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Adult Education and Training from a Longitudinal Perspective

REPORT

Torben Drewes
Trent University
Learning Policy Directorate
Strategic Policy and Research

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Human Resources and Social Development Canada
Publications Centre
140 Promenade du Portage, Phase IV, Level 0
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K1A 0J9
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"The Learning Research Series" are research documents disseminated by the Learning related sections of Human Resources and Social Development Canada. The objective of the Learning Research Series is to publish research on lifelong learning, from childhood to late adulthood, occuring in all learning environments, learning institutions, homes, communities and workplaces. The series intends to build a body of evidence, through critical review, analysis of different data sources, replication and confirmation of results and disseminate the results for public debate and policy development. The series include internal research reports, commissioned research, syntheses, research symposia proceedings and annotated bibliographies.

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Abstract

The primary purpose of the report is to explore the potential for Survey of Labour and Income Dynamics data to further our understanding of adult education and training in Canada. With the introduction of questions about education and training in 2002, SLID offers unique longitudinal data for a three year period and for almost 30,000 individuals. The data show that only about 7% of adults participate in educational programs but over 20% participate in job-related training courses in a typical year. Participation in education programs falls precipitously with age but incidence of courses is more uniform. Both are strongly and positively related to prior educational attainment. Firm size is also strongly correlated with on-the-job training as is previous participation in adult learning. Annual wage growth is significantly affected by education programs for both men and women. The impact of training courses on annual wage growth is much smaller, particularly for women. Education programs are associated with higher unemployment and longer unemployment durations in the following year. Training courses, on the other hand, are associated with lower unemployment in terms of both incidence and duration.

Executive Summary

The primary purpose of the report is to explore the potential for Survey of Labour and Income Dynamics data to further our understanding of adult education and training in Canada. With the introduction of questions about education and training in 2002, SLID offers unique longitudinal data for a three year period and for almost 30,000 individuals.

The incidence of formal education programs among adult learners is quite low with no more than 7% of adults reporting participation in business or trades schools, high schools, colleges, or universities. Those who do participate, however, spend around 385 hours per year. Over 20% of adults participate in job-related training courses in a typical year but average less than 40 hours per year doing so.

Business and management programs account for one-quarter of education programs, followed by programs in architecture, engineering and related technologies. Taken together, courses in commerce, management and business administration and in engineering, applied science technologies and trades account for one half of job-related courses.

The proportion of adults who had undertaken educational programs at any time between 2002 and 2004 fell precipitously with age, from 21% in the 25-34 year old group to 3% for those ages 55 to 64. Incidence of training courses was more uniform across age groups. Women were slightly more likely to have undertaken investments in education programs but equally likely to have been involved in training courses. Visible minority and immigrant status are associated with reduced incidence of training but appear to have no effect on program participation. Although there are industry differences in the incidence of both education and training, no industry stands out from the rest. Education and training are strongly and positively related to prior educational attainment.

Descriptive statistics compiled from SLID data are consistent with results from surveys more specifically designed to address issues around adult education and training. SLID can therefore provide useful new insights into such issues.

Multivariate analysis of incidence confirms the importance of prior educational attainment as a predictor of adult learning and replicates the stylized fact that firm size is strongly correlated with on-the-job training. There are mild provincial differences in incidence with provinces to the east of Ontario generally showing lower levels of both education and training. Provinces to the west of Ontario tend to be similar to Ontario in terms of incidence.

Previous participation in education programs and training courses is a strong predictor of current participation. Particularly in the case of education, this may be an artifact of the data in that education programs are likely to spill over from one year to the next. SLID data do not report education and training episodes on a spell basis and this issue requires further analysis. To the extent that past training causes future training, the potential for increased training to ameliorate income inequality is diminished.

The longitudinal nature of the SLID data permits us to look for "triggers" for adult learning, or episodes that cause individuals to re-evaluate their current stock of human capital and possibly decide to invest in that stock. Unemployment episodes and job changes in the previous 6 months are positively associated with the probability of transitioning into an educational program or training course in any particular month.

Without a complete history of education and training participation, SLID data are not able to resolve the standard statistical conundrum of identifying the impact of adult education on income levels. However, annual wage growth is significantly affected by education programs for both men and women. The impact of training courses on annual wage growth is much smaller, particularly for women.

Education programs are associated with higher unemployment and longer unemployment durations in the following year. This may be the result of the need to transition back into the labour market upon completion of full-time studies. Training courses, on the other hand, are associated with lower unemployment in terms of both incidence and duration.

The primary conclusions of the report are:

- SLID has significant potential to further our understanding of adult learning, primarily due to its longitudinal nature. The report identifies a number of potential avenues of further research.
- While there is considerable activity among adult learners, over the three year period from 2002 to 2004, 93% of Canadian workers undertook no formal education and 60% experienced no training courses. If education programs and training courses are important for productivity, the first policy concern is that the majority of Canadian adults do not participate in them.
- The strong association between prior educational attainment and adult learning suggests that those acquiring additional human capital as adults are not those most in need of additional skills.

1. Introduction

The importance of human capital to individual and societal economic prosperity is well understood and Canada invests heavily in primary, secondary, and postsecondary education. The stock of human capital thus created is, however, in continual need of upgrading. Technological change renders certain human capital obsolete. Witness a worker now 45 years old (and with perhaps two more decades to spend in the labour force) who graduated from high school before the introduction of the IBM PC. Even without obsolescence, levels of schooling individuals thought were adequate when they made their education decisions may now be insufficient for the increasing demands of the labour market. Sectoral shifts caused by new patterns of international trade may require labour mobility between industries and occupations and that mobility may, in turn, be possible only after skill adjustments. Finally, from a broader policy perspective the promotion of a culture of continual engagement in learning may simultaneously promote a culture of innovation, thereby creating the necessary conditions for the development of a comparative advantage in the knowledge driven world economy.

The general process of continual skills development among individuals already in the labour force has been referred to as "lifelong learning". It is important to note that a very wide variety of specific activities fall within this general rubric, ranging from attending short on-the-job training courses to returning to full-time university programs. Empirical research should recognize that the processes underlying decisions to pursue further human capital acquisition as well as the outcomes of such investments may be equally varied.

The promotion of adult education and training has been an important policy objective in this country for some time and we therefore already know a great deal about lifelong learning from both the analytical and the policy side. The importance of lifelong learning is also reflected in the fact that researchers have available a number of surveys specifically designed to investigate adult education and training. The primary source of detailed Canadian information is the Adult Education and Training Survey but a great deal of data is also available from the Workplace and Employee Survey, the International Adult Literacy Survey, and the National Survey on the Changing Nature of Work and Lifelong Learning.

With fairly good data to draw upon from these surveys, what contribution can the Survey of Labour and Income Dynamics (SLID) make to our understanding of lifelong learning? First, it can confirm results we already have on incidence of training and adult education by educational background, age, occupation, firm size and so on. Given the sensitivity of empirical results to the definition of education and training, additional cross-sectional data will be valuable. But more importantly, SLID is longitudinal in nature. SLID may miss some of the detail of adult education and training since this is not its primary focus but the availability of longitudinal data affords a unique opportunity to move beyond descriptive statistics about who is and who is not engaged in lifelong learning and ask questions about causes and consequences.

