BLS WORKING PAPERS

U.S. DEPARTMENT OF LABOR
Bureau of Labor Statistics

OFFICE OF PRODUCTIVITY AND TECHNOLOGY

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Working Paper 363
December 2002

Results and conclusions expressed here are those of the author and have not been endorsed by the Bureau of Labor Statistics or the US Department of Labor.

The Distribution of Decision Rights Within the Workplace: Evidence from Canadian, Australian and UK Establishments

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November 7, 2002

Abstract:
The optimal allocation of decision rights in an organization reflects a trade-off between the costs of transferring relevant information within the hierarchy and the costs that occur when decision-making agents have different objectives than the principal. This paper is a first attempt to quantitatively analyze the allocation of decision rights within the workplace. I use detailed questions on decision-making from three separate data sets to measure the decentralization of decision rights within the hierarchy, to determine what establishment characteristics are related to the location of decision rights, and to examine what human resource practices are correlated with centralization.

JEL Classifications: D21, D23, L23
Keywords: decision rights, hierarchies, decentralization

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Introduction

In a small sole proprietorship, the entrepreneur could know all the details of the business and could make each decision alone without requiring additional sources of information. As the size and scope of the business grows, however, it becomes increasingly difficult for any individual to possess and process all the relevant information and to make all the decisions alone—this is an example of "bounded rationality." One solution to this problem is to transport the information to the individual who possesses the decision rights. This can be quite costly, both in terms of the delays in decision-making and in the actual information transmission costs. Another solution is to grant decision rights to those in possession of the relevant knowledge. This brings up agency costs since the objectives of those with the knowledge are not necessarily aligned with the objectives of the individual with the decision rights.

As the size of modern companies has grown, there is some evidence that both of these solutions have been used. Falling prices in information technology have reduced the costs of information transmission, and the heavy use of IT in many large companies suggests that firms will often transport the knowledge to those with decision rights. At the same time, the increasing use of teams and quality circles suggests that many firms have begun to decentralize decision rights. Researchers have also documented the

The author wishes to thank Mike Gibbs for invaluable support and suggestions on this paper, as well as Dan Hamermesh, Mike Harper, Alec Levenson, Peter Meyer, Sabrina Pabilonia, Larry Rosenblum, Leo Sveikauskas, participants at the Bureau of Labor Statistics Brown Bag workshop and participants at the George Washington University Labor Studies Workshop for their comments. Tony Fang at Statistics Canada provided exceptional help with accessing the WES data.

accompanying adoption of personnel policies such as training and incentive pay, which are tools to reduce the agency problems of decentralized decision rights.

The choice of solution to this problem is unique to the organization. Various features may facilitate or hinder the transmission of knowledge as well as the transfer of decision rights. For example, firms in a high-tech industry may have a greater amount of specialized or perishable knowledge that is difficult to transport—that is, difficult for a single decision-maker to process or comprehend. Thus, high-tech firms may be more likely to decentralize decision rights.

In this paper, I develop a simple model for the optimal location of decision rights in a profit-maximizing firm. I then use three detailed international workplace data sets to analyze the distribution of decision rights within a workplace, using both objective information on specific workplace practices as well as subjective questions dealing with the balance of power in the organization. I identify features of the firm such as industry, size and age of organization, unionization and market structure that affect the distribution of decision rights. In addition, I show the relationship between the distribution of decision rights and the use of complementary human resource practices such as incentive pay, training and monitoring.

Previous Literature

Much of the empirical research on workplace organization has focused on the use of particular organizational tools, such as teams, quality circles, job rotation and incentive pay, frequently within one particular industry. Womack, Jones and Roos (1990), MacDuffie (1995) and Pil and MacDuffie (1996) examined the "innovative human

resource practices" in the US and foreign automobile industries. Ichniowski, Shaw and Prennushi (1997) and Ichniowski and Shaw (1995) examine the effects of "human resource management practices" on productivity among steel finishing lines. Batt (1999) analyzes the productivity effects of Total Quality Management and self-managed teams compared to a more centralized work organization using data from a large telecommunications company.

Recently, there has been an effort to collect cross-industry nationally representative data on workplace practices. Osterman (1994) used a 1992 survey of establishments to describe the incidence of teams, job rotation, Total Quality Management and quality circles among establishments with fifty or more employees. He found a widespread use of these practices and determined that certain establishment characteristics were correlated with that use. Similar data were collected in 1993 and 1995 by the Bureau of Labor Statistics in its Survey of Employer-Provided Training. Gittleman, Horrigan and Joyce (1998) analyzed these data and found similar results to those obtained by Osterman.

Finally, the National Employers Survey, conducted by the National Center on the Educational Quality of the Workforce, also surveyed US establishments in 1994 and 1997 and asked about the use of these and other workplace and human resource practices, as well as the incidence of employee training. One advantage of this survey over previous data collections is that the data can be linked to data on establishment outcomes from the Census Bureau's Longitudinal Research Database. Black and Lynch (1996), and Black and Lynch (2001) have taken advantage of the matched datasets and have found (sometimes small) significant effects on productivity and wages of these workplace

practices, mainly when multiple workplace practices are adopted in combination. Cappelli and Neumark (2001) and Cappelli and Carter (2000) do not find such productivity results, but only find that workers receive a wage premium when in a workplace that adopts such practices.

One reason for the lack of consensus on the effects of workplace practices is that the terms are arbitrarily defined for any given establishment. This is noted in the conclusion of Black and Lynch (1996): "Finally, our results suggest that it is important to move beyond simple measures of the incidence of workplace practices such as training or TQM in order to understand how these types of workplace strategies/investments actually pay off for employers." This study treats these practices as tools that establishments use in the production function—means to an end rather than the end itself. I focus instead on the location of decision rights and view these practices as tools that can be used to reduce the costs associated with that choice of location.

The motivation for this interpretation comes from the growing literature on organization theory. Hayek (1945) emphasized the importance of knowledge and its distribution in society:

> If we can agree that the economic problem of society is mainly one of rapid adaptation to changes in the particular circumstances of time and place, it would seem to follow that the ultimate decisions must be left to the people who are familiar with these circumstances, who know directly of the relevant changes and of the resources immediately available to meet them. We cannot expect that this problem will be solved by first communicating all this knowledge to a central board which, after integrating all knowledge, issues its orders. We must solve it by some form of decentralization.

