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LINKING OUTCOMES FOR WORKERS TO CHANGES IN WORKPLACE PRACTICES: AN EXPERIMENTAL CANADIAN WORKPLACE AND EMPLOYEE SURVEY

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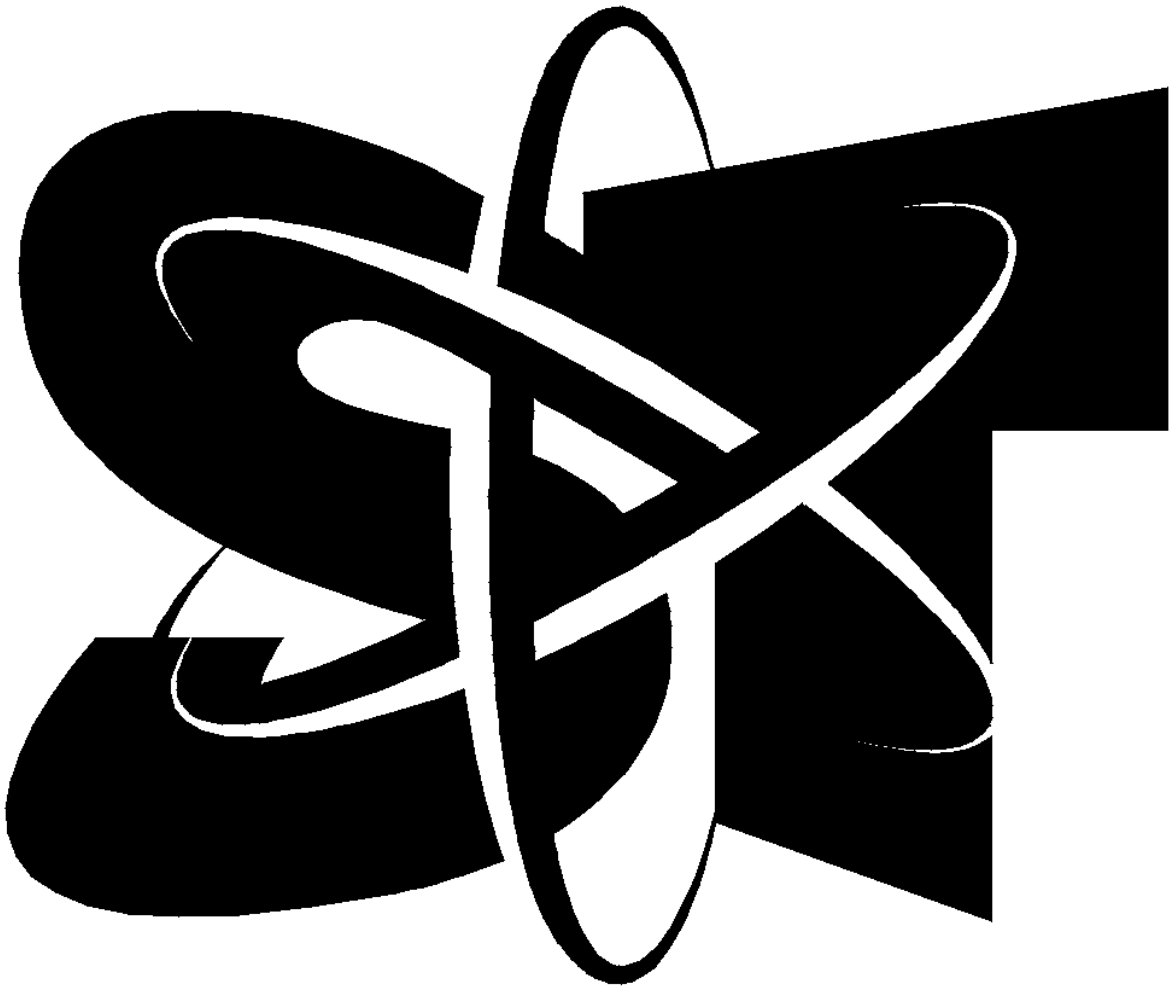
No. 3



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Linking Outcomes for Workers to Changes in Workplace Practices: An Experimental Canadian Workplace and Employee Survey

by

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June, 1996

Presented at the Conference on New Indicators for the Knowledge-Based Economy
Paris, June, 1996

THE INFORMATION SYSTEM FOR SCIENCE AND TECHNOLOGY PROJECT

The purpose of this project is to develop useful indicators of activity and a framework to tie them together into a coherent picture of science and technology in Canada.

To achieve the purpose, statistical measurements are being developed in five key areas: innovation systems; innovation; government S&T activities; industry; and human resources, including employment and higher education. The work is being done at Statistics Canada, in collaboration with Industry Canada, and with a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited and potentially misleading picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and more work has to be done to understand the characteristics of innovative, and non-innovative firms, especially in the service sector which dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries which lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say how much the federal government spends and where it spends it. The next report, to be released early in 1997, will begin to show what the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information will provide a context for reports of individual departments and agencies on performance measures which focus on outcomes at the level of individual projects.

