphasize results robust to multiple methods.

Theory-motivated index

The theory of complementary workplace practices suggests employee involvement is most likely to succeed when it couples high levels of direct employee involvement with representative participation and with supportive workplace practices ranging from the rule of law to high levels of training to appropriate incentive pay plans (Lawler, et al., 1999; Levine 1995). A workplace with all of these practices looks quite different from a traditional, hierarchical factory. Because of the sweeping changes it measures, we call the index that includes direct involvement, representative participation, and supportive practices, the “index of workplace transformation.” The most theory-

driven method we used to develop this measure built up indices of direct and representative participation as well as indices of the theoretically-appropriate HR polices. This section outlines each of these subindices.

Direct participation. The subindex of direct participation as constructed as a z-score of several components. Each component is z-scored before summing or use in a regression.

One component measured the number of tasks performed by frontline employees. It was the sum of whether semiskilled employees do each of 5 operations such as write paragraphs or do arithmetic or solve problems in a group, scoring daily = 4, weekly = 3, monthly = 2, and rarely = 1 (z-scored) plus the proportion of 8 tasks performed at the plant such as set up machines and use quality assurance data to recommend improvements done by semiskilled workers (z-scored).

The second component measured whether groups of workers have influence over six policies such as work methods and task assignments, purchasing new tools, and safety and health policies (z-scored). The third component measured use of teams. It was the sum of 3 z-scored items: whether quality circles or similar groups were present, the proportion of employees in such groups, and whether the groups met on company time.

A one-item index measured whether at least one group of workers had completed a full cycle of a formalized improvement process such as the Plan-Do-Check-Act cycle of Deming.

Finally, an index of whether managers report listening to employees was the sum of three attitude questions: "Each year we expect our shop workers to make substantial improvements in their own method of operations," Our plant's performance depends crucially on the active cooperation of our unskilled and semi-skilled workers," and "We frequently ask workers at our plant to help us in ways not specified in their job description. These were coded 1 = strongly disagree and 5 = strongly agree.

Representative participation. The index of representative participation was the sum of two (z-scored) components. One measured whether joint labor-management committees and/or a union have influence over each of 6 policies, as listed in the direct influence scale. The second component was the sum of a dummy = 1 if labor-management committees existed and a dummy = 1 if such committees met on company time.

Supportive HR practices. We examined four supportive HR practices: grievance procedures, new pay practices, training, and employment security practices. Each subindex was z-scored.

The grievance subindex was the sum of a dummy for having a grievance procedure plus a dummy for having appeals to neutral arbitration.

The new pay practices was the sum of dummies for whether compensation plans for unskilled workers included company-wide profits sharing, gainsharing, team incentives, or skill-based pay exist.

The training index was the sum of z-scored (hours of formal + informal training of new hires) plus z-scored (hours of formal & informal training of workers with at least one year of experience.

The subindex of employment security practices was the sum of a dummy for agreement that the company has made a commitment to our regular work force that (1) "no layoffs will result from productivity increases" and (2) "there will be no layoffs unless there have also been pay cuts for management."

Summary Index. The summary "index of workplace transformation" was the sum of the above three components (z-scored): direct participation, representative participation, and HR policies.

The strength of this index is that it is derived from prior theory (Levine and Tyson, 1992). Because the questionnaire and this index were both constructed based on this theory and before the data were collected, this index avoids data mining. Moreover, the results can be expressed in a parsimonious fashion. The downside of this index is that it imposes strong functional form restrictions on the data; restrictions that are not in fact supported. Implicitly, this method assumes each sub-index is equally important and assumes they are substitutes; that is, a one standard deviation increase in training will have the same effect as a one standard deviation increase in the number of tasks that line workers perform.

Multiple subindices of employee involvement

Our second method enters the 3 main sub-indices independently. This test has most of the advantages of the theory-driven single index, yet relaxes the strong functional form restrictions of the single index. The downside of this method is that the indices are multi-collinear. Thus, individual coefficients are difficult to interpret.

Individual subindices of workplace practices

Our third method enters each of the 3 main sub-indices one at a time. In this method, each sub-index picks up the effects of all HR practices correlated with its presence. Thus, the coefficients capture the effect of workplace transformation more than any single practice. Given the measurement error of each practice, the coefficients are presumably biased down.

Cluster analysis

Our final method, cluster analysis, permits the data to speak about how to reduce the dimensionality of workplace practices. Cluster analysis permits the data to create groups of similar workplaces. Dummies representing these clusters are then entered into the wage equation. The objective of cluster analysis is to find groups of workplaces with similar practices and, conversely, to maximize differences among clusters. Cluster analysis has been widely used in management and economic research to identify meaningful sub-groups of populations (Bearse 1997, Henriques 1999, Sarasvathy 1998). A meaningful set of clusters has low within-group variance and high between-group variance. For any given number of clusters, the centroid method of cluster analysis we use maximizes the ratio of within- to between-group variance on the 11 work index sub-indices described above. This method uses a Euclidean metric to evaluate the distance between clusters.

We performed the cluster analysis separately for the union and nonunion subgroups of employers. Reassuringly, when we performed the cluster analysis on the entire sample, it returned almost the same clusters as the analysis on the separate subsamples.

In cluster analysis one must choose the number of clusters, a problem with no single best solution. If the number of clusters is chosen appropriately, then when we add an additional clusters it will be near (in some metric) to the existing clusters. To turn this intuition into a statistical test, we followed the suggestion of Calinski and Harabasz (1974). They noted that if a cluster is distant from k-1 other clusters, then the k-1 logistic equation predicting cluster membership for each pair should have high explanatory power and a high P-value for the C-H index.

Thus, to choose the appropriate number of clusters, we started with 2 clusters per union and nonunion subgroup. We ran a logistic regression permitting 11 workplace practices to predict cluster membership. (We ran the regressions separately on the union and nonunion clusters.) We then performed the cluster analysis with 3 clusters per union and nonunion subgroup. We ran a logistic regression predicting cluster membership for each cluster, leading to 3 logits for each subgroup. We then took the geometric mean of the 3 P values per subgroup and compared it with

the P-value of the logit when we had only two clusters per subgroup. In both cases the mean P-value when we added the third cluster was smaller than the P-value of the logit with only two.

Baseline wage and turnover equations

Table 1 presents summary statistics.

All regressions control for the workforce's average age, percent male, and percent high school graduates. We include dummies for unionized plants and if the plant is located in Canada. We controlled for the regional price index [7], the log of employment, and the capital labor ratio[8]. The survey data also has an extensive set of controls for product and process characteristics; these were never significant so we stopped including them to preserve degrees of freedom.