March and Simon (1958) apply the term "bounded rationality" to this notion that individuals are limited in the amount of knowledge that they can process and store. This

point is also made in Chandler (1962), who finds that companies organized in "unitary-form" lose efficiency as their size grows, relative to those organized in "multidivisional form." More recent literature develops specific models of decentralized information processing and analyzes the efficiency and delay in different hierarchical structures. [Aoki(1986), Radner (1992), Radner and Van Zandt (1992), Athey et.al. (1994), Aghion and Tirole (1997)]

The objective of this paper is to present new empirical evidence on decision rights, and also to interpret the findings in the context of the organization theory emphasized here. The analysis is derived largely from Jensen and Meckling (1990), who discuss how organizations solve the problems of assigning decision rights. In the next section, I will show how their theory of organizational structure can be used to predict how firm characteristics affect the degree of decentralized decision-making.

The Optimal Location of Decision Rights

The knowledge of any single decision-maker is limited by both current scientific progress and also by his own capacity to absorb, comprehend and process available knowledge. At the same time, Jensen and Meckling (1990) point out that "when knowledge is valuable in decision-making, there are benefits to collocating decision authority with the knowledge that is valuable to those decisions." Two methods, used alone or in conjunction with each other, will achieve this solution: to move the knowledge to the individual who possesses the decision rights; and/or to shift the decision rights to the individual who possesses the knowledge.

Under the first solution, the organization is faced with the costs of transporting knowledge. Radner (1992) defines four aspects of the processing of information that are costly: observation of the environment, capabilities of the processors, the communication network, and the delay between the observation of the environment and the implementation of the decision. The size of these costs will vary depending upon the type of knowledge being transferred, current technology, and the organizational structure. As a result, the nature of these costs will be uniquely determined for any given organization.

Under the second solution, the organization faces agency costs that result from transferring decision rights. "Agency costs include the costs of structuring, monitoring, and bonding a set of contracts among agents with conflicting interests. Agency costs also include the value of output lost because the costs of full enforcement of contracts exceed the benefits." [Fama and Jensen (1983)] Again, various features of the organization determine the size of these costs relative to other organizations.

In making the decision on the optimal location of decision rights, an organization is faced with a trade-off between these agency costs and knowledge transfer costs. Figure 1 demonstrates the intuition behind this argument. On the far left-hand side of the figure, the organization is completely centralized—one single planner makes all decisions and all relevant knowledge is transferred to her. This results in zero agency costs, since the principal and the agent are one and the same. A movement toward the right side of the figure indicates decentralization, which increases agency costs and decreases the cost of transmitting information. When all decision rights have been transferred to the individuals in possession of the knowledge, the organization is completely decentralized,

as indicated by the vertical line on the far right of Figure 1. At this point, agency costs are at their highest, and information costs at their lowest. The organization would optimally choose a location of decision rights that minimizes the sum of these two costs—the minimum point on the total organizational cost curve. Again, these curves will vary from one organization to the next, depending upon organizational structure, current technology and types of knowledge relevant to the decision made in the organization.

A simple model helps to clarify this optimization. Consider a single decision entailed by the production of output[1]. This might be a decision on the quality or amount of a particular input to use, or whether to try a new production process, for example. Let d represent the (hierarchical) distance between the most senior manager in the firm and the level at which the decision is made. When $d = 0$, the decision is made by an agent at the bottom of the hierarchy, while $d = D$ when the top manager makes the decision.

This distance affects costs in two ways. First, a lengthy distance increases the amount of time it takes to make the decision. This may be costly to the firm in terms of lost business, reduced customer satisfaction (and thus future sales), or perishable inputs being lost. The extent to which delays are costly will not be the same for every firm--for example, costs will be lower in firms that do not employ perishable inputs, while costs may be higher in markets that are more volatile or competitive. These delay costs can be represented by $\varphi T(d,\alpha)$ where φ measures the cost per unit of time, $T(.)$ measures the units of time required to make the decision, and α represents other firm characteristics that increase how long it may take to make the decision. Following the results of Radner

[1] More complex sets of decisions and decision-making properties are clearly more realistic. To preserve the simplicity of the model, I focus on a single decision.

(1992), Carter (1995) and others, I assume that $T_d > 0$: as d increases, the decision is made farther up the hierarchy, causing greater delay due to the need to transfer information to and from the decision-maker and the increased queuing for the attention of the decision-maker. By definition, $T_\alpha > 0$.

Another cost of any given hierarchical level of decision-making arises if the objectives of decision-making agents do not perfectly match the objectives of the principal. Thus, for example, if production-line workers were to decide the output level, they might choose a level that minimized effort, rather than one that minimized costs. Again, agency costs will be higher in some types of firms, such as those where it is more difficult or costly to monitor workers. These agency costs are measured by $A(d,\gamma)$ where γ represents firm characteristics that increase agency costs. Thus, $A_d < 0$: as the decision is made higher in the hierarchy, the agency costs decrease. By definition, $A_\gamma > 0$.

Suppose, for example, the relevant decision is the optimal amount of output, q. If either the principal had perfect (or costless) information or the information-holding agent had the same objectives as the principal, the optimal output $\hat{q}$ would be determined by the standard profit maximizing model:

$$Max\ \pi = Pq - WL - RK \tag{1}$$

for inputs L and K and output and input prices P, W and R, respectively. Here, however, regardless of which party decides q, there will be decision-making costs[2] that could result in an optimal output level different than $\hat{q}$, determined by:

$$\underset{q,d}{Max}\ \pi = Pq[\varphi T(d,\alpha) + A(d,\gamma)] - WL - RK \tag{2}$$

[2] I am implicitly assuming that the wages of a worker are not affected by her proximity to the optimal d--in particular, by whether or not she makes the decision.

The size of the deviation from the optimal q will depend on the parameters α, γ and φ. There are still cases in which the resulting output level is the same as in the standard profit maximizing model such as when delay is costless ($\varphi = 0$).

For computational ease, let us restrict our attention to the specialized case when the location of decision rights is separable from the output decision. Thus, rather than maximizing the full profit function, we can consider the problem of choosing the optimal location of decision rights that minimizes the size of the deviation from $\hat{q}$:

$$\underset{d}{Min} \quad \varphi T(d,\alpha) + A(d,\gamma) \tag{3}$$

Note that this essentially describes the Jensen and Meckling diagram. When the decision is made by the most senior manager, $d = D$ so that agency costs approach zero and the delay costs approach their highest value. When the decision is made by the production-line worker(s), $d = 0$, delay costs approach zero and agency costs approach their highest value. If the decision is made by some middle manager or supervisor, $0 < d < D$, and both t and A have nonzero values.

