HIGH-INVOLVEMENT WORK DESIGN AND JOB SATISFACTION

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Using data from the 1999–2002 Canadian Workplace and Employee Survey, the authors investigate the relationship between job satisfaction and high-involvement work practices such as quality circles, feedback, suggestion programs, and task teams. They consider the direction of causality, identifying both reasons that work practices might affect job satisfaction, and reasons that satisfaction might affect participation in high-involvement practices. They find that satisfaction was positively associated with high-involvement practices, a result that held across different specifications of the empirical model and different subsets of data. Conversely, worker outcomes that might signal dissatisfaction, like work-related stress or grievance filing, appear to have been unrelated to high-involvement jobs. However, the data suggest the presence of self-selection: satisfied workers were more likely to increase participation in high-involvement practices, but participation did not predict future increases in satisfaction.

Job satisfaction has important economic effects. Low job satisfaction is associated with higher rates of quitting (Freeman 1978; Gordon and Denisi 1995; Clark, Georgellis, and Sanfey 1998) and higher rates of absenteeism (Clegg 1983; Drago and Wooden 1992); high job satisfaction correlates with improved job performance (Judge et al. 2001b) and organizational citizenship behavior (Organ and Ryan 1995). Dissatisfaction therefore may result in higher labor costs and lower productivity.

This article studies the relationship between job satisfaction and high-involvement work design, which we define as the use of features like quality circles, feedback, suggestion programs, task teams, and job rotation.[1] The breadth of our data, which consist of approximately 25,000 observations spanning four years and every major Canadian industry, allows us to draw very general insights about the relationship between involvement and satisfaction. The data also allow us to check the robustness of our findings in particular subsets, like unionized workers, and to consider the relationship between involvement and a number of other worker outcomes, like absenteeism and self-reported stress. These additional variables may be indicators of dissatisfaction and therefore allow us to test, to some extent, how broad a range of satisfaction measures we can link to high-

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A data appendix with additional results, and copies of the computer programs used to generate the results presented in the paper, are available from the second author at Zoghi.Cindy@bls.gov.

[1]We use the term "high involvement" because it describes a range of management practices, designed to elicit greater input or involvement from workers in operational problem-solving, that are best observed in our data. The definition excludes complementary aspects of how work is organized, like training, pay schemes, and hiring. See Pil and MacDuffie (1996) for discussion and a more detailed definition.

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involvement work practices. Finally, because we use a data set that includes information from both employers and employees and follows both groups over time, we can control for a number of specific sources of bias, and look for evidence on the direction of causality.

We follow Weiss (2002:175) in defining job satisfaction as "an evaluative judgment one makes about one's job or job situation." To study the relationship between this judgment and high-involvement work design, we discuss reasons that high-involvement jobs might be associated with either increased or decreased job satisfaction. We also consider the direction of causality. In other words, both our discussion of theory and our empirical analysis highlight reasons that work practices might affect job satisfaction, but also consider the possibility that satisfaction affects either the reported participation in particular workplace practices or an employer's decision to adopt such practices.

Literature and Background

A large body of literature on socio-technical systems, total quality management, and high-performance work systems argues that some characteristics of work might increase satisfaction. For example, Hackman and Oldham developed the Job Characteristics Theory, which argues that characteristics like participation, learning, and autonomy increase the motivating potential of work (Hackman and Oldham 1976, 1980). Other causal links between high-involvement work design and satisfaction are equally plausible.[2] Involved employees can use their insights to improve their jobs directly. Satisfaction can come from learning, problem-solving, inter-group cooperation, and doing a good job. All of these relationships imply that jobs with a high degree of employee involvement might increase satisfaction.

The existing literature also recognizes, however, that even if a positive association between the characteristics of work and the evaluative judgment that individuals make about their jobs exists, the direction of causality may not run entirely in one direction. Satisfied workers may participate in high-involvement practices more frequently, or establishments with satisfied workers may be more likely to adopt new programs. Even if the participation choice can be controlled for, satisfied workers might also perceive their jobs differently and therefore be more likely to report participation.[3] Such differences in perception also imply that satisfaction may predict reported participation, rather than the other way around.

High-involvement jobs may also correlate with *lower* levels of job satisfaction. Critics argue that workers may dislike job redesign: some employees may prefer Taylorist workplaces (Kelly 1982; Pollert 1991).[4] Narrowly defined jobs allow the employer to easily define performance standards and ensure that an employee will not be asked to do tasks outside the job's definition. Job redesign is often accompanied by work intensification (Green 2004). For instance, most of the examples from a widely cited *Business Week* (1983:100) report on flexibility involve enlarging jobs by adding new responsibilities (Thompson and McHugh 1990). Furthermore, because success in a high-involvement job no longer depends on completion of narrowly defined tasks, "employment security is now conditional on market success, rather than assured by [the worker's] status as directly employed personnel" (Davidson 1991:253). Finally, increased effort levels can also be achieved through increased monitoring. Practices like teams and quality circles create incentives for peer surveillance, which can lead to lower job satisfaction (Delbridge, Turnbull, and Wilkinson 1992; Sewell and Wilkinson 1992; Garrahan and Stewart 1992).

A negative correlation between involvement and job satisfaction would not necessar-

[2]Hackman (1992), for example, argued that participation in groups might both arouse motive states and provide direct personal satisfaction.

[3]Wong et al. (1998) used longitudinal data to show that job satisfaction predicts job perception, while Erez and Judge (1994) found an association between job satisfaction and self-deception.

[4]For surveys of these arguments, see Thompson and McHugh (1990) or Ramsay, Scholarios, and Harley (2000).

ily imply causation. Causality in the reverse direction is again possible. Employers who have particularly dissatisfied employees might have stronger incentives to adopt high-involvement work practices. These employers might do so in an effort to raise morale or in order to impose a form of peer monitoring on those employees perceived as least likely to be committed to the workplace.

While the existing literature offers explanations for either a positive or a negative association between high-involvement work design and job satisfaction, it also points out some reasons that a broad cross-sectional data set may not demonstrate such an association. The differing hypotheses linking satisfaction to involvement are not mutually exclusive and do not apply to all workers. Factors unobserved in large data sets, like affectivity, mood, and personality, mediate the association between work design and job satisfaction (Ilies and Judge 2004; Judge, Heller, and Mount 2002). Even if workers generally appreciate involvement, some workers might be less satisfied. The research linking involvement to job intensity also recognizes that the relationship might not systematically appear in satisfaction data. Many of these authors argue that intensification is a byproduct of a broader move toward "flexibility," which in addition to changes in work design might also involve the increased use of temporary workers and decreased job security. In addition, "intensity" is a different construct from job satisfaction.[5] Jobs that are either stressful or enlarged might nonetheless satisfy.

Finally, the theory of compensating differentials offers one more reason that a systematic relationship might not appear in an empirical analysis. Hamermesh (1977) pointed out that, with perfect certainty and a continuum of different jobs (offering different combinations of wages and characteristics), there should be no difference in satisfaction beyond that due to randomly distributed tastes. If workers prefer involvement, then in equilibrium employers with participatory workplaces can offer relatively lower wages. In this case, satisfaction levels will not vary with the degree of involvement, although differences might be observed after the analysis controls for pay and other variables.

In investigating the link between the attributes of work and job satisfaction, our study builds on a long tradition of empirical research in both economics and industrial relations. While the relationship between job content and job satisfaction has been studied before (for a survey, see Judge et al. 2001a), the strength of our work lies in our use of longitudinal data on employees and their establishments and our ability to look for indications of the direction of causality. Much of the best current work uses data sets limited to a small number of workplaces, an approach that allows researchers to better identify job characteristics and also to observe several workers at the same firm or jobsite.[6] Drago, Estrin, and Wooden (1992), Gordon and Denisi (1995), Godard (2001), and Brown and McIntosh (2003) used such data to show that controlling for workplace characteristics qualitatively changes conclusions about job satisfaction, and meta-analyses confirm a link between work design and job satisfaction (Loher et al. 1985; Fried and Ferris 1987).