The decision to undertake further human capital investment while in the labour force is inherently a revision of previous plans in the sense that, at some point in time, the existing stock of skills is recognized as being insufficient. This process is dynamic and only longitudinal data will allow a search for events that trigger education and training. As well, the literature has

found that those individuals who have already engaged in training are more likely to receive future training.[1] This may be a statistical artifact, however, resulting from unobserved heterogeneity and longitudinal data are required to determine whether there is true state dependence. Finally, longitudinal data will permit much better measurement of learning outcomes in terms of income or employability. With cross-sectional data, income effects of training or education are measured by comparing incomes of those who have undertaken the investment with those who have not. Longitudinal data allow us to observe incomes or employment before and after training for the same individuals.[2]

The purpose of the following report is then to take advantage of SLID's unique longitudinal nature to examine the incidence, causes and consequences of adult education and training learning. The following questions will be addressed:

- Who undertakes lifelong learning in the SLID sample? Is it concentrated among certain individuals? Why is it undertaken?
- What forms of training take place and what role do employers play in financing them?
- How does the pattern of adult education and training in SLID compare to results found in previous Canadian studies? What are the implied trends in lifelong learning over time?
- What are the covariates of adult education and training in SLID and how do they compare to results found in previous Canadian studies?
- Is past training a predictor of future training?
- Are there events such as joblessness or mobility that are associated with training episodes?
- How do post-education and training earnings and employability compare to their pre-education and training values?
- Are there policy concerns that arise out of these findings and, if so, are there lessons for appropriate intervention?

The following section provides a brief overview of the literature addressing adult education and training issues in Canada. Given the central role played by SLID data and the importance of definitions in this area, Section III describes the data and the questions used in the survey to elicit information on education and training. Various descriptive statistics of incidence are provided in Section IV to allow a comparison of SLID results to findings in the literature, as well as to provide descriptive context for the remainder of the report. The following sections used multivariate techniques to examine incidence and outcomes. Conclusions are offered in Section VI.

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1 See, for example, Arulampalam and Booth (2001).

2 Note, however, that the available SLID panels are quite short and the differencing required to produce before and after pictures may reduce the sample size available significantly. Moreover, SLID does not provide information on training received prior to the sample period.

2. Literature Review

2.1 Literature on Incidence

Training has been a long-standing policy concern in Canada, going back four decades to the "manpower training" debates of the 1960's. This literature review begins with the evidence that became available in the 1990's through the Adult Education and Training Surveys.[3] The AETS was specifically designed to measure participation in training by adults who were no longer engaged in formal schooling and was administered as a supplement to the Labour Force Survey in 1990, 1992, 1994, 1998 and 2003. The definition of training in the AETS is implicitly defined by the question put to respondents: "At any time during 1997, did you receive any training or education including courses, private lessons, correspondence courses (written or electronic), workshops, apprenticeship training, arts, crafts, recreation courses or any other training or education?"

To examine the incidence of training, we can draw on three AETS-based studies. Mildly different sample selection rules and definitions lead to slight differences in results,[4] but the outcomes are broadly consistent. These outcomes are compared in Table 2.1. Hum and Simpson (2002) report a moderate decline in the incidence of training from 1994 to 1998, which is confirmed by Learning a Living results. Peters' estimates would suggest that incidence increased from 1998 to 2004. The first two studies are also consistent in their finding that job-related training represents only a portion (although still the major proportion) of all training activity. Comparing the incidence of all job-related activity with the incidence of training sponsored by employers (using Peters' results) suggests that over one third of job-related training is taken by individuals on their own initiative.

Table 2.1
Incidence and Duration of Training in the AETS

	AETS Survey		
	1994	**1998**	**2003**
Total Participation in Training:			
Hum & Simpson	28.1	26.0	
Learning a Living		27.7	
Participation in Job-Related Training			
Hum & Simpson	20.5	19.6	
Learning a Living		21.1	
Peters		28.5	34.7
Peters		17.9*	20.2*
Mean Hours of Job-Related Training Among Participants			
Hum & Simpson	147.7		
Peters	156	150	
Mean Hours of All Adult Ed. & Training			
Learning a Living		209	
* participation rates for employer-sponsored training.			

[3] For a comprehensive review of the state of training prior to the 1990's, see Economic Council of Canada (1992).

[4] For example, Learning a Living participation proportions are based only on those individuals who held a job in 1997 whereas Hum and Simpson appear to use population as the percentage base.

The participation rates reported above hide systematic differences in the incidence of training by individual (and firm) characteristics. The evidence on gender differences is mixed but whatever differences in incidence and duration are found tend to be small. There are, however, considerable differences along other dimensions and upon which there would be a consensus. The major differences (and selected statistics) are:

- Training is highly correlated with initial educational attainment. In the 1998 AETS, 11% of those who did not complete high school participated in some form of training while the rate among university degree holders was 48% (Learning a Living).
- As would be expected from a human capital perspective, the incidence of training declines monotonically with age. The incidence of job-related training was 41.5% for those ages 25 to 34 in the 2002 AETS and fell steadily to 14.9% for those ages 55 to 64.
- Employees of small firms are much less likely to participate in job-related training.
- Public sector employees are more likely to receive training.
- Type of occupation, supervisory status and seniority level affect the incidence and duration of training.
- Union status appears to have little effect on training once other covariates are controlled for (Green and Lemieux, 2007).

The finding that training is highly correlated with prior educational attainment is particularly troublesome for it implies that individuals entering the labour market with low educational levels are unlikely to experience the training required to ameliorate earnings differentials. Further to this finding, some studies have shown that "training begets training", so that earnings differentials are exacerbated.[5] Whether a training episode causes a higher likelihood of more training (the so-called state dependence effect) or rather that individuals with certain unobservable characteristics are simply more likely to receive training (spurious state dependence) is a question that demands longitudinal data to resolve. SLID data offers an opportunity to address the important issue of state dependence.

New results on incidence are emerging from the Workplace and Employee Survey and have been synthesized by Dostie and Montmarquette (2007). These results generally confirm that incidence of training does not differ between men and women, that incidence increases with firm size and with previous educational attainment, and that incidence falls with age. The WES provides considerable detail on the nature of the production process and it should be no surprise that training incidence is positively related to the use of technology. The WES is a matched employer-employee survey which provides much more qualitative information on the firm and yields the conclusion that training incidence is positively linked to innovation, the use of new technologies, and worker turnover at the firm.

[5] See, for example, Arulampalam and Booth (2001).

2.2 Literature on Impacts

Given the large literature estimating the returns to education in Canada, there is surprisingly little evidence on the returns to adult education and training[6]. Zhang and Palameta (2006) use SLID data to investigate the impacts of acquiring further education later in life but use data prior to the inclusion of the training and adult education questions in the 2002 SLID. Adult education is then defined as acquiring additional education after having previously left school and having worked at least one year. Earnings increase only among those acquiring a certificate when compared to those not acquiring additional education. Older men and women who stayed with the same employer while obtaining that certificate saw annual earnings increase by 9% and 10%, respectively, over the earnings of their counterparts not obtaining additional education. Among younger workers, however, obtaining certification appears to be associated with getting a new, better-paying job rather than receiving a higher rate of pay in the existing job. Young women, for example, experienced a 15% increase relative to other young women not obtaining a certificate.

Myers and Myles (2005) use the National Survey on the Changing Nature of Work and Life-Long Learning as well as the AETS to investigate impacts. Given the cross-sectional nature of both of these surveys, they are unable to estimate the longer term impacts of training and rely on self-reporting of wage and/or employment gains. Among lower educated groups, 53% reported that training led to higher incomes compared to 44% of university educated respondents. The probability of reporting that learning was helpful in labour market outcomes was higher for those taking credit-based learning. The size of the firm was not found to be important, but other job characteristics such as occupation were. Private sector workers were more likely to report that learning was a factor in improved labour market outcomes, either through higher earnings, a job promotion, or moving to a better job.