The first order condition characterizing this minimum is:

$$\varphi T_d(d,\alpha) + A_d(d,\gamma) = 0 \tag{4}$$

which shows that the decision can be made by an increasingly higher authority as long as the marginal benefit of doing so in terms of lower agency costs exceeds the marginal cost that arises from higher delay costs. An interior solution to this problem, where $0 < d < D$, exists when this second order condition is met:

$$\varphi T_{dd}(d,\alpha) + A_{dd}(d,\gamma) > 0 \tag{5}$$

Anecdotal evidence about the decision-making patterns of firms indicates that this second order condition may not be met for all possible decisions in every company, but the large number of foremen, supervisors and middle managers suggests that an interior solution exists quite often.

There are three comparative static results of interest here: $\frac{\partial d}{\partial \varphi}, \frac{\partial d}{\partial \alpha}$, and $\frac{\partial d}{\partial \gamma}$.

These give the changes in optimal decision-making location with respect to, respectively, the unit cost of delay, the organizational characteristics affecting the length of delay, and the organizational characteristics affecting agency costs. They are derived as:

$$\frac{\partial d}{\partial \varphi} = \frac{-T_d(d,\alpha)}{\varphi T_{dd}(d,\alpha) + A_{dd}(d,\gamma)} \tag{6a}$$

$$\frac{\partial d}{\partial \alpha} = \frac{-\varphi T_{d\alpha}(d,\alpha)}{\varphi T_{dd}(d,\alpha) + A_{dd}(d,\gamma)} \tag{6b}$$

$$\frac{\partial d}{\partial \gamma} = \frac{-A_{d\gamma}(d,\gamma)}{\varphi T_{dd}(d,\alpha) + A_{dd}(d,\gamma)} \tag{6c}$$

In each case, the denominator is the second order condition, which must be positive for an interior solution. There is no a priori assumption about the cross partials of $T(d,\alpha)$ and $A(d,\gamma)$, so the effects of firm characteristics on the decision-making location are ambiguous. In the case of the price of delay, however, the effect is unambiguously negative: as the price of delay increases, d becomes smaller--it becomes more likely that the decision will be made by someone closer to the shop floor. This is an intuitively appealing result. In the extreme case of a monopolist, the cost of delay is quite small, since the customers have no choice but to wait. Why would the head manager of a

monopoly incur agency costs when she can costlessly make the customers wait while she obtains the information she needs to make the decision? In the empirical sections that follow, I will analyze the signs of these three comparative statics, and test the hypothesis that the price of delay increases decentralization.

Sources of Data

American data on workplace organization are largely limited to case studies of a single establishment or industry. A cross-industry survey of American workplace practices was conducted by Paul Osterman in 1992. The final data contained results on the use of specific workplace practices at 875 manufacturing establishments. Two subsequent surveys are the National Employer Survey, conducted by the National Center on the Educational Quality of the Workforce in 1994 and 1997 and the Survey of Employer-Provided Training conducted by the Bureau of Labor Statistics in 1993 and 1995. These nationally-representative establishment surveys focused on training, but also had detailed questions on the use and intensity of specific workplace practices.

Much richer data exist abroad for addressing questions related to work organization and decision rights. The first such data set is the Workplace Employee Relations Survey (and its predecessor the Workplace Industrial Relations Survey)[3], which the United Kingdom has conducted in 1980, 1984, 1990 and 1998. It consists of responses to a face-to-face interview at the establishment with the senior person responsible for industrial relations or employee relations issues. The 1998 sample of 2,191 establishments is drawn from the underlying population of all U.K. establishments

with at least ten employees[4]. The survey asks detailed questions about the structure of the organization, the amount of participation in decision-making individual workers have, detailed questions about unions and collective bargaining, as well as information on the use of specific workplace practices.

Similar questions were asked in the Australian Workplace Industrial Relations Survey. The survey was conducted once in 1990 and again in 1995. Again, face-to-face interviews were conducted with the senior human resources manager. The 1995 sample consists of 2,001 establishments with twenty or more employees. This is a somewhat more restrictive sampling framework, since a large fraction of all establishments are very small.

A third source of information on decision-making is the Workplace and Employee Survey, which was conducted in 1999 by Statistics Canada[5]. As in the U.K. and Australian data sets, face-to-face interviews were conducted with the senior person responsible for human resources. The sample of around 6,300 establishments was drawn from a stratified sample of all Canadian establishments--unlike the other two data sets, there is no lower limit on the number of employees. Respondents were asked detailed questions about training and technology use, as well as who makes decisions on a number of issues related to the business. Although this is the first wave of the survey, Statistics Canada intends to follow the workplaces for at least four years to create a longitudinal data set.

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[3] Details about the WERS can be found at http://www.data-archive.ac.uk. The data are confidential, but can be obtained through the University of Essex for a nominal fee and by meeting confidentiality requirements.

[4] A subsample of the 1980 (1990) establishments were given a special panel survey and were re-sampled in 1984 (1998) to create two panels of data. I do not use them in this analysis.

The objectives of this empirical work are to describe the distribution of decision rights within organizations, to find establishment characteristics that correspond to the theoretical variables φ, α and γ and to determine how they affect that distribution. The most difficult of these tasks is to define the distribution of decision rights. In each data set, there are many questions that indicate the decentralization of decision rights. Some are quite specific, such as "who negotiated the most recent pay raise?"; others require more subjective estimation, such as "how much influence do workers have over the pace at which their work is done?" A full list of the decision-making questions appears in the Appendix.

In order to create a composite variable, I attribute "points" to an establishment for responses that indicate decentralization, and then normalize based on the number of "points" possible[6]. More weight is given to responses that indicate decisions made at the employee level than to those that indicate decentralization to a middle manager or supervisor. Thus, the composite index of decentralization will range between zero and one, with a value of zero indicating that none of the responses provided evidence of decision-making occurring anywhere but at the top management level. A middle score indicates some degree of decentralized decision rights--either to the middle management or to the employees. A score of one indicates that all responses pointed to decision-making occurring below the senior management level[7].

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[5] Details about the WES can be found at http://www.statcan.ca/english/survey/business/wes.htm. Again, these data are confidential. Statistics Canada does, however, allow limited access. E-mail Ted Wannell at Ted.Wannell@statcan.ca for more details.

[6] The number of possible points varies across countries due to differences in survey questions available, but also across establishments within a country, since some questions that might indicate decentralization are not relevant or answerable by some establishments in the sample.

[7] Note that the default assumption is complete centralization, and points are added to indicate decentralization. The index could have been structured in the reverse, by assuming decentralization and

Table 1 shows the mean value of the decision rights variable, as well as the means of other variables that may affect the distribution of decision rights within an organization. A large percent of these establishments are quite small, with over 50% having employment between the minimum size for the sample and fifty employees. Establishment size may be one component of α, since larger organizations may have more hierarchical levels, which may require more complicated information transfer networks, thus adding to the delay required to make decisions. The same might be true for whether the establishment is part of a multi-plant organization.