Only a few studies have explored the link between attributes of jobs and satisfaction in a broad, multi-industry, data set. The present study, along with Bauer (2004), Clark (1999), Kalmi and Kauhanen (2005), and Ramsay, Scholarios, and Harley (2000), is among the first to extend the literature in this way. Both Kalmi and Kauhanen (2005) and Ramsay, Scholarios, and Harley (2000) also contrasted opposing hypotheses on how involvement might relate to job satisfaction. The data used in these prior papers did not allow the authors to consider the direction of causality, however. Our study uses a linked, longitudinal dataset that allows us to bet-

[5]Karasek (1979) argued that autonomy can mediate job strain even when the job imposes heavy demands. Campion and McClelland (1993) distinguished "knowledge enlargement" from "task enlargement" and found that only the latter is associated with lower job satisfaction.

[6]Other authors have looked at case studies. See, for example, Griffin (1991) or Jones and Kato (2005).

ter control for otherwise unobserved firm characteristics and to test for the presence of self-selection.

Analytical Strategy

In order to study the relationship between involvement and job satisfaction, we follow Clark and Oswald (1996) in treating job satisfaction, *s,* as a function that depends on pay, benefits, and a variety of other factors. We therefore define an individual's job satisfaction as

$$s = s(y, h, i, j), \tag{1}$$

where *y* represents a vector of variables describing pay and benefits, *h* is hours of work, and *i* and *j* represent individual and job characteristics, respectively. Job characteristics include features of high-involvement work design, and statistically significant coefficients on these variables would indicate an association between high-involvement workplaces and satisfaction. In order to estimate equation (1), we must assume that measures of satisfaction are comparable across individuals; this assumption is commonly made in the psychology literature but is uncommon among economists.

Estimation of equation (1) poses some specific econometric issues. For example, in order to control adequately for *y,* we control not only for wages, but also for a range of benefits, and several forms of incentive pay. Estimation of the last two variables, *i* and *j,* is particularly difficult. Although we control for many traits of both workers and workplaces, our results might be biased if unobservable characteristics are correlated with both job satisfaction and the regressors. One such example is management style. It may be that working for an effective manager increases a worker's job satisfaction and that effective managers employ techniques like job rotation and frequent feedback. Thus, some part of the effect of these variables on job satisfaction might in fact be the effect of management style on job satisfaction, biasing the result.

We can mitigate this potential source of bias in two ways. First, because we use linked employee-employer data, we can control for several such characteristics of the employee's workplace in cross-sectional estimates. One survey asks employees about the characteristics of their jobs, including the frequency with which they participate in high-involvement work practices such as suggestion programs, teams, job rotation, and information sharing. A separate survey asks employers if they use, "on a formal basis," these same work practices at the establishment. Employer and employee responses differ. Even if an employer has a formal program implementing some work organization practice, this does not mean that all surveyed workers will hold jobs employing this practice. Likewise, particular jobs may include features of involvement, even without a formal program at the establishment. We include the employer responses in our estimations to allow us to control for aspects of management style that might be correlated with the involvement variables. If an estimation of equation (1) erroneously captures the unobserved management style, then we would expect that effect to disappear when we control for the organizational practices of the firm.

Alternatively, since multiple workers are surveyed in most establishments, we can control for workplace characteristics by including establishment fixed effects in equation (1), which controls for unobservable establishment characteristics that affect all workers equally within the same workplace. Although this method controls for more potential workplace characteristics, it has two weaknesses. First, we cannot identify which specific workplace features correlate with satisfaction. Second, within-establishment variation in satisfaction is much smaller, resulting in reduced explanatory power. We estimate the model using both methods.

Our analytical strategy also addresses a number of other potential issues. For example, the data indicate that those employees who report participation in high-involvement work design typically participate in more than one high-involvement program, which makes it difficult to disentangle the individual effects of involvement practices. Therefore, we also estimate equation (1) first using a single additive index of the number of high-involvement practices, and then using three

separate indicators for whether the employee participates in only one, two to three, or four or more practices. These approaches give perspective on the overall relationship between high-involvement practices and satisfaction, and the indicator variables allow us to identify evidence of non-linearities: the association between additional involvement and satisfaction may vary as the amount of involvement varies.

Another possibility, related to non-linearities, is that the association between involvement and satisfaction differs for certain subsets of the data. For example, workers might find small amounts of involvement desirable, but associate larger amounts of participation with increased work intensity. To check for this, we estimate our model on a subset of "involved" workers. The relationship between satisfaction and involvement may also differ for unionized workers. If workers opt to join unions in part due to concerns about work intensity and scope, then we may see a negative relationship between participatory practices and job satisfaction in this subsample. Therefore, we also compare unionized workers to their non-union counterparts.

As an additional check on the robustness of our results, we test the association between high-involvement work design and alternative measures of worker outcomes. The literature on intensification argues that involvement might be detrimental to workers, and it suggests that these negative outcomes might appear more broadly than could be picked by a narrowly defined measure of job satisfaction. Therefore we identify additional worker outcomes, like days of paid sick leave taken, expressing a desire to reduce hours worked due to work-related stress, or filing a grievance, and test whether these broader measures are associated with participation in high-involvement practices.

All of the estimations described so far rely on cross-sectional data. These results therefore do not indicate causality, which may run in either direction. Unfortunately, our data, which follow each of two cohorts of workers for two years, allow us neither to fully identify the direction of causality nor to disentangle the reasons causality might run in a particular direction. For 26% of individuals, neither the number of involvement practices nor job satisfaction varies in the two-year period. Nonetheless, the longitudinal aspects of the data do provide some information. Therefore, the final task undertaken by our analytical strategy is to look for evidence on the direction of causality. To do this, we first estimate

$$s_2 = s(y_1, h_1, i_1, j_1, s_1, t), \tag{2}$$

where the subscript 1 (2) indicates the first (second) year of the two-year panel, and t is a cohort indicator. This estimation measures the relationship between participating in high-involvement work in the first year and satisfaction in the second year, controlling for unobserved worker characteristics that affect satisfaction. Intuitively, this is akin to measuring whether participation is associated with changes in satisfaction. Identification comes from those who change satisfaction between the two panel years. To look for evidence that causality runs in the other direction, we then estimate for each of the participation variables, j,

$$j_2 = j(y_1, h_1, i_1, s_1, j_1, t), \tag{3}$$

Similar to equation (2), this measures whether satisfaction in the first year is associated with changes in participation between the first and second panel years, with identification coming from those whose participation changes between the two years.

Data

Our data are from the 1999–2002 Canadian Workplace and Employee Survey (WES), a linked file that contains both employer and employee segments.[7] The longitudinal employer sample followed establishments for the entire time frame, adding new establishments in 2001 to replace those that had left the sample. The sample was drawn by stratified random sampling from Canada's Business Register, and covered all employers

[7]The WES user's guide (Statistics Canada 2004) provides a more detailed description of the data, and Kreps et al. (1999) provide a full description of the development and use of this survey.

with paid employees, with the exception of those in the Yukon, Nunavut, and Northwest Territories, and those in crop and animal production, fishing, hunting, trapping, private households, religious organizations, and public administration. To collect these data, survey administrators identified and interviewed one or more contact persons at each establishment, either in person or through a computer-assisted telephone interview. Response rates were high: over 90% in 1999 and 2000, falling to around 85% thereafter. The resulting samples comprised around 6,000 establishments each year.

Employees were followed for only two years, with fresh samples drawn in 1999 and 2001. Up to 24 employees were randomly sampled from lists provided by employers, and then interviewed by telephone. Response rates were typically around 85%, with modest attrition primarily due to employees at continuing establishments leaving the sample. For example, in 1999 the sample contained 23,540 employees from 5,733 establishments. Of these, 20,167 employees remained in 2000, with 86% of the loss due to employee attrition (and the remainder due to establishments leaving the sample). The 2001 sample contained 20,352 employees in 5,274 establishments. By 2002, 16,815 remained, with 79% of the loss explained through employee attrition.

The two datasets therefore allow us to pool the 1999–2000 and the 2001–2002 employee panels, with linked employer information. This results in an unbalanced panel sample of 43,892 employees, and a balanced panel sample of 36,982 employees. Because full information about work organization practices is limited to workplaces with more than 10 employees, we drop 7,515 employee observations from small employers. Some of the remaining observations are missing crucial demographic information or responses to the job satisfaction questions. Therefore, our estimations are based on approximately 25,000 employee observations.