By the final year of the Project in 1998-99, there will be enough information in place to report on the Canadian system on innovation and show the role of the federal government in that system. As well, there will be new measures in place which will provide a more complete and realistic picture of science and technology activity in Canada.

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Research Papers

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French version of this document is also available.

I Introduction

Fundamental changes have taken place in the labour markets of most western nations since the recession of the early 1980s, and indications are that this is continuing. In the Canadian context, labour economists with a public policy orientation are puzzling over a number of significant changes (real or perceived) related to:

* the stagnation of average wages and earnings
* the polarization of earnings
* the rapid decline in earnings among lower paid workers
* the decline in real and relative wages of workers under age 35
* the significant changes in the distribution of working time
* the apparent slowdown in full-time job creation
* fears that job insecurity and instability are on the increase
* the role of technological change in many of these events
* the role of increasing international competition

At the same time, a common perception has developed that fundamental changes are occurring in the nature of work and employer-employee relationships in the workplace. As a consequence nearly all aspects of working life are now coming under scrutiny. This scrutiny has sown a bumper crop of buzzwords and phrases that evoke a whole range of images: the new competitive environment; the high performance workplace; the empowered worker; the disposable worker; core and periphery workers; the flexible firm; the adaptive firm; and so on.

The common thread through these images is that the workplace is a dynamic environment, and that more than ever changes are taking place in the workplace that are significantly influencing the outcome and trends observed in the labour market. When looking for answers as to why such fundamental change has occurred, analysts are focusing more than ever on the demand side...events occurring in firms and establishments.

Statistics Canada has responded to the need for new information to better understand, and as a result hopefully better deal with, the types of changes mentioned above. In particular, the need for data sources that focus on the dynamics of labour market change has been recognized and acted upon over the past decade. The agency has steadily increased its capacity to follow workers longitudinally using both survey and administrative data. Household longitudinal surveys, such as the Labour Market Activity Survey and the new Survey of Labour and Income Dynamics have job mobility, earnings and unemployment dynamics as primary concerns.

At the same time, Statistics Canada has been developing new information on firms and establishments. Longitudinal data sources for establishments and companies have been created by linking longitudinally both survey (e.g. the census of manufacturers) and administrative (often taxation) data. These sources have allowed new insights on firm dynamics, job creation and destruction, productivity, and so on. Furthermore, clients interested in the competitive position of Canadian industry have sponsored surveys on technology use, innovation and the success of small and medium sized enterprises. These surveys are beginning to shed some light on how the adaptive and innovative capacities of firms contribute to their success.

Despite this recent activity, one very fundamental information gap persists. In none of these surveys or administrative data sources[1] is there a link at the micro-level between the activities in the firm and the outcomes for the workers. In other words, there is no direct link between the demand and supply sides of the labour market. In Canada, this gap has hampered analysis. Few countries have developed such micro-data sources to date, with at least one noticeable exception. In France worker and firm data have been linked at INSEE and used in numerous research studies (see Abowd, Kramarz and Margolis, 1994; Enforf and Kramarz, 1994). There are numerous areas of research for which this link is essential if we wish to significantly advance our understanding of important labour market events. More is said this later.

The Workplace and Employee Survey (WES) is a new Statistics Canada undertaking. It is sponsored by Human Resources Development Canada, and is designed to provide an integrated view of the activities of employers and their employees. This is an experimental survey for which a pilot is currently being tested. The survey is intended to provide data on numerous topics associated both with changes in the workplace and workers outcomes. These topics are addressed later in the paper, but they include, for the workplace, the implementation of technology, training, unionization, the use of core and contingent workforces, various aspects of organizational change, business strategies, the type of market in which the firm functions, and so on. For the employees working in these workplaces the survey will focus on training received, job tenure and employment stability, the use of technologies, their occupational and educational characteristics, fringe benefits, unionization and wages and hours of work, among other variables.

II Changing Patterns of Earnings and Working Time

In Canada, the issue of polarization in wages and hours of work has received much attention in the past decade, as it has in the U.S., the U.K. and other countries. Earnings inequality has increased significantly in Canada. Depending upon the measure of inequality used, inequality in annual earnings increased between 12% and 28% between 1979 and 1989, two years that are roughly in the same position in the business cycle (Morissette, Myles and Picot, 1994; Beach and Slotsve, 1994). This rise in inequality appears to have continued into the 1990s (Picot, 1996, Zyblock, 1996).

In Canada, the rise in inequality has been associated with dramatic drops in real earnings of lower paid male workers, as much as 40% between 1975 and 1993. Two things are evident. First, the declines in earnings for lower paid workers are very large, even among males aged 25 to 54, a population among which one expects quite stable employment patterns. Second, it appears as though changes are taking place in the stability of employment over the year (a shift from full-year to part-year or full-time to part-time) that are significantly influencing annual earnings.