If the establishment is in a high-tech industry, the specialized nature of knowledge possessed by workers is a factor that contributes to α, since it takes longer to transfer specialized knowledge up one hierarchical level than more general knowledge. It is somewhat difficult to measure the degree of technology use among establishments, particularly in the UK and Australian data sets. I use a question on the length of time it takes a new employee to learn his job to proxy for technology, although it would be better described as a measure of job complexity. In the Canadian survey, more detailed questions were asked about the introduction and use of software, computer-controlled or computer-assisted technologies and other technologies, which I use to identify high-tech establishments. The former measure results in labeling around twenty percent of establishments as high tech, whereas the latter only labels seven percent as high tech, although in both cases it would be possible to set different threshold values and label a larger or smaller number as high-tech.

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taking away points for responses that indicate centralization--this would result in a higher mean value of decentralization but the same distribution.

A high use of information technologies reduces the decision-making delay by speeding the collection and transfer of information. At the same time, IT capital is sometimes used to monitor workers, making agency costs lower. Thus, IT may be a component of both α and γ. The Australian survey contains a question on whether the establishment has recently adopted any new information technology, and a similar question regarding new software exists in the Canadian data.

The age of the establishment may affect the distribution of decision rights. The delay costs should be lower in an older organization, because the decision-makers have more experience and have more well-established channels for transmitting information. At the same time, however, agency costs should also be lower since workers have had more time to become familiar with the organization's objectives, priorities and manner of doing business. Table 1 shows the age distribution of establishments in the three samples. The significantly lower age for the Canadian group results from the inclusion of very small establishments, which are not included in either the UK or Australian data.

Unions are likely to increase the decision-making delay, since issues must often be negotiated with the union prior to the decision being made. At the same time, unions may increase agency costs, since the union often has quite different objectives from the management. The degree of unionization varies considerably across these three data sets, with a rate of only five percent of employees in Canadian establishments, twenty-one percent in the UK and over forty percent in Australia. Part of these differences are again due to the size restrictions imposed in the sampling framework, although not all.

The competitiveness of the establishment's output and input markets affects the price of delay, φ. In a more competitive market, the organization must respond to

demand and supply changes more quickly. The time it takes to transfer information to a more senior decision-maker will be very costly in terms of lost opportunities. A large share of the establishments--over 70% in the UK, 50% in the Australian data and 24% in the Canadian survey--face "intense" or "strong" market competition. According to the theory, those firms facing greater competition should have greater decision rights at the worker level. In the next section, I present the empirical strategy and results from these three data sources.

Empirical Methodology and Results

To determine how these establishment characteristics affect the distribution of decision rights, I estimate the following empirical model:

$$DR_i = f(union_i, Mkt_i, Tech_i, Size_i, Age_i Multi_i, Ind_i) \quad (7)$$

where DR_i is the decision rights index in establishment *i*; $union_i$ is the percent of workers who are members of a union; Mkt_i is a vector that includes indicators for whether the establishment faces "intense", " strong" or "some or limited" competition; $Tech_i$ includes an indicator for whether *i* is a high-tech establishment, as well as indicators for whether the establishment has recently adopted new technologies and/or new products or new information technologies; $Size_i$ is a vector of establishment size indicators, as measured by total employment; Age_i is a vector of establishment age indicators, in years; $Multi_i$ is an indicator for whether the establishment is part of a larger organization; and Ind_i is a vector of available industry variables--the number of such variables varies between data sets.

The results of ordinary least squares estimation of this model for the three data sets are given in Table 2. In general, positively signed coefficients indicate that the independent variable is associated with increased decentralization of decision rights. Among the variables that test the predicted relationship between φ and d, the results are somewhat supportive of the hypothesis that the price of delay increases the decentralization of decision rights. In all three countries, coefficients are larger (and positive) for indicators of greater competition, relative to the coefficient for the "some/limited" competition variable, although none are statistically significant at a 95 percent confidence interval.

Among the variables that potentially increase α, results are somewhat mixed. Size is inversely related to d--confirming that in larger companies, where information transmission can be much slower, decisions are more likely to be made by senior management. Results on the technology variables strongly indicate that establishments with new or intensive technology investments are likely to decentralize decision-making. Unionization presents a less clear pattern--with some evidence that decision rights are more decentralized in highly unionized establishments in Canada, but no such result in the U.K. or Australia. It is important to keep in mind, however, that the survey questions are asked of senior human resources management, whose opinions about the distribution of decision rights may be affected by whether or not the company is unionized. Finally, results on age are fairly weak and do not seem to affect the location of decision rights much. This was not wholly unpredicted, however, since although information transmission might be faster in older establishments, agency costs might also be lower, suggesting offsetting effects on the location of decision rights. Taken on the whole, these

results suggest that α -- establishment characteristics that increase decision-making delay-- are positively related to decentralized decision-making.

With these data it is rather difficult to identify independent proxies for γ. Age and information technologies are both also features of α, and it is not possible to divide the result into that attributable to agency costs. Thus it is not possible to measure the effect of establishment characteristics that affect agency costs on the optimal location of decision rights.

One concern with using a dependent variable that indexes a large number of diverse questions on decision-making is that an organization makes many different types of decisions, and the process of choosing an optimal decision-making location within the hierarchy may not be the same for all types of decisions. To address this issue, I break down the decision-making questions into four groups: those that pertain to (1) pay-setting, (2) other personnel issues, (3) policies and long-term planning, and (4) production decisions. Complete details of the questions used for each type of decision are included in the appendix. This creates four separate dependent variables in each data set, with the exception of the Canadian data set, which did not contain information on pay decisions.

I estimate the same model as previously. Results of these estimations are in Tables 3-6. Pay decisions are likely to be decentralized among establishments in more competitive markets, those with high tech or new tech, those in multi-plant organizations, and those that have less union participation. Size is a much less important determinant of decentralized pay decision-making. For other personnel decisions, however, unionization and the competitiveness of the market are less important, with technology and

establishment size the important determinants. Factors affecting the location of policy and long-term planning decisions are very similar to those affecting overall decisions--competition (weakly), technology and establishment size. Results for production decisions are somewhat mixed. In the U.K., the variables that have affected other decisions are not significant in the case of production decisions. In the other two data sets, however, we see similar patterns of decentralization among larger establishments, those using high tech or new tech, and those in more competitive settings. Unionization is positively correlated with decentralization in the Canadian data set. Thus, while there are some differences across types of decisions, the patterns are largely similar.

