



State of knowledge review of the wider benefits of adult learning

Adult Learning and Returns to Training Project

Karen Myers | Marc Frenette | Arthur Sweetman | Benoit Dostie | Christopher Langlois

May 2014



SOCIAL RESEARCH
AND DEMONSTRATION
CORPORATION

SOCIÉTÉ
DE RECHERCHE
SOCIALE APPLIQUÉE

The Social Research and Demonstration

Corporation (SRDC) is a non-profit research organization, created specifically to develop, field test, and rigorously evaluate new programs. SRDC's two-part mission is to help policy-makers and practitioners identify policies and programs that improve the well-being of all Canadians, with a special concern for the effects on the disadvantaged, and to raise the standards of evidence that are used in assessing these policies.

Since its establishment in December 1991, SRDC has completed over 100 projects and studies for various federal and provincial departments, municipalities, as well as other public and non-profit organizations. SRDC has offices located in Ottawa, Toronto, and Vancouver.

For information on SRDC publications, contact

Social Research and Demonstration Corporation
55 Murray Street, Suite 400
Ottawa, Ontario K1N 5M3
613-237-4311 | 1-866-896-7732
info@srdc.org | www.srdc.org

Vancouver Office
128 West Pender Street, Suite 301
Vancouver, British Columbia V6B 1R8
604-601-4070 | 604-601-4080

Toronto Office
481 University Avenue, Suite 705
Toronto, Ontario M5G 2E9
416-593-0445

Published in 2014 by the Social Research and
Demonstration Corporation

Table of contents

Introduction	1
Report purpose	1
Companion reports	1
Foundational learning	3
Inputs and outputs for foundational learning	4
Inputs	4
Outputs	5
Intermediate outcomes of foundational learning	6
Human capital	6
Social capital	8
Psychosocial capital	9
Final outcomes of foundational learning	11
Individual financial outcomes	11
Individual non-financial outcomes	21
Social final outcomes	24
Firm final outcomes	26
Summary of state of knowledge for foundational learning	28
Higher education	30
Inputs and outputs for higher education	31
Inputs	31
Outputs	32
Intermediate outcomes of higher education	32
Final outcomes of higher education	33
Individual financial outcomes	33
Individual non-financial outcomes	37
Social final outcomes	38
Firm final outcomes	41

Summary of state of knowledge for higher education	41
Workplace learning	43
Inputs and outputs for workplace learning	44
Inputs	44
Outputs	44
Intermediate outcomes of workplace learning	45
Final outcomes of workplace learning	45
Individual financial	46
Individual non-financial	48
Firm final outcomes	48
Summary of state of knowledge for workplace learning	52
Summary – State of knowledge, gaps, and avenues for further research	53
State of knowledge, gaps, and avenues for further research	54
Foundational learning	54
Higher education	55
Workplace learning	57
Definitions of key terms	60
References	63
Appendix A: A high-level conceptual framework for understanding adult learning outcomes	84

Introduction

Report purpose

This *State of Knowledge Review* is one in a series of papers that have informed the development of an analytical framework for the *Adult Learning and Returns to Training Project*. The project is a three-year multi-disciplinary and collaborative effort to further the knowledge base of conceptual, analytical and methodological issues concerning the scope and measurement of adult learning activities and their associated financial and non-financial returns to individuals, firms and society at large.

The aim of this report is to provide an analysis of the best available empirical evidence on the outcomes associated with participation in adult learning. The review is not meant to be an exhaustive review of the field but rather to provide a conceptual map that helps consolidate knowledge and identify gaps and areas for further policy relevant research. Consistent with our conceptual framework (see Appendix A, or the *What Matters and What Should Count* report), our review considers the literature on a wide range of financial and non-financial outcomes for individuals, firms and society. Our discussion is organized around three broad categories of adult learning: foundational learning; higher education; and workplace learning.

In general, we aim to only include studies in this review if they meet the quality criteria outlined in the *Practical Guide* for generating causal estimates of a program's impact. In the hierarchy of evidence shown in Figure 1, this generally corresponds to the first four types of studies. However, in cases where the literature is sparse, studies that do not meet the criteria are included if a case can be made that they enrich our knowledge base. Throughout the review, a distinction is made between studies that provide descriptive analysis and studies that aim to estimate causal impacts.

Companion reports

The analytical framework for the *Adult Learning and Returns to Training Project* consists of five companion reports. The first report is the *Typology*. The *Typology* report proposes a typology of **adult learning** activities created for this project. The second report, *What Matters and What Should Count*, provides a high-level conceptual framework for investigating a wide range of outcomes associated with various types of adult learning. The third report, the *Practical Guide* is intended to be a user-friendly guide to understanding key methodological issues in the literature on returns to adult learning. The fourth piece is this *State of Knowledge Review*. The fifth piece is a *Dictionary* report that provides definitions for key concepts from all of the companion reports.

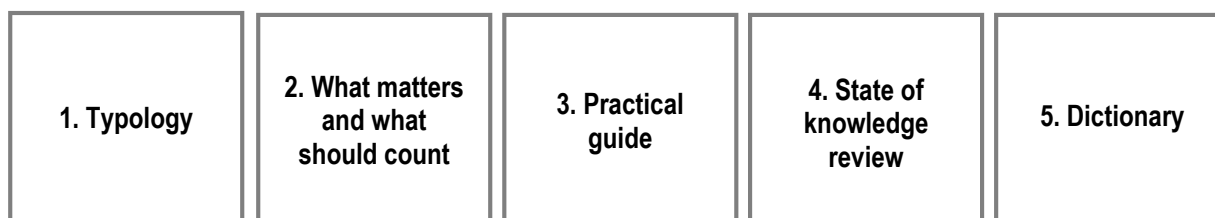


Figure 1 Hierarchy of evidence

Type	Design features	Evidence quality
Systematic reviews and meta-analysis	Use established approach to synthesize all quality research evidence (esp., “upper tier” studies) on a specific issue.	Strongest evidence but only as strong as underlying evidence.
Upper Tier – Individual studies with randomization/credible source of exogenous variation		
Randomized experiments	Well-designed with sufficient sample size.	Very strong evidence.
Natural experiments	High quality source of exogenous variation generating comparison group that provides credible approach to estimating counterfactual. Well-designed pre-post measures of outcomes and well-measured and appropriate data with large sample. Employs techniques such as regression discontinuity, instrumental variables, difference-in-differences or propensity score matching.	Very strong evidence if the source of exogenous variation is credible and if appropriate econometric/ statistical technique(s) is (are) employed to extract the information from the data.
Middle Tier – Limited or no source of exogenous variation, but with credible comparison group/counterfactual		
Some control in the assignment of treatment	Limited source of exogenous variation or some control of selection process (e.g., program administrator, perhaps non-randomly, assigns treatment; different sites follow different procedures; or individuals select into limited range of options). Well-designed pre-post outcome measures; dynamic pre-treatment measures; well measured, appropriate data with large sample. Employs techniques such as difference-in-differences and/or propensity score matching, or an appropriate regression technique.	Studies in this tier produce evidence that ranges from <i>very strong</i> and <i>strong</i> to <i>moderate</i> depending on specific design features. All other things being equal, studies with some control in assignment of treatment are generally ranked higher than studies without control.
Correlational studies including studies relying on selection on observables and case studies with a comparison group	Reasonable approach to estimating counterfactual; well-designed pre-post measures of outcomes; large sample and rich set of covariates. Quality of the comparison group is critical. Employ techniques such as difference-in-differences; population correlation designs; propensity scoring matching, hierarchical linear modeling, structural equation modeling, and OLS regression. Longitudinal designs may use techniques like fixed effects.	Studies without any exogenous variation but with a credible comparison group/counterfactual generally produce evidence that ranges from <i>very strong</i> and <i>strong</i> to <i>moderate</i> depending on specific design features.
Lower Tier – Studies without measured comparison groups/counterfactuals		
Studies without comparison group	Credible case selection, explicit causal logic model and analytical strategy, understanding of the process, quality outcome measures.	Evidence should be considered suggestive.
Participant satisfaction	Collect feedback from participants on value of intervention. Better quality studies ask about “value added” or change in relevant outcomes following from treatment, rather than only eliciting measures or opinions regarding satisfaction, inputs, outputs, processes, or outcomes.	Care needs to be taken to understand potential biases and interpret the findings accordingly.
Expert opinions	Respected organizations or individuals, explicit rationale for opinion.	
Exploratory case studies	Less credible/explicit: case selection criteria, theory of change, analytical strategy or outcome measures. Does not have good quality (or any) outcome measures. May rely on measures of inputs or outputs.	Evidence should be considered suggestive.
Caveat emptor: Some studies claim a high quality source of exogenous variation or rich covariates for matching, but the reader must decide for herself whether these claims are credible. A study using an instrumental variable approach with a poor source of exogenous variation may be best discarded. Even the most sophisticated technique cannot extract information from data that is not there to start with.		

Foundational learning

Foundational learning provides instruction on the basic skills and learning strategies required for further learning or employment. This type of training is targeted to adults who left initial education without qualifications or who have qualifications but need to improve basic skills.

Inputs and outputs for foundational learning

*Inputs are the financial and non-financial resources employed to provide/participate in the learning activity.
Outputs are the immediate, tangible products of learning activity.*

Inputs

From a learner's perspective, inputs to foundational learning include direct costs such as tuition and indirect costs such as transportation and childcare expenses, as well as what economists call the "opportunity costs" of lost leisure time and forgone earnings. From a program provider perspective inputs can be interpreted narrowly to include things like total expenditure per learner and class size or more broadly to include things like professionalization of instructors and the delivery infrastructure.

We are not aware of any rigorous studies that investigate how inputs to foundational learning activities affect outcomes of interest. This is a critical area for further research because adult learning differs from other education sectors in that there is a very wide range of providers, with very different ethos, levels of quality, and methods of accountability. As Feinstein and Sabates (2007) point out, in the adult education sector, "there is relatively little knowledge about what is provided for whom, and to what the effects" (p. 11).

However, there is emerging evidence to suggest that quality matters. In early reviews of the literature on government sponsored training programs, both Martin and Grubb (2001) and Smith and Plesca (2000) assert that the quality of programs targeted to unemployed individuals varies dramatically and that these variations in quality are likely directly linked to outcomes. According to these authors, the most important design features are the inclusions of a substantial work experience component and the opportunity to earn a credential that is recognized by employers in the local labour market. This conclusion is echoed more recently in reviews of the literature by Ferrer and Riddell (2008) and Meager (2008).