Measures

The survey contains two measures of job satisfaction: overall satisfaction, and satisfaction with pay and benefits. We focus on the former, which is measured by a four-point Likert scale, with the four responses being "1 = very dissatisfied," "2 = dissatisfied," "3 = satisfied," and "4 = very satisfied." Workers were most likely to report "satisfied," and the mean value for the full sample is 3.26.

Some estimations replace the dependent variable job satisfaction with other worker outcomes. From the employee survey, we identify (1) workers who indicated that they would prefer shorter working hours, in part because of work-related stress, (2) the number of paid sick-leave days taken by the worker during the previous year, (3) at workplaces with a formal grievance system, workers who had initiated a formal grievance or complaint, and (4) for workers who turned down additional job training, those who did so because they were "too busy with duties on the job." In addition, the establishment survey provides (5) the quit rate. We choose these specific additional variables because they offer a robustness check on the satisfaction results. These other outcomes may indicate different ways of operationalizing dissatisfaction with work.

Prior studies differ somewhat in their definitions of "high involvement" and related concepts like "high performance" or "employee involvement." However, Handel and Levine (2006:74) offered a consensus definition, that "employee involvement practices include job rotation, quality circles, self-directed teams, and most implementations of total quality management, as well as supportive practices such as enhanced training and nontraditional compensation." Our measure of involvement closely matches this description, but also includes suggestion and information sharing programs. Including these is consistent, for example, with Pil and MacDuffie's (1996) definition.

To operationalize this definition, we use the section of the WES's employee survey entitled "Employee Participation," which asked respondents about the frequency with which they participated in seven different high-involvement workplace programs: employee surveys, employee suggestion programs, information sharing programs, job rotation/cross-training, labor-management

committees, quality circles, and self-directed work groups. Employee surveys and suggestion programs measure bottom-up communication, either through general surveys or by generating (particularly through regular meetings) specific suggestions regarding "areas of work that may need improvement." Information sharing refers to top-down communication "about overall workplace performance, changes to workplace organization or the implementation of new technology." The remaining four questions relate to the organization of work, asking if workers participated in (1) "a job rotation or cross-training program," (2) "a team or circle concerned with quality or work flow issues," (3) "a team or labour-management committee that is concerned with a broad range of workplace issues," or (4) "a self-directed work group (or semi-autonomous work group or mini-enterprise group)." To describe the frequency of participation in four of the seven practices, respondents could choose between "never," "occasionally," or "frequently"; for the other three practices, "always" was added as a fourth possible response. We define seven dichotomous variables, one for each practice, that take a value of one if the respondent reported participating at least "occasionally" and zero otherwise. Appendix Table A1 shows the exact wording of all seven questions.

The 1999 and 2001 waves of the establishment-level employer sample provide additional information about the organization of work, the delegation of decision rights, and incentive pay schemes in the worker's establishment. In these two years, the survey asked if six different practices, which correspond closely to six of the seven measures we use to define high involvement, existed "on a formal basis" at the workplace.[8] In addition, the survey asked who (for example, employees, work-groups, or supervisors) made decisions about 12 different activities, like the planning of work, customer relations, staffing, and product development. Finally, the employer sample includes data on whether non-management employees were eligible for productivity-related bonuses or individual incentive pay, group incentive pay, profit-sharing, or merit pay.

As described in the section on analytical strategy, we use these establishment variables to control for otherwise unobserved management practices. While this set of control variables contains many items, it can reasonably be viewed as consisting of two groups of variables: those that directly measure autonomy through the allocation of decision rights, and those that relate more broadly to the structures determining how work is organized, in terms of both work design and pay. Factor analysis allows us to identify two common factors with Eigen values greater than one, confirming that such a classification is appropriate. The first factor, which we call "workplace decision rights," links most strongly to the 12 decision rights variables. The second factor, which we call "workplace organization," loads most heavily on the six work organization variables and somewhat less on the pay measures. Appendix Table A2 shows factor loadings. In addition to the two factors, our control variables also include another 31 different individual and establishment characteristics, which we list individually in Appendix Table A3.

Descriptive Statistics

Table 1 reports how overall satisfaction levels vary according to seven characteristics that we associate with high-involvement work design. Recall that "satisfied" corresponds to a value of 3 and "very satisfied" corresponds to a value of 4; all the means presented in the table fall in the range between these two responses. Without exception, workers who participated in any of the high-involvement practices reported higher levels of satisfaction, with the largest differences for those who participated in suggestion programs, task teams, and quality circles, and for those who were informed about workplace changes. The bottom portion of the table reports mean satisfaction levels by specific demographic and workplace characteristics. These data include some variables not typically found in other analyses. Training, a recent promotion, and productivity-related bonuses all were associated with increased satisfaction.

[8]Employers are not asked about the use of surveys.

Table 1. Satisfaction Rates in the 1999 and 2001 WES.

Group of Workers	*Satisfaction Rate*	
All Workers	3.26	
High-Involvement Variables	*Participating*	*Non-Participating*
Participate in Employee Survey	**3.31**	**3.21**
Participate in Suggestion Program	**3.32**	**3.12**
Participate in Job Rotation	**3.32**	**3.24**
Informed about Workplace Changes	**3.31**	**3.07**
Participate in Task Team	**3.41**	**3.23**
Participate in Quality Circle	**3.39**	**3.21**
Part of Self-Directed Workgroup	**3.33**	**3.21**
Other Characteristics	*Yes*	*No*
Received Classroom Training	**3.34**	**3.20**
Received Productivity-Related Bonus or Incentive Pay	**3.28**	**3.25**
Age below 35	**3.19**	**3.28**
Female	3.26	3.26
Married	**3.29**	**3.20**
With Disability	**3.19**	**3.26**
Covered by Union	**3.21**	**3.29**
Full-Time	**3.26**	**3.21**
Hours within 5 of Optimal	**3.29**	**3.13**
Language at Home Same as Language at Work	**3.27**	**3.18**
Promoted in Past Year	**3.33**	**3.20**
Bachelor's Degree or Higher	**3.31**	**3.25**
Overeducated Relative to Job Requirements	**3.24**	**3.27**
Establishment with Fewer Than 250 Employees	**3.25**	**3.28**

Notes: Weighted means from pooled 1999 and 2001 data. The satisfaction variable can take the value 1 (very dissatisfied), 2 (dissatisfied), 3 (satisfied), or 4 (very satisfied). **Bold** row numbers indicate statistically significant differences at the 99% confidence level.

Undesirable hours, a disability, or an education level that exceeded the level required for the job were associated with decreased satisfaction.

Table 2 reports descriptive statistics on our measures of involvement. The first column identifies the proportion of workers who reported participating, at least occasionally, in each the seven practices that we use to measure high involvement. A substantial fraction participated in each of the practices, and considerable variation exists: only 17% of workers reported participation in a task team, whereas 69% of workers participated in employee suggestion programs, and 80% were informed about workplace changes. Because we also use the responses from the linked workplace survey, column (2) shows the proportion of employees in the sample who worked at an establishment that reported having a formal workplace practice, or that allowed workers to participate in one of the twelve decisions. The fact that the numbers on practices differ across the first two columns is not surprising, and indeed is central to our analytical strategy, which is based on the hypothesis that the workplace controls in the second column pick up otherwise unobserved variation like management style. The differences across columns on suggestion and information sharing programs may indicate that the actual use of these practices exceeded what was done through formal programs. Conversely, participation rates in quality circles and task teams are consistent with the idea that not all workers at a given establishment would necessarily participate in such practices. To highlight these differences, the third and fourth columns look at employee responses conditional on the employer's response. The proportions of employees reporting participation were slightly higher in workplaces that had implemented a formal program than in other workplaces.

Table 2 also indicates that many workers participated in multiple high-involvement

Table 2. Use of High-Involvement Workplace Practices in the 1999 and 2001 WES.