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[1] Workers and firms have been linked on some administrative data sources, and this has allowed some very innovative analyses. These data sources have relatively few variables, however, and the number of questions they can address is limited.

Further analysis indicates that there have been large changes in the distribution of annual hours of work in the Canadian labour market, and that they have been associated with the increasing polarization of annual earnings. In Canada we have seen a significant polarization in hours worked...more people are working longer hours, more are working shorter hours, and fewer are working a regular work week (or work year).

Another feature of rising inequality in some countries is the increase in the wage premium paid to more highly educated workers. While this has been observed to some limited extent in Canada, it is not as prominent a feature of the story as in the U.S. (Myles, Picot and Wannell, 1988; Freeman and Needles, 1991; Bar-Or et al, 1993). The relative wages of, say, college graduates to high school graduates has not changed significantly in Canada, at least to the end of the 1980s.

Another prominent aspect of changing wage patterns in Canada has been the widening gap in the earnings of younger and older workers. In particular, the declining real and relative wages of young people is of much concern. This is a feature that has been observed in many western countries (Davis, 1992).

Finally, as in the U.S., controlling for supply side characteristics such as age and education explains little of the earnings inequality; inequality has been rising within age and education groups, and within industries and occupations. (Levy and Murnane, 1992; Morissette, Myles and Picot, 1994). Accounting for changes in the occupational or industrial structure of the economy explains little of the overall rise in inequality.

i) Implications for Data Development

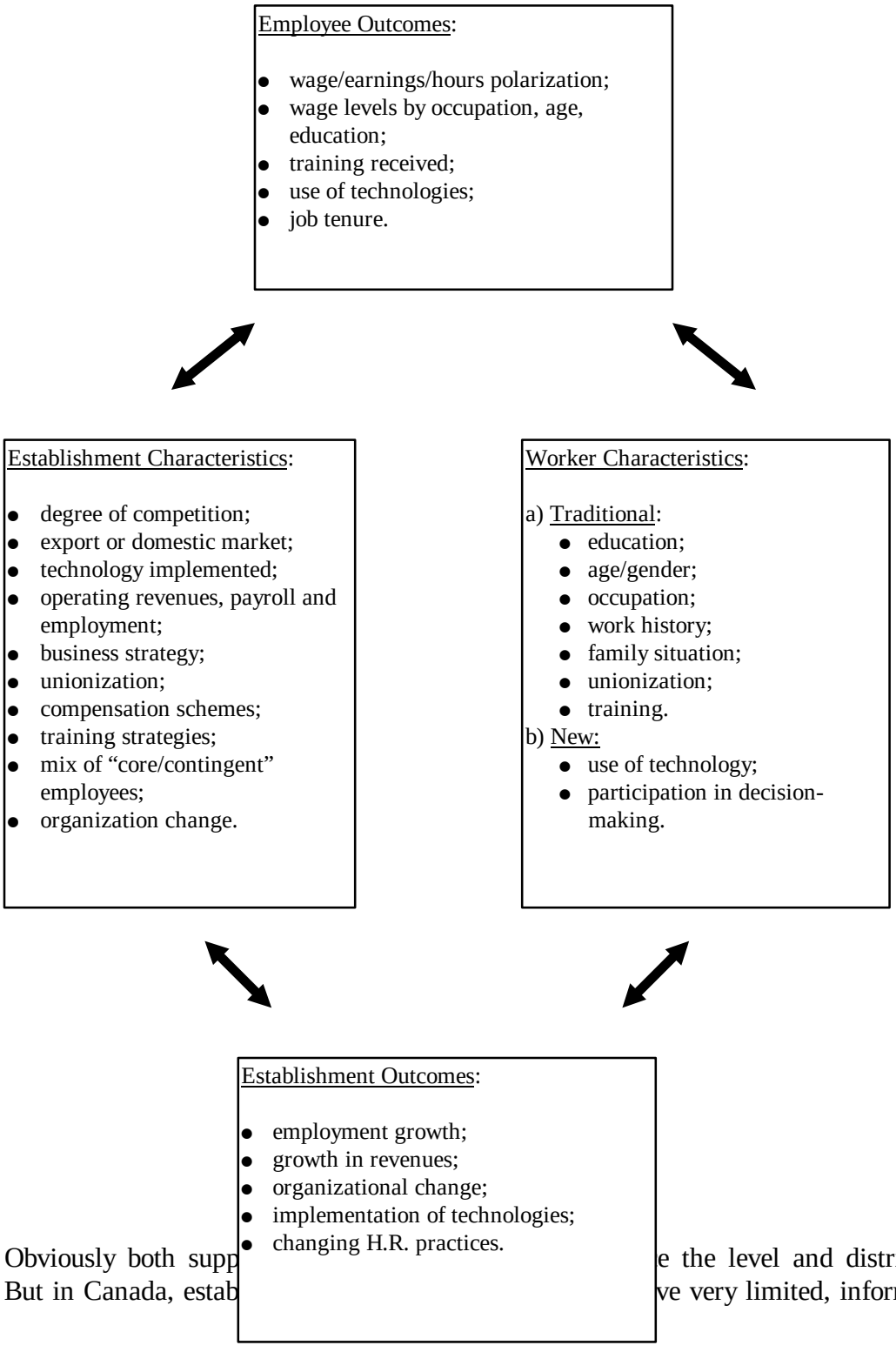
It is when attempting to determine the causes of these changes in earnings patterns that one is drawn to the need for data on both workers and events taking place in the workplaces. For example, the supply of youth labour has been declining in Canada since 1980, and their educational attainment has been, if anything, rising. It seems highly unlikely that supply side explanations are appropriate when attempting to explain the drop in relative and real earnings of the young during the 1980s. One must turn to events influencing the demand for labour. This conclusion has been reached by others (e.g. see Katz and Murphy, 1992).