The baseline wage regression (Table 2, col. 1) has the expected signs. Plants with a higher proportion of men, with a higher proportion of high school graduates, with an older workforce, with a union, and with more employees pay higher wages. Somewhat surprisingly, the regional price index is not statistically significant.

The baseline results on turnover are in Table 2, col. 4. Among the control variables, it is surprising that high education, but not union, %male or size, predicts low turnover. Most past research have found lower turnover among unionized workers, among female workers (when not controlling for their lower wages), and at larger workplaces.

Quantitative Results

Incidence

Table 3a presents regressions on the incidence of employee involvement. The index of direct employee involvement is higher in plants that were large, Canadian, had younger workers, and had more employees with a high school degree. Machines per worker and the proportion male or union of the workforce were not statistically significant (col 1).

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[7] For plants located in US metropolitan areas, we used the American Chamber of Commerce Researchers Association Cost of Living Index ; for plants outside US metropolitan areas, we used the mean for non-metropolitan areas; for Canadian plants, we used purchasing-power parity estimates. For more detail, see Helper and Parkin, 1995. We are grateful to Richard Parkin for calculating these numbers.

[8]While most capital-labor ratios use the value of capital, we measure the number of machines per production worker.

The various subindices of employee involvement were positively correlated, as predicted by theories of complementarities (table 1b).

The Cluster Analysis

The cluster analysis also shows that high-involvement practices were correlated, supporting theories of complementarities (Table 3b). We performed the cluster analysis separately for union and non-union plants. (When we clustered on the pooled sample, the clusters came out quite similarly, with the data largely distinguishing the union and nonunion subsamples based on work practices (not including the union variable itself).) The union workplaces were more likely to have grievance procedures, had more representative participation, and lower level of nontraditional forms of incentive pay.

Within each of the union and nonunion subsamples, the workplaces clustered into two groups: one high on new work practices, the other low. The high-involvement cluster of unionized workplaces had statistically and economically significantly higher levels of direct employee influence, teamwork, and employment security. The high-involvement nonunion workplaces had higher levels of these measures (although the teamwork measure was not statistically significant) and were more likely to have been through a complete improvement cycle and frontline employees carried out more tasks.

The above results describe the differences in workplace practice that the cluster analysis used to define the clusters. It is important to know how these clusters differ along other dimensions. The clusters did not differ significantly on size, location, or the proportion of the workforce that was male or that had a high school degree. In the nonunion, but not the union, subsample, plants in the high-involvement cluster were a bit newer and had a slightly younger workforce. In short, the employers and employees in the high- and low-involvement clusters within each subsample were rather similar.

Robustness checks. When we added a third cluster per union or nonunion subsector, the third cluster was always small (fewer than 16 workplaces). Moreover, on substantive grounds the third cluster was intermediate in terms of both workplace practices and compensation. Thus, our results with cluster analysis are robust to alternative clustering techniques.

Workplace transformation and wages

The basic result of the paper is in Table 4, column 1. A one standard deviation rise in the summary index of workplace transformation predicts above-average wages of 3.5 percent. The effect is 1.5% larger (n.s.) in union firms. These results support hypothesis 1A (human capital theory, efficiency wages, and rent-sharing), but not hypothesis 1C (management by stress). If we examine compensation (wages + benefits) results are similar in magnitude, although statistically significant only for union employers (col. 2).

Similarly, we can analyze managers' reports of compensation relative to the local labor market (col. 3). A one standard deviation rise in the index of workplace transformation increases relative compensation about .2 points (significant only at the 7% level). A one point move is equal to changing from "about 4-9% higher" to "10-20% higher" than compensation received by all workers in the area; thus, a .2 point move corresponds perhaps a 2% move in wages -- not too far from the 3.5% estimated using in column 1.

Results with Less Aggregated Workplace Practices

We also examined which components (direct involvement, representative involvement, or supportive HR practices) drove the positive correlation with wages (Table 5). The index of direct involvement has the largest effect in nonunion workplaces, but no effect in union workplaces. The index of representative involvement, in contrast, has the largest effect in union workplaces, but no effect in nonunion workplaces.

Results with Clusters

In the union subsample the high-involvement cluster paid average production worker wages about 5.5% above the more traditional cluster; this gap was not significant (Table 3b). In the nonunion subsample the high-involvement cluster paid average production worker wages about 6.3% above the more traditional cluster ($P < .10$). For other variables, gaps in cell medians between EI and non-EI plants were bigger for union than non-union plants, but always had the same sign.

In the wage equation with standard controls, the high-involvement nonunion cluster paid average production worker wages almost nine percent above the more traditional nonunion cluster ($P < .01$), while the union high-involvement cluster paid average production worker wages about 4.5% above the more traditional union cluster (difference not significant, table 6, col. 1). These effects were slightly larger for compensation that for wages (col. 2), and smaller and not significant (although of the same sign) for the relative compensation measure (col. 3).

Results with individual HR practices

We also entered the HR practices individually into each regression. Each regression also contained the standard controls, and each practice was z-scored. (Results available on request.)

The individual HR practices usually were correlated with higher wages for unskilled workers; that is, 77% of the coefficients on individual HR practices were positive. The individual practices also had positive coefficients 85% of the time in predicting relative compensation. The individual HR practices also predicted lower turnover most (69%) of the time. There was no consistent pattern of larger or smaller effects at union workplaces, and the individual practices did not predict skilled workers' pay. In general, direct forms of involvement and skill (such as the number of tasks line workers performed) were more correlated than were supportive HR practices such as grievance protections or indirect involvement.

At the same time, most of the coefficients were not individually statistically significant; never more than 5 of the 13 were statistically significant and in the expected direction. Moreover, most of the coefficients were small. The median effect of a one standard deviation increase in a single HR measure was only 2% on unskilled workers' wages and .09 units of the relative wage measure, where 1 point is about 10% higher wages.

Overview of results on wages and workplace transformation

In short, the results paint a fairly consistent picture of a small but usually statistically significant effect of new workplace practices on wages or compensation. The results were robust to various measures of workplace transformation.[9] The results were less clear on whether the effects were larger or smaller in union workplaces.

Turnover and Workplace Transformation

With standard controls, turnover is estimated to be essentially uncorrelated with workplace practices (Table 4, col. 4). Thus, the turnover results do not support hypothesis 1B that specific human capital, rent-sharing or efficiency wages are the reason that high-involvement employers pay higher wages. These results also do not support the management-by-stress hypothesis that transformed workplaces are unsatisfactory workplaces with high turnover.