While little Canadian research exists specifically on inputs to foundational training, there is some emerging Canadian evidence to suggest that even seemingly small details, such as the choice of instructional material, can make a difference. For example, in an exploratory study of Canadian literacy and essential skills upgrading programs, Kline (2009) found that programs that used primarily "authentic" workplace materials were associated with significantly higher skills gains than programs that used more traditional academic approaches.¹

While the literature suggests that quality matters, the answer to improving quality may not be as straightforward as increasing inputs. The literature on the K to 12 education system provides some insights that may be relevant. While there is some evidence that increased inputs (i.e., school resources) are associated with improved labour market outcomes, especially when the initial level of inputs is low, the bulk of evidence suggests that the link between resource inputs and cognitive

¹ In this context, "authentic" means that learning activities are based on documents and other materials actually used in jobs or occupations that are relevant to the learner.

outcomes (test scores) and labour market outcomes is tenuous at best (Hanushek, 1996; Betts, 1996). For example, Card and Krueger (1992), and Heckman, Layne-Farrar and Todd (1995a, 1995b), use data from the US for the American born to look at the impact of educational inputs on labour market outcomes where identification of the exogenous variation comes from individuals who migrate across states. While they find some evidence that inputs matter, the connection is surprisingly weak.² There is an increasing consensus that common measures of teaching quality such as years of experience and having a master's degree have very little influence on outcome measures such as test scores. (See Hanushek and Rivkin for an overview of this literature.) The implication for foundational learning is that the answer to improving quality is not likely as straightforward as investing more resources or professionalizing the field.

Outputs

Our conceptual framework defines outputs narrowly to include the immediate, tangible products and services of learning activities. While analyzing outputs can theoretically indicate the extent to which learning resources were used as intended, there is general agreement among expert practitioners that typical output indicators such as contact hours are only weakly if at all associated with outcomes of interest.

We are not aware of any studies that investigate the relationship between outputs and outcomes. Existing literature is overly dependent on one-dimensional output measures. Even in otherwise high quality studies, participation in adult learning is often measured in binary terms as either one or zero. Indeed, there is often an assumption that “more is better” both in terms of funding, and the number and duration of the learning episodes.

Another measurement challenge is that what happens in the classroom and what is officially reported as contact hours may only be part of the story. As Reder and Strawn (2006) point out in their study of educationally disadvantaged adults, almost half of the learners who were part of their study participated in self-paced study outside of the classroom. Understanding how much learning time is spent outside of the formal classroom is an area worth further investigation.

² Note that they are looking at an earlier era when relative resource increases were relatively large compared to the present period.

Intermediate outcomes of foundational learning

Intermediate outcomes are outcomes which are not usually of value in themselves but are valued because they support the attainment of final outcomes of interest. Our review is organized around three types of intermediate outcomes: human capital; social capital and psychosocial capital.

Human capital

Human capital is the stock of knowledge and skill that an individual possesses as a result of education, training, and experience. We identify four studies that systematically investigate the relationship between participation in foundational learning and human capital gains. In three of the studies, the key indicator is skills gains as measured by pre- and post-program test scores. A fourth study uses changes in self-reported literacy practices. In terms of our hierarchy of evidence (see Figure 1), none of the studies use an exogenous source of variation for selection into the learning intervention, and only one of the studies (Reder, 2009) uses a comparison group. However all four studies take advantage of longitudinal designs that allow skills gains to be directly measured both before and after program participation.³

Two of the studies are recent UK studies that investigate human capital gains associated with participation in foundational adult learning. The first study, Warner and Vorhaus (2008), includes 1,649 learners who participated in numeracy, literacy and English as a Second Language (ESL) courses. Learners wrote nationally recognized, standardized tests for both literacy and numeracy that were specifically designed for the *Skills for Life* program.⁴ On average, numeracy, literacy and ESL learners made significant progress on the *Skills for Life* qualifications framework advancing from what is called Entry Level 3 up to Level 1.⁵

Another UK study (Wolf et. al, 2009) evaluated literacy and numeracy programs delivered in the workplace. Programs were typically about 30 hours in length and were delivered at 53 workplaces to 567 participants. Participants' skills were assessed using an instrument called the *GO! Reading Test* at

³ There are several additional studies that explore the relationship between participation and skills gains, however gains are evaluated primarily in terms of post program self reports. Because self-reported gains are not even benchmarked against learners' pre-program perceptions, these, studies do not meet the minimum standards for inclusion in this review. It is also worth noting that there a handful of random control trials that were conducted in UK in the 1980s and early 1990s. Brooks et al. (2003) concludes that most of studies had significant methodological problems, such as small sample size, unclear method of random allocation and high attrition rate. Thus, these studies are also not included.

⁴ Introduced in 2001, Skills for Life was a national strategy to increase skill levels for low skilled adults in the UK. The strategy included the launch of new skills standards, standardized assessments, and a new curriculum to be delivered a variety of contexts including the community and further education institutes.

⁵ Skills for Life (SfL) Entry Levels 1 and 2 roughly correspond to IALS Level 1, SfL Entry Level 3 with IALS Level 2, SfL Level 1 with IALS Level 3, and SfL Level 2 with IALS Level 4 and 5 (Gillespie, 2004).

three points: before the course began, one year after it ended, and then again 1.5 years later. In contrast to the Warner and Vorhaus (2008) study, skills gains were found only for ESL learners.⁶

One possible explanation for this difference is that while programs studied by Wolf et. al were delivered in the workplace, the programs studied by Warner and Vorhaus were delivered by colleges of further education. However it is difficult to make direct comparisons, since not only were the workplace courses much shorter, but the assessment instrument was also different. Both these factors may also have affected results. It is also worth noting that despite a lack of skills gains, Wolf et. al (2009) did find a significant increase in participation in further learning. The one-year follow up found that participation in further education was significantly higher when compared to a matched sample from the Labour Force Survey. This finding lends support to the notion that the courses were too short in themselves to generate skills gains; however they did provide a bridge to further learning.

A US study (Hollenbeck and Timmeney, 2009) also investigated the efficacy of basic skills training, offered at 10 workplaces in Indiana. The study assessed gains in reading and math using an instrument called the *Comprehensive Adult Student Assessment System* (CASAS). The study reported that the majority of participants made improvements in their test scores, but that gains were small.⁷ About two-thirds of participants made gains in math scores and just over half of participants made gains in reading scores. Perhaps more interestingly, the study also reports considerable variation in both program design and participation outcomes. According to the authors, two features were consistently associated with positive outcomes. The two features were: first, having a senior executive who acted as a “champion” for the program; and second, providing release time so that employees were fully compensated for hours when they were training rather than working.

A second US study (Reder, 2009) investigated how participation in various forms of adult learning affects both proficiency and actual practices. The study was designed to be representative of high school dropouts in the Portland, Oregon metropolitan area between the ages of 18 to 44. The sample included 496 individuals selected by random-digit dialing, and 444 individuals selected from enrolment forms distributed at local adult education centers. Data was gathered in five waves between 1998 and 2005. Hierarchical linear growth-curve models were used to measure changes in practices and proficiencies. A key finding of the study is that proficiencies and practices continue to develop even after individuals leave school. Individuals who experienced skills gains were more likely to report that they regularly practiced their skills in day to day activities. While the study did not find a direct relationship between participation in a learning program and increased skills, it did find that participation in learning programs is associated with a strong and immediate relationship with increased literacy *practices* in everyday life. As Reder explains, “we found no short term effects of such events (including program participation, self-study, or receipt of GED) on proficiency development, but we did find clear short-term effects on measures of engagement in literacy and numeracy practices. Since we found positive correlations between rates of growth in proficiency and practices, it may be

⁶ As the authors note, because the study did not include a comparison group, it is impossible to rule out that these gains accrued at least in part due to more time spent living in the UK and working in an English speaking workplace.

⁷ These findings should be interpreted with caution since the authors report numerous challenges with the administration of the test instrument.

that these short term impacts on practices will eventually mediate longer term effects on proficiency development” (81).

Only two of the four studies described above find that participation in foundational learning was associated with skills gains. Interestingly, no clear pattern emerges by country (UK versus US) or by provider (college-based versus workplace-based). There are several possible explanations, including the obvious possibility that programs reporting gains were better designed to meet learner needs than programs that did not report gains. Other possible explanations may be related to program length and the validity of the assessment tool. For example, to what extent are the assessment instruments aligned with actual skills taught in the learning programs? This is an area that requires further research.

Social capital

Our framework defines social capital using a social network approach, which emphasizes network characteristics that are measurable and possibly influenced by programs. This definition distinguishes social capital from activities to which it may be related, such as volunteering and civic engagement. Social capital outcomes can be separated into bridging and bonding social capital. Bonding social capital refers to relatively homogenous networks connected primarily by close or strong ties. In contrast, bridging social capital refers to networks that include important connections with those unlike ourselves, usually characterized by distant or weak ties. Our framework conceptualizes the development of bridging social capital in particular as a key intermediate outcome of adult learning that may play an intervening role in the realization of socio-economic long-term outcomes.

We were not able to find any studies on the relationship between foundational learning and social capital that meet our standards for inclusion in this review. Although there are numerous studies that investigate this relationship, most studies use only post-program self reports and often suffer from poorly designed measures. In this section we discuss three studies that, while strictly speaking do not meet our standards for inclusion, are at least strengthened by longitudinal designs that capture change over time. The findings of these studies should be considered tentative at best, since these studies often do not follow even basic scientific conventions such as reporting whether or not effects are statistically significant.

A recent US study (McDonald and Scollay, 2009) explored the relationship between participation in a literacy program and the development of an individual’s social network. The authors conducted a three-year longitudinal study of 132 learners and 127 tutors who participated in a California state-wide family literacy program. Using Antonucci’s “social convoy method,” participants were asked to list the people in their lives who would count as being on the inner, middle or outer circle in their social networks – being in one of these circles indicates that such individuals are, to varying degrees, significant members of the respondents’ social lives. About 68% of participants reported having larger social circles by the two year mark. The largest increases were seen in the middle and outer circles, suggesting an increase in the number of social contacts a respondent had through work or education, rather than neighbours or family. Note that effect sizes and significance tests were not reported.

A Scottish study (Maclachlan et al., 2009) explores the relationship between participation in literacy, numeracy and computer skills training and changes in measures of social capital. The study was composed of 613 learners who participated in a first wave of interviews, 393 of whom were

interviewed again one year later. Changes in social capital were measured based on participants' responses to questions about attitudes and beliefs, such as whether they feel safe in their neighbourhood and whether they have friends to turn to for help, as well as participation in a range of activities, such as going to pubs, cinemas, community events or volunteer activities.⁸ Over the course of the observation period, the percentage of women who reported going out regularly increased from about 50% to 61%. There was also a small increase in the percentage of learners who felt they could seek help from their neighbours and friends (88% to 92%). Again note that significance tests are not reported. In addition, despite 38% of participants being men, findings are reported only for women.