These characteristics of the organization such as size, age, industry and unionization do seem to explain some of the choice of distribution of decision rights. At the same time, researchers have noted that the adoption of other human resource practices can affect the organizational structure of the workplace--in particular, many might be considered components of γ. These choices are, however, endogenous to the choice of decision location. As an example, if we observe a correlation between high employee decision rights and adoption of profit sharing, we cannot know whether profit-sharing plans are adopted in order to provide the right incentives to those decision-making employees or whether those employees used their decision rights to obtain a profit sharing plan. Thus we cannot infer causality from an observed correlation between decentralization and any complementary human resource practice. This does not prevent us from exploring which practices are in fact correlated with a particular distribution of decision rights.

Recruiting and training practices may be important because they reduce agency costs. In these data, measurable practices include whether hiring is primarily done from within, whether extensive pre-employment screening is used, and whether the company provides a high amount of formal and/or on-the-job training. Similarly, incentive pay programs tie worker outcomes to desired establishment or corporate outcomes, and thus can be used to reduce agency costs. All three data sets contain information on the presence of individual and group incentive pay programs, profit-sharing, ESOPs and other bonus systems. Another way to reduce agency problems is by monitoring workers through formal appraisals, benchmarking and skill auditing. Communications practices can be adopted to speed the transfer of information to a senior decision-maker. This includes the presence of quality circles, total quality management programs and even suggestion boxes. Family-friendly practices, such as extended leave, maternal or paternal leave, on-site or subsidized child-care could reduce agency costs, and other researchers such as Osterman (1994) have linked family-oriented establishments to workplace transformations. The use of contract and temporary workers may be related to the optimal location of decision rights, especially if those types of workers are employed by an organization that faces greater uncertainty necessitating faster decision-making. Finally, affirmative action policies may affect the distribution of decision rights, since by design they restrict hiring and firing decisions.

To examine these correlations, I estimate the following model:

$$\Pr(hrp_i) = f(DR_i, union_i, Mkt_i, Tech_i, Size_i, Age_i Multi_i, Ind_i) \qquad (8)$$

where hrp_i is a particular human resource practice, such as individual pay-for-performance or formal appraisals, and the remaining variables are defined as before[8].

Results of this estimation are in Table 7. Each cell in the table represents the coefficient on the decision rights variable[9] in the above model. Training practices are strongly correlated with decentralization of decision-making, but recruitment practices are not. Various types of incentive pay plans are correlated with higher decision rights of employees. The same is true for the use of monitoring tools, which may support the notion that steps an organization takes to reduce agency costs are complementary with increasing the autonomy and decision rights of individuals who are in the lower rungs of the hierarchical ladder. The results on practices that increase communication do not match the results from other components of α--in this case, a factor that can increase the speed or quality of information transmission is associated with increased decentralization. Affirmative action policies are weakly associated with increased decision rights for employees and supervisors. The use of contract and temp workers is strongly correlated with decentralized decision-making, which might further support the importance of decentralizing when decisions must be made quickly under uncertainty and competition. Family policies are not correlated with the location of decision rights.

While we cannot infer causality from these estimations, for the most part the results do not contradict those obtained from estimation of model (7). Uncertainty and competition, and tools used to deal with that uncertainty are associated with an increase

[8] Given that this only measures a correlation, I could just as easily keep the decision rights index as the dependent variable, and add the human resource practice to the list of right-hand side variables.
[9] This table reflects only the correlation between the overall decision rights decentralization variable and the human resources practices. Results by type of decision are available from the author, but they do not differ greatly across types of decisions with the exception that pay decision decentralization is not strongly correlated with most of the practices.

in decentralized decision-making. Factors that exogenously or endogenously result in lower agency costs are also correlated with decisions increasingly being made below the top of the hierarchy. It is difficult to measure the speed of information flow in an organization or to identify features that increase that speed; this is not something that can be well addressed with these data.

Conclusion

In this paper, I provide a simple model of the optimal location of decision rights, loosely based on Jensen and Meckling (1990). The model suggests that there is a tradeoff between the costs of delaying a decision that result if a senior manager must accumulate relevant information and the agency costs that result if someone lower in the hierarchy makes the decision. The extent to which this results in a different optimal choice depends upon the cost of delays, as well as organizational characteristics that affect the length of the delay and the size of agency costs. Using data sets from the UK, Australia and Canada, I created indices to measure the decentralization of decision rights from extensive questions on the decision-making practices of establishments. These questions also allow us to learn about what types of decisions are decentralized in an organization, and what characteristics of the establishment affect the balance of power among agents.

I find that factors such as market competitiveness, which raise the price of delay, do move the optimal location of decision rights down toward the bottom of the hierarchy. This confirms the main prediction of the model. Additionally, I find evidence that

establishment characteristics that increase the length of decision-making delays also increase the decision rights of those at the bottom of the hierarchy. Finally, I find a clear relationship between endogenous firm choices that reduce agency costs and higher decision rights of those in the bottom tiers.

I argue in this paper that understanding the effect of organizational capital on an establishment's production must be more than counting which workplace practices the establishment uses. Instead these practices may be tools the organization employs to achieve its optimal distribution of decision rights--whether it will retain greater control at the top of the hierarchical structure or distribute that control to other agents. This is a first attempt to consider what identifiable establishment characteristics affect that optimal distribution and what practices are complements to such a distribution. In future work, I hope to examine whether there is a systematic difference in productivity that results from this choice of decision rights.

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Figure 1.
The trade-off between costs owing to inconsistent objectives and costs owing to poor information as a decision right is moved further from the CEO's office in the hierarchy.

