Employer-Provided Job Training:
Who Really Pays?

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Employer investments in job training are risky since employees may leave their jobs, taking with them the employer's investment in human capital. Specific human capital theory predicts that firms and workers will form implicit bonding arrangements to protect investments in specific human capital. However, although several studies have documented the empirical significance of long-term tenure, it is difficult to distinguish between the various motives that might give rise to observed worker-firm attachments.

In this paper I examine the relationship between bonding and employer investments in human capital. I find that firms that provide company training programs bond workers through wage premiums. Company training programs are associated with wages that are 5 percent higher, on average, than wages of comparably skilled workers. In contrast, firms that provide general training - tuition aid or apprenticeship training - are likely to use pensions as a bonding device. These firms are more likely to provide noncontributory pensions then either firms with company training programs or firms with no training program.

This study differs, in several respects, from previous work concerning job training. First, the focus is on the firm's decision to provide training, rather than the determinants and effects of individual training experiences. Second, problems of selectivity bias are partly overcome by examining within-firm wage differentials, as opposed to individual wage growth. And third, occupational characteristics obtained from the Canadian Classification and Dictionary of Occupations provide a more comprehensive control for the skill and productivity of the occupation than is typically available in individual-level datasets.

I. Introduction

The education and training of workers is of paramount importance in determining the productivity of the workforce, yet U.S. employers spend less than 2% of total payrolls on employee training programs.[1] Evidence from the 1983 Current Population Survey shows that while 35% of employed workers received training to improve skills on their current job, only 11% of workers received skill improvement training through formal company training programs.[2]

Traditionally job training policy in both the U.S. and Canada has focused on the training of disadvantaged workers - those recognized as the least likely to succeed in the educational system and the least likely to receive training in the workplace.[3] Hence previous studies of job training focused on two issues: 1) who gets training, and 2) what impact does training have on the wages and wage growth of individual workers.[4]

In contrast, recent public policy discussions focus on the expansion of private sector work-based training.[5] The impetus for this shift is twofold: 1) the effectiveness of CETA and the

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[1] U.S. employers spent an estimated 45 billion dollars on employee training programs in 1990. ("Industry Report 1990", Training, Oct. 1990.) Training surveyed 12,000 employers of 100 or more workers; estimates are based on a response rate of 22 percent.

[2] Carey, 1985.

[3] Levitan and Gallo (1988) date "sustained employment and training efforts focused on the disadvantaged" as beginning with the Area Redevelopment Act of 1961. The ARA was followed by: the Manpower Development and Training Act (1962), the Job Corps and Neighborhood Youth Corps in 1964, WIN for AFDC recipients (1967). Comprehensive Employment and Training Act (1973), Youth Employment and Demonstration Projects Act (1977), and the Job Training Partnership Act (1982).

[4] Appendix Table 1 shows the findings of recent empirical studies of private sector training; see also Charles Brown (1989) for a review of this literature. Lynch (1992) discusses the limitations of the private sector training measures included in the following micro datasets: CPS, EOPP, NLS, NLSY, and PSID. Studies of government sponsored training programs include: Ashenfelter and Card (1985), Bassi (1984), and Lillard and Kumbhakar (1986).

[5] See The Report of the Commission on Workforce Quality and Labor Market Efficiency (1989); the Department of Labor's Apprenticeship 2000 Initiative(1989); and Parsons (1989). Also see the Report of the Sub-Committee on Training and Employment of the Government of Canada (1987).

Manpower Development Training Act was hindered by a lack of direct employer involvement[6]

and, 2) international comparisons show that U.S. investment in workforce training lags behind that

of its major economic competitors. The 1991 World Competitiveness Report ranks the U.S. and

Canada 17th and 20th, respectively, among 23 developed nations in "the adequacy of in-company

training programs in meeting the needs of a competitive economy"; Japan, Switzerland, and

Germany comprise the top three.

Recent policy initiatives propose that training incentives be aimed directly at employers.

The recommendations of the Commission on Workforce Quality and Labor Market Efficiency

include: 1) new tax incentives for employer-provided training, 2) encouragement of multi-employer

training cooperatives, and 3) government support for the design and certification of employee

training programs (Bassi and Crawford, 1989). Yet little is known about the forces behind

interfirm differences in the incidence of formal training.[7] This is primarily due to data limitations,

but it is also due to the fact that job training is usually studied within the context of a human

capital earnings model in which training is viewed as an investment by individual workers. As

Parsons (1989) points out, this approach is simply an extension of a schooling model "into a

period of incomplete specialization in education." However, job training is distinct from schooling

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[6] Business involvement in government training programs is considered essential to insure that training develop the skills to meet employer needs. This involvement has evolved slowly, beginning with the 1978 re-authorization of CETA which created private industry councils (PICs) to serve an advisory role. The role of the PICs was expanded to encompass more of a policymaking role under the JTPA (1982). (See Levitan and Gallo, 1988)

[7] Policy recommendations have emphasized formal training programs due to the difficulty in implementing and monitoring programs designed to increase the level of informal training (Parsons. 1989).

in two important respects: 1) training has some degree of firm specificity and, 2) training is at least nominally financed by the employer.[8]

But who really pays for training? The firm's decision to provide training is distinct from the investment decision, but "who pays" is important in the determination of the equilibrium level of investment. Human capital theory distinguishes between general and specific human capital based on the fact that the returns to the training investment accrue over a period of time and the rents on specific capital are lost if workers and firms separate. Theory predicts that workers and firms share investments in <u>specific</u> training so as to form an implicit bond to protect the rents in the post-investment period (Becker, 1962; Mincer, 1974). Because the return to <u>general</u> training is not lost upon separation, workers are predicted to incur the full cost of this training through decreased wages in the training period.

There are several reasons why workers may not pay the full cost of general training. First, firms may be unable to shift the cost of training to workers contemporaneous with its provision if workers are capital constrained or if institutional factors place a lower bound on wages.[9] Second, firms may be willing to provide general training because there are rents to be had: 1) firm provision may benefit from preferred tax status[10], 2) there may be economies of scale in

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[8] One exception to the human capital approach is Holtman and Idson (1991) who apply a portfolio approach in examining whether training differentials by firm size are due to the greater willingness of large firms to invest in workers with a higher risk of job turnover.

[9] There is some evidence that minimum wages restrict job training (Fleisher (1981), Hashimoto (1982), and Leighton and Mincer (1981)). In addition, Lazear (1979) suggests that affirmative action may result in shifting workers out of "high learning" jobs since current wages are the most observable indicator of discrimination. Parsons (1989) discusses the contracting problem involved in "break(ing) the link between current wages and current training."

[10] Prior to 1989, tax law in the U.S. favored employer-financing of education and training expenditures. The personal income tax law allowed the deduction of job-related expenditures on education subject to a floor of 2% of adjusted gross income; whereas employer expenditures on

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training[11], and 3) complementarities between general and specific capital may raise the return to general training within the firm. If workers do not in fact pay for general training then firm provision is subject to the same constraint as the provision of specific training - namely the ability of the firm to bond workers.[12]

This paper examines the relationship between employer-provided job training and bonding. Using firm-level data from the Canadian province of Ontario I examine the incidence of three types of training programs: apprenticeships, tuition aid, and company training programs. The first two can be viewed as investments in general human capital since they confer certification that is recognized outside the firm, while company training is more likely to involve training that is specific to the firm. Hence these data provide examples of both general and specific training on a firm-level basis.

These data are unique in several additional respects: 1) wages are provided for both the base and the top occupations in the bargaining unit, 2) the availability of job titles for the base and top occupations enabled a matching of these data with the <u>Canadian Classification and Dictionary of Occupations</u> (CCDO), and 3) data are available for both the public and private sectors.

The CCDO contains measures of educational requirements, specific vocational preparation,

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[10](...continued)
education and training were treated as a fringe benefit - the tax-free limit was set at $5250 in 1988 and expenditures above that amount had to be claimed as taxable income by the employee. (See Quigley and Smolensky, 1990)

[11] Large firms may benefit from economies of scale in providing in-house training and they may also get discounts from outside vendors such as vocational schools or colleges.

[12] The importance of bonding has not gone unnoticed in policy circles. The Department of Labor found that "... fear of pirating is often cited as a reason that employers do not invest more in training" (DOL,1989). In addition, U.S.-Japanese differences in the incidence of employer-provided job training are often attributed to the Japanese culture of lifetime employment (Hashimoto,1979; DOL,1989) and to the steep wage profiles in Japan and the importance placed on seniority in wage determination (Tan,1989).

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and job complexity. I therefore have information about the range of skills employed by the firm as well as the range of wages. This information allows estimation of the effect of training on within-firm wage differentials while controlling for skill differentials.

The comparison of training in the public and private sectors may shed light on training differences in economies with different traditions of long term employment relationships. Public sector employment approximates a "tenure" contract; the demotion or removal of employees is not prohibited but the heavy burden of civil service regulations is likely to leave all but the most serious offenses of misconduct and lack performance unattended.[13] Several studies have found that tenure in the public sector exceeds that in the private sector in the U.S. (Bartel and Borjas, 1977; Utgoff, 1983) and public sector tenure is also longer among Canadian workers.[14]

This study differs, in several respects, from previous work concerning job training. First, the focus is on the firm's decision to provide training, rather than the determinants and effects of individual training experiences. Second, problems of selectivity bias are partly overcome by examining within-firm wage differentials, as opposed to individual wage growth.[15] And third, the

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[13] U.S. Civil Service regulations provide employees with a formal appeal process in the event of demotion or dismissal and place the burden of proof on the employer. The Civil Service Reform Act of 1978 was aimed at addressing the perceived "inability to remove employees whose performance is unsatisfactory", yet under existing law "an employee can only be removed or reduced in grade for poor performance after being given an opportunity to demonstrate acceptable performance"; the right of appeal applies to all employees who have completed the one year probationary period and the burden of "substantial evidence" lies with the government. In addition, reductions in force are required by law to take tenure into account (Shapiro, 1984).

[14] Evidence from Statistics Canada's 1987 Labor Market Activity Survey shows that, among workers over age 24, average tenure in the public sector exceeds average tenure in the private sector by 1.2 years. (The difference in median tenure is 2.2 years). Public sector tenure exceeds private sector tenure by .88 years, with a standard error of .114, controlling for age, education, sex, marital status, province, and firm size.

[15] A selection problem may remain in that firms that are more efficient in providing training will be more likely to do so, this will be discussed below.

occupational characteristics from the CCDO provide a more comprehensive control for the skill and productivity of the occupation than is typically available in individual-level datasets.[16]

I find that both general and specific training occur disproportionately in industries that are characterized by long-term tenure. Furthermore, the way in which firms bond workers depends on the specificity of the investment. Firms that provide company training programs bond workers through wage premiums. Company training programs are associated with wages that are 5 percent higher, on average, than wages of comparably skilled workers. In contrast, firms that provide general training - tuition aid or apprenticeship training - use pensions as a bonding device. These firms are more likely to provide noncontributory pensions then either firms with company training programs or firms with no training program.

The paper is organized as follows. The implications of specific human capital theory are discussed in Section II. The data is described in section III. A comparison of the determinants of general and specific employer-provided job training appears in Section IV. Section V examines the relation between training and various bonding mechanisms. And Section VI concludes.

II. Human Capital Theory, Training, and the Importance of Bonding

Specific human capital theory predicts that firms will bond workers through implicit rent sharing agreements when investments in specific capital are at risk (Becker, 1964; Mincer, 1974).[17] But there are other reasons why employers encourage long term tenure. For example,

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[16] Altonji and Spletzer (1991) matched individual-level data from the NLS High School Class of 1972 to indices constructed from the measures of occupational characteristics in the American Dictionary of Occupational Titles, aggregated to 3-digit DOT codes. Unfortunately they do not report the sensitivity of other individual characteristics to the inclusion of the DOT measures.

[17] See Hashimoto (1979) for a formalization of the specific human capital model.

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hiring or screening costs may make long term tenure efficient even in the absence of training. Or firms may deter shirking via delayed payment contracts, resulting in ex poste worker-firm attachments. The observational equivalence of the implications of human capital theory, on the one hand, and of alternative "contracting" models derived from agency theory, on the other, has made it difficult to empirically distinguish between these models.

Long term tenure is encouraged by any compensation strategy that imposes a capital loss on workers who leave the firm: 1) upward-sloping wage profiles, 2) wage premiums, and 3) pensions may achieve this objective. Agency theory predicts that upward-sloping wage profiles (or delayed payment contracts) will be used to deter shirking; wages are backloaded so that workers, in effect, post a performance bond (Lazear,1981; Lazear and Moore,1984). Similarly, wage premiums affect productivity since premiums increase the present value of current employment relative to alternatives (Becker and Stigler,1974). A pension is essentially equivalent to a delayed payment contract but it has "a more favorable tax status ... it can effectively hold workers *and* substantially reduce workers' tax liabilities" (Ippolito,1991).

Several studies have sought to distinguish between human capital theory and contracting models and have yielded mixed results. A direct test is obtained by examining the relation between wage growth and productivity growth. Medoff and Abraham (1980,1981) find that wage growth is largely independent of productivity growth, supporting a contracting model. In contrast, James Brown (1989) finds that, in the PSID sample, most wage growth occurs during periods of training.[18]

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[18] The training measure in the Panel Study of Income Dynamics (PSID) is in response to "On a job like yours, how long would it take the average new person to become fully trained and qualified?" No distinction is made between general and specific training, nor between employer versus employee financing.