In an Australian study, Balatti et al. (2006) investigate how participating in adult literacy and numeracy courses in Australia is related to changes in social capital. Interview data was coded against two distinct frameworks. The first framework was based on 12 indicators of social capital that aimed to capture changes in network quality, structure, transactions and types. The second framework aimed to capture changes in socio-economic outcomes such as health outcomes, employment and access to goods. The key finding of the study is that learners' social networks directly produced the resources that lead to changes in literacy and numeracy skills and self-confidence, which in turn led to improved socio-economic outcomes. While this claim suggests an important relationship between intermediate and final outcomes of interest, the authors do not report their findings systematically, and in fact provide little data to support their main finding. This makes it difficult to assess the robustness of their claims.

Psychosocial capital

Psychosocial capital includes non-cognitive skills or attributes such as self-efficacy, self-esteem and time and risk preferences. Numerous studies report that participation in adult learning is positively associated with improvements in one's self-esteem and/or self-efficacy. However, we only found a handful of studies that operationalize psychosocial concepts using scales or other well-defined measures. In terms of our hierarchy of evidence, we did not find any studies that use an exogenous source of variation, and only one study uses a comparison group.

Using data from the *Longitudinal Study of Adult Literacy Participants in Tennessee*, Bingman et al. (1999) measure changes in self-esteem for 199 literacy training participants who were followed up with about a year after their initial enrolment.⁹ The study reports a statistically significant increase in self-esteem from 3.52 to 3.66 on the five point Rosenberg Self-Esteem Scale.

In a more recent exploratory case study from New Zealand, Benseman and Tobias (2003) examined the relationship between participation in adult literacy offered by colleges and gains in self reported self-confidence and basic skills. Participants assessed their own skills in reading, writing, spelling, math and computer use, relative to a three level scale, where learners reported their skills to be "not very good, okay, or good/very good." Pre- and post-program self-assessments of skills changed greatly: in terms of writing, the proportion of individuals who reported their ability as "okay, or good/very good" increased from 20% to 73%; similar gains were reported for reading (28% to 89%), math (46% to 84%), spelling

⁸ Note, these measures would not fit our definition of "social capital" but instead would be considered indicators of social engagement and inclusion.

⁹ Roughly two thirds of the group had received less than 80 hours of training, while one third received more. With respect to most survey questions this difference in training hours was not significant.

(13% to 63%) and computer skills (6% to 66%). In addition, respondents were asked if they had developed more confidence as a result of participation. On a five point scale ranging from “much less confident” to “much more confident” 36% claimed to be “more confident” and 48% claimed to be “much more confident” after participating in one of the programs.

Using data from the *British National Child Development Study* (NCDS), Hammond and Feinstein (2005) investigate the relationship between participation in adult learning and self-efficacy. Self-efficacy is measured based on responses to three questions in the surveys in which respondents were given a choice between two statements, one negative and one positive, regarding: a) whether they felt they were getting what they wanted out of life; b) whether they felt they had control over their lives; and c) if they found their problems manageable. They find that individuals who participated in adult learning at some point between the ages of 33 and 42 were 1.34 times more likely to report increased self-efficacy than those who do not participate. Although the study does not specifically focus on foundational learning, we include it here because the likelihood of reporting increased self-efficacy was considerably greater for women with low levels of school attainment.

A more recent study by Metcalf et al. (2009) evaluated college-based literacy and numeracy courses delivered as part of the UK's *Skills for Life* program. This study provides the most rigorous evidence that we are aware of on psychosocial outcomes. The study uses a longitudinal design and includes a sample of adult course participants who had left full-time education, drawn from course enrolment lists (termed the “learners”). The comparison group (i.e., “non-learners”) was drawn from survey data, based on individuals sharing the same characteristics as the learner group. All individuals in the study were given literacy and numeracy tests in the baseline year of the study. To become part of the study sample, individuals had to perform poorly on one of the tests. The initial sample was about 2000 for each group. These two groups were then followed-up for the next three years.¹⁰ While the study did not find any impact on employment or earnings, even three years later, participants experienced a substantial increase in self-esteem measured using a shortened and simplified version of the Rosenberg self-esteem scale. While learners reported a 0.7 increase in self-esteem, non-learners reported a 0.5 decrease; this was statistically significant at the 0.1 level. The authors also report improvements in the ability of learners to conduct a wide range of everyday activities, and independence.

All of the studies discussed above find that participating in learning is associated with modest but statistically significant increases in either self esteem and/or self efficacy. While none of the above studies use an exogenous source of variation or even a high quality comparison group, all of the studies do use a pre-post design and measures based on either standardized scales or reasonably well-designed measures. Given the largely positive results, this is a promising area for further research with more rigorous designs, especially ones that investigate the extent to which changes in psychosocial capital are related to final outcomes of interest.

¹⁰ However, sample attrition was significant, leaving the researchers with about 400 to 500 participants in each group three years later. Although this is a significant loss in sample, there was no systematic attrition based on the initial learning status (learner or non-learner).

Final outcomes of foundational learning

A final outcome is an outcome that is related to the fundamental purpose of implementing, providing, funding, or participating in the learning activity. We distinguish between types of final outcomes depending on to whom they accrue (individuals, firms, society). We also distinguish between outcomes depending on whether they are financial or non-financial.

Individual financial outcomes

Individual financial outcomes are those outcomes experienced by individual learners and their families that can be expressed directly as dollar figures, such as earnings. There are a number of rigorous US based studies that use a random assignment design to investigate outcomes associated with various types of foundational learning for individuals who are unemployed – especially social assistance recipients. There are also a number of high quality US studies that look specifically at outcomes associated with obtaining a GED. Although there are no Canadian studies that employ a random assignment design, there are a few studies that draw on large-scale administrative datasets.

Evidence from California's Greater Avenues for Independence Program (GAIN)

One of the more rigorous studies on foundational skills training comes from California's *Greater Avenues for Independence* (GAIN) program (Riccio et al., 1994). This program was rigorously evaluated through random assignment by Manpower Demonstration and Research Corporation (MDRC). During the late 1980s and early 1990s, applicants and recipients of Aid to Families with Developing Children (AFDC – the US version of social assistance at the time) in six counties in California were categorized into two groups: one whose participation in GAIN was mandatory, the other who was exempt from GAIN. The mandatory group consisted of single heads of families and heads of two-parent families (totalling about 33,000 in the six counties). This group was then randomly assigned into treatment and control groups. Individuals in the treatment group were offered training through GAIN. Individuals in the control group were not offered training from GAIN, but were free to receive similar training from other sources if they chose to do so at their own expense.

The type of training offered depended on certain characteristics of the treatment group. Individuals with no high school diploma or its equivalent, or who failed to achieve predetermined scores on math and reading tests, or were not proficient in English were deemed “in need of basic education.” Basic education was used as a broad banner for Adult Basic Education – ABE (literacy and essential skills), Generalized Educational Development – GED (high school equivalency), and English as a Second Language – ESL (language training). These individuals could choose a basic education class, or choose a job search class first. The job search class is similar to employability training. A second group was designated as “not in need of basic education.” In this case, individuals were offered job search training.

Not everyone in the treatment group received foundational training, as compliance was less than perfect. Furthermore, some individuals may have stopped receiving AFDC prior to their training. Nevertheless, the offer of training did generate an increase in the average number of months of training

in foundational skills. For single parents, the increases were 0.6 for job search, 2.1 for ABE/GED, and 0.6 for ESL (an additional 3.3 months of foundational skills training over the first two to three years following orientation). For heads of two-parent families, the increases were 0.7 for job search, 1.4 for ABE/GED, and 1.1 for ESL (an additional 3.2 months of foundational skills training).

What was the overall impact of these increases in foundational training? The impact in this experimental design refers to the difference in outcomes between the treatment and control groups. The impact of an additional 3.3 months of foundational skills training for single parents was to raise their annual earnings three years after orientation by \$636. For heads of two-parent families, the impact of 3.2 months of foundational training on annual earnings three years following orientation was \$355. Given the population under study (AFDC applicants and recipients), these gains were not negligible in relative terms: 25% for single parents and 11% for heads of two-parent families. Employment rates rose as a result of the program. For single parents, the employment rate was 6 percentage points higher if offered the treatment. For heads of two-parent families, the increase was 4.5 percentage points. The program also lowered welfare dependency, as annual AFDC payments were reduced by \$331 among single parents and by \$277 among heads of two-parent families.

An important point to keep in mind for this study is that the results refer to the intention to treat impact. In other words, it evaluates the impact of offering the treatment on participants' outcomes. The actual impact on those who take-up the training is likely to be larger, although subject to selection bias.

Evidence from the National Evaluation of Welfare-to-Work Strategies (NEWWS)

In the mid 1990s, in partnership with MDRC (Hamilton et al., 2001), the US Department of Health and Human Services (HHS) undertook a study of the effectiveness of welfare-to-work programs. The *National Evaluation of Welfare-to-Work Strategies* (NEWWS) is a study of the effectiveness of eleven mandatory welfare-to-work programs in seven locales: Atlanta, Georgia; Columbus, Ohio; Detroit and Grand Rapids, Michigan; Oklahoma City, Oklahoma; Portland, Oregon; and Riverside, California. Program impacts were evaluated by comparing outcomes for individuals who were randomly assigned to the experimental group with outcomes for individuals that were assigned to a control group. As part of the overall evaluation, the effects of two approaches to preparing welfare recipients for employment were compared in three sites (Atlanta, Grand Rapids, and Riverside). In first approach, the *human capital development approach*, individuals were directed to participate in basic skills training and, to a lesser extent, occupational training before they sought work, under the theory that they would then be able to get better jobs and keep them longer. In the other approach, the *labour force attachment approach*, individuals were encouraged to gain quick entry into the labour market, even at low wages, under the theory that their work habits and skills would improve on the job, and they would thereby be able to advance themselves.

Bos et al. (2002) provide a detailed analysis of the findings related to foundational training. The types of adult education offered under the human capital development approach included adult basic education (ABE) classes, programs preparing students for the GED exam, regular high school classes, and classes in English as a Second Language (ESL). Among these, ABE and GED preparation accounted

for most of the adult education that was delivered.¹¹ In providing services for welfare recipients, adult education programs generally did not adapt their curricula or teaching methods to fit the specific needs of this group of students. Overall, assignment to the human capital approach did not pay off for the welfare recipients in the study in terms of their education outcomes. Most participants did not earn a GED, and few experienced significant increases in their reading and math skills. In terms of labour market outcomes, three-year impacts on earnings and welfare receipt were smaller than those experienced by welfare recipients assigned to the *labour force attachment approach*. However, among the minority of students who did earn GEDs or participated in postsecondary programs, there were substantial benefits in terms of employment, earnings, and self-sufficiency. In other words, although few participants had positive educational outcomes, having a positive educational outcome was strongly associated with having positive labour market outcomes.