	Proportion of Employees:			
Description	*Who Participate*	*In Workplace with Formal Program*	*Who Participate, Conditional on Formal Program*	*Who Participate, Conditional on No Formal Program*
Participate in Employee Survey	.48			
Participate in Suggestion Program	.69	.36	.73	.66
Participate in Job Rotation	.26	.24	.27	.26
Informed about Workplace Changes	.80	.56	.84	.74
Participate in Task Team	.17	.34	.19	.15
Participate in Quality Circle	.26	.42	.26	.26
Part of Self-Directed Workgroup	.38	.15	.45	.37
Workers Help Decide:				
Planning of Daily Individual Work		.48		
Planning of Wkly Individual Work		.40		
Follow-Up of Results		.22		
Customer Relations		.40		
Quality Control		.36		
Purchase of Necessary Supplies		.41		
Maintenance of Machinery and Equipment		.45		
Setting Staffing Levels		.04		
Filling Vacancies		.07		
Training		.23		
Choice of Production Technology		.11		
Product/Service Development		.14		
Proportion of Workers Participating in More Than One High-Involvement Practice	.80			
Mean Number of High-Involvement Practices per Worker	3.03			
Number of Observations	23,211	25,502	Var.	Var.

Note: weighted means from pooled 1999 and 2001 data. The number of observations in rows of column (3) range from 4,200 to 14,400, and in column (4) from 11,100 to 21,300.

practices (bottom of first column), which may make it hard to identify either the association of individual practices with job satisfaction or any interactions among different practices and their relation to satisfaction. Table 3 shows the correlation among key variables. The top portion of the table shows a full correlation matrix for the seven variables used to define high-involvement work design. Several of the variables are closely correlated. Therefore, in addition to reporting estimations in which each variable is entered separately, we will also present results in which either an index or a series of dummy variables captures information about the number of high-involvement practices. Several of our estimations exploit the fact that we observe individuals twice. The bottom of Table 3 identifies the proportion of workers who reported a change in job satisfaction and the number who reported a change in the number of involvement practices. Although the table indicates strong intertemporal correlation, the data do show enough variation to allow for estimations that base identification on changes in satisfaction, changes in participation, or both.

Full-Sample Results

Table 4 reports the results for five different models that study the association between high-involvement work design and job satisfaction. Each of these models uses the full

Table 3. Correlations.

	Suggestion Program	*Job Rotation*	*Informed*	*Task Team*	*Quality Circle*	*Work Group*
Participate in Employee Survey	.36	.17	.40	.17	.21	.23
Participate in Suggestion Program		.26	.52	.24	.31	.29
Participate in Job Rotation			.24	.11	.16	.14
Informed about Workplace Changes				.21	.28	.31
Participate in Task Team					.45	.25
Participate in Quality Circle						.38

	Number of High-Involvement Practices:		
Satisfaction:	*Increased*	*Decreased*	*Remained Same*
Increased	.06	.04	.06
Decreased	.05	.07	.07
Remained Same	.20	.19	.26

data sample of approximately 25,000 workers. In addition, the table reports robust standard errors, adjusting for multiple worker observations within the same establishment. Each model also controls for a full set of worker and workplace characteristics, including the two workplace factors, representing decision rights and work organization. The results for the remaining control variables are shown in Appendix Table A3.[9]

The models in Table 4 differ in terms of the control variables used and in terms of how high-involvement practices are measured. The first four columns show coefficients from ordered probit estimations of equation (1), using population weights provided by Statistics Canada to account for the stratified sampling procedure. Model 1 controls only for the worker and workplace characteristics shown in Table A3. The participation variables generally are associated with increased satisfaction. Coefficients on four of the seven high-involvement variables—suggestion programs, information sharing, teams, and quality circles—are statistically significant at the .05 level. Model 1 controls neither for wages, incentive pay programs, and benefits nor for the two workplace factors derived from the employer portion of the survey. The former might affect results if compensating differentials offset the satisfaction (or dissatisfaction) associated with high-involvement practices. The latter could have an effect if unobserved managerial style biases results. Model 2 adds these controls.[10] Very little changes: exactly the same high-involvement practices remain statistically significant, and the coefficient estimates remain virtually unchanged. Compensating differentials do not appear, in general, to have equalized satisfaction levels, and there is no evidence that the original estimates erroneously captured omitted workplace effects.

Our data indicate that those employees who reported participation typically participated in more than one program, which makes it difficult to disentangle the individual effects of involvement practices. Therefore, Model 3 uses an additive index that counts the number of high-involvement practices used, and Model 4 allows for a nonlinear relationship by splitting the index into three indicator variables for participating in 1, 2–3, or 4+ practices. These additive measures,

[9]For a summary of results from other studies using similar variables, see Brown and McIntosh (2003). While Table A3 reports only the coefficients from Model 2, the coefficient estimates are remarkably stable across models.

[10]With controls for the employer portion of the survey, we would expect to produce more conservative estimates of the benefits of high-involvement workplaces. Collinearity between the control variable from the workplace survey and the participation variable from the employee survey may make the participation variables appear less statistically significant. This would be true even if satisfaction depended only on job, not workplace, characteristics.

Table 4. Association between High-Involvement Work and Job Satisfaction.

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Participate in Employee Survey	.047	.036			–.013
	(.033)	(.037)			(.037)
Participate in Suggestion Program	.159***	.158***			.306***
	(.035)	(.039)			(.040)
Participate in Job Rotation	.048	.053			.101***
	(.035)	(.036)			(.038)
Informed about Workplace Changes	.258***	.252***			.298***
	(.041)	(.043)			(.048)
Participate in Task Team	.157***	.179***			.236***
	(.045)	(.047)			(.048)
Participate in Quality Circle	.130***	.135***			.223***
	(.041)	(.042)			(.042)
Part of Self-Directed Workgroup	.037	.017			.116***
	(.036)	(.037)			(.037)
Additive Index of Workplace Practices			.114***		
			(.011)		
Participated in 1 Practice				.146**	
				(.075)	
Participated in 2–3 Practices				.290***	
				(.068)	
Participated in 4+ Practices				.561***	
				(.070)	
Workplace Organization Factor?	NO	YES	YES	YES	YES
Workplace Decision Rights Factor?	NO	YES	YES	YES	YES
Wage Control?	NO	YES	YES	YES	YES
Worker Characteristics Controls?	YES	YES	YES	YES	YES
Establishment Fixed Effects?	NO	NO	NO	NO	YES
Pseudo R^2	.047	.053	.051	.049	.001
Wald/LR Test	613.35	656.52	628.18	587.41	941.94
Number of Observations	25,502	23,211	23,211	23,211	26,094

Notes: All estimations include control variables for worker characteristics. Columns (1)–(4) report ordered probit coefficients (the dependent variable takes on four possible values) and column (5) reports fixed effects logit coefficients (collapsing the dependent variable into an indicator for whether or not the respondent was "very satisfied"). Robust standard errors are in parentheses, controlling for establishment clustering. Coefficient estimates of the control variables are reported in the appendix.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

which are similar to those used by MacDuffie (1995) and Osterman (2000), provide perspective on the overall association between high-involvement practices and job satisfaction. Furthermore, Model 4 indicates that, as participation increases, the coefficients become substantially larger and more statistically significant—suggesting an increasing nonlinear relationship.[11]

Model 5 takes advantage of the presence of multiple employees at each establishment to control for any remaining unobservable establishment characteristics that affect a worker's job satisfaction. This specification includes establishment fixed effects. Since ordered probit estimates are not generally consistent when fixed effects are included,[12]

[11]Ichniowski, Shaw, and Prennushi (1997) found similar non-linearities in the link between adopting such practices and productivity.

[12]See Greene (2004). In particular, the number of observations within the group needs to be fairly large for the estimates to be consistent.

Table 5. Simulated Probabilities of Job Satisfaction Conditional on (Not) Participating in High-Involvement Practices.