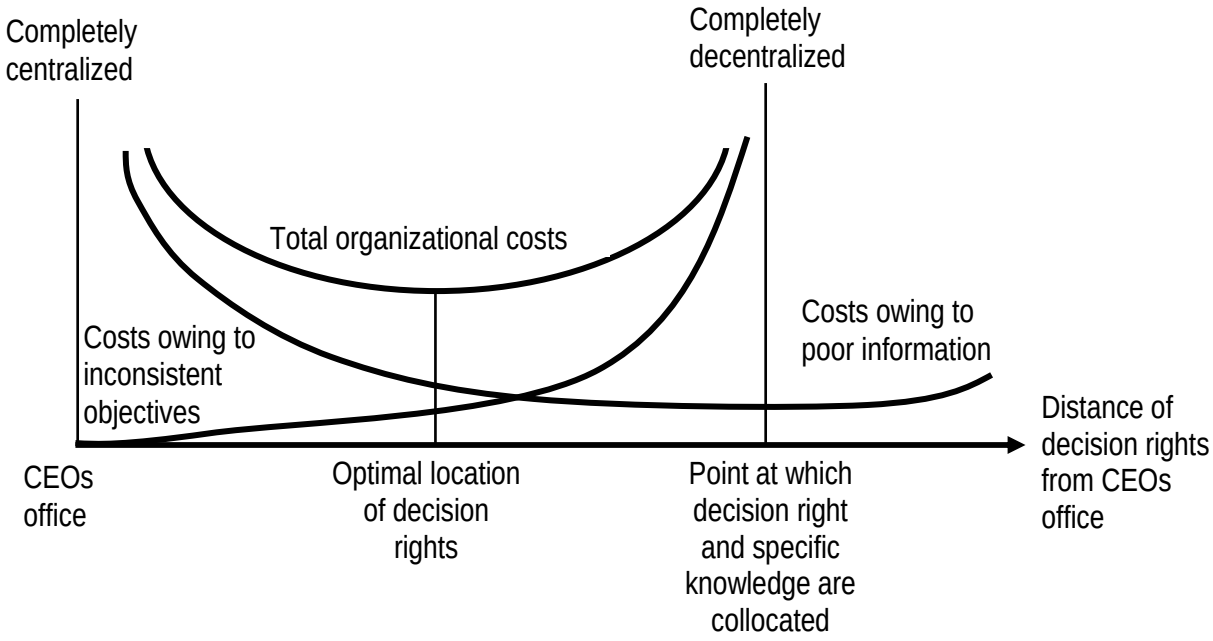

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Table 1. **Summary statistics**			
	WERS 	AWIRS 	WES 
Decision Rights	.2950	.1879	.1563
Size < 25 employees	.4937	.1002	.9011
Size 25-49 employees	.2585	.4027	.0557
Size 50-99 employees	.1309	.2734	.0243
Size 100-249 employees	.0742	.1600	.0132
Size 500+ employees	.0142	.0230	.0025
Age <5 years	.0885	.1244	.2889
Age 5-9 years	.1828	.1708	.2014
Age 20+ years	.4772	.4861	.2408
Unionization	.2102	.3775	.0518
High Tech	.2073	.2079	.0703
New Tech	.6764	.2886	.2383
New IT	--	.4611	.2358
New Product	.4642	--	.3269
Intense Competition	.4087	.2770	.2399
Strong Competition	.3257	.2813	
Some/Limited Competition	.1239	.0552	.3046
Part of Multi-Plant Org.	.3136	.7723	--
Number of Observations	1759	1828	6351

Table 2.
Effect of establishment characteristics on distribution of decision rights in three data sets

	WERS 	AWIRS 	WES 
Unionization	.0003 (.0002)	-.0220 (.0117)	.0729** (.0310)
Intense Competition	.0327 (.0184)	.0158 (.0148)	.0231 (.0154)
Strong Competition	.0166 (.0171)	-.0025 (.0143)	
Some/Limited Competition	.0085 (.0217)	-.0093 (.0210)	-.0102 (.0131)
High Tech	.0208 (.0173)	.0055 (.0081)	.2667* (.0764)
New Tech	.0414* (.0127)	.0154** (.0080)	.0132 (.0126)
New Product	.0318* (.0116)	--	.0104 (.0125)
New IT	--	.0162** (.0070)	-.0170 (.0156)
Size < 25 employees	-.1050* (.0168)	-.0504* (.0156)	-.1671* (.0266)
Size 25-49 employees	-.0877* (.0186)	-.0627* (.0122)	-.0780* (.0294)
Size 50-99 employees	-.0747* (.0156)	-.0591* (.0124)	-.0532** (.0268)
Size 100-249 employees	-.0354** (.0152)	-.0259** (.0121)	-.0240 (.0269)
Size 500+ employees	.0223 (.0172)	.0146 (.0158)	-.0046 (.0287)
Age <5 years	.0892** (.0374)	.0091 (.0121)	.0170 (.0160)
Age 5-9 years	.0046 (.0169)	.0145 (.0111)	.0116 (.0141)
Age 20+ years	-.0053 (.0131)	.0107 (.0092)	.0237 (.0149)
Multi-plant	-.0061 (.0149)	.0243** (.0102)	--
R^2	.1721	.1499	.1272
Number of observations	1396	1814	5422

Standard errors in parentheses. * and ** indicate significance at 1% and 5% respectively. Regressions include industry dummies.

Table 3.
Effect of establishment characteristics on distribution of pay decision rights in two data sets

	WERS 	AWIRS 
Unionization	-.0001 (.0002)	-.0639* (.0205)
Intense Competition	.0509* (.0144)	.0103 (.0231)
Strong Competition	.0368* (.0144)	-.0132 (.0221)
Some/Limited Competition	.0178 (.0150)	-.0435 (.0269)
High Tech	-.0034 (.0132)	.0066 (.0153)
New Tech	.0402* (.0132)	.0248 (.0141)
New Product	-.0007 (.0115)	--
New IT	--	.0205 (.0121)
Size < 25 employees	-.0168 (.0162)	-.0484 (.0299)
Size 25-49 employees	-.0138 (.0153)	-.0727* (.0208)
Size 50-99 employees	-.0125 (.0142)	-.0536* (.0218)
Size 100-249 employees	.0011 (.0135)	-.0084 (.0214)
Size 500+ employees	-.0076 (.0164)	.0173 (.0278)
Age <5 years	.0802* (.0309)	-.0028 (.0192)
Age 5-9 years	.0174 (.0193)	.0034 (.0200)
Age 20+ years	.0126 (.0153)	.0106 (.0154)
Multi-plant	.0486* (.0161)	.0270 (.0165)
R^2	.0912	.1578
Number of observations	1399	1828

See note at bottom of Table 2.