The study further observed that the individuals who were most likely to have positive educational outcomes (such as obtaining a GED certificate or participating in postsecondary education) were those who already had higher initial reading and math skills when they entered the welfare-to-work programs. In other words, the educational intervention worked best for those who already had a minimum threshold skill level. The study also noted that higher average levels of teachers' experience and education in the adult education programs were associated with enhanced payoff to participation in adult education in terms of reading and math skills.

The authors point out several caveats that should be considered in interpreting results. First, the findings reflect on the effectiveness of adult education services provided to a highly disadvantaged group of students: low-income, mostly jobless, single-parent women who lack a high school diploma or GED and are receiving welfare. Second, for welfare recipients in this study, participation in adult education was mandatory. While "traditional" adult education students enrol on a voluntary basis and can therefore be presumed to be motivated to learn, such motivation may sometimes be lacking when students are compelled to participate by mandatory welfare-to-work programs. Like most other adult education students, those mandated to participate often have done poorly in school in the past and may be alienated from traditional educational institutions and modes of instruction. Unlike the voluntary or traditional students, however, students connected to a welfare-to-work program may initially be motivated to attend classes less by the desire to learn or to obtain a credential than by the need to comply with welfare-to-work program requirements in order to avoid reductions in their welfare grant. A third factor that could not be taken into account in the study is that the prevalence of learning disabilities among welfare recipients is estimated to be between 25 and 50 percent. As the program did not assess for learning disabilities, this could affect the programs' ability to address these disabilities, clients' skill development in the programs, and clients' subsequent labour market success.

Evidence from the Jobs Training Partnership Act

As Decker (2010) points out, a critical turning point in the creation of evidence on the efficacy of employment and training programs was the US Department of Labor's *National Job Training Partnership Act Study* (Bloom et al., 1997). The study used a research design based on random

¹¹ Program intake for this study began in June 1991 and ended in December 1994; findings cover June 1991 through December 1997.

assignment of applicants to a treatment group offered JTPA services, or to a control group denied access to JTPA. Furthermore, the study sample was intended to be nationally representative, so that findings could be generalized to the program nationwide. This was one of the first large-scale efforts to assess the effects of an ongoing national workforce development program using random assignment.¹²

According to Bloom et al. (1997), the program generated a modest increase in the earnings and employment of both disadvantaged women and men who enrolled in the program. They reported that JTPA increased total earnings among women enrollees by an average of \$2,738 (converted to 2005 dollars) over the 10 quarters following random assignment. For disadvantaged men, JTPA generated a somewhat smaller increase in earnings — \$2,383, on average. As a percentage of control group means, the earnings increase for women — 15 percent — was substantially larger than the increase for men — 8 percent. After accounting for program costs, the net benefits per enrollee were nearly identical for women and men (\$763 per enrollee).

The most interesting finding for our purposes relates to outcomes associated with the service strategies tested in the study. JTPA counsellors referred eligible applicants to one of three service strategies — (1) classroom training in occupational skills, (2) a mix of on-the-job training (OJT) and/or job search assistance (JSA), and (3) other services, which could include job search assistance, basic education, work experience, or other miscellaneous offerings, but not classroom training in occupational skills or OJT. Bloom et al (1997) found that for women, there were slight variations in estimated impacts by type of service. For women, the second and third strategies produced significantly positive impacts, increasing earnings per enrollee by \$3,416 and \$5,886 respectively. In contrast, the point estimate for the group recommended to classroom training in occupational skills was substantially smaller, at \$939, and not statistically significant. For men, the estimates were moderate and consistently positive across the three service strategies; however, none of these estimates was statistically significant, even though the overall impact estimate for men was positive and statistically significant.

Heinrich et al. (2009) present more recent non-experimental estimates for the *Adult and Dislocated Worker* programs under the current *Workforce Investment Act* (WIA). WIA is the primary federal job training program in the US. The study uses administrative data from 12 states, covering approximately 160,000 WIA participants and nearly 3 million comparison group members. The key measure of interest is the difference in average quarterly earnings or employment attributable to WIA program participation for those who participate, estimated for up to four years following entry into the program using propensity score matching methods. The results for the average participant in the WIA Adult program show that participation is associated with a several hundred-dollar increase in quarterly earnings. Adult program participants who obtain training have lower earnings in the months during training and the year after exit than those who don't receive training, but they catch up within 10 quarters, ultimately registering large total gains. The marginal benefits of training exceed, on average, \$400 in earnings each quarter three years after program entry. In contrast, dislocated workers experience several quarters for which earnings are depressed relative to comparison group workers

¹² Although the study was unsuccessful in recruiting a nationally representative sample, the researchers succeeded in implementing the random assignment design and obtaining internally valid and reliable estimates of the JTPA programs overall as well as impacts of different service strategies.

after entering WIA, and although their earnings ultimately match or overtake the comparison group, the benefits they obtain are smaller than for those in the general adult program.

It is important to keep in mind that the population under consideration for these studies discussed above (social assistance recipients) is likely to have a very low attachment to the labour market. We cannot say from these studies how foundational training would improve outcomes for individuals with a greater attachment to the labour market. In addition, studies also report considerable impact heterogeneity across sites where the experiments are conducted. It is not clear if this is related to differences in the implementation of the experiment, in local labour market conditions, and/or to differences in the characteristics of the participants. Low sample sizes by site may also play a role in generating varying impacts.

A further point is that contrary to workplace training (discussed later), this type of training often leads to occupational switching, which involves considerable destruction of human capital. This creates a large selection bias (i.e., individuals who apply for employability training are often destined to switch occupations). Using the US *National Longitudinal Survey of Youth* (NLSY), Kambourov et al. (2010) find that government-sponsored training (largely employability training) is associated with roughly a 10% increase in wages once they account for selection bias through matching on a wide range of observable characteristics including age, test scores, gender, race, education, and pre-training wage, and occupational switching. Training consisted of a mix of classroom and on-the-job training. Job search assistance was not considered since this is not associated with human capital (and thus, less related to occupational switching).

Canadian evidence

Turning to the Canadian evidence, Warburton (1996) evaluates the impact of literacy, numeracy, and high school equivalency training delivered in one college in British Columbia (Camosun College). Participants were welfare recipients at the time of registration, and a similar comparison group was used to estimate program effects. The study found that participation in training was not associated with a change in welfare dependency, even five years after starting the training program. The study did not look at other labour market outcomes, namely earnings.

In Canada, a significant proportion of employability training programs are linked to the *Unemployment Insurance Program* – UI (now called the *Employment Insurance Program* – EI). Park et al. (1996) evaluate five different programs made available to UI claimants between 1988 and 1991 under the Canadian Jobs Strategy. Using administrative data on earnings and survey data on UI claimants, they compare outcomes of participants in training programs before and after the training to those of non-participants over the same period (i.e., they estimate a fixed effects model). Their evidence is mixed: some programs raised earnings, while others did not. Moreover, some programs only worked when participants did not enter the labour market during a recession. When the programs did work, annual earnings increased by between \$2,000 and \$6,000. Unfortunately, no detailed descriptions of the training programs are provided, including their duration. However, the goal in each case was to raise the employability of participants.

In 1991, Canada consolidated several programs into the *Employability Improvement Program* (EIP). HRDC (1995) evaluated three components of the EIP: Job Opportunities (JO), Project-based Training

(PBT), and Purchase of Training (POT). Under JO, wage reimbursement and financial assistance for training costs were offered to employers who provided on-the-job training to participants. Integrated classroom and on-the-job training are provided to participants of PBT. The PBT program may include skills training, life skills, job search, and/or job placements. Finally, POT is delivered in the classroom and the training focuses on improving job skills. The duration of training under JO and PBT was 24 weeks, while for POT it was 15 weeks.

Using a combination of survey and administrative data, the study examined post-program labour market outcomes of EIP participants to those of EIP eligible non-participants, controlling for observable characteristics. Although the programs were not associated with a change in weekly earnings, participants did work between 10 and 13 additional weeks per year following each type of training program. As a result, annual earnings rose by about \$4,000 to \$5,000 in each case.

In 1996, the UI system was reformed. Aside from changes to eligibility rules, the new EI system placed more emphasis on training in EI Part II through its Employment Benefits and Support Measures (EBSMs). The federal government entered into Labour Market Development Agreements (LMDAs) with jurisdictions, and evaluations were conducted in five provinces and one territory: British Columbia (HRSDC, 2004), Nunavut (HRSDC, 2005), Newfoundland and Labrador (HRSDC, 2006), Alberta (HRSDC, 2009a), Saskatchewan (2009b), and New Brunswick (2009c). We focus more closely on British Columbia since it is the largest province; however results were generally similar in most provinces.

Between 2000 and 2001, current and former EI claimants in British Columbia were eligible to receive training. Training took many forms, including skills development (subsidies for training), wage subsidies offered to employers (to provide on-the-job training), self-employment subsidies, community-based job creation programs, job search assistance, and labour market partnerships (support for human resource planning under labour market adjustment). The average duration of training was 20 weeks. Participants and non-participants were compared using matching techniques. Matching variables included: motivation, employability, employment barriers, pre-participation work experience, past use of EBSMs, and demographic factors.

Although results were reported for both active and former claimants, the time span of the study (24 months) was likely too short to accurately assess the impact on former claimants. This group is more likely to be working, and as a result, their time spent training represents an opportunity cost (lost experience) that would negatively affect their wages compared to former claimants who did not participate in training. In fact, results for former claimants were often negative. Active claimants saw an increase of 155 hours of work per year over the first 24 months following training. The increase was larger for women than for men. In terms of annual earnings, they also increased following training (by \$1,181). Once again, results were more favourable for women (men actually saw their earnings decline). The gender differences in these results are generally consistent with those reported in Heckman et al. (1999).

Evidence on programs not specifically geared to unemployed individuals

We now turn to studies that focus on programs that were not specifically targeted to unemployed individuals. As Messer et al. (2010) point out, most literature focuses either on firm-financed training

or training geared toward unemployed individuals. There is a clear gap in the literature regarding programs aimed at the adult population at large.

A study by Hollenbeck and Huang (2006) evaluated the effectiveness of participants in various skills training programs delivered by community and technical colleges in Washington State. They estimate results for a suite of foundational skills (basic skills, language training, and preparation for high school completion), which are not separated and are collectively referred to as Adult Basic Education (ABE) in their study. They created a comparison group based on common characteristics through matching techniques. Their feeder pool for the comparison was limited to individuals who volunteered at the Labor Exchange, and thus, were likely similar to individuals taking basic skills training. All of the data were taken from administrative sources. As a result, sample attrition is largely not an issue. However, administrative data usually have few characteristics to match with. This might not be so limiting in this case given the pool (the Labor Exchange). Furthermore, administrative data do have some advantages when it comes to matching (e.g., matching on historical program use and low measurement error).

Hollenbeck and Huang (2006) find that the training was associated with a 5.9 percentage point increase in the employment rate of learners nine to twelve quarters after their learning activities. Despite this, there was no significant change in quarterly earnings. These poor earnings results may be related to the short follow-up period or to the small amount of training taken by participants (about two quarters, on average).