The WES data are beginning to generate some results on training outcomes, again reported in Dostie and Montmarquette (2007). Training is found to have a positive impact on the wages of employees, although there are conflicting findings about whether men or women benefit more. Training also is found to have a positive effect on the probability of promotion. The studies summarized in Dostie and Montmarquette tend to emphasize the econometric techniques required to elicit true causal effects. A similar emphasis is found in Hui and Smith (2003) who use the AETS (1998) to assess the impacts of adult education and training on two outcome variables: employment probability and earnings. The paper is primarily devoted to the econometric issue of endogeneity that arises when cross-sectional data are used to estimate such impacts and less to arriving at any consensus about the impacts of training. Indeed, the estimates reported in their paper vary so wildly from one empirical technique to another that one is reluctant even to report an average of their estimates.

[6] There is, however, a large international literature. See Lynch (1997) for an excellent review.

3. Data

Statistics Canada's Survey of Labour and Income Dynamics is a longitudinal household survey covering approximately 97% of the population. Panels of about 30,000 adults are drawn into the survey and interviewed twice a year for six consecutive years on a wide variety of labour market and socio-economic matters.[7] Beginning in 2002, new questions on adult education and training were added to the Survey in order to address issues relating to adult education and data are now available for two panels (Panels 3 and 4) that overlap for the years 2002, 2003, and 2004. Thus, SLID now contains longitudinal data on adult education and training.

SLID's education module captures two types of training: training programs and training courses. Training *programs* are considered to be a series of courses offered by educational institutions and to be used as credits towards a degree, diploma, or certificate. Training programs would include courses taken in high schools, private commercial institutions, CEGEP's and community colleges, and universities. Interviewers are instructed NOT to include courses taken for leisure, recreation or personal interest and respondents are asked if they had objectives related to a current or future job in mind when they enrolled in the program. Field of specialization is available for those pursuing training programs. In principle, a SLID respondent may be reported pursuing multiple training program paths during any year. In the following report, this type of training will be referred to as educational programs.

Training *courses* are courses, seminars, workshops, conferences and forums that are job-related. Unfortunately, SLID asks respondents about only "the most important course" taken during the reference year and we are unable to determine how many training episodes occurred during each year. Within the reference year, the respondent is asked in which months the training course was being taken but we cannot determine whether training in other courses took place at all during other months. The best we can do is ask about the incidence of **at least one** training course and this has important implications for the econometric strategy to be used in estimating models of incidence. For example, count data models would be a natural choice for estimating a model in which the number of episodes of training could be identified. Since it cannot, we are restricted to binary models of incidence over time, although the longitudinal nature of the data does permit some dynamic probit models to be tried.

For each educational/training activity, SLID respondents were asked if employers provided support by providing or paying for the training, allowing a flexible work schedule, providing transportation or any other type of support. Clearly, this is a very liberal concept of support and the data will not allow us to understand the true level of support through any monetary metric.

The focus of the analysis is on adult learners who pursue further education and training during their working years. The sample is therefore restricted to individuals who are at least 25 years of age, who had begun working full-time in 2002 or earlier, and for whom retirement is not the major activity during the reference years. The analysis is intended to exploit the availability of data for individuals over three years. SLID respondents will enter into the 25+ year group in years 2003 and 2004 and will exit through retirement during those years as well. In order to

[7] Annual samples sizes used in this report are almost 28,000.

keep the sample balanced, (i.e., to observe a group of individuals over three full years, only those who were at least 25 years of age in 2002 are included and anyone retiring at any point during those three years is excluded).

4. Descriptive Statistics

We begin with a descriptive overview of the amounts and type of educational and training activities that take place. SLID asks respondents to report on attendance in a number of different types of educational institutions, ranging from commercial schools to universities. For the representative year of 2003[8], Table 4.1 reports incidence of each type of educational program or course and the mean annual hours among those participating. Mean hours refer only to the program or course being described so it is possible for an individual to spend more hours taking job-related courses, for example, during the year than is recorded for the particular course being described in SLID.

Table 4.1
Incidence and Duration of Adult Education and Training: 2003

Type of Institution	Incidence	Mean Hours* (Std.Dev.)	Incidence of Job-Related Ed./Training	Proportion of Job-Related Ed./Training with Employer Support
Business/Commercial School	0.30%	324 (337)	0.28%	42%
College/Applied Arts	2.34	328 (391)	1.97	28
CEGEP	0.17	535 (537)	0.15	13
High School	0.19	421 (404)	0.14	**
Trade School	0.96	410 (395)	0.78	35
University	2.84	385 (532)	2.26	41
Job-Related Courses	21.06	39 (98)	21.06	17

* Mean conditional on participation. ** insufficient no. of observations
Sample size: 26,806
Source: SLID

The most obvious result in Table 4.1 is that there is very little adult education going on when we restrict attention to programs that lead to a credential. Even if there is no overlap between those attending different types of educational institutions, the overall incidence of educational programs is less than 7%. For those pursuing this form of education, however, the amount of training is of considerable duration, with mean annual hours engaged averaging about 400 hours. Incidence falls only slightly when respondents are asked about the job-relatedness of their educational programs, but recall that SLID surveyors are instructed not to include courses taken for pleasure or personal interest. Given that so few are involved, the findings about what proportion of those taking educational programs have employer support may be somewhat academic. It is interesting to note, however, that employer support is considerably higher for educational programs than for job-related courses. "Employer support" is very generously

[8] Results for 2002 and 2004 are reported in the appendix. There appears to be a moderate decline in incidence over the three year period.

defined in SLID and it may simply be the case that these programs, requiring substantial amounts of time, necessitate time away from work more so than courses.

The patterns of job-related courses are clearly substantially different. In this case, one in five workers takes part in training within the single year, but the mean duration of this training is an order of magnitude smaller than it is for programs. All courses are, by definition, job-related so the incidence reported in columns 2 and 4 are identical. Why employer support is so low is something of a mystery.

Given the low estimates of incidence for educational programs, it is tempting to ignore them and focus on the much more prevalent job-related courses. One must be careful, however, in interpreting the numbers. It is true that, for every 100 workers in the labour force (over the age of 24 and not retired), only 2.8 of them will take university level courses while 21 will take job-related courses. But there will be over 1,000 hours of human capital production among those 2.8 workers while only a little over 800 hours will be produced by those taking job-related courses.

Finally, note that the incidence of education and training reported in Table 4.1 are consistent with the AETS results reproduced in Table 2.1.

What kinds of programs and courses are undertaken by adult learners?[9] Table 4.2 reports, for the representative year 2003, the distribution of program types by major groupings of the Classification of Instructional Programs aggregated across all education programs. Business, management and public administration courses dominate the list and, when engineering technologies and health, recreation and fitness are included, more than half of the types of programs taken are accounted for.

Table 4.2
Adult Education Programs by Major Field of Study: 2003 (using CIP Primary Groupings)

CIP Group	Education Programs
Personal Improvement & Leisure	8.1%
Education	7.2
Visual/Performing Arts, Communications Technologies	1.7
Humanities	3.2
Social and Behavioural Sciences/Law	7.2
Business, Management and Public Administration	25.8
Physical and Life Sciences and Technologies	1.1
Mathematics, Computer and Information Services	9.7
Architecture, Engineering, and Related Technologies	14.0
Agriculture, Natural Resources and Conservation	2.2
Health, Parks, Recreation and Fitness	12.7
Personal, Protective and Transportation Services	7.0
Other	0.1
TOTAL	100.0
Sample size: 5,667 Source: SLID	

[9] In the remainder of this report, only job-related educational programs will be considered.

The classification system for job-related courses is somewhat different and the distribution of those courses across subject areas is presented in Table 4.3. The proportion of courses accounted for by business and management subjects is identical to that for education programs. Moreover, the engineering-and health-related subjects dominate the fields even more when combined with those business fields.