The main problem in testing the specific human capital model against alternative theories is that the presence of specific capital is generally unobservable. Researchers have instead inferred the presence of firm-specific capital from evidence of bonding or from the differential wage growth associated with job tenure as opposed to "time in the labor force". Studies have documented the relation between wages and turnover (Pencavel, 1972; Parsons, 1972), wage growth and turnover (Bartel and Borjas, 1981; Mincer and Jovanovich, 1981), and pensions and turnover (Mitchell,1982; Gustman and Steinmeir, 1992) - finding strong support for the hypothesis that bonding does occur. However, there has not been a consensus with respect to the empirical significance of firm-specific factors (firm-specific human capital or contracts). Abraham and Farber (1987) and Topel (1986) find the returns to firm-specific tenure account for only a small portion of wage growth, while Topel (1991) finds large returns.

Evidence of the effects of bonding mechanisms cannot distinguish between different motives for bonding, and similarly, evidence of firm-specific wage growth tells us only about the relative importance of firm-specific factors and cannot distinguish between specific human capital and purely contractual arrangements (Topel,1991).

In contrast, Lynch (1992) examines direct measures of individual training incidence in the National Longitudinal Survey of Youth. She finds that company training raises wages on the current job, but not on subsequent jobs; training obtained outside the firm raises wages in subsequent employment. Lynch(1992b) finds that company training significantly decreases the probability that workers separate from their first employer; off-job training increases the probability of separation, especially for female workers. However, it should be noted that the NLSY is a young sample and evidence from the NLS Young Men shows that training probabilities are low during a worker's first five years in the labor force (Lillard and Tan, 1986).

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Most evidence of firm-specific wage growth and the effects of training are based on studies of individual-level data which may suffer from the inability to sufficiently control for selectivity bias. According to job-matching and sorting models the relation between wage growth and turnover may largely be due to the fact that the most able workers experience the most wage growth and are therefore the least likely to leave their jobs. In addition, the most able workers are precisely those workers who are most likely to receive job training.

The purpose of this paper is to look at firm-level observations of employer investments in human capital - both general and specific - and examine whether bonding is disproportionately evident when employer investments in human capital are at risk. This is done by examining: 1) the relation between training and the slope of the within-firm wage "profile" - that is, the difference between base and top wages, 2) the relation between training and the levels of base and top wages - i.e. are wage premiums evident, and 3) the relation between training incidence and pension provision.

III. The Data

The data consist of approximately 1,700 collective bargaining agreements from the Canadian province of Ontario, with effective dates from 1980 to 1989. This is a subsample of the nearly 38,000 contracts negotiated during that time period, however these contracts represent 25% of total unionized employment during the sample period (see Appendix Table 2). The sample is limited to contracts that have both wage data and information about job training provisions, thus restricting the sample to bargaining agreements covering at least 200 workers.[19,20] The public

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[19] Wage data is available for agreements covering 200 or more workers. Training information is available for private sector agreements covering over 200 workers and most public sector agreements, with some exceptions.

sector comprises 45% of the sample with contracts covering the federal, provincial, and municipal sectors.[21]

The disadvantage of focusing on the union sector, namely the limited ability to generalize the results to the non-union sector, may be outweighed by evidence that a disproportionate amount of *formal* job training occurs in unionized firms.[22] In addition, union wage scales eliminate individual selectivity problems since wages are attached to jobs, not individuals. And the unionized sector in Canada comprises 40% of private sector employment and 75% of public sector employment - certainly a nontrivial portion of the Canadian economy.

These data were merged to two additional sources: occupational characteristics were obtained from the Canadian Classification and Dictionary of Occupations, and industry characteristics were constructed from Statistics Canada's 1987 Labor Market Activity Survey (LMAS). The LMAS is a cross-sectionally representative sample of approximately 40,000 households. The survey contains data about individual characteristics such as age, tenure, and education, as well as wage rates and industry and occupation identifiers.

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[20](...continued)
[20] Evidence from the Adult Education and Training Survey shows that training rates rise with firm size: the rate is 6% in firms of under 20 workers, 11% in firms of 20-99 workers, 15% in firms of 100-499, and 22% in firms of 500 or more workers (Crompton, 1992).

[21] A Data Appendix is available on request from the author. This data is also described in Chaykowski and Currie (1992).

[22] Statistics Canada's 1990 Adult Education and Training Survey shows indirect evidence of the relation between unionization and training among Canadian workers: 1) the industries with the highest training rates are also the most highly unionized, and 2) both formal training and unionization are more prevalent in large firms (Crompton, 1992). Direct evidence will not be available until the release of the 1992 AETS which surveyed respondents' union status. The evidence among U.S. workers is mixed (Charles Brown (1989) reviews this literature).

The job titles for both the base and top occupation in the bargaining unit were matched to the Canadian Classification and Dictionary of Occupations (CCDO). The CCDO contains approximately 30,000 job titles corresponding to 7,500 unique occupations and contains measures of "specific vocational preparation", general aptitude levels required for adequate job performance, "worker functions" describing the level of job complexity, and measures of the physical demands of the job.[23]

The specific vocational preparation provides a control for the training time required to "learn the techniques and skills needed for satisfactory performance in an occupation" (CCDO, 1987). This measure is inclusive of all modes of training: formal schooling, vocational school, apprenticeships, on-the-job training, and previous work experience. Aptitude factors rank the occupation relative to the general working population in relation to five aptitudes: numerical, verbal, spatial, form perception, and intelligence. The worker functions are "based on the premise that every worker is required to function in relation to Data, People, and Things at various levels" and are designed to represent job complexity, skill, and autonomy. For example, the DATA function is measured on a scale ranging from "comparing" to "synthesizing" and the PEOPLE function ranges from "serving" to "mentoring". The aptitude factors and worker functions provide a control for productivity in a wage equation. In addition, the worker functions inform us of the relationship between the nature of skills required by the firm and the type of training provided.[24]

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[23] The 1520 titles in the sample were matched to 472 occupations. Only 184 titles were not found in the CCDO and 39% of these were Federal government jobs that were identified only by division and grade level.

[24] These CCDO measures are exactly analogous to those contained in the American Dictionary of Occupational Titles. The American DOT has received criticism primarily for its uneven coverage of the labor force. However, its content has also been criticized as inadequate. For example, the physical attributes do not capture relevant distinctions such as routinized vs. non-routinized tasks.

(continued...)

For the purposes of this paper, both the aptitude factors and the worker functions were converted to zero-one variables to identify high skilled occupations.[25] These variables are defined in Appendix Table 3.

The matching of job titles to the CCDO allows a finer level of occupational control than the broad categories identified on the union contract (these are: production, office, technical, professional, sales, and police and firemen). Figures 1a and 1b show that the broad occupational groupings mask significant variation in skill levels, as measured by specific vocational preparation.

The measures of company training, apprenticeships, and tuition aid are based on a yes/no coding of program incidence.[26] A company training program is defined as "any training or education program maintained by the employer or which the employer requires or requests employees to take, other than an apprenticeship training program" (Ontario Ministry of Labour). It is further defined to exclude "training or breaking-in learning for newly hired employees and short-term ad hoc familiarization activities." Company training is therefore more likely to be firm-specific than apprenticeships and tuition aid programs. Apprenticeships provide training and

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[24](...continued)
The reliability of the aptitude factors and the worker functions has been largely untested. A major drawback to the use and reliability-testing of the DOT information is that the occupation codes are not consistent with the more widely used Census codes. Despite this, the DOT is the only source of information describing job content for a large sample of occupations. (Miller, et al., 1980)

[25] The simple correlations between the top wage rate and the dummy variables for aptitude (2) and worker functions (3) are significant for both the private and public sectors. The simple correlation with base wages is significant for 3 of the 5 variables in the public sector. At least 3 of the 5 SVP dummy variables shows a significant correlation with base and top wages in both sectors.

[26] The employers' cost of training and the duration of training programs is not available. Charles Brown (1989) discusses both the conceptual problems and the measurement problems involved in determining the cost of training programs. The difficulty is particularly acute in the case of informal training since training is produced jointly with other outputs and trainees learn indirectly from their coworkers.

certification in programs that are registered with the federal government[27]; tuition aid results in college degrees and records of college credit which provide a widely accepted certification of the received training.

Table 1 shows the mean characteristics of bargaining units covering 200 or more workers; the estimation sample is slightly smaller due to missing data for wages, or the inability to confidently match the job titles to the CCDO. In the private sector 70% of bargaining agreements provide some form of employer-financed job training; 78% of public sector agreements contain a training provision.[28]

Company training programs are the most common training provision in the private sector. Tuition aid is the most common provision in the provincial sector and only slightly less common than company training in the municipal sector. This suggests that employers are more likely to provide general human capital under the conditions of a tenure contract - this hypothesis will be tested below. Apprenticeship programs are found primarily in the private sector.[29] Multiple training provisions are not uncommon: 22% of private sector agreements provide both company training and apprenticeships, and 21% of public sector agreements provide company training and tuition aid. This suggests that there is a significant degree of complementarity between general and specific human capital and this may make employers more willing to "pay" for general training.

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[27] Apprenticeship programs in the U.S. are required to provide a minimum of 144 hours of classroom instruction and 2000 hours of on-the-job training (Dept. of Labor, 1987).

[28] Bargaining agreements covering 200 or more workers are more likely to have training provisions than those covering fewer than 200 workers. Fully 50% of the latter group in both the private and public sectors have no training provision.

[29] Registered apprenticeship programs in the U.S. cover 415 trades although three construction trades (carpentry, electrical, and pipe trades) account for nearly 40% of all registered apprenticeships (Dept. of Labor, 1987).

The lower panel of Table 1 shows the distribution of occupational characteristics. The most striking fact is the relatively unskilled nature of base jobs in the private sector; 61% of base occupations require less than 30 days of vocational training compared to 36% in the public sector. This level of skill is also reflected in the aptitude ratings and the worker functions; a base job in the private sector involves a high level of "data, people, or things" functions in only 6% of cases, while 23% of public sector base jobs involve these functions. If base jobholders train to become top jobholders than we would expect a corresponding sectoral difference in the characteristics of top jobs. In fact top jobs are different, on average, in the private and public sectors. The greatest contrast is the importance of "things" functions in the private sector and "people" functions in the public sector. Private sector jobs are also more likely to involve physical labor. These sectoral differences are not surprising since 75% of the private sector jobs in the sample are in the manufacturing industry.[30]

The incidence of training programs by occupation and by industry is shown in Tables 2a & 2b. These narrow occupation groups correspond to the 2-digit CCDO code for the top occupation; the 2-digit level identifies 23 occupations, of which 17 are represented in the sample. Presumably employers finance training to prepare workers for movement up the job ladder, therefore the top occupation is more relevant to the firm's use of highly skilled (i.e. trained) workers. Eighty percent of private sector bargaining agreements cover just three occupations - machining, fabricating, and construction trades. Rates of training range from 50% in construction trades to 80% in machining for both company training and apprenticeships. The high concentration

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[30] This figure can be compared to the full sample of private sector bargaining agreements (including those covering fewer than 200 workers) which shows 57% of employment in manufacturing. Another comparison is the 1987 Labor Market Activity Survey which shows the manufacturing industry comprising 61% of private sector unionized employment in Ontario.

of jobs in just a few occupations confirms the need for the finer level of occupational characteristics obtained from the CCDO.

Firm-level data for the U.S. displays training rates on the same order of magnitude as that shown in Table 2. The Department of Labor's 1989 Employee Benefits in Medium and Large Firms reports the incidence of job-related educational assistance at 69% across all occupations, 81% for professionals, 75% for technical and clerical workers, and 59% for production and service workers. The incidence of training in firm-level data is considerably higher than the training rates observed in individual survey datasets. This is because the presence of an employer-provided training program does not necessarily imply that all workers receive training. In addition, cross-section surveys may question respondents about their training experience only within a fixed time frame and when individuals are asked if they ever received job training the estimates may be subject to substantial recall error.

Figure 2 shows the rates of formal training reported in U.S. and Canadian cross-section surveys (the 1983 U.S. Current Population Survey and the 1990 Canadian Adult Education and Training Survey).[31] The incidence of training by occupation is very similar in the U.S. and Canada; Canada shows a higher incidence of formal training in 12 of 15 occupations, however this may be due to the fact that the CPS pre-dates the AETS by 4 years. The comparability of both firm-level and individual-level training rates in the U.S. and Canada suggests that it may be reasonable to draw inferences from these results to the U.S. job training experience.

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[31] The 1990 AETS surveyed training experience during the 12-month period from December 1989 to November 1990; the 1983 CPS asked respondents if they received "skill-improvement training" through formal company training programs on their current job.

IV. The Determinants of Employer-Provided Training

In this section, the determinants of employer-provided job training are examined for each type of training program: company training, apprenticeships, and tuition aid. The purpose is first, to examine the extent to which the determinants of training incidence vary according to whether training is general or specific. And second, to examine whether training is more likely to occur in industries characterized by long term tenure.

Tables 3a & 3b present the results of reduced form linear probability models estimated separately for the private and public sectors.[32] The probability that a firm provides training is estimated as a function of the job characteristics of the top occupation and firm and bargaining unit characteristics.

The relevant job characteristics are those corresponding to the top occupation. The characteristics of the top occupation provide an upper bound on the skills utilized by the firm, and hence a measure of the firm's demand for skilled workers. The job characteristics provide two sets of measures. First, dummy variables for specific vocational preparation provide a measure of the magnitude of the training investment required for the top job.[33] And second, dummy variables for aptitude levels and worker "functions" provide controls for the nature and complexity of job tasks. I also include an indicator of whether the base job requires a high school education as a control for the quality of labor that can be drawn up the job ladder. The measures of job characteristics are from the CCDO; all variables are defined in Appendix Table 2.