[9] In addition to the results presented here, we also found significant wages increases with employee involvement when EI was measured using factor analysis, and when worker suggestions were included as a measure of EI.

When we permit the 3 subindices to have different coefficients, we find that they are collectively useful in predicting higher turnover ($F = 2.8$, $P < .05$), although the coefficients are estimated imprecisely. The interactions with union are not statistically significant. A positive relation between turnover and employee involvement is inconsistent with theories of efficiency wages, rentsharing, or specific human capital, and supports theories of management by stress.

Disentangling (some of) the Theories

Human Capital Theory

The theory of human capital suggests that any apparent relation between wages and employee involvement is actually due to the relation between wages and employee skill. Our composite measure of workplace transformation, then, is picking up skills in two fashions. Most directly, a measure of training (hours of training received last year per worker) is included in the index. Moreover, human capital theory interprets many of the employee involvement practices as examples of using higher skills; for example, when frontline workers solve problems or perform maintenance.

We find no strong support for the predictions of human capital theory. First, in contrast to hypothesis *HumanCapitalA*, our measure of frontline employee involvement is almost uncorrelated with our measure of training (Table 7, col. 1).

We also find no support for the hypothesis that controlling for training largely eliminates the relation between employee involvement and wages (*HumanCapitalB*, Table 7, col. 2). Specifically, adding training to the wage equation that contains the index of direct employee involvement does not move the coefficient on the latter by an economically or statistically significant amount, while the coefficient of training on wages is small and not significant. This result also casts doubt on the turnover cost version of efficiency wages as driving the higher wages of high-involvement plants (*TurnoverCostA*).

Finally, as noted above, employee involvement does not predict lower turnover; thus, we were unable to test hypothesis *HumanCapitalC* that controlling for training would largely eliminate the relation between employee involvement and turnover.

Compensating Differences

When we added measures of supportive human-resource practices to our regressions, we found that the coefficient on our measures of employee involvement changed very little in the wage

equation, contradicting the compensating differences theory's prediction that adding bonuses or a no-layoff policy would reduce wages. (See table 5a.)

Efficiency Wages

Consistent with efficiency wage theories, wages that are high relative to the local price level or to the region predict low turnover (*EfficiencyWageA*, Table 7, col. 2). A 32 percent rise in the plant average compensation for unskilled employees (1 standard deviation) reduces turnover by about 3 percentage points per year. This effect is about half the mean or a third of the standard deviation of turnover rates across plants.

In addition, we found that firms with more supervisors/worker had both lower wages and less employee involvement. This result is consistent with both gift-exchange versions of efficiency wages (e.g., workers feel management trusts them more if there are fewer supervisors, making workers more willing to provide the 'gift' of involvement), and with monitoring-cost arguments (a higher cost of job loss is a substitute for supervisors in generating effort). (See table 7.)

We further investigated the gift-exchange hypothesis by using a two-item measure of managers' perception of employee loyalty: If managers report that workers might take unfair advantage of management, and if workers sometimes feel reluctant to share their ideas. Consistent with gift exchange theory, employers with more loyal employees (as perceived by the employer) had more employee involvement. A one standard deviation rise in perceived employee loyalty predicted 10% higher direct employee involvement (results available on request; standard controls were included).

This measure of gift exchange does not appear to drive the wage-involvement correlation. Including the two-item index of loyalty in the wage equation had no effect on the index of direct employee involvement's coefficient on wages (results available on request). Thus, we have support for hypothesis *GiftExchangeA*, but not hypothesis *GiftExchangeB*.

Inconsistent with efficiency wage theories, employee involvement does not predict low turnover, so there is no relationship for wages to mediate (contradicting *EfficiencyWageB*). However, more training does predict marginally lower turnover. Consistent with *EfficiencyWageB*, this training effect goes away when wages are controlled for (table 7, column 3).

Incentives and Complementarity

Consistent with hypothesis *IncentiveA*, pay practices such as gainsharing and profitsharing were more common in plants with higher levels of employee involvement. In a noncausal regression, a one standard deviation higher use of new pay practices predicted .11 higher standard deviations on the index of direct employee involvement. (Standard controls, results available upon request.)

Also consistent with the theory of complementarity and the need for employee incentives, high involvement plants had policies limiting layoffs due to employee suggestions (hypothesis *IncentivesB*). The cluster analyses also found that high-involvement plants had above-average employment security and new pay practices (Table 3b).

Management by Stress

As noted above, we did not find support for the predictions of management-by-stress theorists that wages at plants with employee involvement would be lower. However, we did find some support for the management by stress view that union participation is important for workers to win high wages at unionized plants. In union plants, wages rise only if the plant has high representative involvement; and effect of direct involvement alone on wages was negative (and in some specifications, significant) for union plants. In nonunion plants, workers did receive higher wages if they had direct involvement, but not enough to overcome the union-nonunion pay gap. (See table 5, first three panels.)

Plant Survival and Employment Change

We had two measures of employment growth, the indicator variable for plant survival between 1992 and 1999, and the percent change in employment.

The odds of plant closure were essentially identical for the union high- and low-involvement clusters and for the non-union high-involvement cluster, ranging from 16 to 18 percent (differences not significant). In contrast, only 9 percent of the non-union low-involvement cluster were out of business (different from the other 3 clusters at $P < .01$).

The median employment rise (coding plant closure as a very large decline) was 24% at the low-involvement nonunion cluster, which was statistically significantly different from the 9% rise at high-involvement nonunion cluster. Both were statistically significantly higher than the near-zero median change at the two union clusters.

These results suggest high-involvement workplaces do not save jobs at U.S. auto suppliers, consistent with hypothesis *SurvivalB* and contradicting hypothesis *Surviva1A*. There is suggestive (but not always statistically significant) evidence they might predict slower job growth and/or more plant closings.

We found partial support for *ThresholdA*, in that plants with intensive employee-involvement programs[10] had significantly higher employment gains (26%) than plants without any EI, conditional on still being in business. However, in the full sample (with plants which went out of business coded as having 1999 employment of zero), intensive EI was associated with a large, though not statistically significant, decline. (See table 8.)

One possible explanation for slower employment growth at high-involvement plants is that employee involvement raises productivity, but that product demand is inelastic so labor demand declines. In this scenario employee involvement should predict fewer plant closings, even if lower employment growth. In fact, the data do not exhibit this pattern.