Variable	*Pr (Very Satisfied)*	*Pr (Satisfied)*	*Pr (Dissatisfied)*	*Pr(Very Dissatisfied)*
Did (Not) Participate in Employee Survey	.396	.538	.057	.009
	(.312)	(.586)	(.085)	(.017)
Did (Not) Participate in Suggestion Program	.393	.541	.057)	.009
	(.264)	(.611)	(.104)	(.022)
Did (Not) Participate in Job Rotation	.387	.543	.060	.010
	(.338)	(.571)	(.077)	(.014)
Was (Not) Informed about Workplace Changes	.385	.547	.059	.009
	(.222)	(.627)	(.123)	(.028)
Did (Not) Participate in Task Team	.480	.478	.037	.005
	(.327)	(.580)	(.079)	(.015)
Did (Not) Participate in Quality Circle	.454	.498	.042	.006
	(.316)	(.586)	(.082)	(.016)
Was (Not) Part of Self-Directed Workgroup	.402	.532	.056	.009
	(.320)	(.582)	(.082)	(.015)

Notes: Numbers in parentheses indicate the predicted probability of the indicated level of satisfaction conditional on not participating in the program. All estimations include control variables for worker characteristics. Columns report simulated effects for the ordered probit Model 2 in Table 4.

we estimate a logit model. This requires us to collapse the satisfaction measure into a dichotomous variable taking the value of 1 for "very satisfied" and 0 otherwise. In this model, the four high-involvement practices that were statistically significant in Models 1 and 2 remain so. In addition, participation in job rotation or a self-directed workgroup now also has a positive association with job satisfaction. Including establishment fixed effects reduces the amount of variation to be explained by the model, resulting in a much lower Pseudo-R^2; however, the likelihood ratio test indicates that the combined effect of the variables is still statistically significant.

While we cannot infer causality from the estimates in Table 4, the coefficients do imply large marginal differences in satisfaction between those who participated and those who did not. Table 5 simulates the probability of a worker indicating a particular satisfaction level conditional on participation in a given practice (or not), controlling for all other demographic and workplace characteristics. These are predicted probabilities from the second column of Table 4, evaluated at one or zero for the participation variable, and at the means of all other variables. Participating in any one of the high-involvement practices is associated with a much higher probability of a worker reporting being "very satisfied" relative to "satisfied." For example, there is a 38% probability that an average worker who reported participating in a suggestion program would be very satisfied, while a similar worker who did not participate had only a 26% probability of being very satisfied. Similarly, those who participated were 2–6% less likely to be dissatisfied and 1–2% less likely to be very dissatisfied than those who did not participate.

Results for Subsamples: Involved vs. Less-Involved and Union vs. Non-Union

In aggregate, the results support the hypothesis that involvement is positively associated with satisfaction. Suggestion programs, information sharing, quality circles, and task teams have a consistently positive and statistically significant relationship with job satisfaction. None of the results support the view that involvement is linked to decreased satisfaction: except for employee surveys in Model 5, even the statistically insignificant variables have positive coefficients. We now explore the possibility that the relationship between high-involvement work practices

Table 6. Association between High-Involvement Work Design and Job Satisfaction among Involved and Less-Involved Workers.

Variable	*Full Sample*	*Involved Subsample*	*Less-Involved Subsample*
Participate in Employee Survey	.036	.066	.016
	(.037)	(.051)	(.073)
Participate in Suggestion Program	.158***	.214***	.141**
	(.039)	(.059)	(.059)
Participate in Job Rotation	.053	.068	.070
	(.036)	(.043)	(.078)
Informed about Workplace Changes	.252***	.349***	.256***
	(.043)	(.080)	(.053)
Participate in Task Team	.179***	.191***	.089
	(.047)	(.048)	(.197)
Participate in Quality Circle	.135***	.133***	.149
	(.042)	(.044)	(.171)
Part of Self-Directed Workgroup	.017	.049	–.137
	(.037)	(.045)	(.084)
Pseudo R^2	.047	.047	.040
Wald Test	613.35	290.16	218.57
Number of Observations	25,502	14,208	9,003

Notes: Ordered probit coefficients (the dependent variable takes on four possible values). High involvement is defined as participation in more than two of the programs. The models control for worker characteristics, wages, and establishment workplace organization as in the second column of Table 4. Robust standard errors are in parentheses, controlling for establishment clusters.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

and satisfaction is weaker or even negative in certain subsamples of the data. To do this, we compare workers who participated in many practices to those who did not, and we compare unionized workers to non-unionized workers.

Table 6 divides the sample according to the degree of involvement. We designate an employee who reported participation in more than two of the seven high-involvement measures as "involved."[13] Estimating the ordered probit of Table 4, column (2) separately for these involved workers allows us to further investigate the possibility of a non-linear association between participatory practices and satisfaction. For example, a small amount of involvement might be associated with increased satisfaction, while heavy involvement might not. Table 6 presents no evidence for this, however. On the contrary, the data for involved workers show an even stronger positive relationship between high-involvement practices and satisfaction (in both size and significance) than do the data for the full sample. The coefficient estimates for involvement practices are smaller and less statistically significant in the "low-involvement" subsample. These findings are consistent with the results from Table 4, column (4).

A second partition of the data, reported in Table 7, identifies workers in unionized establishments. If those workers who are most averse to job intensification and job enlargement attempt to protect themselves from such adverse outcomes by joining a workplace that is governed by a collective bargaining agreement, then this subset of data might reveal a different relationship between involvement and satisfaction. Although several of the high-involvement practices have smaller and less statistically significant

[13]The cutoff value is arbitrarily chosen, but results are not sensitive to choosing a slightly higher threshold, or to using a combination of workplace and employee responses to define high-involvement jobs.

Table 7. Association between High-Involvement Work Design and Job Satisfaction in Union and Non-Union Establishments.

Variable	*Full Sample*	*Union Sample*	*Non-Union Sample*
Participate in Employee Survey	.036	.112**	–.005
	(.037)	(.055)	(.046)
Participate in Suggestion Program	.158***	.110**	.194***
	(.039)	(.058)	(.050)
Participate in Job Rotation	.053	.041	.059
	(.036)	(.057)	(.046)
Informed about Workplace Changes	.252***	.291***	.241***
	(.043)	(.063)	(.058)
Participate in Task Team	.179***	.057	.249***
	(.047)	(.073)	(.062)
Participate in Quality Circle	.135***	.111*	.140***
	(.042)	(.066)	(.053)
Part of Self-Directed Workgroup	.017	–.018	.030
	(.037)	(.057)	(.046)
Pseudo R^2	.047	.049	.062
Wald Test	613.35	314.32	459.47
Number of Observations	25,502	8,432	14,779

Notes: Ordered probit coefficients (the dependent variable takes on four possible values). The models control for worker characteristics, wages, and establishment workplace organization as in the second column of Table 4. Robust standard errors are in parentheses, controlling for establishment clusters.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

coefficient estimates, there is no evidence that high-involvement work practices, in general, correlate with lower satisfaction for this group. Three of the variables—suggestion programs, information sharing, and quality circles—remain positive and significant, at least at the 10% level, with coefficients qualitatively similar to the corresponding ones in the full sample. In contrast to the full sample, task teams lose their statistical significance, while participation in employee surveys becomes significant.

The Association between Involvement and Other Worker Outcomes

Thus far, the cross-sectional results have produced no evidence of a link between involvement and dissatisfaction. None of the estimations in Tables 4, 6, or 7 yields a single statistically significant negative coefficient on a high-involvement work design variable. However, dissatisfaction that is not expressed in a response to a general question about overall job satisfaction may become apparent in responses to more targeted questions, like those about work-related stress or grievances. Such questions offer an alternate way to operationalize employee dissatisfaction and, more broadly, offer insight into the degree to which the results on job satisfaction extend to related worker outcomes.

Table 8 shows the association between high-involvement work design and other worker outcomes, like work-related stress, filing a grievance, and sick leave taken. Each estimation includes the same set of control variables as in the second column of Table 4. In aggregate, these data give only slight support for the hypothesis that high-involvement work is associated with negative worker outcomes. Of the 35 coefficient estimates, only three are positive and significant at the 5% level. Of these, one has a very small marginal effect, indicating only a small relationship to the desire to reduce work hours. The remaining two variables do indicate adverse outcomes: workers who participated in a quality circle were more likely to file a grievance, and workers who participated in a task team

Table 8. Association between High-Involvement Work Design and Other Worker Outcomes.