Firm and bargaining unit characteristics include employment in the bargaining unit, firm

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[32] Probit models yielded similar results.

[33] It should be noted that "specific vocational training" is measured in time units and not dollar costs.

size, percent female, number of bargaining units in the firm, and dummy variables for the following: whether there is a union shop, whether the firm is national, if the base and top occupations are in the same 2-digit CCDO category, broad occupation group, geographic region, and industry.

Industry average tenure and industry wage differentials proxy for the contracting environment. Average tenure is a measure of the ability of firms in the industry to hold on to workers. This measure is constructed from the 1987 Labor Market Activity Survey using the sample of full-time workers over age 24.[34] Average industry wage differentials measure the differential between the average worker in industry j and the *average* worker[35]; the industry differential is therefore a measure of the value of current employment relative to alternatives for the average worker in the industry.[36]

The models presented in Columns 1, 4, and 7 of Tables 3 include only the characteristics of the bargaining unit and the firm. The remaining columns include the industry characteristics and the CCDO occupational characteristics corresponding to the skill requirements of the top occupation.

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[34] The LMAS identifies 51 industries and these were matched by SIC codes.

[35] Average industry wage differentials were constructed as follows: log wage regressions were run on the sample of full-time workers in the LMAS with RHS variables including tenure, tenure squared, and dummy variables for age category (4), education category (4), province (9), occupation (47),and industry (50). The industry coefficients were then normalized as deviations from the mean differential to get a measure of the within-occupation differential between the average worker in industry j and the *average* worker (i.e. not relative to a "left out" industry). This follows Krueger and Summers (1988).

[36] See Krueger and Summers (1988) for a review of the literature concerning industry wage differentials. Industry wage differentials are pervasive across time and highly correlated across occupations. Labor quality explanations have been found inadequate in explaining these differentials.

The most striking difference between general and specific training is the effect of vocational preparation on the likelihood of training provision. Tables 3a and 3b show that vocational preparation is positively related to tuition aid and negatively related to the provision of company training in the private sector.[37] There may be two distinct effects at work here: 1) there may be a strictly technical relationship such that the degree of specificity decreases with the level of investment, and hence training is more likely to be obtained from outside vendors; or 2) as the level of human capital increases, the firm may be less likely to train workers in-house due to the larger investment that is at stake. If the degree of specificity is constant over levels of investment then we would not expect the type of training to be related to the level of investment. However, if the probability of appropriating returns varies with the level of investment then we would expect this relationship. The result that training varies with the magnitude of investment suggests that firm-provided training may be constrained by the firm's ability to bond workers.

The firm-level and job-level characteristics also show that the determinants of firm-provided training vary considerably by type of provision. It is not surprising to find the percent female negatively related to apprenticeships. However, it is interesting that the negative relation of percent female with company training is not robust to the inclusion of skill measures; and the inclusion of skill measures strengthens the positive effect of percent female on tuition aid. The type of training program is also related to the nature of skills required by the firm, as measured by the data, people, and things functions. Tuition aid is likely to be provided in people-oriented jobs, and unlikely to be provided in technical ("things") jobs; the opposite holds for

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[37] This finding is consistent with Altonji and Spletzer (1991). Using the NLS High School Class of 1972 and the American DOT they found that higher levels of specific vocational preparation increased the probability of off-premises training and decreased the probability of on-the-job training.

apprenticeships.

Firm size can be expected to affect training provision as a measure of both scale economies in training and as a measure of the depth of the firm's hierarchy. While firm size has a positive effect only on tuition aid, the overall effect of firm size and employment in the bargaining unit is positive for all training programs.

Evidence of Bonding? Average industry tenure is positively related to both company training and tuition aid in the private sector, as seen in columns 2, 5, and 8 of Tables 3. This is consistent with the hypothesis that when firms share the rents from training investments we can expect trained workers to be "stayers". However, in the case of general training, there might be a spurious correlation between training and average tenure. If it is correct to assume that workers pay for general training, then a disproportionate amount of training occurs in industries with high wage workers and high wage workers tend not to leave their jobs. The positive effect of average tenure on company training is robust to the inclusion of industry wage differentials, suggesting that bonding occurs. The effect of average tenure on tuition aid is not robust to the inclusion of industry wage differentials and this is consistent with the hypothesis that high wage workers pay for the general training obtained through tuition aid.

The fact that average tenure is not related to the incidence of apprenticeships is not surprising. Apprenticeships constitute an explicit contracting agreement specifying a period of indenture during which the apprentice becomes a fully trained and qualified tradesman. The explicit indenture period provides a guarantee for the firm's training investment and a flexibility such that the apprentice may "pay" for his training but the time path need not coincide with actual training expenditures.

V. The Relation Between Training and Specific Bonding Mechanisms

The analysis of training incidence shows that training occurs disproportionately in industries characterized by long tenure. The concern of this section is 'how does bonding occur?' There are three primary mechanisms by which firms may encourage long term attachments: upward-sloping wage profiles, wage premiums, and pensions.

A. Within-Firm Wage Differentials

If training prepares workers for mobility within the firm, then the appropriate method of analysis is to examine the effect of training on wage growth - i.e. the difference between the base and top wages. Fortunately the coding of the company training variable·is specific, with instructions to "code this field for any statement in the agreement that the employer has a training programme or provides training opportunities in order to prepare employees for advancement to higher grade levels or other job opportunities."[38]

We can also think of a wage difference equation as allowing us to examine the effect of training on top wages while netting out the unobserved characteristics of the firm by controlling for base wages. This is particularly important since the firm's wage-setting strategy is jointly determined with its training policy. Firms that choose a high wage-low turnover strategy to economize on hiring, screening, or monitoring costs will face lower risk with respect to job training investments. If the firm's wage-setting strategy is correlated across occupations in the firm, than a difference equation will eliminate this selection bias on the training variables.

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[38] Unfortunately the distribution of job levels between the base and the top is unknown, and if base jobholders do not in fact train to become top jobholders than the examination of within-firm wage differences may not be appropriate.

Table 4 presents OLS estimates of the difference in log wages between the base and top occupation in the bargaining unit. The wage difference is estimated as a function of the difference in skill measures. I estimated an unrestricted equation in the sense that I included firm and bargaining unit characteristics, allowing that these factors could have differential effects on the base and top wage.

The skill measures include the difference in the specific vocational preparation required for the base and top job (measured in years of required training); and dummy variables to control for the differential nature and complexity of job tasks. The physical labor attributes, the aptitude variables, and the "data, people, and things" function variables are constructed as dummy variables to denote the characteristic of the top job conditional on the base job being absent that characteristic.

Firm and bargaining unit characteristics include firm size, percent female, and dummy variables for whether the base and top occupations are in the same 2-digit CCDO category, broad occupation group, and industry.

It is worth elaborating on the expected effects of training on wage differentials before turning to the results. Suppose two firms, A and B, have top jobs requiring the same amount of specific vocational preparation but only firm A provides training. If firm A provides general training than a competitive labor market requires that the top wages in firms A and B will be comparable. Suppose workers in firm A pay for their training by accepting lower initial wages while workers in firm B pay for their training out-of-pocket. Then employer-provided training will positively affect within-firm wage differentials. Similarly, even though specific training flattens the wage profile relative to general training (since workers receive the full rents on general human capital but only a share of the rents on specific human capital), specific employer-provided training

will steepen the profile relative to workers who pay for training as an out-of-pocket expense.

The results in Table 4 suggest that company training programs are not associated with bonding via upward-sloping wage profiles; company training does not have a statistically significant effect on within-firm wage differentials in the public or private sectors. This suggests that workers do not pay for training by posting a "bond" up front. The effect of apprenticeships cannot be predicted a priori. Apprenticeships involve explicit contracts which guarantee that the firm receives a return on investment - therefore the division of rents is indeterminant. The positive effect of apprenticeships on within-firm wage differentials suggests that, on average, workers share in the investment. Tuition aid has the expected positive sign in the public sector suggesting that workers incur at least part of the investment, however tuition aid negatively affects wage differentials in the private sector.

The analysis of within-firm wage differentials suggests that: 1) private sector workers do not "pay" for specific training by posting a bond at the beginning of the employment relationship; and 2) private sector firms "pay" for part of general training investments and therefore workers experience flatter wage profiles relative to workers who do not receive employer-provided job training.

B. Wage Premiums

There are two reasons why the analysis of wage differentials may not tell us whether training is related to a wage strategy that promotes bonding. First, the specification of the wage difference regressions assumes that training is provided to prepare base jobholders to move into the top job and this may not always be the case. Second, the wage strategy may involve paying a premium at all points in the wage "profile" and this is not distinguishable when examining wage

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differences.

Table 5 presents the results of wage regressions in which I pooled the base and top occupations - hence each bargaining unit is represented by two observations. Columns 1 and 2 display the estimated coefficients from a single regression for the private sector, with column 2 containing the coefficient for each variable interacted with a dummy for whether the observation is a top job. For example, the coefficient for company training in column 1 tells us the estimated wage effect of company training that is common to both base and top jobs; the coefficient in column 2 tells us the additional effect on top wages only. These results show that, within industry and occupation, company training is associated with higher wages in the private sector but there is no significantly different effect on top wages relative to base wages. If the bonding associated with company training is achieved by use of a wage strategy then this suggests that wage premiums, and not upward sloping wage profiles, are at work.

A comparison of the results in Tables 4 and 5 shows that although tuition aid is associated with flatter wage "profiles" in the private sector, the slope is due primarily to higher base wages and not lower top wages. (On average, bargaining units covered by tuition aid provisions earn top wages that are only 1.2% lower (5.1-6.3) than other top occupations.)

The public sector results differ from the private sector results. First, company training has a significant effect on top wages but not on base wages - this suggests an "upward-sloping profile". And second, while the tuition aid effects are qualitatively similar to the private sector results, they are considerable smaller in magnitude.

The results of this section suggest that private sector firms do not protect investments in human capital by adopting steep wage profiles (in effect requiring workers to post a bond up front). This is the case regardless of whether investments in training are general or specific. However

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there are other ways to defer compensation. The next section examines the relation between training investments and deferred compensation in the form of pension plans.

C. Pensions

The extent to which pensions are used as a bonding device to protect specific capital is difficult to examine. Pensions and training are determined simultaneously and "good" jobs can be expected to have both pensions and training opportunities, as well as relatively high wages. Tables 6a and 6b present the results of linear probability models which show that all three types of training programs are positively associated with pension provision in the private sector. Only tuition aid has a positive and significant effect on pension incidence in the public sector. These regressions include the CCDO occupational controls since firms have an incentive to bond all highly skilled workers, regardless of the source of training, as long as hiring and screening costs are correlated with skill levels.

The difficulty in examining pensions is compounded by the fact that pension plans may vary significantly. The two main types of pensions are defined benefit and defined contribution plans. Only under a defined contribution plan does the worker have some control over the portion of compensation that gets deferred to the retirement years. In this sense the defined contribution plan is more like a savings program than a traditional pension plan. It can therefore be expected that the defined contribution plan will have less of a deterrent effect on worker mobility, especially if workers who expect to be job changers self-select into jobs with defined contribution plans.

The importance of distinguishing between types of pension plans is evident in columns 3-6 of tables 6. In the private sector, the relation between apprenticeships and pensions exists only for noncontributory plans; the relation between company training and pensions is relevant only to

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contributory pension plans. In addition, the occupational skill measures (specific vocational preparation, aptitudes, and worker "functions") have a significant effect on the probability that noncontributory pensions are provided, but no effect on the probability of contributory pension provision. These models were estimated with and without industry and occupation controls.

Since employers choose between providing no pension or providing one of the two main types of pensions, the relation between training and pension incidence is estimated more efficiently with a multinomial logit model. Table 7 displays the results of the multinomial logit model for the private and public sectors with the estimates and standard errors in columns 1 and 3 and the derivatives in columns 2 and 4. The omitted category is 'no pension'. The sample size is smaller than in previous tables due to the fact that the type of pension plan was coded as "uncertain" in twenty percent of cases and I excluded these contracts from the analysis. The IIA assumption of the multinomial logit model was tested using a Hausman test.[39] The chi-square statistic from the private sector model is 2.98 with 24 degrees of freedom, and therefore the IIA assumption is not rejected. The chi-square statistic for the public sector model reflects the poor fit of that model which is also evident in the comparison of the actual and predicted outcome frequencies (see bottom of Table 7).

The main result is that, in the private sector, noncontributory pensions are more likely to be provided in the presence of general training than in the presence of either company training programs or no training. Firms with apprenticeship programs are 6 percent more likely to provide non-contributory pensions than firms with no training program; tuition providers are 10 percent

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[39] The IIA property of the multinomial logit model implies that, for example, the choice of providing a noncontributory pension is independent of the option to provide a contributory pension. This assumption is tested by removing one of the options from the choice set and testing for the equality of the unrestricted and restricted parameter estimates.

more likely to have non-contributory pensions. However, there is no significant relation between noncontributory pensions and company training. The relation between contributory pensions and training is positive for all types of training in the private sector, but is not statistically significant.

Results for the public sector show that firms providing tuition aid are 23 percent more likely to have contributory pensions than firms with no training. And firms providing apprenticeships and company training are no more likely to have either type of pension than firms with no training program.