Table 4.3
Training Courses by Principal Subject of Study: 2003

CIP Group	Training Courses
Educational, recreational and counselling services	9.0%
Fine and applied arts	2.2
Humanities and related fields	4.1
Social science and related fields	8.6
Commerce, management and business admin.	25.8
Agricultural and biological sciences and technology	2.7
Engineering and applied sciences	1.1
Engineering and applied science technologies and trades	23.6
Health professions, science and technology	19.3
Mathematics and physical sciences	1.0
No specialization	2.7
TOTAL	100.0
Sample size: 4,721 Source: SLID	

The literature clearly shows that adult training is not uniformly distributed across individuals, varying systematically with age, education and industry. Table 4.4 explores the relationship between training and age, a relationship that is particularly important to the issue of life-long learning. After all, if the incidence of training drops precipitously with age, then it can hardly be considered to be "life-long". Note that the incidence estimates in Table 4.4 are for educational or training activity at any point during the three year period, 2002 to 2004. This explains the higher values in Table 4.4 compared to those in Table 4.1.

Table 4.4
Adult Education and Training Courses by Age in 2002
(Three Year Incidence by Age Group)

Age Group	Education Programs	Training Courses
25-34	21.3%	39.6%
35-44	10.6	41.8
45-54	6.9	39.2
55-64	3.3	32.8
Sample size: 29,685 Source: SLID		

The proportion of adults undertaking educational programs does drop dramatically with age.[10] Educational programs involve very significant investments of time, as seen in Table 4.1, and

[10] The decline in incidence by age may be even greater if the sample did not exclude individuals retiring at any point during the three year period. These individuals are least likely to have participated in education and training. I am grateful to one of the reviewers for pointing this out.

possibly money. As the time left to amortize such human capital investments diminishes, fewer of them generate the required rate of return. Training courses, on the other hand, appear to represent advantageous investments through most of the working life, not really tailing off until what are usually the last 10 years of labour force activity. Even for the oldest group, however, a third of workers undertook training at some point during the three years.

Just as women are more likely to pursue higher education, so too are they more likely to engage in education programs as adult learners. Table 4.5 shows an appreciably higher rate of participation in education programs among women, which is consistent with evidence that women are more likely to be found in part-time studies at the university level (Drewes and O'Heron (1999)). There is no significant difference in the incidence of training courses, however, which is consistent with most findings in the literature. Individuals identifying themselves as being in a visible minority group are slightly more likely to have participated in education programs but are much less likely to have undertaken training courses. A lower incidence of training is also evident for immigrants relative to non-immigrants. Why these two groups are less likely to have undertaken training is an interesting but complex question that is not possible to answer in any adequate way with simple tabulations.

Table 4.5
Adult Education and Training Courses by Demographic Characteristics (Three Year Incidence)

Characteristic	Education Programs	Training Courses
Male	9.4%	39.5%
Female	12.9	38.6
Not Visible Minority	10.5%	38.7%
Visible Minority	12.1	30.1
Non-Immigrant	10.6%	39.3%
Immigrant	10.7	31.1

Sample size: 29,685
Source: SLID

One of the most troubling results found in the literature on training is that individuals with higher levels of educational attainment are more likely to experience further human capital investments. Since training is also found to generally improve labour market outcomes, this implies that income and employment inequalities associated with different levels of schooling are reinforced after formal schooling. The SLID data confirms the positive correlation between educational attainment (measured at the beginning of the three year period) and adult education and training, as reported in Table 4.6. Less than 1% of those with no more than completed high school undertake educational programs leading to certification, compared to over 20% of those with at least a Bachelor's degree. Those with the fewest educational credentials are the least likely to acquire such credentials as adults while those with the most (and, one would presume, those in least need of them) are more likely to acquire more. With respect to training courses, the situation for the least educated is not nearly so bleak. However, there continues to be a very dramatic difference in those levels by prior educational attainment. On the whole, then, adult education and training do not work towards equalization of human capital stocks.

Table 4.6
Adult Education and Training Courses by Educational Attainment in 2002
(Three Year Incidence by Education Group)

Educational Attainment	Education Programs	Training Courses
Less than completed High School	0.8%	18.1%
Completed High School	0.9	28.2
Some Post-Secondary Education	15.0	38.5
College	14.4	42.3
Bachelor's	16.4	58.1
Higher than Bachelor's	20.7	61.1

Sample size: 26,654
Source: SLID

It stands to reason that the need for skills upgrading will depend on the nature of the production process, particularly the degree to which complex technology or organization is involved. Does the probability of undertaking adult education or training then depend on the industry in which the individual is employed? Table 4.7 explores this question by estimating the incidence of education and training by industry classification.[11] Since some individuals change industry during the three year period, this descriptive look is restricted to one year, 2003, and it is assumed that the industry of employment while undertaking education or training is that of the main job held in 2003.

Table 4.7
Adult Education and Training Courses by Industry in 2003
(Incidence by NAICS 2002)

Industry (Grouping #3)	Education Programs	Training Courses
Agriculture	3.1%	11.9%
Forestry, Fishing, Mining, Oil and Gas	2.5	23.3
Utilities	3.1	40.5
Construction	5.1	14.9
Manufacturing	5.4	15.9
Trade	3.2	16.1
Transportation and Warehousing	3.0	16.8
Finance, Insurance, Real Estate and Leasing	7.3	37.4
Professional, Scientific and Technical Services	8.8	28.7
Business, building and other support services	6.0	17.2
Educational Services	10.8	38.4
Health Care and Social Assistance	8.7	39.7
Information, Culture and Recreation	6.4	27.9
Accommodation and Food Services	5.8	9.5
Other Services	7.4	22.6
Public Administration	8.1	41.4

Sample size: 22,873
Source: SLID

While there is variation in the incidence of education programs across industries, differences are perhaps surprisingly small. We already know from table 4.1 that not a great deal of activity takes place in terms of educational programs in terms of numbers of individuals involved. The estimates above suggest that whatever activity does take place occurs across all sectors.

[11] Occupational differences are examined in the multivariate model below.

Training course incidence shows more variability, although in relative terms the highest value is approximately four times higher than the lowest, as is true for educational programs. The Pearson correlation coefficient between the two sets of estimates is 0.54, suggesting that there is a positive correlation between them of moderate strength. Industries in which greater levels of educational program activity take place are also more likely to involve a higher incidence of training courses.

The literature review and the results reported in Table 4.1 suggest that slightly over 20% of adults participate in job-related courses per year. If the likelihood of participation is evenly distributed across the labour force, we could expect everyone to have cycled through skills upgrading courses each 5 year period. Quite a different picture emerges if it is the same 20% of the labour force that participates in training courses every year, for then 80% of individuals would never take training courses. The multivariate analysis to follow addresses this issue more formally, but a rough sense of the extent to which adult education and training are concentrated among certain individuals can be had by simply examining the number of years (out of three) SLID respondents report having undertaken education program or training courses.[12]

Table 4.8
No. of Years in which Adult Education and Training Courses are Reported

Number of Years	Education Programs	Training Courses
0	92.6%	62.2%
1	1.9	20.6
2	3.2	11.4
3	2.3	5.8

Sample size: 29,685
Source: SLID

Over the three years from 2002 to 2004, slightly less than 93% of adults had never undertaken any human capital investments in the form of educational programs. The situation is somewhat brighter for training courses, although a significant majority of adults experienced no courses at all during the period.

Understanding the relationship between education and training on the one hand and labour market income on the other is a complex matter and simple descriptive statistics are not up to the task of sorting out the direction(s) of causality. Nevertheless, it may be interesting to examine the patterns of income by incidence. Table 4.9 reports median annual market income in 2002 and 2004 for those who participated in programs or courses at any time during the three year period.