Variable	*Reduce Hours (Stress)*	*Days Absent*	*Filed Grievance*	*No Time for Training*	*Establishment Quit Rate*
Participate in Employee Survey	.0001	.722*	–.012	–.049	.014*
	(.001)	(.392)	(.012)	(.043)	(.008)
Participate in Suggestion Program	.003**	–.393	–.017	.019	.004
	(.001)	(.552)	(.013)	(.044)	(.008)
Participate in Job Rotation	–.002	–.307	.012	–.053	.009
	(.001)	(.219)	(.014)	(.041)	(.008)
Informed about Workplace Changes	–.003**	.342	–.009	.088	–.013
	(.003)	(.373)	(.016)	(.062)	(.009)
Participate in Task Team	–.003**	–.308	.007	.114**	–.008
	(.001)	(.367)	(.015)	(.052)	(.010)
Participate in Quality Circle	.003*	–.229	.036**	–.022	.012
	(.002)	(.344)	(.017)	(.048)	(.010)
Part of Self-Directed Workgroup	–.001	.245	–.016	.074	–.003
	(.001)	(.502)	(.012)	(.039)	(.007)
R^2 or Pseudo R^2	.257	.024	.038	.069	.096
Wald Test	348.88	—	147.08	84.25	—
Number of Observations	23,211	23,211	14,009	2,673	23,211

Notes: Columns (1), (3), and (4) report probit marginal effects. Columns (2) and (5) report OLS coefficients. The models control for worker characteristics, wages, and establishment workplace organization as in the second column of Table 3. Robust standard errors are in parentheses, controlling for establishment clusters.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

were more likely to indicate that they lacked the time for additional training.

Indicators of Causality

Although the estimations so far present considerable evidence of a positive correlation between involvement and satisfaction, the limitations of a data set in which most of the variation is cross-sectional preclude us from drawing definitive conclusions about causation. Nonetheless, we can use the two consecutive observations of each worker to look for indicators of the direction of causality. Table 9 represents the results of eight separate estimations. The first estimation, at the top of the table, tests equation (2). Since the variables used in deriving the workplace factor controls are only available for 1999 and 2001, this estimation controls for workplace characteristics by including establishment fixed effects in a logit, similar to the model in column (5) of Table 4. A positive coefficient on the lagged participation variables would suggest that workers who participated in year one were more likely to be very satisfied in year two, conditional on their initial satisfaction level. The results are striking: participation does not seem to predict changes in satisfaction. Nearly all the coefficient estimates are statistically insignificant.

The bottom of Table 9 shows the results of analyses seeking indicators of causality in the opposite direction. This portion of the table consists of seven different estimations of equation (3), one for each measure of high involvement, again estimated with fixed effects ordered logits. These seven estimations test whether job satisfaction in period 1 predicts participation in period 2 for a given high-involvement practice, controlling for participation in the first period (along with a full set of control variables and establishment fixed effects). In this set of estimations, job satisfaction is a statistically significant predictor of participation for six of the seven measures of high-involvement work design. Satisfied workers were significantly more likely than other workers to increase participation in high-involve-

Table 9. Indicators of Causality.

Type of Involvement	*Very Satisfied (Year 2)*
Participate in Employee Survey (Year 1)	.050
	(.040)
Participate in Suggestion Program (Year 1)	.032
	(.042)
Participate in Job Rotation (Year 1)	.003
	(.040)
Informed about Workplace Changes (Year 1)	–.004
	(.051)
Participate in Task Team (Year 1)	.181*
	(.051)
Participate in Quality Circle (Year 1)	–.014
	(.045)
Part of Self-Directed Workgroup (Year 1)	–.036
	(.039)
LR Test	3688.79
Number of Observations	21,899

	Year 1						
	Employment Survey	*Suggestion Program*	*Job Rotation*	*Informed*	*Task Team*	*Quality Circle*	*Self-Directed Workgroup*
Very Satisfied Year 2	.116***	.161***	.030	.225***	.212***	.164***	.087***
	(.035)	(.037)	(.036)	(.046)	(.044)	(.037)	(.035)
LR Test	1,403	1,794	1,413	1,061	1,939	2,411	2,338
Observations	21,160	21,306	20,947	15,957	17,319	20,618	22,162

Notes: The table reports fixed effects logit estimations (collapsing the dependent variable into an indicator for whether or not the respondent was "very satisfied"), with control variables for worker characteristics, as well as the year-one value of the dependent variable. Robust standard errors are in parentheses, controlling for establishment clustering.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

ment practices. To our knowledge, this is the first paper to present evidence of this form of selection bias in such a wide-ranging sample. As Wright et al. (2005) documented, causality has received insufficient attention in the prior literature on human resource practices, so the results presented here indicate that endogenous participation variables may cast doubt on the implications inferred by researchers in a number of prior cross-sectional studies.

Given this evidence of selection bias, we use our final estimations to investigate whether the cross-sectional association between satisfaction and involvement persists in a sample that limits the possibility for self-selection. To do this, we use organizational-level variables instead of the individual employee's reported participation. Table 10 presents results from one such approach. We use the mean participation variables of all employees at that workplace, first individually (top of table) or as an additive index (bottom of table). While this aggregated organizational measure, which gauges the degree to which a participatory work environment is associated with job satisfaction, may mitigate selection bias, it also requires a tradeoff. The estimations reported in Table 10 no longer directly control for unobserved workplace characteristics like management style, and using organizational aggregates also introduces noise. The results produce large standard errors and, for the most part, statistically insignificant coefficients, meaning that it is no longer possible to identify the relationship between particular measures of involvement and satisfaction. However, the composite measure, the average number of programs reported per worker at a given

establishment, is positive and statistically significant; at least some of the cross-sectional association between involvement and satisfaction persists when measured at the organizational level.

Table 10. Association between High-Involvement Work Design and Job Satisfaction, Using an Organizational Participation Aggregate.

Percent of Workers in the Workplace Who:	*Coeff.*
Participate in Employee Survey	–.001
	(.065)
Participate in Suggestion Program	.181**
	(.081)
Participate in Job Rotation	–.096
	(.071)
Informed about Workplace Changes	.260***
	(.085)
Participate in Task Team	.181*
	(.103)
Participate in Quality Circle	.099
	(.088)
Part of Self-Directed Workgroup	.019
	(.071)
Number of Observations	23,211
Wald Test	446.3
Pseudo R^2	.040
Average Number of Programs Workers in the Workplace Participate in	.094***
	(.018)
Number of Observations	23,211
Wald Test	417.7
Pseudo R^2	.038

Notes: Ordered probit coefficients (the dependent variable takes on four possible values). Both models control for worker characteristics, wages, and establishment workplace organization, as in the third column of Table 3. Robust standard errors are in parentheses, controlling for establishment clusters.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

Discussion

We have used a rich, linked data set to investigate the relationship between high-involvement jobs and employee satisfaction. Our cross-sectional results indicate that suggestion programs, information sharing, teams, and quality circles all were positively associated with job satisfaction, and the coefficients imply large marginal effects. Similar results hold for the specific subset of unionized workers. Even among workers who were already participating in high-involvement jobs, additional participatory practices were positively related to job satisfaction.

These cross-sectional results are consistent with the results of other studies that have used broad, multi-industry datasets from Australia (Drago 1996), the United Kingdom (Ramsay, Scholarios, and Harley 2000), and Finland (Kalmi and Kauhenen 2005). All of the authors of those studies hypothesized, as we do, that involvement might either benefit or harm workers. Drago (1996), using the Australian Workplace and Industrial Relations Survey, showed that both "transformed" and "disposable" workplaces use participatory practice more frequently than "traditional" workplaces do. "Transformed" workplaces are positively associated with outcomes like job security or promotion opportunities, while "disposable" workplaces are not. Ramsay, Scholarios, and Harley (2000), using the Workplace and Employee Relations Survey, found that high-performance work systems are associated with both increased commitment and increased job strain. Kalmi and Kauhenen (2005), using the Finnish Quality of Work Life Survey, provided direct tests of the association between involvement and satisfaction. Their results, like ours, show a positive relationship between participatory jobs and job satisfaction and no consistent relationship with job strain.

While the cross-sectional results confirm other findings and contribute to our understanding of the link between workplace practices and job satisfaction, our additional estimations point to a number of research extensions. For example, our measures of additional worker outcomes suggest that future research can better consider the broader question of whether involvement benefits workers. Job satisfaction measures only one aspect of that question. While some studies have looked at outcome measures, like wages, employment security, or safety (see Handel and Levine 2006 for a survey), our work expands this list. Actions like turning down training, missing work, filing grievances, or reporting significant job-related

stress may signal negative outcomes that do not appear in broader measures like wages or turnover.