The results in Table 7 appear somewhat surprising. We expect bonding mechanisms to occur disproportionately in the presence of specific human capital. However, firms have an incentive to bond high skilled workers who possess general human capital since hiring and screening costs are likely to increase with skill levels. The results may be understood when we consider the inherent mobility costs associated with specific human capital. The fact that specific human capital is nontransferable implies that as workers acquire more specific human capital they will be less likely to leave their jobs. If learning on the job is on-going then this mobility cost increases with tenure. The firm's explicit efforts to bond workers will therefore be concentrated primarily in the early years of tenure at which time pension compensation may be too far in the future to act as an effective bonding device. In contrast, general training does not induce tenure-related mobility costs.

The results in Table 7 are robust to various specification changes - specifically, including industry dummies or detailed occupation dummies yields substantially the same results. Including the average wage in the 2-digit CCDO category also yields no substantive change.

VI. Conclusions

This paper finds that private sector employer-provided training is more likely to occur in industries characterized by long tenure. And employer-provided training is associated with both wage premiums and non-contributory pensions. However, the way in which firms bond workers depends on the specificity of the training investment.

Firms that provide company training programs bond workers through wage premiums. Company training programs are associated with wages that are 5 percent higher, on average, than wages of comparably skilled workers. In contrast, firms that provide general training - tuition aid or apprenticeship training - are likely to use pensions as a bonding device. These firms are more likely to provide noncontributory pensions then either firms with company training programs or firms with no training program.

While all firms have an incentive to bond highly skilled workers, the fact that general training providers are more likely to be pension providers suggests that these firms incur at least part of the training investment - i.e. employers "pay" for general training.

The different bonding mechanisms associated with general and specific training can be understood in light of the fact that specific training involves inherent mobility costs. Since specific capital is largely nontransferable, workers will be less likely to leave their jobs as their specific human capital increases. In contrast, general training does not induce tenure-related mobility costs.

The results also show that in the public sector there is no relation between training incidence and average industry tenure; and no relation between training and pension incidence. Also, the wage effects of training are of smaller magnitude than those in the private sector. These sectoral differences may reflect the lower risk associated with training investments in a sector with a tradition of "tenured" employment.

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The results in this paper should be received in light of the limitations imposed by the data. First, there is no information about the cost of training. It may be that the differences between general and specific training reflect systematic differences in the magnitude of training investments. Second, the homogeneity of bargaining units may differ considerably - affecting the likelihood that base and top jobs are on the same "promotion path". However, despite these potential measurement problems, the results suggest that worker-firm attachments are important when employers invest in human capital.

The results in this paper suggest that policy initiatives aimed at remedying U.S. deficiencies in job training will not be effective unless they explicitly address the issue of worker-firm attachments. Some current proposals, including 1) extension of apprenticeship programs beyond the currently covered trade occupations and 2) establishment of employer training cooperatives, partially address the issue by decreasing the riskiness of the employer's investment. Other proposals, which have been largely influenced by the Japanese experience, include: 1) requiring employers to establish training programs, 2) subsidization of employer programs, and 3) government skill certification. However, it is not clear how much of the Japanese policy merely ratifies practices which would occur anyway in an economy with a tradition of lifetime employment (Tan, 1989). Firms are more likely to invest in human capital when they have a long-term view of the payoffs.

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Table 1. Mean Characteristics of Bargaining Agreements Covering 200 or More Workers

	Private Sector		Federal		Municipal		Provincial	
	Full Sample	Estimation Sample[1]	Full Sample	Estimation Sample	Full Sample	Estimation Sample	Full Sample	Estimation Sample
Number of Contracts	1463	903	139	49	438	379	468	305
Job Training Provisions								
Company Training	.560	.549	.784	.959	.461	.472	.340	.364
Apprenticeships	.378	.403	.144	.306	.144	.132	.062	.052
Tuition Aid	.131	.114	.410	.347	.404	.391	.517	.557
Any Training	.701	.705	.892	1.000	.676	.673	.690	.718
Pensions								
Pension Provided	.815	.833	.827	.776	.938	.945	.763	.744
Contributory	.229	.278	.741	.571	.050	.053	.679	.656
Noncontributory	.401	.367	.029	.061	.418	.425	.017	.010
Bargaining Unit Characteristices								
Employment	734	701	1,535	1,218	621	662	1,083	1,215
	(48)[2]	(62)	(283)	(293)	(48)	(55)	(97)	(136)
Firm Size	2,025	1,837	41,119	12,274	2,491	2,441	6,478	6,836
	(97)	(116)	(3616)	(3549)	(126)	(130)	(692)	(870)
Base Wage (1986 $)	10.357	10.247	11.156	10.951	11.677	11.835	10.712	10.427
	(.087)	(.093)	(.336)	(.468)	(.179)	(.192)	(.134)	(.144)
% Wage Difference	.302	.382	.582	.729	.405	.537	.363	.439
Percent Female	.260	.267	.221	.124	.300	.285	.688	.678
Urban	.444	.426	.173	.245	.699	.673	.571	.584
Union Shop	.473	.476	.058	.041	.347	.330	.079	.072
#Barg. Units in Firm	3.465	3.639	15.270	7.612	4.114	4.053	5.423	5.498
Industry								
Manufacturing	.753	.757	.079	.184	.000	.000	.000	.000
Primary	.057	.054	.000	.000	.000	.000	.004	.007
Transportation	.079	.074	.302	.429	.130	.103	.032	.023
Trade	.053	.052	.000	.000	.000	.000	.011	.016
Service	.057	.062	.108	.204	.370	.367	.846	.843
Occupation								
Production	.903	.908	.309	.592	.443	.422	.558	.564
Professional	.008	.003	.245	.082	.016	.013	.261	.210
Technical	.007	.007	.129	.184	.000	.000	.028	.036
Office	.049	.048	.302	.143	.258	.261	.137	.164
Sales	.032	.034	.000	.000	.000	.000	.000	.000
Police and fire	.000	.000	.014	.000	.244	.274	.017	.026

CCDO Characteristics of Base and Top Occupations in the Estimation Sample

	Private		Federal		Municipal		Provincial	
	Base	Top	Base	Top	Base	Top	Base	Top
Specific Vocational Preparation								
<= 30 days	.618	.021	.204	.000	.382	.037	.364	.003
1-3 months	.147	.027	.122	.020	.198	.003	.121	.000
3-6 months	.126	.069	.327	.102	.111	.013	.157	.026
6-12 months	.063	.082	.061	.061	.216	.095	.062	.154
1-2 years	.022	.064	.041	.163	.082	.061	.085	.075
2-4 years	.021	.669	.204	.449	.008	.570	.203	.620
4-10 years	.002	.069	.041	.204	.003	.222	.007	.121
Requires H.S. Educ	.049	.788	.408	.878	.103	.847	.361	.784
Physical Requirements								
Sedentary	.039	.041	.347	.367	.185	.235	.118	.236
Light	.255	.186	.143	.306	.203	.190	.233	.200
Medium	.360	.639	.224	.286	.113	.274	.580	.475
Heavy or Very Heavy	.339	.134	.286	.041	.499	.301	.069	.089
Aptitude Levels								
No High Apt. Scores	.705	.037	.347	.020	.388	.032	.489	.003
All High Apt. Scores	.028	.739	.204	.531	.214	.604	.210	.613
Worker Functions								
High Data Fcts	.029	.744	.265	.857	.216	.715	.121	.669
High People Fcts	.008	.031	.082	.265	.013	.290	.049	.331
High Things Fcts	.022	.740	.122	.429	.008	.375	.010	.469

[1] Excludes contracts with missing percent female, wage, or CCDO code. [2] Standard errors in parentheses

Table 2a. Incidence of Employer Provided Training

Private Sector

By Occupation

Occupation	# of Contracts	Employment	Company Training	Apprent- iceships	Tuition Aid	Any Training
Managerial,Administration	1	215	.	.	1.000	1.000
Natural & Social Sciences	11	6,219	.240	.	.174	.305
Medicine/Health	5	3,129	1.000	.	.	1.000
Art/Sports	12	11,407	.592	.	.069	.661
Clerical	27	30,430	.236	.	.613	.849
Sales	4	1,883	.	.	1.000	1.000
Services	25	14,871	.725	.230	.	.725
Farming/Fish/Frstry/Mining	5	1,325	.600	.	.445	.600
Processing	48	91,640	.684	.294	.226	.694
Machining	170	159,378	.812	.825	.661	.900
Fabricating/Assembling	244	137,134	.723	.593	.083	.837
Construction trades	337	163,373	.555	.485	.154	.761
Transport operators	25	14,828	.729	.095	.022	.729
Crafts/equip operators	4	3,031	.330	.	.	.330
N.O.C.	26	13,103	.496	.280	.091	.496

By Industry

Industry	# of Contracts	Employment	Company Training	Apprent- iceships	Tuition Aid	Any Training
Forest products	132	56,978	.689	.647	.170	.844
Food and tobacco	120	53,944	.450	.241	.099	.558
Mining and minerals	63	31,675	.799	.687	.036	.860
Plastics and chemicals	47	21,257	.493	.496	.097	.624
Textiles & apparel	85	34,611	.394	.347	.	.599
Metal smelting	78	71,852	.857	.923	.280	.973
Tools and machines	50	16,608	.397	.591	.041	.768
Appliances, electrical	85	40,667	.746	.428	.182	.777
Transportation equipment	94	130,963	.876	.864	.792	.938
Transportation	49	33,854	.747	.239	.073	.782
Utilities	20	39,164	.075	.	.814	.889
Retail	48	78,715	.626	.111	.012	.626
Hotel and restaurant	33	18,571	.613	.251	.	.680
Personal services	1	'50	.	.	.	.
Other Services	39	22,257	.687	.229	.077	.750

Notes: Percentages are weighted by employment
       Occupation corresponds to the top job title.

Table 2b. Incidence of Employer Provided Training

Public Sector

By Occupation

Occupation	# of Contracts	Employment	Company Training	Apprent-iceships	Tuition Aid	Any Training
Managerial,Administration	23	34,386	.533	.	.071	.533
Natural & Social Sciences	112	137,738	.584	.233	.256	.643
Teaching	24	43,693	.177	.	.174	.208
Medicine/Health	60	23,414	.463	.	.152	.512
Art/Sports	1	260	1.000	.	.	1.000
Clerical	43	65,688	.894	.031	.091	.932
Sales	8	9,556	.256	.	.256	.256
Services	9	3,178	.649	.	.500	1.000
Police/Fire/Guards	122	121,886	.501	.	.473	.788
Farming/Fish/Frstry/Mining	1	250	.	.	1.000	1.000
Processing	5	1,678	1.000	.421	.421	1.000
Machining	12	7,714	.655	.821	.320	.821
Fabricating/Assembling	64	55,122	.715	.150	.113	.802
Construction trades	234	148,821	.410	.454	.636	.834
Transport operators	11	26,523	.991	.	.895	1.000
N.O.C.	5	1,458	.744	.	.744	.744

By Industry

Industry	# of Contracts	Employment	Company Training	Apprent-iceships	Tuition Aid	Any Training
Mining and minerals	2	706	1.000	1.000	1.000	1.000
Metal smelting	5	1,511	1.000	1.000	.151	1.000
Transportation equipment	1	3,194	1.000	1.000	.	1.000
Transportation	36	58,293	.538	.824	.722	.979
Utilities	31	92,305	.987	.549	.257	1.000
Retail	5	27,786	1.000	.	.	1.000
Finance,Insur.,Real Estate	2	2,770	.	.	.	.
Hotel and restaurant	3	917	.	.	.	.
Education	104	45,161	.586	.121	.410	.739
Hospital	197	78,834	.363	.035	.637	.764
Other health care	41	16,312	.349	.	.583	.635
University	35	37,536	.489	.048	.670	.724
Police and fire	112	115,361	.488	.	.500	.792
Federal	20	9,180	.877	.127	.567	1.000
Provincial	24	128,266	.331	.	.030	.347
Municipal	97	56,811	.524	.032	.076	.547
Cultural	16	5,553	.823	.	.816	.950
Other Services	3	869	.341	.	.	.341

Notes: Percentages are weighted by employment.
Occupation corresponds to the top job title.