Note that the lack of earnings gains is possibly explained by negative selection in college-based literacy and numeracy courses. Although the authors control for a wide range of observable characteristics, participants probably also differ from non-participants in important ways that are unobservable. Importantly, those who registered for the courses may have had low literacy/numeracy skills to begin with, and this may have negatively affected their earnings. The fact that the authors find no effect may simply reflect a counterbalancing of the negative selection effect with a positive training effect.

Messer et al. (2010) provide the first experimental evidence on the effect of a government voucher program for the general adult population. The authors analyze the labour market effects of a large-scale randomized field experiment that provided vouchers for fee-based adult education courses to a representative sample of the adult population in Switzerland. In the experiment, a random sample of participants in the *Swiss Labor Force Survey* (SLFS), first observed in 2005, was issued a voucher that could be redeemed for adult education courses in the first half of 2006. The authors exploit the exogenous variation generated by random assignment of the voucher to identify causal effects of the voucher treatment on earnings, employment status, and subsequent participation in adult education in 2007. More than 10,000 individuals were observed from 2005 through 2007. The treatment group consisted of 1,422 individuals, which were compared to a control group of 9,099 individuals who did not receive the voucher offer.

The overall voucher effect is determined by the rate at which vouchers are picked up in the treatment group and by the effect of voucher-induced adult education on labour market success. The latter effect might differ from non-experimental estimates of the effects of adult education, which will be biased if selection into adult education is driven by unobserved characteristics. In addition, individuals who comply with the voucher assignment by picking up the voucher may have non-average returns to adult

education. The authors compare OLS estimates of the returns to adult education with IV estimates that use voucher receipt as an instrument for adult education.

They find no statistically significant average effects of voucher-induced adult education on earnings and employment one year after treatment. However, the authors note that the limited precision of their IV estimates does not allow them to statistically reject the existence of small positive effects. They conclude that returns to adult education vary significantly between sub-populations. Importantly, they find although individuals with lower levels of education were less likely to comply with the voucher assignment, they were also the group that gained the most. In particular, individuals with vocational training appear to largely benefit from voucher-induced adult education. Thus the authors conclude that an adult education voucher program can have significant effects if targeted specifically at sub-groups like less educated adults.

Krueger and Rouse (1998) evaluate workplace literacy training at two mid-size companies in New Jersey (one in the services sector, the other in the manufacturing sector) between 1992 and 1995. The training was specifically tailored to each company's needs and also included some ESL training and training in communication, stress reduction, and time management. All workers were eligible to take training, except in cases where the worker's absence from their regular duties would disrupt the flow of production in the company (classes met during regular shifts). Participants received their regular wages while they attended class. The training was delivered at a local community college. Classes typically met for two hours, twice per week, and were taught in five 8-12-week sessions. In total, 480 workers participated in the training, for a total of 12,500 hours of instruction (an average of 26 hours per worker).

The evaluation approach consists of a fixed effects model. Specifically, the authors tracked changes in wages and other workplace outcomes (e.g., absenteeism, performance awards, turnover, etc.) before and after the training, and compared those changes in outcomes to a comparison group of workers who did not participate in the training program. In terms of wages, participation in training was associated with a 0.4% increase in the hourly wage among participants in the manufacturing company. For a worker with annual earnings of \$24,000,¹³ that represents an additional \$100 per year. For the services company, no change in wages was recorded.

The fixed effects model takes into account unobserved, time-invariant differences between participants and non-participants. It does not, however, account for the possibility that participants chose to train (or were recommended for training by their supervisors) based on their own potential benefits of training. To lend more credibility to their findings, the authors first show that training participants had similar wage trends as non-participants prior to enrolling in the training program. Second, they use an instrumental variable approach to try to remove the possibility of endogenous sorting into the training program. They argue that since training was offered during regular work hours, the probability of participating in training was influenced by the workers' work schedule. Assuming that the work schedule is not an independent determinant of wages (perhaps an unrealistic assumption), the authors use the schedule as an instrument for training participation. Under this approach, they find a slightly

¹³ Workers in the manufacturing company earned about \$12 per hour, on average. We assume a workweek of 40 hours.

larger wage effect in the manufacturing company (0.7%), and now observe a positive wage effect in the services company (also 0.7%). However, these estimates are imprecise (i.e., the standard errors are high), and as a result, not statistically significant. As such, the authors suggest that little weight should be placed on these results.

Evidence on high school diploma/equivalency

The literature on high school diploma/equivalency has focused almost exclusively on equivalency. This literature is largely American and is motivated by the fact that in the US most dropouts who eventually obtain high school certification do so by writing the General Educational Development (GED) exam. The GED is a test-based, internationally recognized credential that is intended to be roughly equivalent to a high-school diploma. We did not find any Canadian evidence on the labour market outcomes of GED recipients. While it is unclear how well the US results would generalize to the Canadian labour market, in the absence of Canadian data, the US results are worth reviewing.

One of the more influential works in the area is by Cameron and Heckman (1993). Using the *National Longitudinal Survey of Youth* (NLSY) in the US, they looked at the wages of employed males at age 25 for three groups: those with a traditional high school diploma, those who dropped out but passed the GED, and those who dropped out and did not obtain a GED. Holders of a traditional high school diploma fared much better in the labour market than GED holders, ceteris paribus. Perhaps more importantly, holders of a GED were statistically indistinguishable from non-GED dropouts in terms of their wages (although there was about a 5% increase in wages). Cameron and Heckman explain this finding by arguing that the GED is relatively easy to obtain, as median preparation time is only 20 hours and pass rates are quite high. As a result, the GED does not provide additional human capital.

Shortly following the Cameron and Heckman study, Murnane, Willet and Boudett (1995) exploit the longitudinal nature of the same data (the NLSY). They find similar results as Cameron and Heckman (roughly a 5% return on wages among employed males in their mid-20s), although in their case, the results were statistically significant. These results suggest that the GED may have modest effects on wages, on average. In a later study (Murnane, Willet and Tyler, 2000), it is argued that low-skilled dropouts may benefit more from the GED for two reasons. First, GED preparation time is generally longer for lower skilled dropouts. Thus, GED training may be a source of human capital for them (not so for higher skilled dropouts who on average, spend less time preparing for the test). Second, lower skilled dropouts may benefit from a signalling effect of obtaining the GED. Obtaining a GED may signal to potential employers that the dropout is productive, relative to dropouts who did not obtain the GED. For low skilled dropouts, this distinction may be quite important.

Murnane, Willet, and Tyler (2000) replicate earlier results by Cameron and Heckman with the *High School and Beyond* data in the US. They consider average annual earnings of 27 year old males over the two year period 1990-1991. Overall, they found that the GED raised earnings by about 8% to 9%, although these results are not statistically significant. They estimate separate effects by quartile of mathematics test score in grade 10. This demonstrated that those in the bottom quartile gained large benefits from the GED with a 27% increase in annual earnings, once experience and years of schooling were taken into account. They find no effect for those in the top three quartiles.

A follow up study by the same authors (Tyler, Murnane, and Willet, 2003) studied the same issue for females. Given labour force selection issues with women, especially those in peak child-bearing years, the authors generated preferred estimates that included zero earnings and did not control for labour market experience. Once again, they found no impact on annual earnings overall but a \$2,701 increase in annual earnings among low skilled dropouts (i.e., those in the bottom half of the math score distribution).

At this point, the literature reached a consensus: GED training had little or no impact on average, but fairly large impacts among low-skilled dropouts. However, no causal (or quasi-causal) evidence has been presented so far. Another study by Tyler, Murnane, and Willet (2000) exploited state variation in minimum GED pass marks. The authors were able to compare dropouts with similar characteristics who wrote the GED and obtained the same score, but due to differences in pass cut-offs, either did or did not obtain their GED. This identification approach has two caveats. First, it considers relatively low-skilled high school dropouts – those who barely did or did not pass the GED exam. Second, it effectively nets out the human capital effect since GED scores were identical. The remaining effect is thus due to signalling. The study showed a large effect among young (16 to 21 year old) white dropouts. Specifically, the GED was associated with a 10% to 19% increase in annual earnings for this group. However, they find no effect among minority dropouts. Note that the authors include zero earnings even though they did not focus exclusively on females. They argue that one of the benefits of obtaining the GED might be to gain employment, which can only be captured by including individuals without earnings.

Basic skills and financial situation

There are several studies that investigate the relationship between literacy skills gains and financial outcomes regardless of whether the individual participates in a learning activity. While these studies do not specifically address the question of the efficacy of foundational learning, we discuss them here because they provide a compelling argument for the importance of foundational skills for financial outcomes. For example, Green and Riddell (2003) study individual-level IALS scores in relation to earnings and find a sizeable effect with these test scores accounting for a substantial fraction of the return to education. In complementary work, Ferrer, Green, and Riddell (2006) use individual-level test scores to explore immigrant labour market outcomes and find that these explain the entire immigrant-domestic born gap in the rate of return to education.¹⁴

In addition, several studies take advantage of two sets of UK longitudinal data: the 1958 *National Child Development Study* (NCDS) and the 1970 *British Cohort Study* (BCS70). For example, Machin et al.

¹⁴ A challenge to interpreting these results is that unobserved ability may contaminate the relationship between both measures and labour market success. To avoid this, Sweetman (2004) uses immigrants' source country average levels of educational outcomes. Note that this is also closer to the policy question that may be posed by a government considering investing in improved educational outcomes. That is, is there a relationship between the nations' average level of educational achievement and labour market outcomes? He finds that an index of country level average test score outcomes has a substantial influence on the rate of return to education experience by immigrants in the Canadian labour market. Individuals from countries with high quality test score outcomes have much higher rates of return to education in Canada.

(2001) use the NCDS to consider the relationship between changes in test scores at the ages of 16 and 37 and individuals earnings. Men whose test scores improved over this time period had 3% higher earnings than those whose scores stayed the same or declined. Women whose test scores improved had had 11% higher earnings. Using BCS70, Bynner and Parsons (2006) also investigate the relationship between literacy and numeracy skills trajectories (from age 21 to 34) and earnings outcomes. They report that women whose skills improved not only had a higher probability of being fully employed, but were also more likely to have set aside savings and made investments. Men whose skills improved also had higher employment rates (94%-81%) and were less likely to be receiving any form of social assistance. Taken together these studies show a strong relationship between skills gains and positive changes in employment and earnings.