Perhaps most important, our additional estimations indicate that selection may explain a portion of the strong positive correlation between involvement and job satisfaction. Satisfied workers are more likely to increase participation in high-involvement practices, but participation does not predict future increases in satisfaction. This result suggests that a range of studies linking involvement with satisfaction may partially reflect selection bias. Our empirical finding does not definitively assign causality, however; we do not observe a natural experiment. Therefore, it is important to individually identify and study various potential sources of bias. Do satisfied and less satisfied workers differ in the way they describe their jobs? Do satisfied workers volunteer to participate in involvement programs? Are managers more likely to ask satisfied workers to participate in involvement programs? Do overall levels of morale affect managers' choice of whether or not to introduce new involvement schemes? Answers to these questions, particularly if supported with evidence from broad, multi-industry data sets, will considerably advance the effort to identify causal links in the association between job satisfaction and high-involvement work design.

Table A1
Wording of Survey Questions Used to Define High-Involvement Job Design

Instructions: Although a program or policy may exist somewhere in your workplace, we are only interested in those that apply directly to you. If the answer to any of questions 31 (a) to 31 (d) is "always", answer "frequently".

31 (a) How frequently are you asked to complete employee surveys? (*Never – Occasionally – Frequently*)

31 (b) How frequently do you participate in an employee suggestion program or regular meetings in which you offer suggestions to your superiors regarding areas of work that may need improvement? (*Never – Occasionally – Frequently*)

31 (c) How frequently do you participate in a job rotation or cross-training program where you work or are trained on a job with different duties than your regular job? (*Never – Occasionally – Frequently*)

31 (d) How frequently are you informed (through meetings, newsletters, e-mail or Internet) about overall workplace performance, changes to workplace organization or the implementation of new technology? (*Never – Occasionally – Frequently*)

31 (e) How frequently do you participate in a task team or labour-management committee that is concerned with a broad range of workplace issues? Note: Task teams and labour-management committees make recommendations to line managers on such issues as safety, quality, scheduling, training and personal development programs. (*Never – Occasionally – Frequently – Always*)

31 (f) How frequently do you participate in a team or circle concerned with quality or work flow issues? (*Never – Occasionally – Frequently – Always*)

31 (g) How frequently are you part of a self-directed work group (or semi-autonomous work group or mini-enterprise group) that has a high level of responsibility for a particular product or service area? In such systems, part of your pay is normally related to group performance.

(Self-directed work groups:

- Are responsible for production of a fixed product or service, and have a high degree of autonomy in how they organize themselves to produce that product or service.
- Act almost as "businesses within businesses."
- Often have incentives related to productivity, timeliness and quality.
- While most have a designated leader, other members also contribute to the organization of the group's activities.)

(*Never – Occasionally – Frequently – Always*)

Table A2
Factor Loadings of Workplace Control Variables

	Establishment Survey	
Variable	*Factor 1: Decision Rights*	*Factor 2: Workplace Organization*
Workers help decide planning of daily individual work	.663	–.238
Workers help decide planning of weekly individual work	.670	–.273
Workers help decide on follow-up of results	.547	–.182
Workers help decide on customer relations	.521	–.154
Workers help decide on quality control	.572	–.066
Workers help decide on purchase of necessary supplies	.434	–.144
Workers help decide on maintenance of machinery and equipment	.433	–.076
Workers help decide on setting staffing levels	.318	–.092
Workers help decide on filling vacancies	.342	–.052
Workers help decide on training	.472	–.072
Workers help decide on choice of production technology	.436	–.090
Workers help decide on product/service development	.455	–.070
Employee suggestion program	.218	.415
Information sharing	.383	.512
Flexible job design	.256	.375
Problem-solving teams	.363	.475
Joint labor-management committees	.223	.329
Self-directed work groups	.317	.335
Individual incentive pay	.095	.073
Gainsharing	.140	.180
Profit-sharing	.103	.118
Merit pay	.182	.148
Observations	26,641	

Notes: The Kaiser-Meyer-Olkin measure of sampling accuracy for the 22 variables exceeds .81, indicating that the variables have enough in common to merit factor analysis. We retain the first two factors, both of which have Eigen values exceeding 1.

Table A3
Association of Worker and Workplace Characteristics with Job Satisfaction

Variable	*Coefficient*	*Standard Error*
Tenure	–.004	(.002)
Experience	–.002	(.006)
Experience^2/100	.025*	(.013)
Female	.023	(.037)
Married	.023	(.038)
Has Children	.083***	(.036)
Covered by Union	–.015	(.038)
High School Only	.126***	(.048)
Bachelor's Degree	–.145***	(.050)
Advanced Degree	.083	(.078)
Home Language Not Work Language	–.123***	(.055)
Disability That Limits Work Activities	–.038	(.091)
Education Exceeds That Required for Job	–.043	(.041)
Received Classroom Training within Prior Year	.053	(.034)
Hours per Week	–.008***	(.003)
Would Prefer ± 5 Hours	–.304***	(.043)
Overtime Hours	.077	(.050)
Uses a Computer on the Job	.070	(.045)
Works Late Shift	–.105	(.071)
Promoted within the Last Year	.109***	(.038)
Manager	.031	(.115)
Professional	–.110	(.101)
Technical/Trade Worker	–.095	(.092)
Marketing/Sales Worker	—	—
Clerical/Administrative	.008	(.096)
Production Worker with No Trade	–.115	(.102)
Natural Log of Hourly Wage	.271***	(.053)
Year 2001	–.075**	(.033)
Workplace Characteristics		
Number of Employees/100	.001	(.001)
Vacancy Rate	–.101	(.212)
Many Competitors	–.039	(.040)
Decision Rights Factor	.020	(.016)
Workplace Organization Factor	–.036*	(.021)

Notes: Ordered probit coefficients from model in column 2 of Table 3. Robust standard errors in parentheses, controlling for establishment clusters.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

REFERENCES

Bauer, Thomas K. 2004. "High Performance Workplace Practices and Job Satisfaction: Evidence from Europe." Bonn: IZA discussion paper No. 1265 (August).

Brown, Donna, and Steven McIntosh. 2003. "Job Satisfaction in the Low Wage Service Sector." *Applied Economics,* Vol. 35**,** No. 10 (July)**,** pp. 1241–54.

Business Week. 1983. "A Work Revolution in U.S. Industry." Issue 2790 (May 16), p. 100.

Campion, Michael A., and Carol L. McClelland. 1993. "Follow-up and Extension of the Interdisciplinary Costs and Benefits of Enlarged Jobs." *Journal of Applied Psychology,* Vol. 78, No. 3 (June), pp. 339–51.

Clark, Andrew E. 1999. "What Makes a Good Job? Evidence from OECD Countries." Mimeo, CNRS and LEO–Cresp, Université d'Orléans.

Clark, Andrew E., Yannis Georgellis, and Peter Sanfey. 1998. "Job Satisfaction, Wages, and Quits: Evidence from German Panel Data." *Research in Labor Economics,* Vol. 17, pp. 88–101.

Clark, Andrew E., and Andrew J. Oswald. 1996. "Satisfaction and Comparison Income." *Journal of Public Economics,* Vol. 61, No. 3 (September), pp. 359–82.

Clegg, Chris W. 1983. "Psychology of Employee Lateness, Absence, and Turnover: A Methodological Critique and an Empirical Study." *Journal of Applied Psychology,* Vol. 68, No. 1 (February) pp. 88–101.

Davidson, Julia O. 1991. "Subcontract, Flexibility, and Changing Employment Relations in the Water Industry." In Paul Blython and Jonathan Morris, eds., *A Flexible Future? Prospects for Employment and Organization,* pp. 241–58. Berlin: de Gruyter.

Delbridge, Rick, Peter Turnbull, and Barry Wilkinson. 1992. "Pushing Back the Frontiers: Management Control and Work Intensification under JIT/TQM Regimes." *New Technology, Work and Employment,* Vol. 7, pp. 97–106.

Drago, Robert. 1996. "Workplace Transformation and the Disposable Workplace: Employee Involvement in Australia." *Industrial Relations,* Vol. 35, No. 4 (October), pp. 526–43.

Drago, Robert, Saul Estrin, and Mark Wooden. 1992. "Pay for Performance Incentives and Work Attitudes." *Australian Journal of Management,* Vol. 17, No. 2, pp. 217–32.