Table 4.
Effect of establishment characteristics on distribution of personnel decision rights in three data sets

	WERS 	AWIRS 	WES 
Unionization	.0002 (.0004)	-.0196 (.0175)	.0544 (.0322)
Intense Competition	.0235 (.0279)	.0034 (.0227)	.0209 (.0171)
Strong Competition	.0116 (.0277)	-.0141 (.0217)	
Some/Limited Competition	-.0133 (.0333)	.0027 (.0347)	.0065 (.0151)
High Tech	.0191 (.0207)	.0059 (.0125)	.2169* (.0783)
New Tech	.0251 (.0222)	.0067 (.0121)	.0001 (.0154)
New Product	.0315 (.0196)	--	.0162 (.0141)
New IT	--	.0197 (.0108)	-.0312** (.0153)
Size < 25 employees	-.1921* (.0233)	-.0513** (.0247)	-.1743* (.0339)
Size 25-49 employees	-.1553* (.0249)	-.0688* (.0181)	-.0859** (.0378)
Size 50-99 employees	-.0877* (.0208)	-.0671* (.0184)	-.0504 (.0344)
Size 100-249 employees	-.0410** (.0197)	-.0317 (.0178)	-.0454 (.0357)
Size 500+ employees	.0540* (.0219)	.0178 (.0250)	-.0232 (.0372)
Age <5 years	.0558 (.0448)	.0205 (.0201)	.0205 (.0185)
Age 5-9 years	-.0024 (.0278)	.0163 (.0164)	.0032 (.0162)
Age 20+ years	-.0079 (.0207)	.0155 (.0137)	.0066 (.0170)
Multi-plant	-.0419 (.0222)	.0281 (.0154)	--
R^2	.1572	.0795	.0697
Number of observations	1501	1826	5627

See note at bottom of Table 2.

Table 5.
Effect of establishment characteristics on distribution of policy/planning decision rights in three data sets

	WERS 	AWIRS 	WES 
Unionization	.0011*	.0172	.0673
	(.0004)	(.0104)	(.0380)
Intense Competition	.0455	.0237**	
	(.0398)	(.0106)	.0234
Strong Competition	.0025	.0088	(.0163)
	(.0379)	(.0105)	
Some/Limited Competition	.0150	-.0023	-.0128
	(.0436)	(.0149)	(.0137)
High Tech	.0398	.0127	.1868**
	(.0317)	(.0092)	(.0840)
New Tech	.0624*	.0116	.0036
	(.0253)	(.0077)	(.0141)
New Product	.0645*	--	-.0091
	(.0219)		(.0136)
New IT	--	.0045	-.0028
		(.0069)	(.0174)
Size < 25 employees	-.2393*	-.0566*	-.0765**
	(.0298)	(.0167)	(.0389)
Size 25-49 employees	-.1520*	-.0447*	-.0328
	(.0341)	(.0135)	(.0413)
Size 50-99 employees	-.1471*	-.0492*	-.0596
	(.0288)	(.0136)	(.0433)
Size 100-249 employees	-.0730*	-.0242	-.0051
	(.0275)	(.0137)	(.0409)
Size 500+ employees	.0532	-.0113	-.0210
	(.0329)	(.0192)	(.0424)
Age <5 years	.1518*	.0059	.0110
	(.0625)	(.0117)	(.0158)
Age 5-9 years	-.0114	.0200	.0168
	(.0340)	(.0106)	(.0160)
Age 20+ years	-.0054	.0050	.0376**
	(.0260)	(.0090)	(.0173)
Multi-plant	-.0557**	.0262*	--
	(.0259)	(.0093)	
R^2	.2216	.2269	.0735
Number of observations	1552	1828	5446

See note at bottom of Table 2.

Table 6.
Effect of establishment characteristics on distribution of production decision rights in three data sets

	WERS	AWIRS	WES
Unionization	-.0001 (.0003)	-.0177 (.0159)	.0901* (.0301)
Intense Competition	.0168 (.0243)	.0210 (.0221)	.0319 (.0182)
Strong Competition	.0393 (.0240)	-.0014 (.0212)	
Some/Limited Competition	.0441 (.0341)	-.0087 (.0300)	.0149 (.0175)
High Tech	.0231 (.0213)	-.0006 (.0108)	.4161* (.0833)
New Tech	-.0016 (.0207)	.0178 (.0109)	.0201 (.0178)
New Product	.0242** (.0182)	--	.0228 (.0167)
New IT	--	.0142 (.0098)	-.0418** (.0188)
Size < 25 employees	.0310 (.0214)	-.0516** (.0222)	-.2442* (.0240)
Size 25-49 employees	-.0112 (.0233)	-.0670* (.0176)	-.1213* (.0285)
Size 50-99 employees	-.0246 (.0212)	-.0717* (.0175)	-.0606** (.0270)
Size 100-249 employees	-.0095 (.0195)	-.0424** (.0178)	-.0322 (.0243)
Size 500+ employees	.0105 (.0210)	.0371 (.0213)	.0212 (.0283)
Age <5 years	.0357 (.0430)	.0175 (.0172)	-.0052 (.0199)
Age 5-9 years	.0102 (.0241)	.0266 (.0150)	-.0083 (.0194)
Age 20+ years	-.0088 (.0205)	.0176 (.0124)	-.0075 (.0195)
Multi-plant	.0088 (.0215)	.0127 (.0139)	--
R^2	.0903	.1329	.1433
Number of observations	1547	1816	5763

See note at bottom of Table 2.

Table 7.
Correlation between decision rights and complementary human resource practices in three data sets

	WERS 	AWIRS 	WES 
Recruitment and training			
Internal labor market	.0151 (.0848)	.0001 (.0392)	.0174 (.0917)
Pre-employment screening	.2514 (.2122)	--	--
Significant formal training	.3362* (.1286)	.3151** (.1502)	.2229* (.0690)
Significant OTJ training	--	--	.2516* (.0826)
Incentive pay			
Individual incentive pay	.1566* (.0582)	.0816 (.1181)	.1577** (.0799)
Group incentive pay	.1038 (.0567)	.1650** (.0785)	.0669 (.0390)
Workplace incentive pay	.1435 (.0720)	--	--
Organization incentive pay	.0474 (.0428)	.0457 (.0237)	--
Profit sharing	.3583** (.1496)	.1012* (.0332)	.0485 (.0328)
Merit pay		--	.1649* (.0535)
ESOP	.2633* (.1017)	-.0120 (.1275)	.0043 (.0025)
Bonus pay	--	.4126* (.1399)	--
Monitoring methods			
Formal appraisals	.4872** (.2041)	.7107* (.1498)	--
Benchmarking	.8744* (.1769)	.4597* (.1395)	--
Skill auditing	--	.4723* (.1148)	--

Table 7 (cont'd)			
	WERS 	AWIRS 	WES 
Communication			
Quality circles	.3933* (.0943)	.1759** (.0726)	.2536* (.0574)
Total quality management	--	.6122* (.1375)	--
Suggestion box	--	--	.1573* (.0477)
Other policies			
Affirmative action	.2445 (.1864)	.2647 (.1532)	--
Family policies	.0366 (.0592)	-.0080 (.0711)	--
Contracting out	.7182* (.1601)	.6065* (.1430)	--
Temp workers	.2453* (.0963)	--	--
Just-in-time inventorying	--	.1438** (.0649)	--
See note at bottom of Table 2.			