[12] As discussed above, SLID does not identify specific spells of education or training. This kind of data would be preferred in addressing the issue of concentration. For example, some reporting themselves as having taken education programs in two different years of SLID might simply have been enrolled in a single program that spanned those years.

Table 4.9 Median Market Income		
Three Year Incidence of …	**2002**	**2004**
Education Programs		
Yes	$27,023	$33,471
No	$32,000	$35,007
Training Courses		
Yes	$41,869	$45,453
No	$26,141	$27,617
Source: SLID		

Median incomes are lower for those investing in human capital through formal educational programs, a finding which confirms results that will appear later in this report that suggest that these individuals are paying a labour market price for their investments. Unfortunately, SLID does not allow us to know whether participation in these programs is full-time or part-time but one can infer from Table 4.9 that at least some participants are stopping out of work while pursuing these programs. While they may forego earnings while participating, growth in median incomes in this group is higher than it is among non-participants suggesting that there is a return to their investments. Training courses also appear to have substantial impacts on income growth, although caveats about inferring causality from descriptive statistics must be borne in mind. Similarly, the higher incomes among those who have experienced at least one training episode over the sample period may be due as much to the fact that they have higher levels of education as to any causal role of training. Clearly, multivariate analysis is required to make any further headway in understanding the incidence and impact of education and training.

5. Multivariate Analysis

5.1 Incidence

To gain an understanding of the contribution of any one particular factor on training incidence, we require multivariate analysis that will control for other compounding factors. To do so, the report estimates random effects probit models for the incidence of education and training that take account of the panel structure of the data.[13] In the first pass, a simple model is estimated that excludes past training in order to allow the use of observations in all three years for each individual. The results are reported in Table 5.1 as marginal effects.

Many of the coefficients reveal the same patterns seen in the descriptive statistics. The probabilities of taking educational programs or training courses both decline with age, apparently more so for the former. Males are less likely to participate in programs but more likely to take training courses. Both types of human capital investments are significantly more likely to occur the higher is the level of educational attainment. The coefficients on industry dummies confirm the impression given by Table 4.7 that there are no significant differences in the incidence of education programs across industries, with the exception of the health care sector. Compared to workers in the agriculture sector, those in the accommodation and food services industries are less likely to participate in training courses while those in a number of other industries, especially the financial and utilities industries, are more likely to take training courses. The impact of occupation is estimated for the first time and, compared to the reference group of occupations in management, all other occupations are less likely to involve education programs. The results on training courses are more varied by occupation. The sciences, health and social science occupations are more likely to involve training courses while the rest, including manufacturing, are less so.

Table 5.1
Random Effects Probit Model
(Dependent Variable is Binary Indicator for Education/Training Coefficients are Marginal Effects)

Explanatory Variable	Education Programs	Training Courses
Age	-0.0001	0.0096**
	(0.0003)	*(0.0019)*
Age Squared	-0.0000	-0.0001**
	(0.0000)	*(0.00002)*
Male (1 if male, 0 if female)	-0.0002**	0.0340**
	(0.00009)	*(0.0050)*
EDUCATION (ref. education=less than High School)		
High School Graduate	-0.0011**	0.0372**
	(0.0002)	*(0.0087)*
Some PSE (")	0.0103**	0.1230**
	(0.0022)	*(0.0174)*
Non-University Certificate	0.0068**	0.1023**
	(0.0012)	*(0.0074)*

[13] A fixed effects logit estimator was tried in order to account for correlation between unobserved individual attributes and the regressors. There was insufficient variation in the regressors over the three year period to produce reliable within-group estimates for most of the covariates of interest.

Table 5.1 ***(continued)***
Random Effects Probit Model
(Dependent Variable is Binary Indicator for Education/Training Coefficients are Marginal Effects)

Explanatory Variable	Education Programs	Training Courses
Bachelor's	0.0051**	0.2385**
	(0.0013)	*(0.0124)*
Above Bachelor's	0.0056**	0.2749**
	(0.0017)	*(0.0162)*
INDUSTRY (reference industry = Agriculture)		
Forestry, Fishing, Mining, Oil and Gas	0.0001	0.0674**
	(0.0003)	*(0.0202)*
Utilities	0.00003	0.1924**
	(0.0005)	*(0.0373)*
Construction	-0.00002	0.0110
	(0.0003)	*(0.0178)*
Manufacturing	0.0001	-0.0078
	(0.0003)	*(0.0161)*
Trade	-0.0003	-0.0055
	(0.0002)	*(0.0159)*
Transportation and Warehousing	-0.0003	0.0137
	(0.0002)	*(0.0185)*
Finance, Insurance, Real Estate and Leasing	0.0007	0.2258**
	(0.0006)	*(0.0259)*
Professional, Scientific and Technical Services	-0.00002	0.0678**
	(0.0003)	*(0.0208)*
Management, Admin. and Other Support	0.0006	0.0298
	(0.0006)	*(0.0205)*
Educational Services	0.0004	0.1060**
	(0.0005)	*(0.0236)*
Health Care and Social Assistance	0.0010	0.1501**
	(0.0007)	*(0.0227)*
Information, Culture and Recreation	-0.00002	0.056**
	(0.0003)	*(0.0220)*
Accommodation and Food Services	-0.00004	-0.656**
	(0.0003)	*(0.0141)*
Other Services.	.0003	0.0799**
	(0.0004)	*(0.0222)*
Public Administration	0.0009	0.1933**
	(0.0007)	*(0.0262)*
OCCUPATION(ref. occupation = management)		
Business, Finance and Administrative	-.0005**	-0.0281**
	(0.0001)	*(0.0063)*
Natural and Applied Sciences and Related	-0.0005**	0.0364**
	(0.0001)	*(0.0107)*
Health	-0.0005**	0.0929**
	(0.0001)	*(0.0136)*
Social Sci., Education, Gov't Service & Religion	-0.0004**	0.0792**
	(0.0001)	*(0.0110)*
Art, Culture, Recreation and Sport	-0.0004**	-0.0273*
	(0.0001)	*(0.0145)*
Sales and Service	-0.0004**	-0.0111*
	(0.0001)	*(0.0066)*
Trades, Transport and Equip. Operators & Related	-0.0002**	-0.0223**
	(0.0001)	*(0.0072)*
Primary Industry	-0.0004**	-0.0222*
	(0.0001)	*(0.0130)*
Processing, Manufacturing and Utilities	-0.0005**	-0.0572**
	(0.0001)	*(0.0093)*

Table 5.1 ***(continued)***
Random Effects Probit Model
(Dependent Variable is Binary Indicator for Education/Training Coefficients are Marginal Effects)