Davis (1992) suggests that technological change that favours more experienced (older) workers may be part of the cause. It may also be that as firms attempt to reduce costs in face of increasing international competition, older workers may be better protected from the growing wage competition than younger workers for a variety of reasons, including efficiency reasons, seniority rules, firm-specific training, or other “institutional” barriers that favour job incumbents over new employees. But in all these cases, changes in the adoption of technology, skill requirements or compensation patterns in firms are associated with the decline in youth wages. And this may only be occurring in some types of firms (e.g. new, those in competitive markets or exposed to international trade, those adopting new technologies, etc.). Data on events in these firms need to be linked to wage patterns among particular types of workers (e.g. younger, older, less skilled, more highly skilled) to better understand these processes.

Possible explanations of rising earnings inequality in general leads one in the same direction. Currently the most accepted explanation for the increasing polarization of wages in labour markets is skill-biased technological change (e.g. Bound and Johnston, 1992, Freeman, 1995), and changes in trading patterns (Wood, 1995). In Canada, work using special firm surveys on technology, innovation and H.R. practices, linked with longitudinal data on manufacturing establishments (including average wages in establishments) is beginning to shed light on these issues. Focusing on changing relative wages among industries and between production and non-production workers, Baldwin and Rafiquzzaman (1996) conclude that both trade and technological change are associated with changing relative wages. Work has also been done on technology use and training (Baldwin, Gray and Johnson, 1995) and other aspects of human resources (Baldwin and Johnson, 1995) in manufacturing. With detailed data on the workers (e.g. controlling for education and occupation information on training intensity and do receives the training data on all industries) and the ability to focus directly on wage distributions, significant contributions to such work could be made. Furthermore, it is more and more recognized that there may be other changes associated with the introduction of technologies, such as organizational change, changing relative demand for high and low skilled labour, and changes in training patterns that can significantly influence the wages and other aspects of workers lives. Once again data on both events in firms, and wages and other supply-side characteristics of workers are needed to assess the impact of such changes.

Polarization of hours of work appears to be playing an important role in earnings inequality in Canada. While there is no convincing explanation of this trend at present, the results are consistent with the often discussed tendency of firms to move towards a “core” of full-time workers, many of whom may be working longer hours, supplemented by an increasing number of “contingent” workers: part-time, part-year, contract, or temporary workers, who may be working fewer hours per year. The duration of jobs held in Canada is also becoming polarized in a manner consistent with this explanation (Heisz, 1996). Such a staffing strategy would provide the firm with more flexibility and maneuverability when altering the size of their effective labour force in response to demand fluctuations. This would reduce their costs and increase their competitiveness. It may also increase wage polarization and lead to increasing segmentation in the labour market. But to be able to assess such a hypothesis one has to know something of the extent to which such staffing strategies are indeed being followed, and whether it is among firms that are following them that one observes change in the levels or distributions of earnings of workers. Again the need for demand side data to shed light on wage issues such as these.

Chart 4: Workplace Activities and Human Capital Characteristics Potentially Influencing Employee and Establishment Outcomes



Obviously both supp e the level and distribution of wages. But in Canada, estab ve very limited, information on

the workers. The opposite is also true. This initially led us to consider a survey such as the Workplace and Employee Survey.

The possible advantages of a survey like the WES for the analysis of various are depicted in chart 4. Employee outcomes, including wage levels and distributions, training, job stability, etc., can be associated both with the traditional supply-side human capital characteristics of workers, as well as demand-side events occurring in establishments. The types of supply and demand side data that are being collected in the pilot are outlined. They include, on the demand side, the introduction of a new technology, the mix of full time and temporary/part time/contract workers, business and training strategies, organizational changes, sales, payroll, the type of market in which the establishment functions, and other variables. On the supply side the usual human capital variables (age, education, work experience, occupation, training taken) are included, along with new variables, such as the use of technology.