Alternatively, plants that faced financial difficulties in 1992 may have been more likely to adopt more employee involvement, but the benefits of employee involvement did not out-weigh the bad conditions that led to its adoption. Again, the data are not consistent with this interpretation: Managers in high-involvement plants were less, not more, likely to report their plants had had layoffs or downsizing in the preceding four years than were managers at low-involvement plants (results available on request).

Qualitative Evidence: The Quasi-Natural Experiment

As the above section showed, employee involvement is correlated with higher wages. What we would really like to know is if a random plant adopts employee involvement, will wages rise? Our OLS regression results do not necessarily shed light on this question, because the determinants of adoption of employee involvement may be correlated with the determinants of employee involvement's effect on wages (Athey and Stern, 1997).

[10] Intensive employee involvement is set equal to 1 if the firm is in the top third on our scale of direct involvement and in the top half on our human resources and representative involvement scales. Since union and nonunion plants differ dramatically in their values on representative involvement, we scaled them separately on this measure.

By directly observing firms both before and after they introduced employee involvement, we can gain some insight into the causal processes that might link the two. We learned during visits made for other reasons that the plant below was about to change its employee involvement policy. In the course of writing this paper, we made arrangements to visit them again, without knowing what the outcome of the policies had been. (The semi-structured interviews we used for this portion of the research, written before we made our second visit, is available from the authors). This design reduces the sample-selection problems endemic to case-study research.

We wanted to find a plant that changed its employee involvement policies, and then look at what happened to its wages. In 1996, Helper visited Forest City Technologies in the course of a project on pollution prevention. This firm's four plants are located in the small town of Wellington, Ohio, which is about one hour south of Cleveland. The firm was established in 1956, and has grown steadily since. It remains non-union. In 1996, the firm had 450 employees, almost 1/3 more than it had in 1992.

A large part of this firm's operation involves putting anti-corrosion and other types of coatings onto fasteners used in automotive engines. The business is highly competitive; our interviewees complained of 'Gestapo-like tactics' on the part of their customers to depress prices. The firm makes about 200 products, which it supplies to dozens of customers. Although the firm has some contracts that go for 'years and years', much of the business is done on a short-term basis with no contracts; if a customer sends a batch of parts to be coated, there is no guarantee of if or when it will send another one.

The core of Forest City's process is getting many small, oddly shaped parts, as fasteners are wont to be, into some kind of mold, mount, or convenient position in which to apply a coating en masse. Forest City's competitive advantage appeared to lie in having engineers who could design ever more clever jigs, fixtures, and leads to orient the parts quickly and precisely so that the coating can be applied by machine rather than by hand. In 1996, there were five coating processes at Forest City of which we saw three in detail.

All processes are intensive in the use of relatively unskilled labor; on average direct labor accounts for 55% of costs. The operators were paid on average $8 per hour (about average for the area); training for most jobs consisted of watching someone else do the process for a while. However, the nature of work appeared to vary a fair amount across processes.

In one area, the fasteners were painted with a thin strip of sealant coating, which had to go in a precise location. The firms' engineers had figured out how to use tumblers (big bowls of parts that are jiggled by an electric motor underneath) to orient the small parts so that the coating can be applied by machine rather than by hand. The operators' job is to watch the parts coming out of the machine, to remove any that are defective, and to call a skilled maintenance worker if the machine stops running. In practice, the operator cannot check every part, because the parts come off of the machine very quickly (and also the work quickly induces boredom, as could readily be observed on the operators' faces). If quality is very important (as in an airbag part, for example), extra inspectors are added.

In contrast, in the rubber coating area (known in the plant as "shake and bake"), the operators paced themselves. They placed small rubber gaskets on trays with cavities (like a muffin pan with holes for many tiny muffins), and then switched on a vibrating mechanism to get the gaskets to fall into the holes. After putting a few gaskets in holes by hand, the operator puts another tray with similar cavities on top, and then places them in the oven to bake. When they come out of the oven, she visually inspects them and packs them into shipping containers to be sent to the customer. The pace was not particularly onerous, and relations with management seemed quite friendly. (As we stood there watching, the manager who was leading us around started to help the operator orient the parts, completely without fanfare--just that he was standing there, so he might as well help out. This was the only case of a manager performing such assistance we observed on our plant visits.)

Forest City had started a suggestion program in late 1992, but it seemed moribund in 1996. Operators were not expected to contribute suggestions for improvement, and typically did not stay more than a year or two. Particularly in the painted sealant area, there seemed to be unrealized potential for involving operators. For example, these operators spent all day watching how the parts came out of the tumblers and into the feeder trays; if asked, they might well have been able to make suggestions about the circumstances under which misalignments or other defects are likely to occur. There was no quality circle program either in 1992 or 1996.

The firm's management agreed there was untapped potential. In a 1993 survey, the firm's marketing director listed "increasing employee involvement" as "extremely important." (Interestingly, he also listed "moderating the growth of wages and benefits" as "very important.") At the time of our visit in summer 1996, the firm was in the early stages of implementing an

employee empowerment program called the "5-point star" program developed by Dimensions International, a Pittsburgh consulting firm. The drive to do this was spearheaded by the human resources manager.

In cooperation with the consulting firm, Forest City identified five functions of supervisors; the plan was to devolve these among work teams of about five people each. When a worker took over an additional function, they earned wage incentives; in addition there was profit-sharing and seniority bonuses. To explain the system to employees (and to demonstrate why their income would now fluctuate with the business cycle) financial information had just begun to be posted in the lunchroom.

We interviewed the human resource vice-president again in July 1999. The base wage had risen slightly, to $8.85 per hour. But the pay-for-knowledge system had raised wages significantly, in two ways. The first was a direct outcome of the program; workers could get up to $12.10 per hour for having all five star points and doing well on a subjective evaluation. About 60% of workers had earned at least one star point, and the average wage had increased to $10 per hour, well above the rate of inflation. (Note that this increase was not a foregone conclusion; if the pay-for-knowledge system existed but workers did not get certified, there would be no pay increase.)

A second source of wage increase was a bonus system based on firm performance. The bonus had ranged from $1500-2000 per year, 7 to 10 percent of average straight-time earnings. The HR manager felt that the profit increase was due in substantial part to the employee involvement system. The evidence for this assertion was indirect: individual tasks done by operators acting as star points were cheaper (and higher quality) than when done by supervisors; turnover was down, particularly among those who had been at the plant 2-3 years; employment at the firm had continued to increase (to 515); and the plant managers had changed from serious skepticism about the program to enthusiastic support of it.