Drago, Robert, and Mark Wooden. 1992. "The Determinants of Labor Absence: Economic Factors and Workgroup Norms across Countries." *Industrial and Labor Relations Review,* Vol. 45, No. 4 (July), pp. 135–41.

Erez, Amir, and Timothy A. Judge. 1994. "Dispositional Source of Job Satisfaction: The Role of Self-Deception." Cornell University, Center for Advanced Human Resource Studies (CAHRS) Working Paper Series, Working Paper 94-14.

Freeman, Richard B. 1978. "Job Satisfaction as an Economic Variable." *American Economic Review,* Vol. 68, No. 2 (May), pp. 135–41.

Fried, Yitzhak, and Gerald R. Ferris. 1987. "The Validity of the Job Characteristics Model: A Review and Meta-Analysis." *Personnel Psychology,* Vol. 40, No. 2 (Summer), pp. 287–322.

Garrahan, Philip, and Paul Stewart. 1992. *The Nissan Enigma: Flexibility at Work in a Local Economy.* London: Mansett.

Godard, John. 2001. "High Performance and the Transformation of Work? The Implications of Alternative Work Practices for the Experience and Outcomes of Work." *Industrial and Labor Relations Review,* Vol. 54, No. 4 (July), pp. 776–805.

Gordon, Michael E., and Angelo S. Denisi. 1995. "A Re-Examination of the Relationship between Union Membership and Job Satisfaction." *Industrial and Labor Relations Review,* Vol. 48, No. 2 (January), pp. 222–36.

Green, Francis. 2004. "Why Has Work Effort Become More Intense?" *Industrial Relations,* Vol. 43, No. 4 (October), pp. 709–41.

Greene, William H. 2004. "The Behavior of the Maximum Likelihood Estimator of Limited Dependent Variable Models in the Presence of Fixed Effects." *Econometrics Journal,* Vol. 7, No. 1 (June), pp. 98–119.

Griffin, Ricky W. 1991. "Effects of Work Redesign on Employee Perceptions, Attitudes, and Behaviors: A Long-Term Investigation." *Academy of Management Journal,* Vol. 34, No. 2 (June), pp. 425–35.

Hackman, J. Richard. 1992. "Group Influences on Individuals in Organizations." In Marvin Dunnette and Leaetta M. Hough, eds., *Handbook of Industrial and Organizational Psychology* (2nd edition), Vol. 3, pp. 199–267. Palo Alto, Calif.: Consulting Psychologists Press.

Hackman, J. Richard, and Greg R. Oldham. 1976. "Motivation through the Design of Work: Test of a Theory." *Organizational Behavior and Human Performance,* Vol. 16, No. 2 (August), pp. 250–79.

____. 1980. *Work Redesign.* Reading, Mass.: Addison-Wesley.

Hamermesh, Daniel S. 1977. "Economic Aspects of Job Satisfaction." In Orley E. Ashenfelter and Wallace E. Oates, eds., *Essays in Labor Market Analysis,* pp. 53–72. New York: John Wiley.

Handel, Michael J., and David I. Levine. 2006. "The Effects of New Work Practices on Workers." In Edward E. Lawler III and James O'Toole, eds., *America at Work: Choices and Challenges,* pp. 73–85. New York: Palgrave MacMillian.

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi. 1997. "The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines." *American Economic Review,* Vol. 87, No. 3 (June), pp. 291–313.

Ilies, Eli, and Timothy A. Judge. 2004. "An Experience-Sampling Measure of Job Satisfaction and Its Relationships with Affectivity, Mood at Work, Job Beliefs, and General Job Satisfaction." *European Journal of Work and Organizational Psychology,* Vol. 13, No. 3 (September), pp. 367–89.

Jones, Derek C., and Takao Kato. 2005. "The Effects of Employee Involvement on Firm Performance: Evidence from an Econometric Case Study." William Davidson Institute Working Paper No. 612 (May).

Judge, Timothy A., Daniel Heller, and Michael K. Mount. 2002. "Five-Factor Model of Personality and

Job Satisfaction: A Meta-Analysis." *Journal of Applied Psychology,* Vol. 87, No. 3 (June), pp. 530–41.

Judge, Timothy A., Sharon Parker, Amy E. Colbert, Daniel Heller, and Remus Ilies. 2001a. "Job Satisfaction: A Cross-Cultural Review." In Neil Anderson, Deniz S. Ones, Handan K. Sinangil, and Chockalingam Viswesvaran, eds., *Handbook of Industrial, Work, and Organizational Psychology,* Vol. 2, pp. 25–52. London: Sage.

Judge, Timothy A., Carl J. Thoresen, Joyce E. Bono, and Gregory K. Patton. 2001b. "The Job Satisfaction–Job Performance Relationship: A Qualitative and Quantitative Review." *Psychological Bulletin,* Vol. 127, No. 3 (May) pp. 376–407.

Kalmi, Panu, and Antti Kauhanen. 2005. "Workplace Innovations and Employee Outcomes: Evidence from a Representative Employee Survey." Centre on Skills, Knowledge, and Organisational Performance Research Paper 61 (November), Oxford and Warwick Universities.

Karasek, Robert A., Jr. 1979. "Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign." *Administrative Science Quarterly,* Vol. 24, No. 2 (June), pp. 285–308.

Kelly, John E. 1982. *Scientific Management, Job Redesign, and Work Performance.* London: Academic Press.

Krebs, Howard, Zdenek Patak, Garnett Picot, and Ted Wannell. 1999. "The Development and Use of a Canadian Linked Employer-Employee Survey." Mimeo, Statistics Canada.

Loher, Brian T., Raymond A. Noe, Nancy L. Moeller, and Michael P. Fitzgerald. 1985. "A Meta-Analysis of the Relation of Job Characteristics to Job Satisfaction." *Journal of Applied Psychology,* Vol. 70, No. 2 (May), pp. 280–89.

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

Organ, Dennis W., and Katherine Ryan. 1995. "A Meta-Analytic Review of Attitudinal and Dispositional Predictors of Organizational Citizenship Behavior." *Personnel Psychology,* Vol. 48, No. 4 (Winter), pp. 775–802.

Osterman, Paul. 2000. "Work Reorganization in an Era of Restructuring: Trends in Diffusion and Effects on Employee Welfare." *Industrial and Labor Relations Review,* Vol. 53, No. 2 (January), pp. 179–96.

Pil, Frits K., and John P. MacDuffie. 1996. "The Adoption of High-Involvement Work Practices." *Industrial Relations,* Vol. 35, No. 3 (July), pp. 423–55.

Pollert, Anna. 1991. "The Orthodoxy of Flexibility." In Anna Pollert, ed., *Farewell to Flexibility?* Oxford: Basil Blackwell.

Ramsay, Harvey, Dora Scholarios, and Bill Harley. 2000. "Employees and High-Performance Work Systems: Testing Inside the Black Box." *British Journal of Industrial Relations,* Vol. 38, No. 4 (December), pp. 501–31.

Sewell, Graham, and Barry Wilkinson. 1992. "Someone to Watch over Me: Surveillance, Discipline and the Just-in-Time Labour Process." *Sociology,* Vol. 26, No. 2, pp. 271–89.

Statistics Canada. 2004. "Guide to the Analysis of the Workplace and Employee Survey." Catalogue No. 71-221-GIE. Ottawa.

Thompson, Paul, and David McHugh. 1990. *Work Organizations: A Critical Introduction.* London: MacMillan.

Weiss, Howard M. 2002. "Deconstructing Job Satisfaction: Separating Evaluations, Beliefs, and Affective Experiences." *Human Resource Management Review,* Vol. 12, No. 2 (Summer), pp. 173–95.

Wong, Chi-Sum, Chun Hui, and Kenneth S. Law. 1998. "A Longitudinal Study of the Job Perception–Job Satisfaction Relationship: A Test of Three Alternative Specifications." *Journal of Occupational & Organizational Psychology,* Vol. 71, No. 2 (June), pp. 127–46.

Wright, Patrick M., Timothy M. Gardner, Lisa M. Moynihan, and Mathew R. Allen. 2005. "The Relationship between HR Practices and Firm Performance: Examining Causal Order." *Personnel Psychology,* Vol. 58, No. 2 (Summer), pp. 409–46.