Table 3a.
Linear Probability Models for Training Incidence

Private Sector

Dependent Variable:	Company Training			Apprenticeship			Tuition Aid		
# Obs	898	898	898	898	898	898	898	898	898
CCDO Characteristics									
6-12 mos SVP[1]		-0.194	-0.196		-0.022	-0.014		0.025	0.031
		(-2.31)[2]	(-2.33)		(-0.28)	(-0.18)		(0.46)	(0.56)
1-2 yrs SVP		-0.124	-0.124		-0.229	-0.227		0.347	0.349
		(-1.05)	(-1.06)		(-2.11)	(-2.1)		(4.57)	(4.61)
2-4 yrs SVP		-0.212	-0.21		-0.11	-0.115		0.195	0.191
		(-1.82)	(-1.81)		(-1.02)	(-1.07)		(2.59)	(2.56)
4-10 yrs SVP		-0.196	-0.192		0.004	-0.007		0.189	0.181
		(-1.37)	(-1.34)		(0.03)	(-0.06)		(2.05)	(1.97)
Requires heavy physical labor		-0.051	-0.053		-0.288	-0.28		0.005	0.011
		(-0.89)	(-0.93)		(-5.46)	(-5.32)		(0.13)	(0.3)
All top aptitude ratings		-0.125	-0.122		0.144	0.131		0.121	0.112
		(-1.5)	(-1.46)		(1.85)	(1.7)		(2.24)	(2.08)
No top aptitude ratings		-0.282	-0.282		-0.149	-0.147		0.031	0.033
		(-2.61)	(-2.61)		(-1.49)	(-1.47)		(0.45)	(0.47)
High Data Fcts		0.255	0.254		0.084	0.087		-0.095	-0.093
		(3.4)	(3.39)		(1.22)	(1.27)		(-1.97)	(-1.93)
High Things Fcts		0.091	0.084		-0.01	0.014		-0.189	-0.172
		(1.06)	(0.98)		(-0.13)	(0.18)		(-3.41)	(-3.09)
High People Fcts		-0.01	-0.015		-0.286	-0.268		0.182	0.195
		(-0.09)	(-0.13)		(-2.64)	(-2.48)		(2.4)	(2.58)
Base job requires H.S. educ		-0.233	-0.227		0.144	0.126		0.201	0.188
		(-2.73)	(-2.66)		(1.83)	(1.59)		(3.65)	(3.42)
Industry Characteristics									
Avg Industry Tenure		0.025	0.032		0.006	-0.02		0.023	0.004
		(3.06)	(2.61)		(0.83)	(-1.74)		(4.34)	(0.51)
Industry wage differential			-0.172			0.626			0.455
			(-0.78)			(3.07)			(3.2)
Bargaining Unit Characteristics									
Employment	0.013	0.019	0.019	0.03	0.037	0.038	0.007	0.014	0.015
	(1.06)	(1.66)	(1.64)	(2.74)	(3.46)	(3.54)	(0.91)	(1.92)	(2)
Firm Size	0	-0.009	-0.009	-0.007	-0.01	-0.01	0.017	0.013	0.013
	(-0.04)	(-1.26)	(-1.24)	(-1.08)	(-1.51)	(-1.6)	(3.37)	(2.88)	(2.81)
Percent Female	-0.172	-0.091	-0.1	-0.199	-0.219	-0.186	0.006	0.071	0.094
	(-2.45)	(-1.37)	(-1.48)	(-3.06)	(-3.55)	(-2.99)	(0.13)	(1.64)	(2.17)
Union Shop	0.104	0.095	0.097	0.002	-0.038	-0.044	0.069	0.082	0.078
	(3.1)	(2.87)	(2.91)	(0.07)	(-1.25)	(-1.45)	(3.09)	(3.83)	(3.64)
#Bargaining units in firm	0.017	0.021	0.02	0.004	0.004	0.005	0.003	0	0.001
	(3.95)	(4.93)	(4.9)	(0.98)	(1.1)	(1.21	(1.22)	(0.12)	(0.23)
Part-time workers not covered	-0.185	-0.186	-0.188	-0.119	-0.101	-0.09	-0.094	-0.096	-0.091
	(-4.03)	(-4.05)	(-4.08)	(-2.8)	(-2.36)	(-2.21	(-3.1)	(-3.23)	(-3.08)

Table 3a (continued)

Private Sector

Dependent Variable:	Company Training			Apprenticeship			Tuition Aid		
Urban	-0.092	-0.051	-0.05	-0.143	-0.128	-0.13	0.036	0.044	0.042
	(-2.01)	(-1.11)	(-1.09)	(-3.8)	(-3.02)	(-3.1)	(1.21)	(1.5)	(1.44)
Base & top job = same occup	-0.023	-0.037	-0.038	0	0.041	0.044	-0.005	0.019	0.021
	(-0.6)	(-0.98)	(-1)	(-0.1)	(1.17)	(1.27)	(-0.22)	(0.77)	(0.88)
National	-0.008	0.041	0.042	-0.16	-0.301	-0.306	0.082	0.011	0.007
	(-0.1)	(0.58)	(0.6)	(-2.8)	(-4.61)	(-4.71)	(1.57)	(0.24)	(0.16)
Occupation[3]									
Professional	-0.278	0.062	0.054	-0.94	-0.267	-0.237	0.091	-0.074	-0.052
	(-1)	(0.21)	(0.19)	(-1.5)	(-0.99)	(-0.88)	(0.5)	(-0.39)	(-0.28)
Technical	-0.392	-0.077	-0.085	-0.138	-0.177	-0.149	0.201	-0.314	-0.294
	(-1.86)	(-0.31)	(-0.35)	(-0.71)	(-0.78)	(-0.66)	(1.45)	(-1.98)	(-1.86)
Office	0.26	0.298	0.302	-0.27	-0.282	-0.295	0.016	-0.014	-0.023
	(3.13)	(3.5)	(3.54)	(-3.51)	(-3.58)	(-3.76)	(0.28)	(-0.26)	(-0.43)
Sales	0.1	0.191	0.177	-0.177	-0.258	-0.205	-0.046	-0.122	-0.083
	(0.76)	(1.81)	(1.64)	(-1.46)	(-2.63)	(-2.06)	(-0.54)	(-1.78)	(-1.2)
Intercept	0.472	0.225	0.156	0.454	0.417	0.668	0.065	-0.286	-0.103
	(7.14)	(1.95)	(1.08)	(7.43)	(3.9)	(4.98)	(1.5)	(-3.83)	(-1.1)
Industry Dummies	12			12			12		
Region Dummies	10	10	10	10	10	10	10	10	10
R-Square	0.159	0.167	0.168	0.257	0.26	0.268	0.173	0.216	0.226

[1] SVP = Specific vocational preparation (Source: CCDO).
[2] T-statistics in parentheses.
[3] Production is the left out occupation group.

Table 3b.
Linear Probability Models for Training Incidence

Public Sector

Dependent Variable:	Company Training			Apprenticeship			Tuition Aid		
# Obs	731	731	731	731	731	731	731	731	731
CCDO Characteristics									
6-12 mos SVP		-0.003	0.002		0.217	0.226		0.01	-0.004
		(-0.03)	(0.02)		(3.17)	(3.33)		(0.09)	(-0.04)
1-2 yrs SVP		-0.002	-0.001		0.076	0.078		0.078	0.076
		(-0.02)	(-0.01)		(1.08)	(1.11)		(0.68)	(0.67)
2-4 yrs SVP		0.018	0.027		0.123	0.139		0.26	0.237
		(0.14)	(0.21)		(1.64)	(1.86)		(2.12)	(1.94)
4-10 yrs SVP		0.012	0.023		0.075	0.094		0.377	0.35
		(0.09)	(0.17)		(0.96)	(1.21)		(2.96)	(2.75)
Requires heavy physical labor		0.153	0.15		0.012	0.006		0.145	0.154
		(2.51)	(2.45)		(0.35)	(0.17)		(2.47)	(2.63)
All top aptitude ratings		-0.042	-0.051		0.037	0.02		-0.381	-0.356
		(-0.86)	(-1.03)		(1.29)	(0.67)		(-8.07)	(-7.42)
No top aptitude ratings		0.378	0.403		-0.171	-0.124		-0.285	-0.352
		(2.2)	(2.31)		(-1.68)	(-1.21)		(-1.72)	(-2.1)
High Data Fcts		0.114	0.112		0.037	0.034		0.161	0.165
		(1.72)	(1.7)		(0.94)	(0.86)		(2.52)	(2.59)
High Things Fcts		-0.04	-0.039		0.128	0.131		-0.042	-0.047
		(-0.72)	(-0.69)		(3.87)	(3.98)		(-0.79)	(-0.88)
High People Fcts		0.059	0.054		-0.035	-0.045		-0.266	-0.253
		(1.09)	(1)		(-1.1)	(-1.39)		(-5.08)	(-4.83)
Base job requires H.S. educ		-0.041	-0.05		0.038	0.021		-0.03	-0.006
		(-0.7)	(-0.84)		(1.08)	(0.6)		(-0.53)	(-0.11)
Industry Characteristics									
Avg Industry Tenure		-0.001	-0.018		0.036	0.004		0.008	0.054
		(-0.03)	(-0.69)		(3.33)	(0.23)		(0.45)	(2.15)
Industry wage differential			0.461			0.855			-1.22
			(0.93)			(2.92)			(-2.56)
Bargaining Unit Characteristics									
Employment	0.013	0.024	0.023	0.004	0.027	0.026	0.002	-0.013	-0.01
	(1.02)	(2)	(1.92)	(0.56)	(3.87)	(3.64)	(0.17)	(-1.11)	(-0.9)
Firm Size	-0.002	-0.003	-0.004	0	0	-0.002	-0.004	-0.004	-0.002
	(-1)	(-1.4)	(-1.64)	(0.37)	(-0.36)	(-1.38)	(-1.86)	(-1.93)	(-0.9)
Percent Female	-0.104	-0.069	-0.057	-0.228	-0.179	-0.158	0.135	0.325	0.294
	(-1.39)	(-0.8)	(-0.66)	(-5.55)	(-3.53)	(-3.09)	(1.76)	(3.93)	(3.54)
Union Shop	-0.057	-0.06	-0.061	-0.013	-0.002	-0.004	0.096	0.104	0.108
	(-1.24)	(-1.3)	(-1.33)	(-0.51)	(-0.07)	(-0.16)	(2.04)	(2.35)	(2.4)
#Barg Units	-0.002	-0.002	-0.001	-0.005	-0.01	-0.008	-0.001	0.009	0.007
	(-0.34)	(-0.46)	(-0.29)	(-1.95)	(-3.48)	(-2.93)	(-0.2)	(1.97)	(1.9)
Part-time workers not covered	0.043	0.05	0.051	-0.006	-0.016	-0.013	0.074	0.103	0.09
	(1.05)	(1.23)	(1.27)	(-0.29)	(-0.67)	(-0.56)	(1.79)	(2.65)	(2.6)

Public Sector

Dependent Variable:	Company Training			Apprenticeship			Tuition Aid		
Urban	-0.065	-0.043	-0.045	0.002	0.041	0.037	0.066	0.073	0.078
	(-1.43)	(-0.92)	(-0.96)	(0.07)	(1.48)	(1.36)	(1.42)	(1.62)	(1.74)
Base=Top Occ	0.048	0.021	0.019	0.038	0.164	0.161	-0.11	-0.11	-0.105
	(0.98)	(0.38)	(0.35)	(1.43)	(5.14)	(5.06)	(-2.18)	(-2.12)	(-2.03)
Federal	0.315	0.413	0.388	-0.188	0.158	0.111	0.376	0.286	0.353
	(3.33)	(4.73)	(4.24)	(-3.63)	(3.06)	(2.07)	(3.87)	(3.4)	(4.02)
Provincial	-0.109	-0.102	-0.106	0.017	-0.002	-0.009	0.302	0.304	0.314
	(-2.02)	(-1.6)	(-1.65)	(0.58)	(-0.05)	(-0.24)	(5.45)	(4.92)	(5.1)
Occupation[3]									
Professional	0.094	0.053	0.063	-0.041	-0.112	-0.093	-0.319	-0.251	-0.278
	(1.32)	(0.54)	(0.64)	(-1.06)	(-1.91)	(-1.58)	(-4.36)	(-2.62)	(-2.9)
Technical	-0.126	-0.119	-0.113	-0.075	-0.22	-0.21	0.033	0.205	0.191
	(-1.08)	(-0.96)	(-0.92)	(-1.18)	(-3.02)	(-2.89)	(0.28)	(1.73)	(1.61)
Office	0.349	0.341	0.345	-0.008	-0.042	-0.034	0.059	0.023	0.013
	(6.67)	(5.76)	(5.81)	(-0.27)	(-1.19)	(-0.98)	(1.1)	(0.41)	(0.23)
Police/Fire	-0.137	-0.246	-0.248	-0.232	-0.387	-0.39	0.352	0.395	0.398
	(-1.86)	(-2.51)	(-2.53)	(-5.78)	(-6.67)	(-6.76)	(4.68)	(4.18)	(4.24)
Intercept	0.549	0.45	0.633	0.141	-0.453	-0.114	0.176	-0.131	-0.614
	(7.57)	(1.75)	(1.95)	(3.54)	(-2.98)	(-0.6)	(2.37)	(-0.53)	(-1.98)
Industry Dummies	8			8			8		
Region Dummies	10	10	10	10	10	10	10	10	10
R-Square	0.249	0.262	0.263	0.432	0.348	0.356	0.209	0.314	0.32

[1] SVP = Specific vocational preparation (Source: CCDO).
[2] T-statistics in parentheses.
[3] Production is the left out occupation group.

Table 4. Effect of Training on Within-Firm Wage Differences

Dependent Variable: Difference in log wages between base and top job

# Observations	Private Sector		Public Sector	
	902	902	772	772
Company Training		-0.005		0.009
		(-0.49)		(0.86)
Apprenticeship		0.048		0.022
		(4.09)		(1.13)
Tuition Aid		-0.039		0.023
		(-2.19)		(1.93)
Specific Vocational Preparation	0.015	0.015	0.017	0.015
	(3.26)	(3.23)	(5.96)	(5.32)
Percent Female	0.41	0.418	0.951	0.942
	(6.02)	(6.18)	(12.49)	(12.26)
Percent Female squared	-0.337	-0.338	-0.986	-0.969
	(-4.1)	(-4.14)	(-14.15)	(-13.78)
Heavy labor on BASE job only	0.019	0.017	-0.045	-0.043
	(1.43)	(1.32)	(-2.59)	(-2.47)
Heavy labor on TOP job only	-0.039	-0.031	0.035	0.04
	(-1.9)	(-1.52)	(1.71)	(1.95)
Top job requires high "data" fcts	0.08	0.08	-0.009	-0.01
	(3.8)	(3.8)	(-0.62)	(-0.7)
Top job requires high "people" fcts	0.085	0.107	0.065	0.072
	(2.28)	(2.86)	(4.23)	(4.55)
Top job requires mid "people" fcts	-0.038	-0.038	-0.008	-0.01
	(-3)	(-2.96)	(-0.53)	(-0.71)
Top job requires high "things" fcts	-0.048	-0.053	-0.005	-0.006
	(-1.95)	(-2.17)	(-0.31)	(-0.39)
Top job requires all aptitudes	0.001	0.001	0.057	0.062
	(0.05)	(0.06)	(3.38)	(3.64)
Avg wage of 2-digit occupation	-0.032	-0.034	0.005	0.007
	(-5)	(-5.29)	(0.86)	(1.05)
Base & top = same 2-digit occupation	-0.047	-0.046	-0.058	-0.057
	(-3.77)	(-3.73)	(-3.68)	(-3.61)
Occupation:				
Professional	0.445	0.483	0.115	0.118
	(4.29)	(4.67)	(4.6)	(4.71)
Technical	-0.048	-0.028	0.299	0.301
	(-0.7)	(-0.41)	(8.1)	(8.13)
Office	-0.008	0.002	0.223	0.219
	(-0.26)	(0.07)	(9.3)	(9.07)
Sales	-0.23	-0.233		
	(-4.97)	(-5.05)		
Firm Size	0	0.001	-0.001	-0.001
	(0.22)	(0.48)	(-2.04)	(-1.99)
Union Shop	-0.023	-0.022	-0.025	-0.026
	(-2.16)	(-2.04)	(-1.95)	(-2.05)
Intercept	0.654	0.66	0.201	0.171
	(8.46)	(8.56)	(2.53)	(2.14)
Industry Dummies	12	12	16	16
R-Square	0.362	0.376	0.706	0.709

[1] T-statistics in parentheses.