Discussion and Conclusion

After qualitative results from dozens of plant visits and quantitative results from almost a dozen tables, what have we learned?

The preponderance of evidence suggests that involvement raises wages for blue-collar workers. This evidence is broadly consistent with theories of human capital, efficiency wages, incentives, and rent-sharing. We also found that managers usually implemented these programs in

ways that were consistent with economists' notions of incentives and complementarity, since firms with more involvement tended also to have more employment security and contingent pay.

We had less success uncovering the drivers of the wage-involvement relationship. As discussed below, we found the most support for efficiency wage notions, and no support for hypotheses based on compensating differences.

Consistent with efficiency-wage theories, firms with more supervisors/worker had both lower wages and less employee involvement. This result is consistent with both gift-exchange versions of efficiency wages where workers feel management trusts them more if there are fewer supervisors, and with monitoring-cost arguments where a combination of higher wages and employee self-policing is a substitute for supervisors. We also found evidence that paying a higher wage helps managers to protect an investment in training. In our field work, we found much evidence that workers viewed participation in employee involvement programs as a form of gift exchange with management. This finding was echoed in our regressions, in the sense that workforces that managers perceived to be loyal participated more. However, we did not find statistical support for the hypothesis that this loyalty-mediated participation explains higher wages.

We found qualitative support for human-capital hypotheses that involvement leads to higher wages because it requires higher skill, particularly in our quasi-experiment, in which management believed that training was crucial for the successful delegation of supervisory tasks to workers. We found modest quantitative support, in that plants with more involvement have a higher percentage of high-school graduates in their workforces. However, we found no correlation between employee involvement and training in the data.

We found almost no support, either quantitative or qualitative, for the compensating differences idea that involvement leads to higher wages because it requires more effort or more onerous effort than production work. In our field work, we found that workers did not consider some types of employee involvement (participation in problem-solving) to be onerous, while introduction of the types of involvement they did find onerous (additional tasks to be done on the line) were not typically associated with increased compensation. In our quantitative work, we did not find that plants that introduced additional forms of compensation (such as protection from layoffs) paid lower wages.

In our fieldwork, we found a number of workplaces that seemed to be run according to 'management by stress' principles, where introduction of employee involvement led to workers'

knowledge being used against them, to speed up their work and to facilitate the start-up of rival, lower-wage plants. But (perhaps not surprisingly in a survey filled out by managers) we did not find direct support for the theory in our data.

We did find indirect support, however, for the idea, common to rent-sharing and management by stress theories, that union participation in employee involvement programs increases their benefits to workers. Different aspects of employee involvement lead to wage increases in union and non-union plants. In union plants, wages rise only if the plant has high representative involvement; the effect of direct involvement on wages was negative (and in some specifications, significant). In nonunion plants, workers did receive higher wages if they had direct involvement, but not enough to overcome the union-nonunion pay gap.

While we found consistent evidence that employee involvement leads to higher pay, we found that involvement has a knife-edge character with respect to plant survival. The preponderance of evidence suggests involvement reduces employment, largely because of the positive correlation between employee involvement and plant closure. This evidence is consistent with employee involvement raising employees' bargaining power. It is also consistent with the possibility that typical employee involvement plans are poorly implemented, even though best-practice plans can improve organizational performance. A story that is consistent with our evidence would be the following:

Many firms adopted employee involvement in the early 1990s as part of a fad, one that had low costs, but also low benefits. However, some firms adopted the programs quite intensively. These plants saw significant increases in fixed costs. These costs included large expenditures of money for training, and of management time for responding to fears about what the program would mean, participating in quality-circle meetings, responding to suggestions, etc. (These expenditures were so large that the program had negative effects on Forest City's performance in its first two years, according to the human-resources vice president, who championed the program.) In addition, complementary human resource policies such as no-layoff policies make labor a quasi-fixed factor. Even if employee involvement on average produces performance improvements that outweigh these costs, a liquidity-constrained firm can still go bankrupt if demand shrinks enough so that the firm cannot pay its higher fixed costs.

The auto supplier industry is characterized by such severe competitive conditions. For example, 40% of plants in the database had laid off at least 10% of their workforces in the 4 years

prior to the survey, and these were all plants that had survived long enough to be surveyed. Thus, higher death rates due to higher fixed costs were quite possible, even if productivity and quality were rising. However, if a firm managed to avoid such bad luck, substituting the higher fixed costs of employee involvement for lower variable costs (due to less scrap, and more efficient material and labor usage due to worker suggestions) could be quite profitable, leading the plant to expand.

Our results are still preliminary. One set of problems concerns the internal validity of the quantitative results. Modest changes in specification sometimes changed results (or, more commonly, their statistical significance). For example, results often depended on whether we pooled subindices into a single index. The causal connection between adoption of new workplace practices and organizational performance is also in doubt. However, we do not find much support for the theory that desperate plants adopt employee involvement and then still go out of business[11].

An additional set of problems concerns the external validity of the quantitative results. Most of our hypotheses received some qualitative support. Nevertheless, few of the hypotheses received much support from the quantitative data, in part due to modest sample sizes, high measurement error, and low precision of estimates. Many of our measures look at the existence of programs, rather than the thoroughness or consistency of their implementation, leading probably to particularly high measurement error.[12] In future analysis, we can control for these effects more

[11] We have an instrument that would allow us to separate managerial quality from plant outcomes, namely sales of the car model that they plant supplied parts for. However, given the above, we are not optimistic about its predictive power.

[12] One situation we encountered surprisingly often was workers feeling that management had reneged on promises, and withdrawing participation from the program. One would not expect such an employee involvement program (one with little actual involvement) to be very effective in improving firm performance enough to keep plants open. A prominent example of perceived reneging occurred at a large steel mill, where the United Steelworkers at the firm's Cleveland Works pulled out of all joint programs after management in 1995 announced participation in a nonunion joint venture to make steel in Alabama. Thousands of workers had lost their jobs at the facility over the preceding 15 years, and the union saw management's move as signaling a lack of commitment. "How can we be like family here if they're setting up a competing plant somewhere else?" asked one union official. They also felt that some of the profits being used to invest in the new plant had come from their hard work, and should be used to compensate them for sacrifices (e.g., wage cuts, layoffs, and increased work effort) in lean times. Managers did not see their behavior as reneging; they regarded the Alabama project as "another business venture," and did not see why the union should be concerned. For other examples of such incidents, see MacDuffie and Helper (1997, p.127); Helper (1998).

thoroughly, by separating out measures of the extent of participation in programs (such as numbers of suggestions received, and subjective assessments of program effectiveness) .