But the use of these data need not be restricted to outcomes for workers. Outcomes for establishments, such as growth in employment or operating revenues, organizational change, the implementation of technology, etc. can also be linked both to other activities taking place in the establishment, and the characteristics of the workers. For example, the education or occupational distribution of the work force may be closely tied to the activities and outcomes of the establishment, as might the extent of unionization. These data can be used to analyze both worker and establishment outcomes, although the focus is very much on the worker outcomes. It was primarily for this purpose that the survey was developed. The availability at the micro-data level of such linked information will advance significantly the ability to understand the changes that we have been observed in firms and the labour market in Canada. The possible research uses of such data are considerable, and are discussed later in the paper. Following is a description of the pilot survey that is underway.

III Approach and Content

i) A Two-Stage Approach

Respondents for the Workplace and Employee Survey will be selected in a two stage process. In the first stage, a sample of employers will be drawn from the statistical establishment level of the Central Frame Database**.** This database is a depository of basic information on all business entities in Canada. The establishment sample will be stratified by industry, region and employment. Using Frame and other information, interviewers will arrange face-to-face interviews with representatives of the employer -- usually the manager responsible for human resources. One of the primary objectives of the interview will be for the interviewer to select a random sample of employees from an employer-provided list. Employees will be interviewed by telephone, at a time and place they deem appropriate. This process thus results in a single-stage sample of establishments and a two-stage sample of employees.

It is intended that the production version of the survey track the same establishments over time with some form of replenishment to account for establishment deaths and other forms of

sample attrition. Workers would be tracked over time for as long as they remain with the same firm and for one additional period after they leave. Exiting workers would be replaced in the sample by others from the same establishments, ideally by recent hires. Thus the sample of workers will not be a panel in the strictest sense, but will allow researchers to study all relevant period-to-period transitions. The pilot is currently underway as a cross-sectional test, however, and the focus at the present is on producing cross-sectional data.

ii) Content

To fulfill its objectives, the Workplace and Establishment Survey will be collecting a broad range of information -- particularly from employers. In many workplaces more than one respondent will be required. In order to get the questions to the person best able to answer them, the survey is broken into a number of modules. The modular approach will also be useful in the longitudinal production survey, where modules will be cycled over longer periods to reduce the response burden in any single year.

a) Employer Questionnaire

The employer questionnaire is divided into 10 modules. A brief summary of each module follows. (Complete questionnaires are available upon request.)

Workforce Characteristics and Job Organization

Covers the work arrangements of employees (full-time/part-time, temporary/permanent, seasonal, on-site/off-site, contract etc.), recent hiring and separations, and the presence of unfilled vacancies. All questions in this section are broken down into five occupational groups.

Compensation

Covers variable pay plans, gross payroll, non-wage benefits and the distribution of earnings in the company. Most questions capture occupational detail.

Training

Covers the presence of formal training programs, which occupational groups received training in the past year, how training is funded and how much is spent on training.

Human Resource Function

Determines who has responsibility for human resources, the level of employee involvement in decision-making, and the incidence, type, extent and effects of recent organizational change.

Collective Bargaining

Asks about the presence and membership (by occupation) of collective bargaining groups, treatment of “flexibility” issues in contracts, work stoppages and grievances.

Establishment Performance

Covers operating revenues and expenditures, employment, change from the previous year, variability in revenues by quarter and foreign ownership.

Business Strategy

Asks respondent to rate the importance of elements of business strategy, estimate their distribution of sales by market area and specify the number of competitors in their market.

Technology Use

Asks about overall computer usage in establishment, looks at specific major technology implementations in the past three years (hardware/software, computer-controlled technologies and other technologies) and the effects of the implementations.

Use of Government Programs

Looks at establishment use of grants and loan, employee-related programs, tax provisions, information services and other ventures with government.

b) Employee Questionnaire

The employee questionnaire is not as clearly blocked as the employer questionnaire, since it will only involve a single respondent. The questionnaire covers: job characteristics, requirements when hired, hours of work, pay and benefits, working off-site, leave, promotions, technology use, training, participation in decision-making, work stoppages, recent work history, education, family situation and membership in designated employment equity groups. While the questionnaire covers a fairly wide range of topics, pre-testing has shown it to be not overly burdensome for respondents.[2]

IV Operational Issues in the Development of WES

This is an experimental survey for which a pilot is being conducted. There are obviously numerous operational issues which arise when attempting to develop a new survey such as WES. It is important for providers and users of data alike to understand these issues, as they can influence the use to which the data are put. Briefly, some issues encountered in the pilot include:

* Obtaining a list of employees from the employer... As noted above, establishments are selected from the business register in Statistics Canada, and a random sample of workers within these establishments is chosen by the interviewer while conducting the establishment interview. Approximately six employees per establishment are selected, unless total employment is less than that, in which case all employees are selected. Obtaining the list has not presented serious difficulties in the pilot.

* Ensuring the list matches the establishment for which the demand side data are being collected...In some complex companies this becomes an issue, as an “establishment”

[2] Typically interviews lasted about 25 minutes.

may refer to many locations. Some "profiling" of the companies by the interviewers has been necessary to ensure that the entity for which both the demand side and worker data is being collected is well defined.