Individual non-financial outcomes

Individual non-financial outcomes are outcomes experienced by the learner and/or the learner's family that are not directly expressed in financial terms. We discuss four studies that investigate individual non-financial outcomes using various indicators of self-reported health and social wellbeing. Because the literature in this area is relatively sparse, we also turn to a brief discussion of the broader education literature. Since our focus in this report is foundational learning, we highlight findings associated with compulsory schooling (either obtaining an additional year of high school or actually obtaining a high school diploma.). While it is unclear whether the findings of this literature would apply to foundational learning obtained later in life, the studies are worth considering, as at a minimum they provide insight into a wide range of outcomes that may be worth further investigation. In terms of our hierarchy of evidence (Figure 1), none of the four studies that focus specifically on adult learning are able to exploit exogenous sources of variation or to control for selection bias. Thus, although all four studies report positive relationships between adult learning and health and well-being, it is important to keep in mind that these studies are unable to establish the direction of causality, or even whether a causal relationship exists at all. In terms of the broader education literature, more recent studies have aimed to address this methodological challenge by exploiting changes in laws around compulsory education and thus are able to make more credible claims about causality.

Health and wellbeing

Feinstein and Hammond (2004) use the *UK National Child Development Study* data to investigate the relationship between participation in adult learning between the ages of 33 and 42 and health and wellbeing. About 58% of individuals in their sample participated in at least one adult learning activity during this period. Although they consider adult learning in a number of different forms – academic training, vocational learning, employer-provided training and leisure training – we report the findings in the report on foundational learning since the vast majority of learning activities included in the study would not be classified as either higher education or workplace learning according to our typology (see *Adult Learning Typology*).

They investigate whether participation is associated with a wide range of non-financial outcomes including six measures of health (smoking behaviour, drinking behaviour, exercise, life satisfaction, leaving or entering depression), and six measures of social cohesion (racial tolerance, political cynicism, support for authority, political interest, number of group memberships, and voting). Overall

they find that participating in adult learning was associated with improved outcomes for nine of the twelve indicators. However, the effects differed by type of course. For academic and employer courses, outcomes improved for only five of twelve indicators. For vocational courses, outcomes improved for only one indicator. For leisure courses, outcomes improved for six of the twelve indicators. In a second study also using NCDS data, Hammond and Feinstein (2006) find a relationship between participation in adult learning and overall wellbeing. They report that the adjusted odds of having improved wellbeing were between 1.2 and 1.3 times greater for those who took courses.

Another large-scale study (Matrix Knowledge Group, 2009), using data from the *British Household Panel Survey*, found that adults who participated in adult education had greater levels of wellbeing than those who did not participate, although the authors noted that individuals who participated in part-time formal education actually reported lower scores for life satisfaction.

Jenkins (2011) used the *English Longitudinal Study of Ageing* to study the relationship between adult learning and well-being for adults over the age of 50. Taking into account work status, marital status, existing educational attainment and physical health, Jenkins investigated outcomes associated with four types of adult learning: obtaining basic qualifications; formal education; music and arts classes; and physical activity classes. Formal education and music and arts classes were significantly associated with positive changes in quality of life and life satisfaction and wellbeing.

Evidence from the broader literature on education and health and wellbeing

There is a large literature on the effects of education on health. As several reviews of this literature have concluded (Grossman and Kaestner, 1997; Wolfe and Haveman, 2001; Riddell, 2006), there is considerable empirical evidence to support the claim that the relationship between education and health outcomes is causal both in developed and developing nations.

As Riddell (2006) points out however, there is less evidence on the mechanisms by which education impacts health. Education may affect how individuals assess information and/or it may increase the efficiency by which individuals use that information. It may also affect individuals' time preferences and lead individuals to decrease the extent to which they discount the future. For example, Kenkel (1991) found that education is not only associated with better health outcomes, but also better health behaviours such as more exercise, less smoking and lower alcohol consumption. Interestingly, the estimated impact of additional education did not decline substantially when controls were included for health knowledge. This suggests that the effect of education on health occurs mainly through the *utilization* of health knowledge rather than simply its acquisition.

More recent studies have further addressed the question of causal mechanisms by exploiting changes in compulsory schooling laws. For example, Lleras-Muney (2004) explores the relationship between education and mortality. She uses the US Census (1960, 1970, and 1980) to select a sample of individuals who were 14 years old between the years 1915 and 1939. She constructs synthetic cohorts and then matches cohorts to the compulsory attendance and child labour laws that were in place in their state-of-birth when they were 14 years old. Using an instrumental variable approach, she finds that one extra year of high school is associated with a 3% to 6% decrease in the probability of dying within the next 10 years. In a related study, Lleras-Muney (2005) also reports a large causal effect of education on mortality. She calculates that for individuals living in the United States in 1960, one more

year of education increased life expectancy at age 35 by as much as 1.7 years. A Danish study (Arendt, 2008) also takes a similar approach and exploits a compulsory school reform to investigate whether education has a causal effect on hospitalization. For women, he finds a large and statistically significant effect of education on the probability of being hospitalized, whereas he only finds a significant effect for men for selected lifestyle-related diagnoses.

Glied and Lleras-Muney (2008) investigate the relationship between education and the adaption of new treatment approaches. Performing instrumental variable regression analyses, the authors find support for the hypothesis that the education gradient is steepest for those diseases that have seen the most health-related innovation.

Chevalier and Feinstein (2006) investigate the relationship between education level and depression. Using the NCDS longitudinal data, and observing changes in mental health over the course of two decades, they consistently find that education is associated with a significant reduction in the risk of adult depression, especially for women. Among both men and women at the age of 42, having attained an A-level qualification during their youth is associated with a more than 5% decrease in the probability of experiencing depression (women experience a slightly larger decrease), though no further decrease is experienced with participation in university.

Several studies explore the relationship between education and health effects on the next generation. Currie and Moretti (2003) use an instrumental variable approach (exploiting the expansion of higher education in the US in the 1960s and 1970s) to investigate the relationship between mother's education and children's health. They find a direct relationship between mother's education and improved infant health as measured by birth weight and gestational age. They estimate that in the period in the US between the 1940s and the 1980s, 12% of the decrease in the probability of low birth weight and 20% of the decrease in the probability of preterm birth can be attributed to increased maternal education. The effect may have occurred through increased rates of marriage and prenatal care, as well as through substantial reductions in smoking. The authors also estimate that between birth and age 15, low birth weight children incur an additional USD 5.5 to USD 6 billion more in health, education, and other costs than children of normal birth weight.

Other studies focus on children's education outcomes. Chevalier (2004) finds that an increase of one year of parental education, at least for natural parents, has a causal impact on children's outcomes. Using nine cross-sections from the *British Family Resource Survey* between the years 1994 and 2002 to compile a sample of 18,715 individuals who were between 16 to 18 years of age at the time of the survey, Chevalier considers the intergenerational effects of a parent's education on that of their children. He addresses this question by exploiting a discontinuity in parental educational attainment, which stems from changes in the minimum school leaving age rising from 15 to 16 which took place in the 1970s in the UK. An important caveat is that this strategy identifies the effect of parental schooling only for parents with a "lower taste" for education and may not reflect the general social returns of parental education. However, since policies are more likely to target individuals at risk of not maximizing their educational potential, the estimates are of interest. He finds a positive effect of parents' education (both mothers and fathers) on their children's schooling achievements. An increase of one year in parent's education raises the likelihood of their children staying on beyond the compulsory schooling age by 4-8%. The estimates are robust to the introduction of additional controls

for income, labour force participation, fertility and neighbourhood quality, indicating that the effect of parental education is direct.

Note that while the outcomes discussed in this section are principally private returns in that benefits accrue to the learner and learner's family, they may generate significant returns to society at large. For example, while we discuss health as an individual non-financial outcome, it may also be a social benefit if it means less reliance by people on publicly provided health care or welfare payments. In the next section we turn to social benefits.

Social final outcomes

Social outcomes are the outcomes that accrue to those beyond the individual learner, their family, or their employer. We did not identify any studies that looked specifically at the relationship between foundational learning and social outcomes. Thus in this section, we again turn to the broader education literature. We briefly discuss several studies that investigate social outcomes associated with obtaining a high school diploma, such as changes in civic engagement, savings to the tax and transfer system, reduced crime, and voting behaviour. As with the previous section, we note that it is unclear whether the same benefits would be associated with obtaining a diploma later in life or if similar benefits would be associated with other types of foundational learning, such as literacy and essential skills training.

Civic engagement

Milligan, Moretti, and Oreopoulos (2004) address the question of whether education improves citizenship. The authors focus on the US and the UK, but provide some results for Canada as well. They consider whether individuals who have more education are more likely to vote in elections and also whether education raises the "quality" of people's involvement in society. Here "quality" is measured by various indicators, such as following the news and political campaigns, and political and community engagement. The authors use variation in educational attainment generated by compulsory school attendance laws and child labour laws. The estimates thus relate to the impact of additional secondary schooling on civic participation. Generally, the authors find that having a higher level of education raises the probability of voting in the US, and Canada to a lesser extent, but not in the UK. Having graduated from high school raises the probability of voting by close to 15% in the US (not conditional on registration), while the estimated impact is around 9% in Canada. With respect to other measures, in the US they found that high school graduates have a higher probability of following campaigns and public issues, and participating in political meetings and community programs.

Sondheimer and Green (2010) use data from the Perry Preschool evaluation, the Tennessee STAR evaluation and the "I Have a Dream" scholarship program to track children over the long term, examining their voting rates as adults. In all three studies, they find that exogenously induced changes in high school graduation rates have powerful effects on voter turnout rates. The pooled estimate from the three studies shows that while a high school dropout would have a 15.6% chance of voting, the same individual would have a 65.3% chance of voting if randomly induced to graduate from high school.

Taxes and transfers

Educational attainment is also strongly associated with savings to the transfer system and increased tax revenue. There is considerable evidence that the higher an individual's educational attainment, the less likely they are to rely on public transfers (see Wolfe and Haveman, 2001 for a discussion of several early studies). From an accounting standpoint, the relationship between education and tax revenues is even more striking. In a report for the Canadian Council on Learning, using Canadian Census data and the *Survey of Labour and Income Dynamics* (SLID) in Canada, Hankivsky (2008) uses a "prevalence-based methodology" – measuring opportunity costs to society from current or previous dropouts in 2008 – to estimate this relationship. She estimates annual losses to the tax and transfer system per dropout, as well as at the aggregate level. Per year, compared to a high school graduate, a high school dropout receives \$4230 more in social assistance, pays \$226 less in taxes, contributes \$68 less in EI premiums, and receives \$2767 more in EI payments. At the aggregate level, this amounts to \$972 million more paid out in social assistance, \$378 million less generated in tax revenue, \$199 million less in EI premiums and \$1.1 billion more in EI payments.