In general, we have more confidence in results that can be replicated using multiple methods. Correspondingly, we have less confidence in the largely negative results from the quantitative analysis here because many were not consistent with the qualitative data. One thing we have learned from our plant visits is that employee involvement programs are adopted in a dazzling variety of ways. In future work, we can link these insights more closely with the survey data, to better disentangle which types of programs have which types of effects.

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Table1: Summary Statistics

Control Variables	Mean	Median	Std Dev
Average age	35.80	35.00	6.42
Canada	0.14	0.00	0.34
% workforce with HS diploma	78.40	85.00	22.74
Log (employment)	5.30	5.35	1.02
Log (machines/prodn. workers)	-1.81	-1.70	1.06
% workforce male	59.37	60.00	23.85
Regional price index	1.04	1.05	0.09
Unionized shop workers	0.39	0.00	0.49
Indexes of workplace practices. All indices are z-scored. Moreover, each component is z-scored before summing.			
Improve = Employees have completed full cycle of improvement process	0.00	0.38	1.00
Direct employee influence= groups of workers have influence over each of 6 policies (work methods, safety, etc.)	0.00	0.30	1.00
Teams = z(QCs present) + z(%employees in teams) + z(teams meet on company time)	0.00	0.00	1.00
Tasks performed by semiskilled workers = z(Semiskilled do 5 operations such as arithmetic, writing; scoring daily = 1,.., rarely = 4) + z(Semiskilled do each of 8 tasks such as set up machines, inspect work in progress)	0.00	0.00	1.00
Managers report that employees do improvements, managers depend on employees, and managers ask workers for help (1=strongly agree, 5=strongly disagree)	0.00	0.17	1.00
Index of Direct involvement = Sum of above	0.00	0.14	1.00
Committees = Labor-mgt committee exists + committee meets on company time	0.00	0.70	1.00
Representative employee influence = committees & union have influence over each of 6 policies (work methods, safety, etc.)	0.00	-0.42	1.00
Index of Representative involvement = Sum of above	0.00	-0.08	1.00
Employment security = no layoffs from productivity + none w/o mgt. pay cuts	0.00	-0.93	1.00
Index of grievance plans = a formal grievance plan exists + highest level is outside arbitrator	0.00	0.08	1.00
Company-wide profitsharing, gainsharing or team incentives or skill-based pay exist	0.00	0.27	1.00
Training = hours of formal training + hours of informal training, measured separately for new hires and for current hourly employees	0.00	-0.06	1.00
Index of supportive HR practices = Sum of above	0.00	-0.09	1.00
Index of Workplace Transformation = Sum of direct involvement, representative involvement and supportive HR practices	0.00	-0.03	1.00

Outcomes			
Log(Unskilled compensation)	2.53	2.51	0.32
Log(Unskilled wages)	2.25	2.21	0.29
Relative Compensation (1 : much lower, 7 : much higher than local labor market)	4.70	4.00	1.37
Annual %turnover	6.31	3.00	8.81
%change in employment 1992 to 1999 (if still in business)	0.18	0.17	0.70
%change in employment 1992 to 1999 (including plants that went out of business)	-0.13	-0.13	0.36
Out of business by 1999	0.15	0.00	0.36

Table 2: Baseline Wage Equations

	1 Ln (Unskilled Wages)			2 Ln (Unskilled Comp.)			3 Relative Compensation		
	B		**SE**	**B**		**SE**	**B**		**SE**
(Constant)	0.859	**	0.182	0.968	**	0.212	1.266		1.213
Average age	0.010	**	0.002	0.012	**	0.002	0.034	*	0.013
Canada	0.361	**	0.039	0.295	**	0.045	-0.039		0.252
% workforce with HS diploma	0.002	**	0.001	0.002	**	0.001	0.006		0.004
Log (employment)	0.069	**	0.013	0.085	**	0.015	0.314	**	0.084
Log (machines/prodn. workers)	0.007		0.012	0.004		0.014	0.063		0.078
% workforce male	0.004		0.000	0.004	**	0.001	0.008	*	0.003
Regional price index	0.216		0.132	0.198		0.153	-0.395		0.890
Unionized shop workers	0.116	**	0.026	0.142	**	0.030	0.281		0.171
R^2	***0.497***			***0.449***			***0.139***		

Table 3a: Incidence of Direct Employee Involvement

Dependent Variable = Direct Employee Involvement (z)

	1			2			3			4		
	B		**SE**	**B**		**SE**	**B**		**SE**	**B**		**SE**
(Constant)	-0.700		0.860	-0.730		0.858	-0.523		0.842	-0.288		0.81
Average age	-0.024	**	0.009	-0.023	*	0.009	-0.023	**	0.009	-0.024	**	0.00
Canada	0.441	*	0.176	0.428	*	0.176	0.461	**	0.173	0.371	**	0.16
% workforce with HS diploma	0.006	*	0.003	0.005		0.003	0.005		0.003	0.004		0.00
Log (employment)	0.240	**	0.060	0.239	**	0.060	0.234	**	0.059	0.197	**	0.05
Log (machines/prodn. workers)	-0.017		0.056	-0.018		0.056	-0.004		0.055	0.003		0.05
% workforce male	-0.001		0.002	-0.001		0.002	-0.002		0.002	-0.003		0.00
Regional price index	-0.098		0.625	-0.054		0.624	0.018		0.617	0.116		0.59
Unionized shop workers	-0.092		0.120	-0.108		0.121	-0.064		0.118	-0.420	**	0.12
Index of Training (z)				0.080		0.054						
Index of Employment Security (z)							**-0.01485**		**0.10774**			
Previous * union							**0.215**	**	**0.06655**			
Supportive HR practices (z)										**0.259**	**	**0.05**
Previous * union												
Representative employee involvement (z)										**0.219**	**	**0.05**
Previous * union												
R^2	***0.109***			***0.102***			***0.14466***			***0.213***		
F test on **bold coefficients**							8.014083		**	22.623	**	