Table 5. Log Wage Regressions: Base and Top Occupations

	Private Sector		Public Sector	
	(1)	(2)	(3)	(4)
		Top Occup Interaction:[1]		Top Occup Interaction:
Company Training	0.050 (3.86)[2]	0.008 (0.45)	0.011 (1.06)	0.035 (2.58)
Apprenticeship	0.03 (2.1)	0.047 (2.45)	-0.038 (-2.01)	0.033 (1.37)
Tuition Aid	0.051 (2.46)	-0.063 (-2.22)	0.028 (2.55)	-0.038 (-2.57)
Bargaining Unit Chars:				
Employment	-0.005 (-1.17)	0.003 (0.42)	0.007 (1.93)	-0.002 (-0.55)
Firm Size	0.004 (1.36)	-0.004 (-1.11)	0.001 (1.29)	0.001 (1.96)
Percent Female	-0.411 (-15.45)	0.207 (6.00)	-0.038 (-1.47)	-0.05 (-1.66)
Union Shop	0.014 (1.1)	-0.021 (-1.16)	0.028 (2.3)	-0.03 (-1.85)
Part-time workers not covered	-0.042 (-2.41)	0.031 (1.31)	-0.012 (-1.09)	0.011 (0.74)
Urban	0.008 (0.66)		0.025 (2.87)	
# Bargaining units in firm	0.006 (4.65)		0.001 (1.59)	
CCDO Characteristics:				
3-6 mos SVP	-0.087 (-3.63)		-0.013 (-0.76)	
6-12 mos SVP	-0.079 (-2.14)	-0.105 (-2.09)	0.019 (0.5)	-0.018 (-0.35)
1-2 yrs SVP	0.005 (0.09)	0.088 (1.06)	0.003 (0.09)	0.068 (1.45)
2-4 yrs SVP	0.175 (1.47)	-0.095 (-0.71)	0.23 (5.96)	-0.134 (-2.54)
4-10 yrs SVP	0.103 (0.59)	0.049 (0.26)	0.209 (2.87)	0.012 (0.15)
Requires heavy physical labor	-0.016 (-0.89)	-0.045 (-1.54)	0.061 (2.87)	-0.103 (-3.84)
Requires all aptitudes	-0.117 (-1.87)	0.166 (2.23)	0.106 (3.49)	-0.116 (-3.46)
Requires no aptitudes	-0.072 (-2.89)	-0.143 (-3.2)	-0.061 (-2.45)	0.142 (2.37)

Table 5 (cont.) Log Wage Regressions: Base and Top Occupations

	Private Sector	(x Top)	Public Sector	(x Top)
"Data" fcts rank high	-0.003 (-0.04)	-0.075 (-0.9)	-0.118 (-5.39)	0.166 (5.9)
"Things" fcts rank high	-0.137 (-1.68)	0.047 (0.51)	-0.233 (-5.44)	0.191 (4.21)
"People" fcts rank high	-0.166 (-1.55)	0.258 (2.22)	0.075 (1.99)	-0.056 (-1.34)
National	0.03 (1.37)			
Intercept	2.443 (69.28)		2.261 (54.77)	
1 if Top Occup	0.192 (4.6)		0.175 (3.43)	
Industry	12		9	
Occupation	14	14	14	14
Regions	10		10	
Years	8		8	
R-Square	0.711		0.887	
Number Observations	1805		1465	

[1] Sample pools base and top occupations; columns 2 and 4 show the coefficients on variables interacted with the dummy variable for "top" occupation.
[2] T-statistics in parentheses.

Table 6a. Linear Probability Models of Pension Provision

Private Sector

Dep. Variable	Pension		Noncontributory Pension		Contributory Pension	
# Obs	765	765	505	505	416	416
Company Training	0.066 (2.22)	0.041 (1.35)	0.059 (1.43)	0.025 (0.62)	0.11 (2.29)	0.062 (1.17)
Apprenticeship	0.063 (2.00)	0.077 (2.39)	0.095 (2.30)	0.099 (2.4)	0.06 (1.04)	0.089 (1.51)
Tuition Aid	0.084 (1.82)	0.086 (1.88)	0.097 (1.42)	0.061 (0.93)	0.119 (1.5)	0.124 (1.53)
6-12 mos SVP	-0.092 (-1.38)	-0.187 (-2.5)	-0.059 (-0.59)	-0.341 (-2.92)	-0.192 (-1.87)	-0.206 (-1.86)
1-2 yrs SVP	-0.259 (-2.49)	-0.335 (-3.04)	-0.43 (-2.75)	-0.469 (-2.98)	-0.247 (-1.52)	-0.293 (-1.68)
2-4 yrs SVP	-0.167 (-1.67)	-0.265 (-2.51)	-0.418 (-2.54)	-0.456 (-2.76)	-0.068 (-0.47)	-0.147 (-0.93)
4-10 yrs SVP	-0.327 (-2.72)	-0.434 (-3.46)	-0.719 (-3.67)	-0.77 (-3.97)	-0.097 (-0.56)	-0.186 (-1)
Requires heavy physical labor	-0.122 (-2.43)	-0.086 (-1.7)	-0.125 (-1.93)	-0.048 (-0.75)	-0.151 (-1.84)	-0.138 (-1.66)
Base job requires H.S. educ	0.122 (1.82)	0.043 (0.57)	0.119 (1.03)	-0.083 (-0.68)	0.286 (2.86)	0.284 (2.41)
All top aptitude ratings	0.015 (0.22)	0.022 (0.3)	0.254 (2.14)	0.127 (1.06)	-0.106 (-1.01)	-0.071 (-0.64)
No top aptitude ratings	-0.433 (-5.0)	-0.459 (-5.22)	-0.401 (-3.52)	-0.437 (-3.79)	-0.453 (-3.76)	-0.428 (-3.46)
High Data Fcts	0.137 (2.12)	0.147 (2.15)	0.322 (3.17)	0.282 (2.79)	0.01 (0.11)	0.076 (0.78)
High Things Fcts	-0.054 (-0.72)	-0.011 (-0.14)	-0.177 (-1.48)	-0.1 (-0.85)	-0.039 (-0.34)	-0.028 (-0.23)
High People Fcts	0.082 (0.89)	0.133 (1.27)	0.207 (1.08)	0.293 (1.49)	-0.035 (-0.28)	0.053 (0.36)
Employment	0.008 (0.79)	0.003 (0.3)	0.01 (0.75)	0.006 (0.46)	0.07 (2.03)	0.041 (0.98)
Firm Size	0.003 (0.43)	0.003 (0.33)	0.009 (0.89)	0.003 (0.26)	-0.01 (-0.66)	0.003 (0.2)
Percent Female	-0.229 (-4.16)	-0.183 (-3.02)	-0.249 (-3.46)	-0.184 (-2.36)	-0.204 (-2.18)	-0.181 (-1.71)

Table 6a. (continued)

Private Sector

Dep. Variable	Pension		Noncontributory Pension		Contributory Pension	
# Obs	765	765	505	505	416	416
Union Shop	0.032	0.029	0.031	0.057	0.066	0.062
	(1.13)	(0.97)	(0.79)	(1.43)	(1.43)	(1.28)
#Bargaining units in firm	-0.009	-0.008	-0.018	-0.013	-0.006	-0.01
	(-2.43)	(-2.11)	(-3.01)	(-2.1)	(-1.17)	(-1.86)
Part-time workers not covered	-0.154	-0.157	-0.156	-0.13	-0.203	-0.183
	(-3.84)	(-3.91)	(-2.88)	(-2.5)	(-3.39)	(-2.96)
Urban	0.092	0.085	0.141	0.145	0.056	0.025
	(2.42)	(2.26)	(2.71)	(2.88)	(0.87)	(0.37)
Base & top job = same 1-digit occupation	-0.085	-0.09	-0.101	-0.084	-0.086	-0.078
	(-2.7)	(-2.75)	(-2.33)	(-1.93)	(-1.66)	(-1.41)
National	-0.049	-0.007	-0.259	-0.174	0.08	0.154
	(-0.75)	(-0.09)	(-2.1)	(-1.22)	(0.91)	(1.24)
Intercept	0.825	0.931	0.806	0.87	0.606	0.731
	(7.91)	(8.07)	(5.84)	(5.61)	(3.63)	(4.01)
Region	10	10	10	10	10	10
Years	8	8	8	8	8	8
Industry	no	12	no	11	no	12
Occupation	no	4	no	4	no	3
R-Square	0.24	0.285	0.324	0.409	0.027	0.375

Notes: Columns 3-6 include observations with the dependent variable equal
to 1 and observations of "no pension provision".
T-statistics in parentheses.

Table 6b. Linear Probability Models of Pension Provision

Public Sector

Dep. Variable	Pension		Noncontributory Pension		Contributory Pension	
# Obs	525	525	277	277	357	357
Company Training	-0.005 (-0.15)	0.028 (0.79)	0.029 (0.67)	0.075 (1.85)	-0.032 (-0.63)	0.051 (1.02)
Apprenticeship	-0.106 (-1.69)	-0.024 (-0.37)	-0.254 (-3.18)	-0.3 (-3.25)	-0.033 (-0.39)	-0.027 (-0.33)
Tuition Aid	0.134 (3.54)	0.099 (2.71)	0.053 (1.18)	-0.006 (-0.13)	0.212 (4.04)	0.145 (2.94)
6-12 mos SVP	0.198 (1.87)	0.124 (1.12)	0.182 (1.66)	0.067 (0.52)	0.048 (0.38)	0.051 (0.4)
1-2 yrs SVP	0.345 (3.19)	0.284 (2.57)	0.284 (2.69)	0.234 (2.11)	0.353 (2.72)	0.276 (2.16)
2-4 yrs SVP	0.422 (3.58)	0.34 (2.81)	0.603 (4.56)	0.477 (3.33)	0.433 (2.92)	0.328 (2.29)
4-10 yrs SVP	0.424 (3.47)	0.331 (2.61)	0.668 (4.92)	0.515 (3.53)	0.362 (2.35)	0.231 (1.53)
Requires heavy physical labor	-0.005 (-0.09)	-0.006 (-0.1)	-0.262 (-3.32)	-0.171 (-2.22)	0.039 (0.53)	0.18 (2.36)
Base job requires H.S. educ	0.015 (0.34)	-0.004 (-0.09)	-0.124 (-2.54)	-0.048 (-0.82)	0.102 (1.8)	-0.002 (-0.03)
All top aptitude ratings	0.112 (2.34)	0.091 (1.94)	-0.01 (-0.2)	-0.065 (-1.34)	0.153 (2.1)	0.244 (3.3)
No top aptitude ratings	0.503 (3.36)	0.413 (2.68)	0.604 (4.05)	0.481 (2.98)	0.14 (0.48)	0.039 (0.14)
High Data Fcts	-0.053 (-0.88)	-0.056 (-0.97)	-0.138 (-1.74)	-0.189 (-2.39)	-0.053 (-0.7)	-0.024 (-0.35)
High Things Fcts	-0.097 (-2.04)	-0.081 (-1.63)	-0.14 (-2.94)	-0.08 (-1.68)	-0.211 (-2.82)	-0.25 (-3.39)
High People Fcts	-0.017 (-0.35)	-0.01 (-0.21)	0.019 (0.36)	0.05 (0.97)	-0.091 (-1.25)	-0.16 (-2.22)
Employment	-0.023 (-2.23)	-0.005 (-0.43)	-0.004 (-0.31)	-0.004 (-0.29)	-0.016 (-1.33)	-0.012 (-0.97)
Firm Size	-0.011 (-6.08)	-0.013 (-6.98)	-0.004 (-1.64)	-0.005 (-1.87)	-0.011 (-5.42)	-0.008 (-3.81)
Percent Female	0.031 (0.49)	-0.008 (-0.11)	-0.156 (-2.51)	-0.17 (-2.29)	0.01 (0.1)	-0.274 (-2.46)

Table 6b. (continued)

Public Sector

Dep. Variable	Pension		Noncontributory Pension		Contributory Pension	
# Obs	765	765	505	505	416	416
Union Shop	0.021	0.02	0.092	0.09	0.108	0.16
	(0.46)	(0.46)	(2.03)	(2.16)	(1.39)	(2.23)
#Bargaining	0.007	0.005	-0.002	-0.014	0.009	0.004
units in firm	(1.92)	(1.35)	(-0.42)	(-2.44)	(2.02)	(0.96)
Part-time workers	-0.021	-0.034	-0.089	-0.071	-0.037	-0.038
not covered	(-0.58)	(-0.94)	(-1.81)	(-1.52)	(-0.75)	(-0.84)
Urban	0.051	0.077	-0.036	0.016	0.109	0.138
	(1.24)	(1.92)	(-0.77)	(0.36)	(1.82)	(2.51)
Base & top job	0.065	-0.005	0.033	-0.069	0.067	0.012
= same 1-digit	(1.48)	(-0.1)	(0.67)	(-1.08)	(1.15)	(0.18)
occupation						
Federal	-0.063	0.143	-0.424	0.316	0.326	0.502
	(-0.85)	(1.64)	(-4.31)	(1.31)	(3.06)	(4.56)
Provincial	-0.134	-0.117	-0.612	-0.58	0.284	0.493
	(-2.81)	(-2.39)	(-10.2)	(-9.02)	(3.31)	(5.59)
Intercept	0.292	0.526	0.524	0.782	-0.431	-0.144
	(1.55)	(2.74)	(2.99)	(4.19)	(-1.66)	(-0.57)
Region	10	10	10	10	10	10
Years	8	8	8	8	8	8
Industry	no	7	no	7	no	5
Occupation	no	4	no	4	no	4
R-Square	0.377	0.459	0.769	0.826	0.457	0.568

Notes: Columns 3-6 include observations with the dependent variable equal
to 1 and observations of "no pension provision".
T-statistics in parentheses.