Crime

Higher education levels may lower crime by raising wage rates, which increase the opportunity cost of crime. Education may also decrease the extent to which an individual discounts the future thus increasing the cost of any future punishment as a result of crime. Several studies investigate the relationship between education and crime. For example, Lochner and Moretti (2004) utilize US Census data (1960, 1970, and 1980) and FBI data (1960, 1970, 1980, and 1990) to examine whether increasing education levels cause reductions in crime among adult males in the US. The authors find that higher education levels, particularly graduating from high school, consistently lower the probabilities of incarceration, criminal arrests, and self-reports of undertaking criminal activity. The authors employ compulsory school attendance laws as an independent source of variation in educational attainment. Their causal estimates of the impact of education on incarceration indicate that high school graduation lowers incarceration probabilities by 0.8 percentage points for white males and 3.4 percentage points for black males. Differences in educational attainment can explain as much as 23% of the black-white gap in male incarceration rates. They estimate that a 1% increase in the male graduation rate would amount to a social fiscal benefit of \$1.4 billion, from reduction in crime alone.

Anderson (2010) addresses the question of whether increasing the minimum dropout age reduces juvenile crime rates by exploiting state-level variation in the minimum dropout age. Using county-level arrest data for the United States between 1980 and 2006, a difference-in-difference empirical strategy compares the arrest behaviour over time of various age groups within counties that differ by their state's minimum dropout age. Anderson (2010) finds that the minimum dropout age has a significant and negative effect on property and violent crime arrest rates for individuals aged 16 to 18 years-old. Raising the minimum dropout age to 18, as opposed to 16 or 17 years of age, lowers the juvenile arrest rate by 9.7% and 11.5% respectively. Interestingly, Anderson suggests that these results are consistent with an incapacitation effect; school attendance decreases the time available for criminal activity. Machin, Marie, and Vujic (2011) also use a change in schooling laws to address the relationship between high school completion and crime in the UK. They find that a 1% reduction in the proportion

of the group of individuals who dropped out of high school is associated with a 0.85% to 1% drop in convictions with respect to property crime.

Firm final outcomes

Firm outcomes are experienced by the firm in which the learner is employed. While there is a large scholarly literature on firm outcomes of workplace training, there is little academic literature specifically on foundational training as it relates to firms. The literature that does exist is based largely on exploratory case studies. Two Canadian studies provide a useful summary of the case study literature. Long (1997) conducted a survey of employers who had implemented workplace LES programs. Bloom, Burrows, Lafleur, and Squires (1997) conducted a similar study for the Conference Board of Canada around the same time period. As Kuji-Shikatani and Zorzi (2007) point out, more recent reports seem to be primarily based on literature reviews of these earlier studies (e.g., Ananiadou, Jenkins, & Wolf, 2003). Based on a review of this literature, Kuji-Shikatani and Zori (2007) identify commonly cited benefits of workplace LES programs:

- Workers improved their document use, communication, problem solving skills.
- Workers were more confident and had a better attitude toward their work. Teamwork improved, with workers more willing to contribute in meaningful ways.
- Workers were more able to cope with change and adapt to new processes or products. Workers were more receptive to further workplace training, enabling them to learn more complex skills, and to learn skills more quickly.
- The productivity of workers improved: workers were better able to follow instructions, made fewer errors, worked faster, and were able to troubleshoot and identify solutions.
- Labour-management relations improved because there was better communication between management and workers, and workers better understood organizational culture.
- There were fewer accidents in the workplace and absenteeism was reduced.
- It was easier for the companies to recruit and retain workers, with some companies having turnover rates much lower than the industry norms.

As Kuji-Shikatani and Zori (2007) note, most of the literature on employer outcomes of LES training is anecdotal in nature and largely fails to investigate actual outcomes such as skills gained, and reduced error rates. This is at least in part because few companies collect the necessary quantitative data. For example, a recent US study by Hollenbeck and Timmeney (2009) found that while employers and workers reported frequent productivity gains, they could not estimate the return on investment because firms did not collect data that allowed business return to be formally measured. In addition, a major challenge is developing a credible strategy for isolating the causal impact of training.

Nonetheless there are several case studies that have attempted to quantify the outcomes of foundational learning for firms using a Return on Investment approach. We briefly highlight some of the most widely cited ROI studies. For example, Ford (1994) provides an ROI case study of a US workplace literacy training program at Magnavox Electronic Systems Company. The evaluation of the

program was based on a longitudinal design in which data was collected before, during and after the training program. The study reported a ROI of 741%. This relatively high ROI is explained by the author as resulting from small direct cash outlay for the training (due to a partnership with a government department) as well as improved productivity and reduced scrap and rework costs.

Two UK studies present ROI results. Skillsnets (2005) presents a case study of Glanbia Meats PLC that provided English language training to its employees who were largely migrant workers. There were 32 participants, broken into three groups and the program was delivered over the course of 12 evening sessions. The study reported that the training generated a ROI of 61%. In addition, several intangible benefits were also identified, such as improved confidence of employees, improved staff retention, better career progression potential, reduced accident risks, and improved hygiene awareness. A second study by the ROI Institute (2007) presents a case study of VT Shipbuilding's literacy, numeracy, and IT skills training. According to the study, the training – offered to 60 employees and supervisors – generated a ROI of 140%, in addition to a number of intangible benefits, including enhanced communication skills, improved health and safety, and enhanced career progression.

There are also two notable ROI studies from Canada. Ouimet (1994) examined a training program intended to enhance supervisors' skills related to problem-solving and task planning and execution. The study estimated an ROI of 215%, which the author attributes to minimized training costs due to employees' investment of their own time in training, as well as the efficient transfer of learning to the workplace through the use of real workplace problems in the training program.

The other Canadian study is by the Canadian Society for Training and Development (2010), which examined the outcomes of a basic computer skills course at ArcelorMittal Dofasco, a steel manufacturing company. The course was offered on a voluntary basis to all employees, although it was intended to improve business performance in the Slab Handling and Storage area. In fact, classes included employees holding a variety of job positions. This meant that participants' education could have ranged from those who had not completed high school to college and university graduates. While the study attempted to measure ROI, unanticipated participant and scheduling changes, and an insufficient number of Slab Handling and Storage employees, did not allow the analysis to draw reliable conclusions about the training's contribution to improved productivity. Moreover, because the training was not targeted to Slab Handling and Storage employees, more than half of participants reported that it was not possible for them to apply their new learning to a high degree on the job because of its irrelevancy to their work situation.

We are aware of one study that uses nationally representative survey data to look at workplace literacy. Hollenbeck (1993) analyzed data from two large, nationally representative surveys of individuals in the US (the 1991 US *National Household Education Survey*, and the January 1991 US *Current Population Survey*) and found substantial payoffs to participation in workplace literacy programs. The estimates of marginal impacts were 11% to 17% increases in earnings, and by implication, productivity. However as the authors conclude, these estimates should be interpreted cautiously, since less than 1% of the sample participated in workplace programs, and these individuals were likely not representative of the entire sample.

Summary of state of knowledge for foundational learning

Table 1 provides a high level summary of the state of knowledge with respect to foundational learning.

Table 1 Foundational learning state of knowledge summary

Component	State of knowledge
Inputs and outputs	- No rigorous studies on what inputs matter to foundational learning activities/systems. K-12 indicators like class size likely not relevant, so further research needed to identify indicators. - Exploratory studies suggest design and delivery features vary widely and may be associated with final outcomes of interest. This may be a promising area for further research. - We are not aware of any studies that investigate which outputs matter.
Intermediate outcomes Human, social, and psychosocial capital	- We are only aware of four studies that systematically investigate human capital gains using standardized scales. Evidence is mixed. (Two out of four studies report positive results). - No rigorous studies on whether foundational learning enhances social capital but numerous exploratory studies provide anecdotal evidence that foundational learning is associated with increases in size of a learner's network. - Only a few studies systematically investigate whether foundational learning enhances psychosocial capital. These studies and numerous exploratory studies provide some evidence that learning increases self-esteem and self-efficacy. - No evidence on whether changes in intermediate outcomes are associated with final outcomes of interest. This may be a promising area for further research.
Individual final outcomes Financial and non- financial	- There are several rigorous studies on the financial outcomes of foundational learning. Outcomes range from modest to insignificant effects on wages, earnings, and employment status. - Note that modest outcomes may have more to do with both small doses and poor design rather than with inherent weaknesses with this type of learning. Another possibility is that in a knowledge economy, foundational learning at best serves as a bridge to further learning. An area for further research could be to test the hypothesis that program design matters and that better designed programs are associated with better financial outcomes. - There are a few studies that report positive non-financial outcomes, such as increased well-being. There are also several rigorous studies that aim to quantify non-financial benefits, such as health outcomes and intergenerational effects associated with a high school diploma in general. However it is unclear whether these findings would apply to diplomas earned later in life or if similar benefits would be associated with other types of foundational learning.

Table 1 Foundational learning state of knowledge summary

Component	State of knowledge
Social final outcomes Financial and non-financial	- No studies specifically address whether foundational learning is associated with positive social financial outcomes. But several rigorous studies aim to quantify benefits associated with a high school diploma in general (regardless of whether it is obtained later in life). - Relative to high school dropouts, graduates pay more in taxes and receive less in cash and in-kind transfers. They also contribute less to crime-related costs and are more likely to vote.
Firm final outcomes Financial and non-financial	Few rigorous studies explore firm outcomes. Numerous case studies report positive outcomes but cases are usually selected post hoc and tend to focus only on self-reported success stories and thus overstate benefits. While findings should not be considered conclusive, they do provide insight into wide range of outcomes that may be associated with foundational learning.

Higher education

Higher education is offered by post-secondary education institutions such as universities, colleges of applied arts and technology, and private career colleges, and results in a post-secondary credential.

Inputs and outputs for higher education

Inputs are the financial and non-financial resources that go into the provision of the learning activity. Outputs are the immediate, tangible products of learning activity.

Inputs

From a learner's perspective, inputs to higher education include the usual direct costs such as tuition fees and books, as well as indirect costs such as transportation and the opportunity cost of foregone earnings. However when considering individual inputs to adult schooling, it is important to recognize that the decision to pursue higher education as an adult involves a fundamentally different calculus than the initial post-secondary participation decision (Light, 1995; Myers and de Broucker, 2006). Unlike youth in their initial phase of education, adults have diverse life experiences in terms of their work, education, and family formation pathways (Hogan, 1978; Marini, 1984). The decision to return to school must be weighed against family responsibilities and other time constraints. Even low wage workers face the large "opportunity costs" of foregone earnings. Unlike foundational learning, tuition for higher education is often quite substantial. Programs are also usually longer in duration and may even require full-time study.

Moreover, as several commentators have observed, the risks associated with investing in human capital are greater for adults than for youth. In general, risks increase over the life course because the time horizon to recoup the cost of the investment is shorter. More specifically, investment in human capital later in life is especially risky for adults with low levels of initial education because they are unlikely to have strong foundational learning skills or a track record of educational success. We are aware of only one study that has addressed the relationship between risk tolerance and human capital investment later in life. In an innovative social laboratory experiment designed to investigate what financial incentives are most effective in encouraging working poor adults to invest in human capital, Eckel et al. (2007) show that among the working poor, risk tolerance is strongly and positively associated with willingness to invest in human capital. The researchers conclude that risk is a key determinant of educational investment decisions for low-income individuals.