Table 3b: Cluster Analysis of the Plants											I : I
											II
											III : Lc
Cluster name	Union & High Involvement			Union & Low Involvement			Nonunion & High Involvement			Nonunio Involv	
	Mean	**Median**	**Std Dev**	**Mean**	**Median**	**Std Dev**	**Mean**	**Median**	**Std Dev**	**Mean**	**Median**
Variables used to create the clusters											
Index of Committee Existence (z)	0.37	0.70	0.62	0.08	0.70	1.04	-0.10	0.00	0.96	-0.27	0
Index of Direct Involvement (z)	0.60	0.53	0.49	-0.96	-0.79	0.72	0.67	0.65	0.52	-1.05	-0
Index of Job Security (z)	0.03	0.78	0.92	-0.27	-0.93	1.00	0.22	0.78	1.01	-0.12	-0
Index of Grievance Plans (z)	0.92	1.24	0.60	0.87	1.24	0.61	-0.45	-1.08	0.83	-0.77	-1
Supportive HR Practices (z)	0.46	0.42	1.08	0.11	0.04	0.83	0.05	-0.04	0.94	-0.50	-0
Index of Improvement Process (z)	0.22	0.38	0.67	-0.25	0.38	1.23	0.34	0.38	0.33	-0.66	0
Workplace Transformation (z)	0.92	0.91	0.80	-0.34	-0.34	0.73	0.19	0.19	0.74	-1.03	-0
Index of Worker Group Influence over 6 Policies (z)	0.71	0.90	0.74	-0.69	-0.89	0.80	0.48	0.30	0.70	-0.87	-0
Index of Committee & Union Influence over 6 Policies (z)	1.03	0.82	1.16	0.20	-0.01	0.89	-0.32	-0.83	0.68	-0.56	-0
Index of Improvement through Listening (z)	0.33	0.17	0.73	-0.82	-0.97	0.95	0.44	0.74	0.72	-0.48	-0
Index of New Pay Practices (z)	-0.23	0.27	0.89	-0.26	-1.02	0.90	0.34	0.27	1.07	-0.07	0
Index of Representative Involvement (z)	0.90	0.92	0.91	0.18	0.18	0.94	-0.27	-0.08	0.86	-0.53	-0
Index of Tasks Performed by Semiskilled Workers (z)	0.41	0.34	0.69	-0.59	-0.38	0.84	0.40	0.34	0.86	-0.67	-0
Index of Use of Teams (z)	0.10	0.00	0.70	-0.41	0.00	1.09	0.33	0.44	0.67	-0.36	0
Index of Training (z)	0.18	0.00	1.35	-0.12	-0.04	0.61	-0.01	-0.06	0.61	-0.05	-0
Relation of Clusters with Other Variables											
Average age	38.33	39.00	6.36	38.86	38.50	6.52	33.18	33.00	5.70	35.28	35
Canada	0.19	0.00	0.40	0.24	0.00	0.43	0.09	0.00	0.29	0.08	0
% workforce with HS diploma	78.69	85.00	20.03	70.14	80.00	26.08	81.11	90.00	23.61	79.65	80
Log (employment)	5.60	5.53	0.83	5.38	5.55	1.02	5.30	5.33	0.96	4.86	4
Log (machines/ prodn. workers)	-1.89	-1.83	1.13	-2.02	-1.77	1.07	-1.81	-1.70	1.06	-1.48	-1
% workforce male	62.87	65.00	24.36	62.82	65.00	26.73	55.64	55.00	22.23	60.46	60
Regional price index	1.05	1.07	0.08	1.06	1.09	0.08	1.04	1.01	0.09	1.04	1
Log (compensation of skilled)	2.96	2.94	0.27	2.89	2.87	0.36	2.82	2.84	0.22	2.75	2
Log (wages of skilled)	2.65	2.64	0.24	2.60	2.64	0.35	2.55	2.56	0.21	2.50	2
Log (compensation of unskilled)	2.71	2.69	0.31	2.65	2.63	0.36	2.46	2.43	0.25	2.39	2
Log (wages of unskilled)	2.40	2.38	0.28	2.36	2.33	0.34	2.19	2.16	0.24	2.14	2
Relative compensation	5.07	5.00	1.51	4.76	4.50	1.23	4.63	4.00	1.31	4.39	4
Labor turnover rate	5.21	2.00	8.62	3.82	2.00	5.23	7.36	4.00	10.19	7.44	5
Log (total # employees 1999 / total # employees 1992)[1]	0.07	0.11	0.54	0.05	0.11	0.70	0.21	0.19	0.62	0.35	0
Log (total # employees 1999 / total # employees 1992)[2]		0.04			0.03			0.13			0

OOB (= 1 if plant closed between 1992 and 1999)	0.17	0.00	0.38	0.18	0.00	0.39	0.16	0.00	0.37	0.09	0
Number of firms in cluster	98			78			173			95	

[1] Conditional on still in business in 1999.

[2] Employment equals negative infinity for firms that shut down; thus, only the median is well defined

Table 4: The Effect of the Summary Index on Wages & Turnover

	1 **Ln(Unskilled Wages)**			2 **Ln(Unskilled Comp.)**			3 **Relative Compensation**		
	B		**SE**	**B**		**SE**	**B**		**S**
(Constant)	0.909	**	0.180	1.030	**	0.209	1.507		1.
Average age	0.010	**	0.002	0.012	**	0.002	0.034	**	0.
Canada	0.347	**	0.038	0.281	**	0.045	-0.124		0.
% workforce with HS diploma	0.002	**	0.001	0.002	**	0.001	0.005		0.
Log (employment)	0.061	**	0.013	0.076	**	0.015	0.271	**	0.
Log (machines/prodn. Workers)	0.009		0.012	0.007		0.014	0.073		0.
% workforce male	0.004	**	0.000	0.004	**	0.001	0.007	*	0.
Regional price index	0.240		0.129	0.227		0.150	-0.188		0.
Unionized shop workers	0.089	**	0.026	0.109	**	0.031	0.130		0.
Workplace transformation (z) * Union	0.015		0.023	0.036		0.027	0.077		0.
Workplace transformation (z)	0.035	*	0.015	0.032		0.018	0.189		0.
R^2	***0.517***			***0.473***			***0.162***		
F-Test of Workplace Transformation Index & its interaction with Union	6.56	**		7.12			4.06	*	

Table 5: The effect of Subindices on Wages
All regression include the baseline controls from Table 3.