Explanatory Variable	Education Programs	Training Courses
FIRM SIZE (ref. firm size = <20)		
Firm Size 20 to 99 employees	0.0001	0.0423**
	(0.0001)	*(0.0070)*
Firm Size 100 to 499 employees	0.0001	0.0668**
	(0.0001)	*(0.0079)*
Firm Size 500 to 999 employees	0.0001	0.0841**
	(0.0002)	*(0.0106)*
Firm Size more 1000 or more employees	0.0002	0.0924**
	(0.0001)	*(0.0066)*
Public Sector Employment	-0.0002*	0.0063
	(0.0001)	*(0.0081)*
Job Duration in Months	0.000002**	0.0001**
	(0.0000)	*(0.00002)*
Job is Permanent (1 if yes)	-0.0005**	0.0545**
	(0.0002)	*(0.0055)*
Job Change (1 if job change during the year)	0.0002	0.0121
	(0.0001)	*(0.0074)*
Unemployment (1 if unemployed during yr.)	0.7714**	-0.047**
	(0.0222)	*(0.0092)*
Self Employed (1 if yes)	-0.0004**	0.0623**
	(0.0001)	*(0.0082)*
Urban (1 if urban resident)	0.0001	-0.0067
	(0.0001)	*(0.0051)*
Married (1 if married)	-0.0004**	0.0107**
	(0.0001)	*(0.0048)*
Visible Minority (1 if visible minority)	0.0001	-0.062**
	(0.0002)	*(0.0089)*
Immigrant (1 if immigrant)	0.00002	-0.0275**
	(0.0002)	*(0.0079)*
PROVINCE (ref. province is Ontario)		
Nfld.	-0.0005**	-0.0545**
	(0.0001)	*(0.0091)*
PEI	-0.0003**	-0.0343**
	(0.0001)	*(0.0111)*
NS	-0.0004**	0.0261**
	(0.0001)	*(0.0100)*
NB	-0.0004**	-0.040**
	(0.0001)	*(0.0085)*
QUE	-0.0005**	-0.0545**
	(0.0001)	*(0.0056)*
MAN	-0.00003	-0.0076
	(0.0001)	*(0.0085)*
SASK	-0.0001	0.0024
	(0.0001)	*(0.0088)*
ALTA	0.0001	0.0470**
	(0.0001)	*(0.0089)*
BC	0.0002	0.0017
	(0.0002)	*(0.0083)*
Rho	0.585	0.433
No. of Observations	69,715	69,715
No. of Individuals	26,409	26,409

* significant at 5%, ** significant at 10%
Source: SLID

The importance of firm size shows up in the estimates for training courses but is less important to the incidence of programs. Undertaking educational programs is less likely for those whose jobs are in the public sector, but there is no significant difference between the private and public sector when it comes to training courses.

The coefficients on job characteristics and unemployment point to the conclusion that undertaking educational programs is an investment made by the individual rather than a joint decision by employer and employee. The rather large positive coefficient on unemployment probably reflects causality resulting from a departure from the labour force to engage in studies rather than a causality running from an unemployment spell to the decision to upgrade skills. Training courses, on the other hand, are more likely to occur among those who have held permanent jobs for a longer period of time and who are undergoing job changes. Recall that in SLID, a change in tasks is considered to be a job change and the positive coefficient on job change in Table 5.1 may be picking up promotion-related training.

Married individuals are less likely to undertake educational upgrading, perhaps reflecting an affordability issue, but are more likely to invest in training. Immigrants and visible minorities do not have different probabilities of educational program participation but are less likely to experience training courses, as was found in Table 4.5.

Urban residence has no impact on incidence but geography does matter. The incidence of education programs is lower than in Ontario in all provinces to the east but is not significantly different in provinces to the west. With the exceptions of Nova Scotia to the east and Alberta to the west, the same can be said about the incidence of training courses.

A policy issue of some important in the area of training is the question of whether "training begets training". If so, public policy to promote training as a means of closing earnings inequalities across workers is less likely to achieve that goal. With the longitudinal nature of SLID comes the opportunity to observe the incidence of training through time and therefore, in principle, the means to test the hypothesis that past training causes future training. Doing so, however, is not a simple matter of including in an empirical model of training incidence an indicator of training in the past.

First, of course, we lose one year of data in order to construct the lagged indicator of training. If the object is to explore the role of training in the previous year, only observations from 2003 and 2004 will allow us to measure training in the previous year. The second problem is considerably more complicated. In a random effects probit model with a past training or education as an explanatory variable, an "initial conditions" problem arises because we are unable to observe the stochastic process underlying the training choices prior to 2002. An individual may undertake training (or education) in 2002 because of training in the previous period or because of individual, unobservable and observable effects. This produces correlation between the random effects term and the initial observation of the dependent variable.

There is no consensus on the appropriate econometric approach to the problem. Arulampalam and Stewart (2007) report good results with Orme's (2001) method for dealing with the initial conditions problem and that approach is used in estimating the dynamic probit model for

education and for training.[14] The correlation between the initial observation of the indicator for training or education and the random individual-specific error is accounted for by the inclusion of an estimated term in the manner that is similar to the familiar Heckman two-stage selection bias correction. This correction term is derived from a probit model of training or education in the initial period, estimated using variables in the first period plus pre-sample information. It is admittedly difficult to find instruments that could be considered determinants of first period training or education but not of subsequent changes. To permit identification, immigrant and visible minority status were included in the reduced form, first-period probit and excluded from the dynamic probit model. The assumption is that these attributes may explain the initial probability of training/education but not subsequent changes. Results are reported in Table 5.2 where the Inverse Mills Ratio is the correction term.[15]

Participation in education programs in the previous year is a statistically significant predictor of participation in the current year. Some care is necessary in interpreting this result. The length of programs reported in Table 4.1 suggests a strong possibility that the positive coefficient is simply picking up the tendency for an education program to span more than one calendar year. Without clear information on the start and end dates of individual spells spent in programs, it is not possible to resolve this issue of interpretation. The same issue may arise in the case of training courses but, given the much shorter mean length of these courses, it is much less likely that the positive coefficient on lagged training course incidence is an artifact of courses running through the end of one year and into the beginning of the next. Bearing the econometric issues in mind, one might then conclude that, in the case of job-related courses, past training causes future training.

The remaining estimated marginal effects generally retain their signs when compared to Table 5.1 although magnitudes do change. Recall that the model reported in Table 5.2 not only includes an indicator for past education or training, but is also estimated using only two years of the data so that differences in estimates are to be expected. Nevertheless, the interpretation of the estimates provided in the text surrounding Table 5.1 continue, in the main, to hold.

Table 5.2
Dynamic Probit Model
(Dependent Variable is Binary Indicator for Education/Training: Marginal Effects Reported)

Explanatory Variable	Education Programs	Training Courses
Indicator for Lagged Program/Courses	0.0416**	0.0758**
	(0.0117)	(0.0118)
Age	-0.0003	0.0064**
	(0.0002)	(0.0021)
Age Squared	-0.0000	-0.0001**
	(0.0000)	(0.00002)
Male (1 if male, 0 if female)	-0.0005	0.0205**
	(0.0006)	(0.0057)
EDUCATION (ref. education=less than High School)		
High School Graduate	-0.0059**	0.0153**
	(0.0014)	(0.0095)
Some PSE (")	0.0175**	0.0546**
	(0.0043)	(0.0108)
Non-University Certificate	0.0144**	0.0577**
	(0.0030)	(0.0081)

[14] An excellent discussion of Orme's method is provided in Henley (2000) and an application can be found in Propper (2000).

[15] Estimates for industry and occupational dummy variables have been dropped to conserve space. Full details are available from the author on request.

Table 5.2 *(continued)*
Dynamic Probit Model
(Dependent Variable is Binary Indicator for Education/Training: Marginal Effects Reported)