Table 7. Multinomial Logit Model of Pension Provision

	Private Sector				Public Sector			
# Observations	766				560			
Dependent Var.:	Non-contributory Pension		Contributory Pension		Non-contributory Pension		Contributory Pension	
	Coeff (std err)	Deriv.	Coeff. (std err)	Deriv.	Coeff (std err)	Deriv.	Coeff. (std err)	Deriv.
Company Training	0.425 (0.237)	0.006	0.554 (0.246)	0.053	0.218 (0.423)	0.023	-0.053 (0.321)	-0.026
Apprenticeship	0.614 (0.260)	0.082	0.395 (0.269)	-0.019	-0.664 (0.633)	-0.059	0.006 (0.504)	0.045
Tuition Aid	1.198 (0.535)	0.089	1.166 (0.535)	0.056	0.143 (0.429)	-0.060	1.110 (0.321)	0.235
CCDO Characteristics of Top Job								
6-12 mos SVP	0.168 (0.499)	0.019	0.128 (0.482)	-0.001	-2.033 (0.964)	-0.209	0.457 (0.726)	0.234
1-2 yrs SVP	-0.226 (0.501)	0.127	-1.015 (0.532)	-0.196	-0.902 (1.103)	-0.171	1.405 (0.808)	0.368
2-4 yrs SVP	0.699 (0.350)	0.188	-0.072 (0.350)	-0.143	0.503 (0.839)	-0.091	2.069 (0.657)	0.422
4-10 yrs SVP	-0.943 (0.628)	-0.222	-0.073 (0.594)	0.153	0.716 (0.880)	-0.032	1.451 (0.731)	0.272
Base job requires H.S. educ	1.341 (0.834)	-0.015	1.940 (0.798)	0.211	0.023 (0.586)	-0.079	1.240 (0.397)	0.271
Requires heavy physical labor	-0.505 (0.357)	0.048	-0.963 (0.403)	-0.134	-1.112 (0.608)	-0.155	0.877 (0.488)	0.266
Bargaining Unit Characteristics								
Employment	0.901 (0.395)	0.077	0.821 (0.398)	0.029	-0.243 (0.195)	-0.010	-0.175 (0.083)	-0.023
Firm Size	0.052 (0.062)	0.016	-0.018 (0.066)	-0.013	-0.054 (0.051)	-0.002	-0.045 (0.012)	-0.006
Percent Female	-1.498 (0.410)	-0.123	-1.393 (0.435)	-0.055	0.524 (0.712)	0.080	-0.518 (0.653)	-0.148
Union Shop	0.179 (0.232)	-0.055	0.554 (0.241)	0.097	0.678 (0.482)	0.052	0.108 (0.462)	-0.021
National/Fed	-1.450 (0.663)	-0.408	0.252 (0.531)	0.321	-3.409 (0.921)	-0.352	0.805 (0.663)	0.400
Provincial					-5.575 (0.782)	-0.526	0.549 (0.475)	0.486

Table 7. (continued)

Dependent Var.:	Private Sector				Public Sector			
	Non-contributory Pension		Contributory Pension		Non-contributory Pension		Contributory Pension	
	Coeff (std err)	Deriv.	Coeff. (std err)	Deriv.	Coeff (std err)	Deriv.	Coeff. (std err)	Deriv.
#Bargaining units in firm	-0.155 (0.037)	-0.037	-0.012 (0.029)	0.025	0.032 (0.059)	0.003	0.003 (0.028)	-0.001
Part-time workers not covered	-0.764 (0.283)	-0.068	-0.680 (0.307)	-0.021	-0.010 (0.486)	0.022	-0.356 (0.334)	-0.078
Urban	0.603 (0.228)	0.145	0.030 (0.236)	-0.102	-0.772 (0.467)	-0.119	0.782 (0.330)	0.223
Intercept	-0.939 (0.701)	0.068	-1.676 (0.827)	-0.222	3.368 (1.849)	0.420	-1.902 (1.331)	-0.639
Actual frequency	0.456		0.339		0.299		·0.504	
Predicted	0.486		0.371		0.097		0.673	
Chi-square for IIA Test		2.984				-8.102		
Prob<Chi-square		0.000						

Notes: Standard errors in parenthses. Excluded category is "no pension".
Derivatives are calculated at the means of the independent variables.

Table A1. Previous Studies of Job Training

Study	Data	Training Measure	Training Incidence	Average Duration	Determinants of Training Incidence
Altonji and Spletzer (1991)	NLSHS72[1] (1986)[2]	Participation in employer-provided training in last or current job:			Non-white, female, aptitude (SAT score), verbal/math/clerical skill req'mnts of job (DOT).
		Any training	46%	338 hrs	
		OTJ	28%	190 hrs	
		Informal	20%	233 hrs	
		Off-premises	20%	101 hrs	
		Tuition Aid	9%	193 hrs	
Barron, Black, and Lowenstein (1987)	EOPP (Survey of Firms)	Training of most recent newhire during first 3 months of job tenure.	---	151 hrs	White, male, experience, current work horizon.
Duncan and Hoffman (1979)	PSID (1976)	In training: if tenure <training req'd for typical worker to be fully trained & qualified.	20% of sample was "still training"	1.61 yrs (white men) .8 yrs (black men) .7 yrs (white females)	Male, plant size, union, education, tenure, white collar.
Holtman and Idson (1992)	QES (1972-73)	Participation in employer-privided training program.	25%	---	Firm size, male, educ, tenure, low experience, white collar.
Holtzer (1990)	EOPP (Survey of Firms)	Training of most recent newhire during first 3 mos: Formal	---	8.7 hrs	-----------
		Informal	---	43.8 hrs	
		Coworker	---	36.9 hrs	
Lillard and Tan (1986)	NLS (1967-80)	Training since last interview (2 yr intervals)	30% (Y. Men) 10% (M. Men) 24% (Career Women)	--- --- ---	Educ: largest effect on company training (Y.Men) Nonwhite:no effect for women
	CPS (1983)	Training to improve skills on current job:			Educ: larger effect on company training than OTJ; same effect for men & women
		Any training	38%	---	Nonwhite: neg. effect on company training only but no effect on NLS women
		Company training	12%	---	
		On-the-Job	15%	---	Tech change: increases the effect of educ on OTJ (CPS) and company training (NLS)
	EOPP (198?)	Training during 18 month period (1/79 to 6/80)	11%	---	Educ,labor force attachment, union (for OTJ), job changes (for voc. educ).
Lynch (1992)	NLSY (1983)	Training on current job:			
		OTJ	4.2%	31 wks	White, married, union, tenure, previous OTJ.
		Off-job	.4%	41 wks	Female, low-tenure.
		Apprenticeship	.4%	63 wks	White, male, union, local unempl. rate.

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[1] NLSHS72 = National Longitudinal Survey of the H S Class of 1972   PSID = Panel Study of Income Dynamics
   EOPP   = Employment Opportunity Pilot Project   CPS = Current Population Survey
   QES   = Quality of Employment Survey
   NLS   = National Longitudinal Survey (Young Men Mature Men/Career Women)
[2] Survey year in parentheses.

Table A2.

Number of Collective Bargaining Agreements, By Effective Year

Effective Year	Full sample		Estimation sample		Estimation Sample as Percent of Full	
	# of Contracts	Total Employment	# of Contracts	Total Employment	Contracts	Employment
1980	225	23,543	2	980	0.89%	4.16%
1981	1,129	132,851	37	35,847	3.28%	26.98%
1982	3,320	536,503	95	114,727	2.86%	21.38%
1983	4,434	585,976	160	117,886	3.61%	20.12%
1984	5,802	827,883	302	243,574	5.21%	29.42%
1985	4,810	662,730	277	211,121	5.76%	31.86%
1986	4,575	609,736	229	157,201	5.01%	25.78%
1987	4,536	695,931	261	236,119	5.75%	33.93%
1988	4,467	585,071	180	134,962	4.03%	23.07%
1989	3,441	480,100	133	79,993	3.87%	16.66%
1990	831	179,525	2	921	0.24%	0.51%
Total	37,570	5,319,849	1,678	1,333,331	4.47%	25.06%

Number of Collective Bargaining Agreements, By Sector

Sector	Full sample		Estimation sample		Estimation Sample as Percent of Full	
	# of Contracts	Total Employment	# of Contracts	Total Employment	Contracts	Employment
Primary	500	87,148	50	28,177	10.00%	32.33%
Manufacturing	11,773	1,466,197	720	442,760	6.12%	30.20%
Transportation	1,500	220,804	69	73,018	4.60%	33.07%
Trade	2,648	254,907	48	78,715	1.81%	30.88%
Finance	517	10,089	.	.	.	.
Service	3,194	183,589	57	29,296	1.78%	15.96%
Federal	764	521,619	49	59,671	6.41%	11.44%
Municipal	9,096	1,309,388	380	251,023	4.18%	19.17%
Provincial	7,578	1,266,108	305	370,671	4.02%	29.28%
Total	37,570	5,319,849	1,678	1,333,331	4.47%	25.06%

Table A3. Variable Definitions

Variable	Definition

I. Bargaining Agreement Provisions:

Company Training — 1 if employer "has a training program or provides training opportunities in order to prepare employees for advancement to higher grades or other job opportunities."[1]

Apprenticeship — 1 if employer has an established training program for apprentices.

Tuition Aid — 1 if employer contributes to tuition payments.

Pension — 1 if Pension plan.

Avg Real Wage — Average real wage over the life of the contract.

II. CCDO Job Characterisitics:[2]

Specific Vocational Prep — Training time required to "learn the techniques and skills needed for satisfactory performance in an occupation". Measured categorically.

Base Job Requires H.S. educ — 1 if General Educational Development (GED) is 11-12 yrs of education or above (GED>=4). The GED level expresses the "approximate duration of formal schooling ... required to attain average, satisfactory work performance."

Heavy Physical Labor — 1 if Physical Activities is denoted as "Heavy" or "Very Heavy". (Heavy is defined as lifting 100 lbs. maximum with frequent lifting of up to 50 lbs.)

All high Aptitude Ratings — 1 if the occupation requires the aptitude level achieved by the top third of the working population in all categories: Verbal, Numerical, Spatial, Form Perception, and Intelligence.

No high Aptitude Ratings — 1 if the occupation requires no aptitudes at levels corresponding to that achieved by the top third of the population.

High Data Functions[3] — 1 if job involves Synthesizing, Co-ordinating, or Analyzing (0-2).

High Things Functions — 1 if job involves Setting-Up, Precision Working, Operating-Controlling (0-2).

High People Functions — 1 if job involves Mentoring, Negotiating, Instructing, or Supervising (0-3).

III. Firm and Bargaining Unit Characteristics:

Employment — Number of employees in bargaining unit at the effective date.

Firm Size — Total unionized employment in the firm at the effective date.

Percent Female — Percent female in bargaining unit.

Union Shop — 1 if closed or union shop.

Number Barg Units — Number of bargaining agreements negotiated by firm during effective year.

Part-Time Workers Not Covered — 1 if bargaining agreement excludes part-time workers.

Urban — 1 if plant location is in a metropolitan area.

National — 1 if agreement covers employees outside of Ontario, including U.S.

Base & Top Job = Same Occup — 1 if base and top job are in the same 2-digit CCDO occupation.

IV. Differences between Base and Top Occupations:

Specific Vocational Prep — Difference in training times measured at the midpoint of the respective categories.

Top job requires high DPT fcts — 1 if top job requires a high level of DPT functions and base job does not.

No heavy labor on top job — 1 if base job requires heavy (or very heavy) labor and top job does not.

Heavy labor on top job only — 1 if top job requires heavy (or very heavy) labor and base job does not.

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[1] Ontario Ministry of Labour.

[2] See Canadian Classification and Dictionary of Occupations. Employment and Immigration Canada, 1987.

[3] The Worker Functions are "based on the premise that every worker is required to function in relation to Data, People, and Things at various levels." (CCDO) The functional relationships are are defined on a scale from 0 to 7 in descending order of complexity.