* Contacting Employees and Eliciting Employee Responses... This was probably the area of greatest concern at the beginning of the exercise, and remains so. Employers are generally not willing to have employees interviewed on company time if the interview is to be of any length. Thus, employers are asked to distribute "contact" forms to the employees, which the employees subsequently return. An interview is then held by phone with the employee. The pilot survey results suggest that if employers are reminded to distribute the forms, the results are improved. Nonetheless, worker response rates in the pilot were in the 60% to 65% range, which will prompt a review of this process for the production survey to determine ways of increasing this rate.

* Two-stage estimation procedures....First sampling establishments and then employees within establishments results in a two-stage sample of employees. New estimation procedures are being developed by methodologists in Statistics Canada to provide population estimates of employees, and to put employee weights on the sample.

* Establishment Response Burden and contacting the Correct Respondent...This has been another concern from the beginning. We have worked with employer groups and individual firms in a pre-test to ensure, to the extent possible, that the questionnaire made sense to the firms, and that it appears relevant for issues with which they are concerned. The response rate to the establishment questionnaire was in the 80% range in the pilot, quite good when compared to similar surveys. A very large share of the Human Resource managers, who are the first contact, seemed to be quite accepting of the questionnaire, no doubt because it evidently addressed issues in which they were interested. The questionnaire has also been broken into modules so that responses can be provided by two or three different managers in an establishment if necessary. This reduces the response burden of any particular manager, and likely increases the quality of the data. The survey modules are designed to be sent to the company level if necessary, where the necessary information and the correct respondent may reside. Information on who provided the responses to various parts of the survey is being collected, but is not yet available. If the pilot demonstrates that response burden is a particularly difficult issue, some of these modules may be eliminated from the first production survey, and included on the second.

* Handling Multi-Location Establishments... For the purposes of reporting to Statistics Canada, companies may identify establishments which are in fact multiple locations. This is particularly the case in the financial sector. If human resource practices, adoption of technology, compensation plans, etc. differ among the locations within such a large establishment, this can present problems in the analysis of the data. In such a case, it is not clear which employees sampled are exposed to which, say, new technology. Thus, in a relatively few cases, these complex establishments selected in the sample needed to be "profiled" to determine a suitable level (perhaps somewhere

between establishment and location) for the interview. That is, one is seeking a level in the company that: (1) is homogeneous with respect to the questions asked in the survey, and (2) can provide a list of employees associated with that level to be used in the selection of the worker sample. The issue of coverage of both the establishment questionnaire and the employee list can, in these cases, become quite important. Interviewers were trained to pay particular attention to coverage issues, and ensure that the "establishment" being surveyed was well defined and appropriate.

* Developing a Longitudinal Survey... Ultimately WES is intended to be a longitudinal survey in the establishments. However, because of the novel nature of the survey, it was decided to test WES as a cross-sectional survey in the pilot. The focus of the project team's efforts has been to develop a successful cross-sectional survey. Issues related to developing a longitudinal survey that will have to be addressed include:

    * handling births and deaths of establishments, and replenishing the sample through time
    * handling exits of employees from the establishments
    * replenishing the employee sample in establishments due to new hires
    * minimizing non-response attrition in both the employer and employee sample
    * longitudinal weighting of the sample
    * strategies for dealing with changes in ownership and organization of establishments
    * dealing with turnover of primary contacts in establishments

i) Evaluation of the Pilot Data and Processes

The pilot survey has been completed, and data are being edited and entering into the "production" version of a hierarchical data base which has been developed. There will be data on approximately 700 establishment and 2500 workers. Little is known as yet about the quality of the pilot data. The overall response rates were roughly 80% in the establishment survey, and 60% to 65% among employees in these establishments. The response rate among establishment was very good when compared to similar establishment surveys. The response rate among employees was lower then average primarily because of the method used to contact the employee. As noted earlier, consent forms were dropped off with the employers by the interviewer during the personal interview. The employer then distributed the forms to employees, who in turn sent them back to Statistics Canada. A telephone survey was then conducted with the employee. This process was used in order to minimize the demands placed on employers, such as requesting telephone numbers of employees. It was felt that there was a confidentiality issue (although perhaps not a legal issue) in asking employers to hand out employee telephone numbers. The evaluation of the data and the processes will focus on ways of improving the employee response rates.

The data and process evaluation will take place over the summer, and will focus on other issues such as:

- Adequacy of the Survey Frame;
- Sampling Procedures;
- Total and Item Non-Response;
- Quality of Response;
- Who in the Firm Responded to Various Sections;
- The Adequacy of Edit and Imputation Procedures Used in the Pilot;
- The Adequacy of the Estimation Procedures;
- The Consistency of the Employee and Employer Responses;
- Where Possible, Comparison of the Data with that from Similar Sources.