Explanatory Variable	Education Programs	Training Courses
Bachelor's	0.0103**	0.1443**
	(0.0031)	(0.0125)
Above Bachelor's	0.0094**	0.1503**
	(0.0035)	(0.0156)
FIRM SIZE (ref. firm size = <20)		
Firm Size 20 to 99 employees	0.0001	0.0428**
	(0.0008)	(0.0086)
Firm Size 100 to 499 employees	0.0007	0.0537**
	(0.00009)	(0.0094)
Firm Size 500 to 999 employees	0.0009	0.0753*
	(0.0015)	(0.0126)
Firm Size more 1000 or more employees	0.0016*	0.0714**
	(0.0009)	(0.0078)
Public Sector Employment	-0.0030**	0.0041
	(0.0010)	(0.0092)
Job Duration in Months	-0.00002**	0.00005
	(0.00001)	(0.00003)
Job is Permanent (1 if yes)	-0.0017**	0.0452**
	(0.0009)	(0.0071)
Job Change (1 if job change during the year)	0.0005	0.0267**
	(0.0009)	(0.0097)
Unemployment (1 if unemployed during yr.)	0.6094**	-0.5479**
	(0.0284)	(0.0115)
Self Employed (1 if yes)	-0.0016**	0.0542**
	(0.0008)	(0.0094)
Urban (1 if urban resident)	0.0003	-0.0169**
	(0.0009)	(0.0058)
Married (1 if married)	-0.0022**	0.0103
	(0.0006)	(0.0056)
PROVINCE (ref. province is Ontario)		
Nfld.	-0.0032**	-0.0537**
	(0.0010)	(0.0012)
PEI	-0.0020**	-0.0495**
	(0.0011)	(0.0119)
NS	-0.0018**	0.0024
	(0.0008)	(0.0103)
NB	-0.0018**	-0.0402**
	(0.0009)	(0.0096)
QUE	-0.0030**	-0.0393**
	(0.0008)	(0.0066)
MAN	0.0004	-0.0165*
	(0.0102)	(0.0093)
SASK	-0.0002	0.0039
	(0.0010)	(0.0097)
ALTA	0.0001	0.0252**
	(0.0085)	(0.0093)
BC	0.0002	0.0035
	(0.0009)	(0.0093)
Inverse Mills Ratio	0.0019	0.0768
	(0.0003)	(0.0036)
Rho	0.073	0.280
No. of Observations	44,847	44,847
No. of Individuals	24,352	24,352

* significant at 5%, ** significant at 10%
Source: SLID

To this point, the analysis of incidence of education programs and training courses has followed most of the literature in looking for explanations in the nature of the person or the job. The longitudinal nature of SLID permits a different kind of exploration that is more dynamic in nature. Post-schooling investments in human capital must arise through a reassessment of the adequacy of the current stock of skills. It may be that technological progress, for example, steadily erodes human capital causing periodic reinvestments but we should also see particular "triggers" such as unemployment or job changes that involve the need for skills upgrading.

SLID data allow the observation on a monthly basis of labour force status, the main job held, and education or training activity. As already discussed, SLID data do not record the latter activities on a spell basis, but it is possible to observe any transitions into an educational program or training course for the 36 months of data available. For the 30 months up to the end of 2004, the start of programs and courses has been related to any period of joblessness or any main job change in the previous 6 months. A probit model is used in which the dependent variable is a binary indicator taking a value of one if a transition is made into a program/course from one month to the next and zero otherwise. The probability of such a transition is related to recent joblessness or job change by pooling all observations and the probit results are reported in Table 5.3. Note that these estimates are intended only to be suggestive. The underlying statistical structure will be highly complex, demanding a much more rigorous econometric strategy than can be pursued in this report.

Table 5.3
Probit Model for the Start of Programs or Courses
(Note: Table Reports Marginal Effects)

Explanatory Variable	Education Programs	Training Courses
Unemployed in Previous 6 Months	0.0057 (0.0003)	0.0014 (0.0003)
Main Job Change in Previous 6 Months	0.0148 (0.0003)	0.0034 (0.0002)
N = 2,577,450 Standard errors in parentheses Source: SLID		

The positive and highly significant coefficients suggest that individuals initiate human capital investments in response to changes in their labour market situation. Note that the table reports marginal effects so that the values of the coefficient on unemployment indicate that someone who has recently experienced unemployment has a probability of beginning an educational program that is 0.57 percentage points higher than someone who has not been unemployed and a probability of beginning a training course that is 0.14 percentage points higher. Thus, although these triggers are statistically significant, their marginal impacts on participation are not very large. A more thorough empirical analysis that fully exploits SLID's monthly vectors and takes a more structured approach is required, but outside the scope of this report.

5.2 Earnings Impacts

To explore the impact of education programs and training courses on earnings, the availability of both beginning of year and end of year wages in SLID is exploited. For each individual and each year of the data, proportional wage growth is related to indicators for programs and

courses. This differences out unobserved individual characteristics that are correlated with both training and wages. The approach relies on the assumption that the wage growth of those not participating in education and training can be taken as the counterfactual wage growth of those who do in order to identify the earnings impacts of human capital investments during the year. The principle objection to this strategy is the so-called "Ashenfelter dip". It may be that a temporary dip in earnings prompts individuals to enroll in training programs. If such training does restore earnings to normal levels then observed earnings growth for those who are observed to undertake training overstates the impact of that training. The use of hourly wages rather than earnings may ameliorate this problem to some extent. There is also the possibility that training within a given employer is causally linked to promotions which are in turn associated with wage growth through the year. In SLID, promotions are supposed to be coded as job changes but, if this is not the case, the wage impacts of training may be upward biased.[16] The likelihood of promotions not being captured as job changes in SLID cannot be determined.

Table 5.4 reports the results of a panel regression model for annual wage changes. Differencing causes all non-varying explanatory variables one might normally see in a human capital earnings function to drop out and the model contains only an indicator for a change in the main job during the year and indicators for education programs and training courses.[17] Controlling for job changes, education programs have a significant and large impact on annual wage growth for both men and women, being associated with over 3 additional percentage points of growth. The impacts of training courses, while significant, are much smaller, particularly for women. This is consistent with different sizes of the investments involved, as reported in Table 4.1. Education programs involve large investments of time and would not be undertaken without an appreciable return in terms of wage growth. Smaller returns are required to make the shorter training courses economical. Moreover, as human capital theory suggests, gains from firm-specific skills training may accrue to the employer and not the employee.

Table 5.4
Random Effects Regression for Wage Changes
(Dependent Variable: Annual Proportional Wage Change)

Explanatory Variable	Males	Females
Job Change During Year	0.063**	0.047**
	(0.014)	*(0.013)*
Education Programs During the Year	0.032**	0.037**
	(0.012)	*(0.011)*
Training Courses During the Year	0.017**	0.009*
	(0.005)	*(0.005)*
Constant	0.058**	0.059**
	(0.003)	*(0.003)*
No. of Observations	18,027	17,898
No. of Individuals	8,125	8,131

* significant at 5%, ** significant at 10%
Source: SLID

[16] I am grateful to a reviewer for raising this possibility.

[17] A more complete exploration of earnings impacts may be warranted but would constitute a major research project on its own. Results in Table 5.4 are intended only to be suggestive.

5.3 Employment Impacts

Estimating employment impacts of participation in education programs and training courses must begin with a precise definition of the outcome to be used in measuring those impacts. It is possible, for example, to ask how training courses affect the number of weeks per year of full-time employment, the probability of unemployment, the duration of unemployment, and so on. This report focuses on how adult education and training affect the probability of unemployment and the number of weeks of unemployment.

Estimating unemployment impacts of education and training introduces difficult econometric issues. For example, comparing the unemployment probabilities of those who have undertaken training with those who have not identifies the causal effect of training only if the groups are otherwise identical with respect to those probabilities. They are unlikely to be so. Moreover, using some sort of regression technique relating unemployment to education and training will introduce simultaneity bias if an episode of unemployment increases the likelihood that adults undertake human capital investments. A complete examination of the role of education and training on unemployment would require a separate research report on its own and, in this report, two simple strategies are used to provide some suggestive results. First, the longitudinal nature of the data allows the estimation of unemployment probabilities and durations using past education and training as explanatory variables. Thus, the model will estimate the effect of education and training on unemployment in period *t* for those who experienced unemployment in period *t-1*. This may, to some extent, overcome the simultaneity issue. Second, a model of current unemployment probabilities and durations against past education and training is augmented with as many potential explanatory variables for unemployment as are available. A random effects Tobit model is estimated to produce simultaneous estimates of the effect of covariates on probability of unemployment and on the number of weeks of unemployment conditional on unemployment occurring. The sample is, of course, restricted to labour force participants and the results are reported in Table 5.5.[18]

[18] Controls for industry are not reported. Full results are available from the author.