Figure 1a. Private Sector
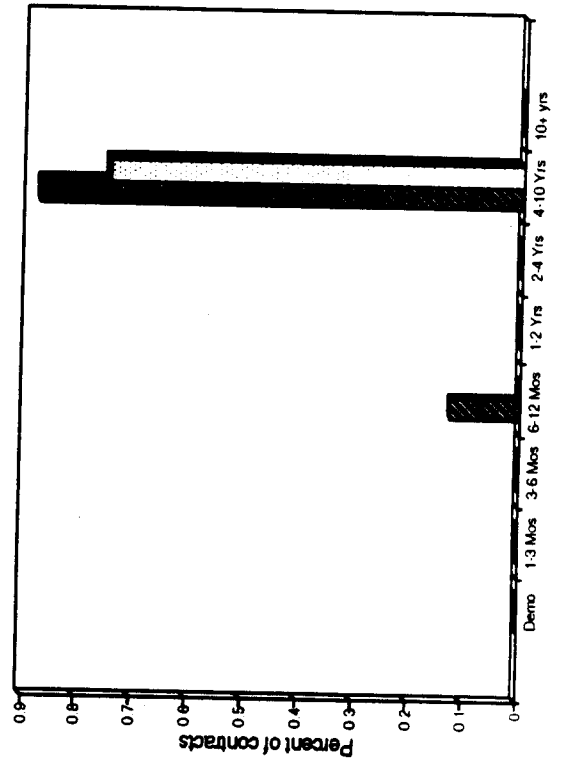Distribution of Specific Vocational Training, By Broad Occupation
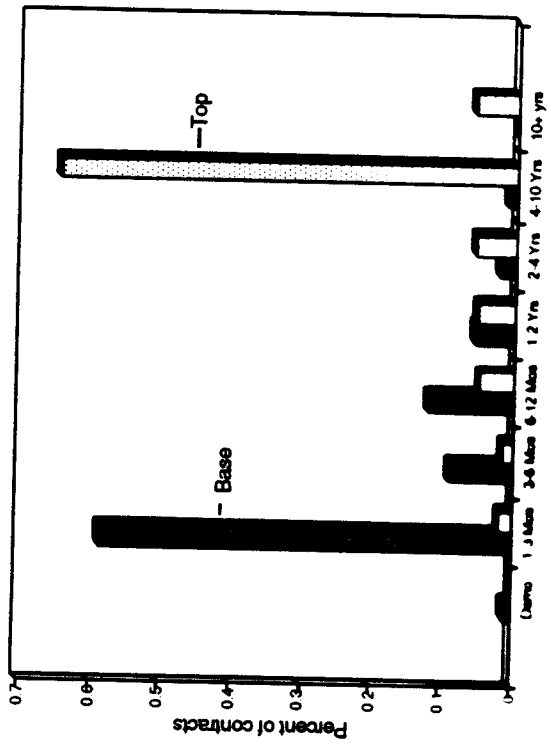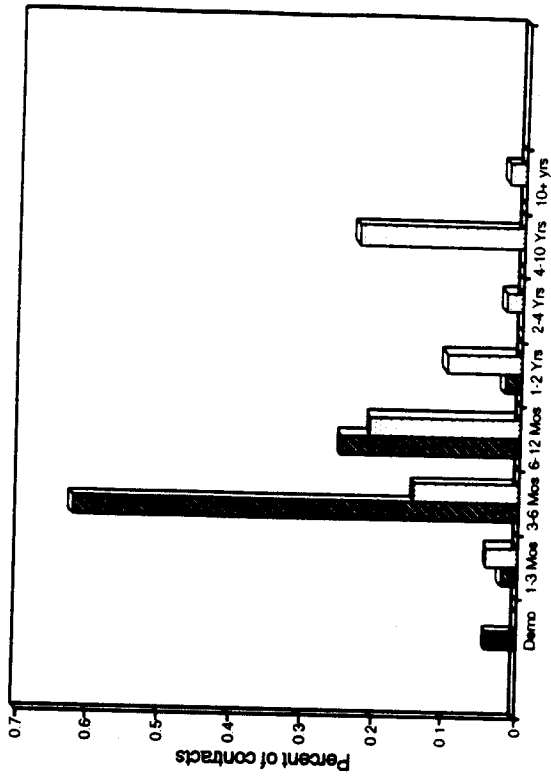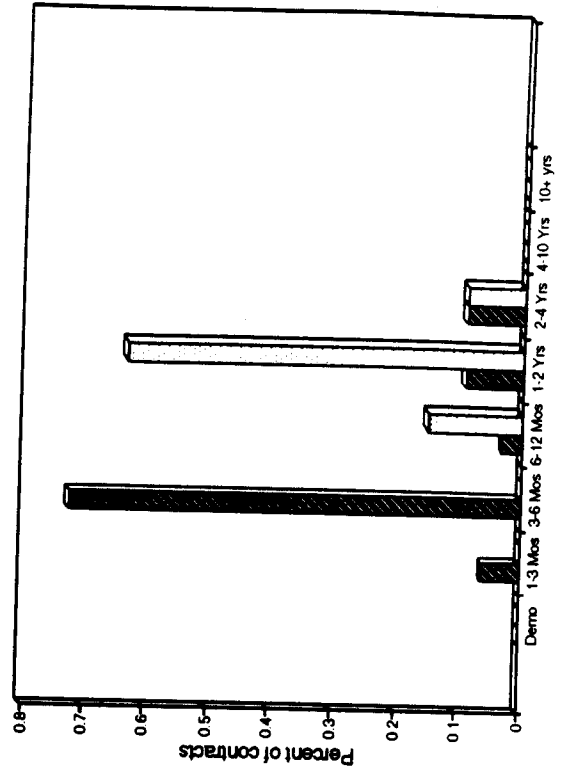
Figure 1b. Public Sector
Distribution of Specific Vocational Training, By Broad Occupation
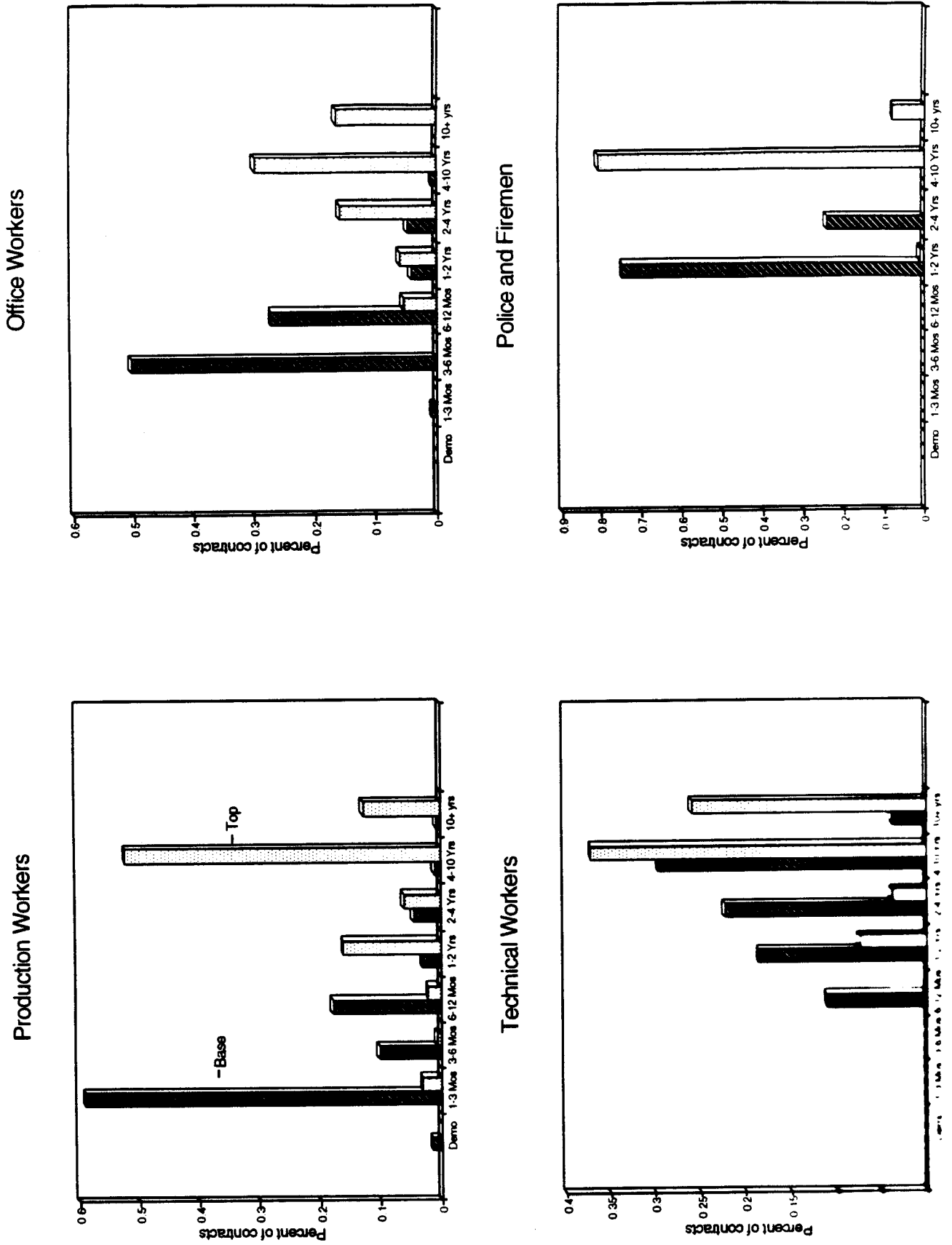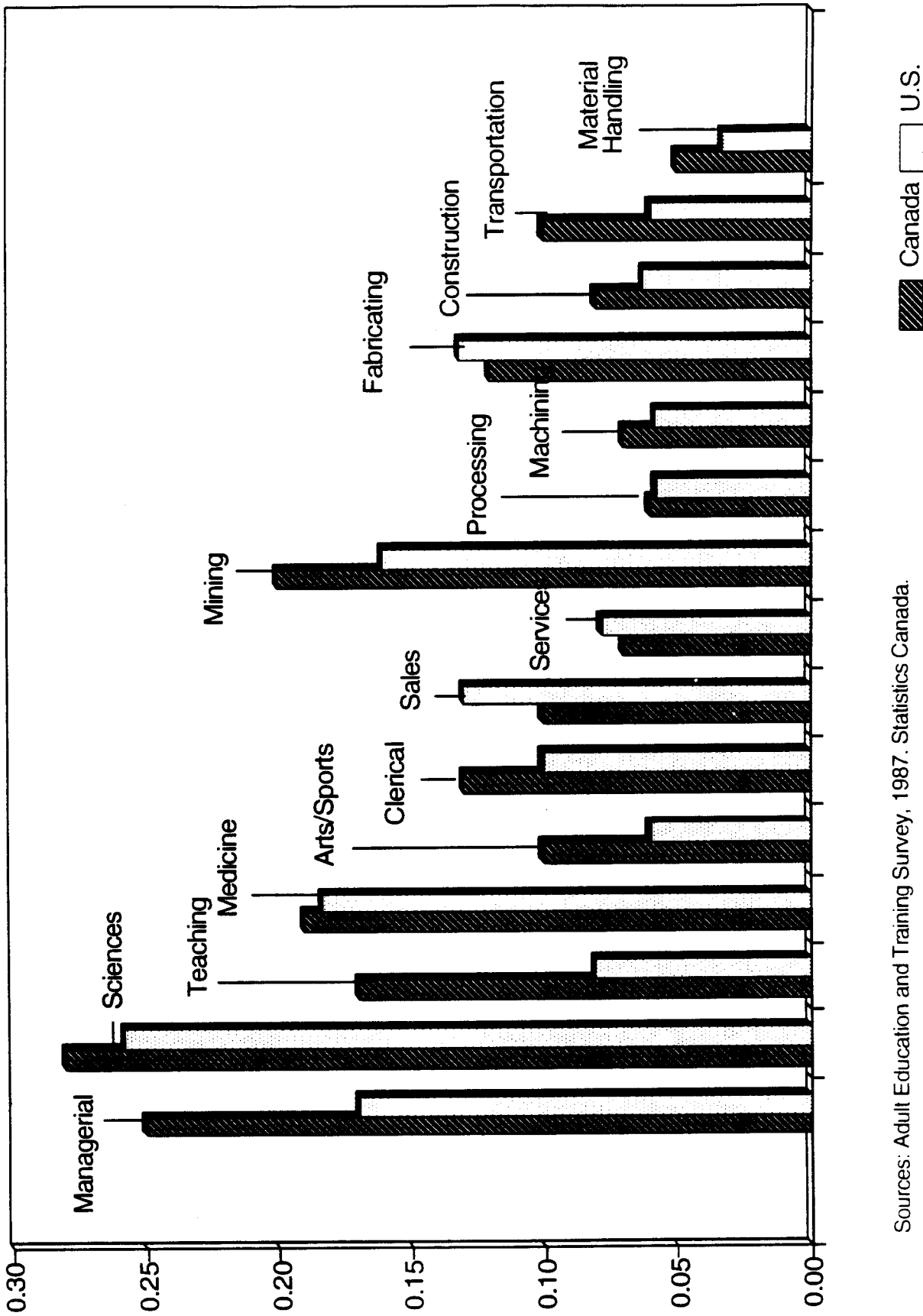
Figure 2

U.S. and Canadian Training Rates, By Occupation

Sources: Adult Education and Training Survey, 1987. Statistics Canada.
Current Population Survey, 1983. BLS