Considerable data on the operational aspects of the survey were collected during the pilot (e.g. length of interviews, who responded to the interviews, particular problems in the interviews, etc.) and these will be analyzed in order to improve the production version of the survey.

ii) An Overview Report

The first step in using the data will be the production of an overview report. This will outline the major observations in the data in a number of topic areas, but will not get into issues where, for example, an event or characteristic of the firm (e.g. the adoption of technology, a significant organizational change or the type of market in which a firm worker) is associated with a worker outcomes (e.g. wage levels or distribution, the training received, or the job duration and stability). This will be left for later research work. The overview report will focus primarily on the incidence of various events or practices, such as:

- hirings, unfilled vacancies and separations;
- a more flexible workforce? The use of temporary, part-time and contract workers;
- the degree of organizational change observed in the past three years -- in what industries and what types of firms;
- the incidence of the implementation of new technologies -- in what industries and types of firms;
- the use of technologies by employees; both incidence and intensity;
- training offered by employers and taken by employees;
- compensation practices and fringe benefits.

The production survey will be stratified by geographical region, industry and firm size. The pilot was conducted for particular region/industry combinations in order to test the operations and methodology of the survey in various strata. Thus, the pilot data are not representative of the economy as a whole but rather refer to particular industry/province combinations.

V Research Possibilities

The Workplace and Employee Survey has been designed to inform research on a wide range of issues. We feel that there are three particular strengths that the survey program will offer to researchers: 1) new information on events occurring in workplaces; 2) the ability to correlate a broad range of establishment practices; and, 3) the ability to link employer and employee information. This latter characteristics will allow major new directions in research to develop, and in particular will allow events in establishments to be associated directly with worker outcomes, something not previously possible using micro-data.

This brief outline of a few research projects is intended to underline the importance of linking the events in the company with workers outcomes. When two or three cycles of the WES are completed, a range of new topics requiring longitudinal data could be introduced. The dynamics of the workplace environment and its association with worker outcomes would be emphasized. This would allow more casual analysis, something which is often quite difficult when cross-sectional data only are employed. Potential research topics include:

i) Job Security and Core/Contingent Employment Patterns: The Association with Technological Change, Competition, and Other H.R. Practices in Firms

Since work is the means by which the majority of Canadians secure both their income and, to a great extent, their self-esteem and social network, any breakdown in the traditional pattern of work is important. There is considerable fear in the population concerning the availability and stability of employment, and what the breakdown of this stability may mean for the income of Canadian families. Probably the most controversial aspect of the potential changes that are taking place in firms, including cost-cutting, the introduction of technology and changing staffing practices, is the impact that they have on employment levels and stability.

But there are numerous unanswered questions. Has work become as unstable as is generally believed, or is the barrage of media reports and anecdotal evidence developing this accepted wisdom? Just how underspread is the use of the core/contingent model, and with it the use of contract/temporary work? The advantage of the WES is that the employment instability, or the type of workforce put in place in a firm (in terms of full-time/part-time/temporary/contract, etc.), could be linked to other characteristics of the firm, such as:

* The extent to which they trade in international markets, since one of the explanations one often hears regarding the changing nature of employment contracts (and the use of outside contractors) is that it is in response to international competition.

* The business strategy of the firms, as there should be a link between the firms strategies and what is in fact occurring

* The introduction of technologies, as firms which aggressively move to replace labour with capital may also choose to reduce labour costs by other means, such as restricted use of full-time indeterminate employment contracts, at least for the less skilled workers.

* The industry and occupational structure firms, as there may be pockets of the movement towards less stable employment.

* Other human resource practices of the firm, such as benefits paid, training offered, wage levels, etc. It may be that the alteration of the type of contracts offered employees is reflective of an overall human resource strategy on the part of the firm. This could be tested in numerous ways using the data, including the direct questions regarding firm strategies.

The changing distribution of hours of worked could be addressed in this project as well; work arrangements may vary significantly among different types of companies.

ii) The Adoption of Technology, Training and Skills

The relationship between the adoption of technologies, training and the skills of workers leads to a number of research questions which might be addressed using WES data, including:

* The Association between the Occupational and Educational Distribution of Workers in Firms and the Adoption of Technologies

  One of the first tasks would be to use these data to re-address the question, "Do firms that adopt technologies have a significantly different skill (occupational and educational) mix than those that do not, controlling for a number of other characteristics of the firm "? We may extend this to look at new hires in firms that have recently adopted a new technology.

* Who in the Firm Uses the Technology, and How did they Acquire the New Skills Necessary

  How do employees learn to use computer applications and other technologies? And what types of workers use the technologies and receive training? Combining data from the workers survey with that from the employers survey (on the incidence of adoption of technologies and the groups affected) would allow us to provide direct evidence on the use of technologies by low and high skilled workers (again defined by occupation and education). The questions concerning the means of acquiring the necessary skills would also be useful in assessing just how different types of workers acquire the necessary training.