Table 5.5
Random Effects Tobit Model for Unemployment, Marginal Effects Reported
(Dependent Variable is No. of Weeks of Unemployment in Year *t*)

Explanatory Variable	Estimated Marginal Effects on Pb. of Unemployment	Estimated Marginal Effects on Wks of Unemployment
Education Program in Year *t-1* (1 if yes, 0 if no)	0.011*	0.286*
	(0.006)	*(0.151)*
Training Courses in Year *t-1*	-0.023**	-0.630**
	(0.003)	*(0.086)*
Age	0.001**	0.037**
	(0.0002)	*(0.005)*
Male (1 if male, 0 if female)	-0.017**	-0.488**
	(0.003)	*(0.086)*
EDUCATION (ref. education=less than High School)		
High School Graduate	-0.026**	-0.714**
	(0.004)	*(0.116)*
Some PSE (")	-0.025**	-0.696**
	(0.004)	*(0.127)*
Non-University Certificate	-0.010**	-0.275**
	(0.004)	*(0.106)*
Bachelor's	-0.040**	-1.208**
	(0.004)	*(0.132)*
Above Bachelor's	-0.048**	-1.544**
	(0.004)	*(0.166)*
OCCUPATION (ref. occupation = management)		
Business, Finance and Administrative	-0.090**	-3.276**
	(0.002)	*(0.093)*
Natural and Applied Sciences and Related	-0.072**	-2.974**
	(0.002)	*(0.123)*
Health	-0.080**	-3.680**
	(0.002)	*(0.153)*
Social Sci., Education, Gov't Service & Religion	-0.074**	-2.979**
	(0.002)	*(0.130)*
Art, Culture, Recreation and Sport	-0.065**	-2.77**
	(0.002)	*(0.189)*
Sales and Service	-0.082**	-2.88**
	(0.002)	*(0.088)*
Trades, Transport and Equip. Operators & Related	-0.076**	-2.736**
	(0.002)	*(0.094)*
Primary Industry	-0.078**	-4.039**
	(0.001)	*(0.108)*
Processing, Manufacturing and Utilities	-0.066**	-2.53**
	(0.002)	*(0.121)*
Marital Status (1 if married, otherwise 0)	-0.027**	-0.667**
	(0.004)	*(0.086)*
Urban (1 if urban resident, otherwise 0)	-0.0004	-0.011
	(0.003)	*(0.083)*
Visible Minority (1 if visible minority, otherwise 0)	0.017**	0.429**
	(0.009)	*(0.205)*
Immigrant (1 if immigrant, otherwise 0)	-0.001	-0.017
	(0.006)	*(0.145)*
Rho	0.132	0.132
Mean (conditional for "weeks of unemployment")	0.068	10.07
No. of Observations	32,377	
No. of Individuals	16,354	

Provincial and industry controls included but not reported
* significant at 5%, ** significant at 10%
Source: SLID

According to the estimates, educational programs in the previous year have a positive effect on both the probability of experiencing unemployment in the following year and on the number of weeks of unemployment for those experiencing an episode (although the latter coefficient is only marginally significant). At the same time, the coefficients on educational attainment reproduce the stylized fact that higher education means lower unemployment in terms of incidence and duration. A possible explanation for this apparent inconsistency is that those undertaking educational programs experience a period of unemployment in making a transition back into the labour force upon completion of full-time programs or into new jobs for those working while studying. We know that these programs are associated with higher annual wage growth and it may be that such growth requires labour market transitions involving some period of unemployment. It certainly is unlikely that undertaking investments in educational programs causes a deterioration in general, longer term labour market experiences.

Training courses, on the other hand, are associated with a reduction in the probability of unemployment and in the duration of unemployment spells in the following year. One must be cautious in interpreting this as a causal relationship despite the use of lagged training and control variables. If there are unobserved personal characteristics that make the individual more likely to undertake training and also less likely to experience unemployment, then past training and current unemployment will be correlated if those characteristics are permanent. Although the estimates may not prove that training causes a reduction in the probability of unemployment for an individual, they certainly are consistent with that reasonable hypothesis.

6. Conclusions and Policy Implications

The primary purpose of this report has been to explore the potential for SLID data to further our understanding of adult education and training in Canada. To do so, it has focused on Canadian adults who have already worked full-time for some time after formal schooling. SLID produces estimates of the incidence and duration of education and training that are broadly consistent with values found in surveys that are explicitly designed to investigate these issues and this provides a certain level of confidence in using SLID data to leverage additional insights out of its longitudinal structure.

Participation in educational programs that can lead to certification is not widespread, with no more than about 7% of adults reporting enrolment in such programs in any year. The mean number hours spent by adults pursuing certification is, however, substantial and the overall quantity of human capital investment is under-estimated by simple incidence. The incidence of job-related courses is considerably more prevalent with about 21% of adults reporting involvement in this form of lifelong learning in any year. However, over the three year period from 2002 to 2004, over 60% of adults report having had no formal training in courses. Thus, if job-related training courses are important for productivity, the first policy concern is that the majority of Canadian adults do not participate in them.

The de Broucker and Myers' (2006) report, *Too Many Left Behind: Canada's Adult Education and Training System*, articulates another major concern with adult education and training in Canada and that is that the labour market improvements that accrue to those acquiring additional human capital as adults do not accrue to the "right" adults. Those most in need of additional skills are not those acquiring them. Previous educational attainment is the best proxy for acquired human capital and SLID data confirm that the incidence of adult education and training is significantly higher for those who have already completed at least some post-secondary education than for those with high school or less. This is true even when controlling for occupation and industry of employment. Adding to the concern about the ability of education and training to equalize labour market success across individuals is the finding that past training is a predictor of future training, a result that is available to us only due to SLID's longitudinal design.

Other common findings about adult education and training found in the literature are also found in the SLID data. The incidence of education programs declines quickly with age, although the incidence of courses does so at a much slower rate. There is no clear gender differential in incidence and those employed in larger firms are more likely to undertake courses, although not more likely to participate in education programs.

SLID allows us to go beyond the normal cross-sectional approach to incidence that uses contemporaneous individual and firm attributes to investigate the issue. The report finds that recent job changes and recent unemployment spells are statistically significant predictors of the start of education and training activity, although the magnitude of the effects is small.

Estimating the earnings and employability impacts of education and training has spawned an entire literature on program evaluation and this report can only offer suggestive findings. There is evidence that undertaking investments in either programs or courses during a year has a positive impact on wage changes during that year. Programs produce larger impacts, as is to be expected given the larger investments required by them. The wage growth effects of courses are moderate, and larger for men than for women. Undertaking training courses is associated with reduced incidence and duration of unemployment in the subsequent year. Educational programs appear to increase incidence but have no impact on duration.

This report has been more suggestive than definitive. Several issues and opportunities have been identified as being worthy of (and needing) separate inquiries of their own. The ability to observe monthly indicators of education or training activity, as well as monthly labour force status and job identifiers might be explored with the more appropriate event history econometric methods. The earnings and employment impacts of education and training each are deserving of separate research initiatives. Clearly, SLID has considerable amounts, and new types, of data that could be converted to information about adult education and training in Canada and the role that these activities play in personal and national economic well-being.

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8. Appendix

Table A.1
Incidence of Adult Education and Training: 2002, 2003, 2004

Type of Institution	Incidence		
	2002	2003	2004
Business/Commercial School	0.45%	0.30%	0.30%
College/Applied Arts	2.54	2.34	1.79
CEGEP	0.30	0.17	0.20
High School	0.25	0.19	0.15
Trade School	0.96	0.96	0.64
University	3.20	2.84	2.35
Job-Related Courses	22.10	21.06	20.72

Source: SLID