Dependent variable = Log(compensation of unskilled workers)

	B	SE	B	SE	B	SE
Unionized shop workers	0.123	* 0.031	0.148	* 0.029	0.113	* 0.032
Supportive HR practices (z) * Union	0.040	0.028				
Supportive HR practices (z)	0.008	0.018				
Direct employee involvement (z) * Union			-0.019	0.027		
Direct employee involvement (z)			0.055	* 0.017		
Representative employee involvement (z) * Union					0.071	* 0.028
Representative employee involvement (z)					-0.008	0.019
R^2	###		###		###	

Dependent variable = Log(wages of unskilled workers)

	B	SE	B	SE	B	SE
Unionized shop workers	0.100	* 0.026	0.121	* 0.025	0.113	* 0.032
Supportive HR practices (z) * Union	0.025	0.286				
Supportive HR practices (z)	0.014	0.389				
Direct employee involvement (z) * Union			-0.057	0.162		
Direct employee involvement (z)			0.022	* 0.010		
Representative employee involvement (z) * Union					0.049	* 0.024
Representative employee involvement (z)					-0.001	0.016
R^2	###		###		###	

Dependent variable = Relative compensation (1 to 7 scale)

	B	SE	B	SE	B	SE
Unionized shop workers	0.236	0.178	0.301	0.170	0.164	0.185
Supportive HR practices (z) * Union	-0.027	0.158				
Supportive HR practices (z)	0.138	0.104				
Direct employee involvement (z) * Union			-0.019	0.027		
Direct employee involvement (z)			0.055	* 0.017		
Representative employee involvement (z) * Union					0.252	0.158
Representative employee involvement (z)					-0.003	0.110

R^2	### #	### #	### #

Dependent variable = Employee Turnover

	B	SE	B	SE	B	SE	B	SE	B	SE
Unionized shop workers	-1.142	1.205	-1.288	1.187	-1.410	1.140				
Supportive HR practices (z) * Union	-0.004	1.049							**0.014**	### #
Supportive HR practices (z)	-0.338	0.698					### #	### #	0.080	0.111
Direct employee involvement (z) * Union			0.090	1.062					### #	### #
Direct employee involvement (z)			-0.206	0.707			### #	* ### #	0.202	0.104
Representative employee involvement (z) * Union					1.104	1.053			**0.280**	### #
Representative employee involvement (z)					-0.887	0.660	### #	### #	-0.042	0.111
Union & Low Involvement										
Union & High Involvement										
Nonunion & Low Involvement										
R^2	### #		### #		### #		***0.2***		### #	
F test on **bold coefficients**							2.07		1.014	

Note: All regressions controlled for workforce average age, a dummy for Canada, the % workforce with a high school diploma, Log (employment), Log (machines/prodn. workers), the % workforce male, and the regional price index.

Table 5a: The Effect of Supportive HR practices on Wages

All regressions include the baseline controls from Table 3.

Dependent variable= Log (wages of unskilled workers)

		B		SE	B		SE
unionized shop workers	0.101	**	0.028		0.107	**	0.028
direct employee involvement (z)	0.050	**	0.014		0.051	**	0.015
Representative employee involvement	-0.009			0.016	-0.011		0.016
union*representative employee inv.	0.059	**	0.025		0.062	**	0.024
union* direct	-0.053	**	0.024		-0.060	**	0.024
contingent pay (z)					-0.019		0.014
employment security (z)					0.019		0.015
union* contingent pay					0.056	**	0.025
union* employment security					0.003		0.023
R-squared	0.516				0.529		

Table 6: The Effects of Clusters on Wages

	Log (unskilled wages)			Log (unskilled comp.)			Relative compensati		
	B		**SE**	**B**		**SE**	**B**		
(Constant)	0.896	**	0.181	1.011	**	0.210	1.349		1
Average age	0.011	**	0.002	0.013	**	0.002	0.036	**	0
Canada	0.354	**	0.038	0.288	**	0.044	-0.063		0
% workforce with HS diploma	0.002	**	0.001	0.002	**	0.001	0.006		0
Log (employment)	0.062	**	0.013	0.076	**	0.015	0.287	**	0
Log (machines/prodn. workers)	0.006		0.012	0.003		0.014	0.059		0
% workforce male	0.004	**	0.000	0.004	**	0.001	0.008	*	0
Regional price index	0.219		0.130	0.204		0.151	-0.307		0
Union & Low Involvement	0.059	*	0.035	0.066		0.041	-0.035		0
Union & High Involvement	0.103	**	0.036	0.132	**	0.042	0.321		0
Nonunion & Low Involvement	-0.089	**	0.031	-0.107	**	0.036	-0.301		0
R^2	***0.512***			***0.468***			***0.151***		

Table 7: Efficiency Wage Tests

Whole sample	1						2						3.000
	Direct employee involvement (z)						**Ln (Unskilled Wages)**						
	B		**SE**	**B**		**SE**	**B**		**SE**	**B**		**SE**	
UNION	-0.041		0.120	-0.089		0.121	0.118	**	0.026	0.119	**	0.025	
Zscore(TRAIN)	0.081		0.049				0.005		0.011				
Zscore(DIRECT)							0.026	**	0.013				
supervisors/worker				-1.180	**	0.476				-0.249	**	0.098	
R²	***0.367***			***0.120***			*0.389*			0.510			

Sample of firms recent hiring

	Direct employee involvement (z)						**Ln (Unskilled Wages)**						**Turnover**	
	B		**SE**	**B**		**SE**	**B**		**SE**	**B**		**SE**	**B**	
UNION	-0.782	**	0.309	-0.003		0.135	0.132	*	0.072	0.112	**	0.028	-0.446	1.3
Zscore(TRAIN)	0.285		0.622				-0.004		0.061				-0.879	0.5
Zscore(DIRECT)							0.009		0.036					
supervisors/worker				-0.954	*	0.515				-0.211	**	0.028		
R²	***0.272***			***0.120***			***0.581***			***####***			***0.101***	

Note: All regressions controlled for workforce average age, a dummy for Canada,
the % workforce with a high school diploma, Log (employment),
Log (machines/ prodn. workers), the % workforce male,
and the regional price index

Table 8: Threshold Effects of Employee Involvement on Employment Growth, 1993-99

	Full Sample (N=454)			Still in Business Sample (N=385)		
	B		**SE**	**B**		**SE**
(Constant)	0.221		2.211	0.069		1.072
Canada	1.017	**	0.465	0.533	**	0.249
Average age	0.008		0.024	0.021	*	0.012
% workforce with HS diploma	0.011	*	0.007	0.010	**	0.004
% workforce male	0.001		0.006	0.000		0.003
Regional price index	-2.022		1.509	-0.717		0.745
Unionized shop workers	-0.365		0.304	-0.359	**	0.166
Log (employment)	-0.032		0.152	-0.161	**	0.081
Log (machines/prodn.workers)	-0.053		0.149	-0.043		0.078
Index of Direct Involvement (z) * Union	0.384		0.263	0.150		0.139
Index of Direct Involvement	-0.196		0.169	-0.143	*	0.080
Intensive employee involvement	-0.444		0.283	0.259	*	0.149