* The Training Patterns in Firms Adopting New Technologies, and Other Companies

  We have the opportunity to contribute to the discussion of the extent to which firms that introduce new technologies make provisions for the acquisition of new skills. The

direct questions on the training provided during the adoption of the technologies, and other questions on the training programs of the firms in general can be used in this work. It would be possible to distinguish between the training programs of those firms adopting significant technologies, and others. Data from the worker survey would be of value. The focus would not only be on the incidence of training in the firms, but also the depth and nature of it.

iii) Effects of Competition and Technology on Wage Distributions

One major research question relates to the influence of technology and trade on wage **distributions.** Many analysts are attempting to determine whether it is trade or technology that is driving the polarization in wages and labour demand. But these are probably not mutually exclusive phenomenon. International competition probably drives firms to adopt new technologies, and that both of these influence wages and labour demand. With the WES data it would be possible to focus on the degree of competition and the adoption of technology simultaneously. One could ask:

* Is the adoption of technology more intense among firms that have a significant degree of competition, and in particular firms that compete directly internationally? That is, to what extent does one observe these phenomena in the same firms?

* Are there significant differences in the wage distributions (using data from the employee survey to get distributions) between (a) firms that tend to adopt technologies, or firms that function in competitive markets, particularly international markets, and (b) other firms, controlling for characteristics such as the occupational and educational distributions of the workers, and the industry of companies.? Controlling for the occupational and educational distributions is an important part of this work, and something that others have been unable to do because of the lack of data similar to the WES. This analysis would allow us to assess the impact on the overall wage distribution of an increase in the number of firms adopting technology or competing internationally, something that is believed to be happening.

This type of analysis would not initially provide a direct test of the adoption of technology or a change in trading patterns on the polarization of wages, but when longitudinal data become available this may be possible.

iv) The Determination of Wages : What Can We Learn?

There are a number of questions regarding the determination of wages that we can address using the strength of the WES file, such as:

* Is there a wage premium associated with the use of technologies by workers?

  The ideal way to address this question is to have longitudinal data on workers and their use of technologies, particularly information technologies, and use fixed-effects models

to address the question. In the absence of such longitudinal data, one can conduct a cross-sectional analysis of the wage gap between the users and non-users of various types of technology, controlling for worker characteristics such as education, occupation, age and work experiences, as well as controlling for establishment level characteristics, such as a crude productivity measure, the business strategy of the firm, whether the firm has a highly qualified workforce, and other such variables. The result should be better than most cross-sectional studies could achieve, because of the richness of the co-variates available from the two surveys. Furthermore, the WES goes beyond using information on the incidence of computer usage by providing data on the type of usage (different applications) and intensity of usage (time spent working on computers). This additional information of the use of computers will allow considerable refinement to the original research in this area.

* Earnings and Human Capital Models: Introducing New Possible Explanations

Human capital and earnings models have been, by necessity, largely supply side driven. It is the characteristics of the workers that have been offered as the principle determinants of wages, at least in part because the available data was largely household survey data. Recently some studies have started to incorporate demand side variables, such as productivity, into wage models that focus on average wages in plants. These papers suffer from the same shortcoming, only the lack of data is in this case on the supply side (characteristics of workers), not on the demand side.

With WES, it will be possible to do both. One can look at the importance of establishment variables such as innovative activities, the introduction of technologies, the presence of novel methods of compensation, the degree of training in the firm, and possibly a crude measure of productivity, while controlling for worker characteristics such as education, work history, age, gender, and other important variables. No other data set would allow comprehensive data from both the supply and demand side to come to bear on this question. In particular, vehicles with demand side data suffer from the inability to control for human capital features of the workers, a very big shortcoming.

There are numerous other potential topics not mentioned here, particularly those employing only the establishment survey data. The focus has been on the use of the integrated employer/employee data. Other topics in industrial relations (e.g. collective bargaining, fringe benefits, the policies and practices of union and non-union firms), training (e.g. the association between training and turnover/wages), establishment performance, the adoption of technology and organizational change, and establishment dynamics and labour demand might also be addressed using WES data.

Finally, as public policy priorities change so too will the manner in which these data are used. History has taught us that while it is important to specify the issues for which a survey is initially developed, through time these issues change; it is almost impossible to foresee the many application of a broad-ranging on-going survey such as the WES.

VII Current Status of the *Workplace and Employee Survey*

A pilot of the WES has been completed, and the data are being edited and completed. The pilot involves a final sample of about 700 establishments and 2500 employees.

The planned production version of the survey will have some 5000 establishments and 30,000 employees. Funding for the production version of the survey has not yet been procured. The sample for the pilot is based on a stratification scheme designed for the production survey. We have selected entire strata for inclusion in the pilot, rather than trying to stretch a relatively small set of firms into a nationally representative sample. This will enable us to test the analytical and inferential potential of the production design by way of targeted industrial and regional studies based on the data from the pilot.

The ultimate goal is to implement a production survey in the fall of 1997, and to make the Workplace and Employee Survey a part of Statistics Canada's program of regular surveys.

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