Appendix A.

Questions used to create decision rights variables in WERS:

Pay:

- Which of these employee relations matters forms part of the job of supervisors at this workplace…pay or conditions of employment?...systems of payments?
- Do supervisors have the authority to make final decisions on deciding on pay rises for people who work for them?
- Are there any committees of managers and employees at this workplace primarily concerned with consultation? Which issues are discussed…pay issues?
- Which of the following parties were directly involved in determining or negotiating this pay rise (if any) for employees in the largest occupational group…employee association officials?...non-union employee representatives?
- Which of the following statements most closely characterizes the way that pay is set for [each occupation]…negotiation with individual employees?

Personnel Issues:

- Which of these employee relations matters forms part of the job of supervisors at this workplace…recruitment or selection of employees?...training of employees?...systems of payments?...handling grievances?...staffing or manpower planning?...performance appraisals?
- Do supervisors have the authority to make final decisions on taking on people who work for them?
- Do supervisors have the authority to make final decisions on dismissing workers for unsatisfactory performance?
- If any non-managerial appraisals, who carries out these appraisals…an individual's immediate supervisor or foreman?...employees at the same level/grade?...subordinates or employees at a lower level/grade?
- Are there any committees of managers and employees at this workplace primarily concerned with consultation? Which issues are discussed…employment issues?...welfare services and facilities?...training?

Policy/Planning:

- Which of these employee relations matters forms part of the job of supervisors at this workplace?...equal opportunities?...health and safety?
- Are there any committees of managers and employees at this workplace primarily concerned with consultation? Which issues are discussed…financial issues?...future plans or trends?...government regulations?...health and safety?...equal opportunities?

Production Issues:

- Would you say that individual employees in the largest occupation group have (a lot, some, a little, none)discretion over how they do their work?
- Would you say that individual employees in the largest occupation group have (a lot, some, a little, none) control over the pace at which they work?
- Which of the following statements apply to the way teamworking (if any) operates at this workplace?...Team members are able to appoint their own team leaders…Team members jointly decide how the work is to be done.

- Are there any committees of managers and employees at this workplace primarily concerned with consultation? Which issues are discussed?...production issues?...working practices?
- If over the past five years management here introduced any of the changes listed (new technology, working time arrangements, organization of work, work techniques or procedures), what type of involvement did the employees likely to be affected have in introducing and implementing this change? (they decided, they negotiated, they were consulted, they were informed, there was no involvement)

Question used to create decision rights variables in AWIRS

Pay:

- Who usually makes decisions about changes to pay of non-managerial employees?...a first line supervisor or line manager?
- Is there a joint consultative committee currently in place at this workplace? Which of these matters does the jcc have the authority to deal with?...pay and conditions?
- In the last year has management at this workplace negotiated with employees as a group over pay rates?
- In the last year has management at this workplace negotiated with employees individually over pay rates?

Personnel Issues:

- Are Key Performance Indicators in use at this workplace? Who was involved in the design of these Key Performance Indicators?...first line supervisors?...employees at this workplace?
- Who usually makes decisions about recruitment of non-managerial employees?...a first line supervisor or line manager?
- Who usually makes decisions about dismissals?...a first line supervisor or line manager?
- Who usually makes decisions about allocation of resources for in-house training?...a first line supervisor or line manager?
- Is there a joint consultative committee currently in place at this workplace? Which of these matters does the jcc have the authority to deal with?...discipline of employees?...individual grievances?
- In the last year has management at this workplace negotiated with employees as a group over performance appraisals?...work hours?...penalty rates?...discipline and dismissals? ...training?...leave arrangements?...child care or family leave arrangements? ...consultation or negotiation arrangements?...grievance handling?...superannuation?
- In the last year has management at this workplace negotiated with employees individually over performance appraisals?...work hours?...penalty rates?...discipline and dismissals?...training?...leave arrangements?...child care or family leave arrangements? ...consultation or negotiation arrangements?...grievance handling?...superannuation?

Policy/Planning:

- Does management at this workplace have a plan which outlines the workplace's corporate goals and the ways of achieving them? Who had an input into the development of the current plan?...supervisors/middle management?...employees from this workplace?
- Is there a joint consultative committee currently in place at this workplace? Which of these matters does the jcc have the authority to deal with?...financial/investment

decisions?...equal employment opportunity or affirmative action matters?...occupational health and safety?

- In the last year has management at this workplace negotiated with employees as a group over occupational health and safety?
- In the last year has management at this workplace negotiated with employees individually over occupational health and safety?

Production Issues:

- If over the past year management at this workplace introduced any of the changes listed (major new office technology, major new plant, machinery or equipment, major changes to how non-managerial employees do their work), how involved in the decision to introduce the change were other workplace managers here?...employees likely to be affected? (made the decision, had significant input, were consulted, were informed, were not informed)
- Who usually makes decisions about levels of overtime?...employment levels for the whole workplace?...changes in work practices?
- Is there a joint consultative committee currently in place at this workplace? Which of these matters does the jcc have the authority to deal with?...introduction of new technology?...new product or service lines?...work organization?
- How much influence would you say workers in the largest occupation group have over how work is allocated to them? (none, a little, some, a lot)
- How much influence would you say workers in the largest occupation group have over how they do their job? (none, a little, some, a lot)
- How much influence would you say workers in the largest occupation group have over the pace at which their work is done? (none, a little, some, a lot)
- How much influence would you say workers in the largest occupation group have over the time they can start and stop work each day? (none, a little, some, a lot)
- In the last year has management at this workplace negotiated with employees as a group over work practices or work organization?...retrenchments or redeployment?
- In the last year has management at this workplace negotiated with employees individually over work practices or work organization?...retrenchments or redeployment?

Questions used to create decision rights variables in the WES

Personnel Issues:

- Who normally makes decisions with respect to setting staffing levels?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to filling vacancies?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to training?...work supervisor?...work group?...non-managerial employee?

Policy/Planning:

- Who normally makes decisions with respect to choice of production technology?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to product/service development?...work supervisor?...work group?...non-managerial employee?

Production Issues:

- Who normally makes decisions with respect to daily planning of individual work?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to weekly planning of individual work?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to follow-up of results?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to customer relations?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to quality control?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to purchase of necessary supplies?...work supervisor?...work group?...non-managerial employee?
- Who normally makes decisions with respect to maintenance of machinery and equipment?...work supervisor?...work group?...non-managerial employee?