From a provider perspective, standard measures of inputs to the higher education system include expenditure per student, expenditure relative to GDP, expenditure relative to total public expenditure and student/faculty ratios. There is growing recognition by policy makers and other experts that these inputs are only weakly if at all associated with desirable outcomes for adult learners. Numerous policy papers and exploratory studies have concluded that the post-secondary system is not responsive to the needs of working age adults.

Several US jurisdictions have responded to this issue by transforming their approach to adult education and developing what has been referred to as *Career Pathways* initiatives. *Career Pathways* are sector-specific career ladders linked to a sequence of modular or "stacked" educational opportunities. A major innovation of the *Career Pathways* approach is that literacy training is offered in the context of occupational training which accelerates learning and ensures that the transition from basic training to

post-secondary is as seamless as possible. In addition, by developing modular based curricula with multiple entry and exit points, the career pathways provide a flexible approach that is responsive to the economic realities of working-age adults.

Perhaps the best example of a pathways project is Washington State's *Integrated Basic Education and Skills Training* (I-BEST) program. I-BEST began as a demonstration project with ten sites and a strong commitment to evaluation and continuous improvement. Initial results were impressive. Students in the (I-BEST) pilots earned five times more college credits and were 15 times more likely to complete a workforce education program than other adult learners with the same goals (Washington State Board for Community and Technical Colleges, 2005). There are now over 70 I-BEST programs in Washington State. There is a growing consensus that delivering literacy training in an occupational context improves transitions from ABE to PSE, increases PSE persistence and raises the supply of workers trained in occupations in demand in local labour market. (See Myers et al., 2009, for a discussion of the career pathways approach).

The extent to which various approaches to transforming inputs to higher education make a difference for educationally disadvantaged adults is an important area for further investigation.

Outputs

Outputs can be interpreted narrowly to include the immediate, tangible (usually quantifiable) products and services of learning activities such as contact hours. Analyzing outputs can indicate the extent to which a learning activity was delivered and to which resources were used as intended. We are not aware of any studies that investigate the relationship between outputs and outcomes of higher education, but standard output indicators like credits obtained are likely relevant.

Intermediate outcomes of higher education

Intermediate outcomes are outcomes which are not usually of value in themselves but are valued because they support the attainment of final outcomes of interest.

We are not aware of any research that systematically examines intermediate outcomes associated with participation in higher education. This may be an area worth further investigation. A better understanding of the intermediate outcomes associated with higher education may help us to understand the mechanisms by which well-established final outcomes like earnings are achieved, and thus help explain variations in outcomes experienced by learners.

Final outcomes of higher education

A final outcome is an outcome that is related to the fundamental purpose of implementing, providing, funding, or participating in the learning activity. We distinguish between types of final outcomes depending on to whom they accrue (individuals, firms, society). We also distinguish between outcomes depending on whether they are financial or non-financial.

Individual financial outcomes

Individual financial outcomes are those outcomes experienced by individual learners and/or their families that can be expressed directly as dollar figures such as earnings. We have identified eight studies which look at the individual financial outcomes associated with adult participation in higher education. The financial indicators used in these studies are wages, earnings, hours or weeks worked, or employment. In terms of our hierarchy of evidence (see Figure 1), none of the studies use an exogenous source of variation, but all of the studies are strengthened by longitudinal designs and well-defined measures. Longitudinal data allows the researcher to account for time-invariant unobserved heterogeneity, but does not account for unobserved time varying characteristics like changing motivations or attitudes.

College and university

Using administrative data, Jacobson, LaLonde and Sullivan (2005a) track the earnings and community college enrolment of displaced workers in the state of Washington for several years prior to displacement until several years following displacement. They find that one additional year of community college credits obtained post-displacement is associated with a 9% and 13% increase in long-term earnings among men and women, respectively. A follow-up study by the same authors (Jacobson, LaLonde, and Sullivan, 2005b) finds similar results for older displaced workers (aged 35 or more). Among older displaced workers, long-term earnings increased by 8% among men and by 10% among women.

In a related paper, Jacobson, Lalonde and Sullivan (2005c) conclude that retraining can be a productive investment both for displaced workers and for society but that in general current public investments in retraining are far too small to substantially mitigate the earnings losses of displaced workers (which may be as high 20% of previous earnings or perhaps much higher). Because the long-term effects of displacement on earnings are large, policymakers would need to make comparably large investments in workers' skills to fully offset displaced workers' losses.

Using data from the US *National Longitudinal Survey of Youth* (1979-1989) for a sample of 16 to 32-year-old men, Light (1995) finds that the returns to additional schooling acquired following a period of no school activity are smaller than the returns among those who acquired the schooling in a continuous manner. Nevertheless, the benefits to adult schooling were large enough to eliminate the earnings gap between returnees and continuous learners in a few short years.

Leigh and Gill (1997) also use longitudinal survey data from the NLSY (1979-1993). They examine 28 to 35 year old men and women who returned to obtain a community college diploma. Their findings suggest that acquiring a community college diploma later in life generates the same benefit as acquiring it continuously following high school. These findings don't necessarily contradict Light (1995), since the authors only consider those who completed their studies after returning.

A more recent US study distinguishes between the two possible sources of earnings growth following a return to school: shifts in levels and trends (Myers, 2009). The study utilizes 13 years of longitudinal data from the *Panel Survey of Income Dynamics* (1992-2005). Focusing on adults without post-secondary credentials, the study finds that the increased earnings associated with returning to school in adulthood is largely the result of a shift in the level of earnings, as opposed to the earnings trend. This suggests that studies with shorter time horizons are probably capturing the full picture in terms of earnings trends. Given the long-term stability in earnings following the initial level shift, it also suggests that a long-term time horizon is not necessarily required to detect the long-term trend.

Canada has also produced important studies. Riddell and Riddell (2006) analyzed the impact of returning to school for single parents who were receiving social assistance in British Columbia in the early 2000s. Using survey data collected for the *Self-Sufficiency Project* demonstration¹⁵ at baseline and at three follow-up periods (18, 36, and 54 months), the authors found that returnees had stronger earnings growth than non-returnees regardless of whether a credential was earned. Another Canadian study (Ferrer and Menendez, 2009) focused on adult learners who obtain a university degree. Using the 1995 *National Graduates Survey* (NGS), these researchers estimate the effect of delaying completion of a university education. They find that the earnings premiums for adults who obtain a university degree later in life were actually higher than the earnings premiums for graduates who completed their schooling continuously.

Zhang and Palameta (2006) used a nationally representative sample drawn from the *Survey of Labour and Income Dynamics* (1993-1998 and 1996-2001) to analyze the earnings gains of full-time workers who obtained higher education credentials later in life. The authors compare the earnings gains of returnees versus non-returnees conditional on initial education level. They find that male learners with an initial education of high school or less actually received higher returns than their more educated counterparts who already had a post-secondary credential before they returned to school (10% versus 6 % for wages, and 9% versus 6 % for earnings). Female learners with an initial education of high school or less also enjoyed higher wage gains than their more-educated counterparts (10% versus 1%). For women, wage gains did not translate into earnings gains.

In a more recent study also using data from the Canadian *Survey of Labour and Income Dynamics*, Drewes (2008) also finds that for both men and women, participation in higher education is associated with significant annual wage growth.

¹⁵ The Self-Sufficiency Project (SSP) was a Canadian demonstration project carried out in the 1990s in the provinces of British Columbia and New Brunswick. SPP had a random assignment design that aimed to provide evidence on the effects of a financial incentive on long-term welfare recipients, defined as those who had been on income assistance (IA) for at least 12 of the past 13 months.⁵ The study focused on single parents with children, the group with the lowest exit rates from welfare.

Frenette, Upward and Wright (2010) use Canadian longitudinal administrative data (the *Longitudinal Worker File* – LWF) to study the earnings consequences of participating in postsecondary studies following job displacement. The study is similar to the ones by Jacobson, LaLonde, and Sullivan (2005a and 2005b), although the focus is on any postsecondary training (not just community college). Another distinction is that the study examines the role of participating in PSE, as opposed to obtaining credits. Following displaced workers from 5 years prior to displacement to 9 years post-displacement, the study finds that participating in PSE shortly following displacement is associated with an increase of \$7,000 in annual earnings compared to displaced workers who did not participate. Statistically significant effects are found by sex, age, marital status, and (pre-displacement) union coverage. The one exception is among older men, which stands in contrast to Jacobson, LaLonde, and Sullivan (2005b) who find positive and statistically significant effects among this group.

It is clear from the US and Canadian studies that pursuing higher education in adulthood is generally beneficial to participants. The returns are roughly the same as when the schooling is acquired earlier in life, which are fairly large and have been estimated using convincing methods (Card, 1999).

Why are the financial benefits of pursuing higher education so much larger than those associated with foundational skills training? One possibility is that there are significant unobserved differences between individuals who pursue foundational learning versus individuals who pursue higher education. Those in need of foundational skills training may not be able to capitalize on their training to the same extent as higher skilled individuals who qualify for PSE studies. While this explanation is plausible, there are likely several other interrelated reasons at play. First, postsecondary programs are often longer in duration, giving learners more time to enhance their skills. Second, programs are usually regulated and well established, so quality standards are more likely to be in place than is the case with foundational training. Third, credentials associated with post-secondary programs tend to send a strong signal to employers. Finally, in today's economy, a sizable proportion of decent-paying jobs require a post-secondary credential. As such, foundational learning episodes may be useful primarily as a bridge to further learning rather than as a means to labour market advancement.

This was certainly the finding of a large scale Washington State study (Prince and Jenkins, 2005) of 35,000 learners who started in literacy and basic skills programs. This study found that only the small minority of learners (less than 5%) realized any gains from their learning investment. The only learners who made gains were those who made the transition from a literacy program to a post-secondary program and persisted for a least one year of college level studies. As this study suggests, in a knowledge economy, foundational skills training may simply not be enough. In this context it is worth noting that over the course of a five year observation period, only two out of ten learners who made the transition to post-secondary actually persisted long enough (the equivalent of one full year of college study) to reach the “tipping” point for achieving significant economic gains.

Given the potential benefits of PSE, it is important to understand its barriers. A Canadian study by Chapman, Crossley, and Kim (2003) examines the role of credit constraints from a survey of recently displaced workers (the *Canadian Out of Employment Panel* – COEP). They find that having positive liquid assets at the time of job loss is positively associated with pursuing self-financed training (largely PSE). This cash-on-hand measure is negatively correlated with reporting that money or tuition stood in the way of attending PSE (among those who did not attend). The authors further estimate that

eliminating financial barriers (perhaps through a voucher program) could potentially raise PSE attendance among recent job losers by 68% (from 11.1% to 18.7%).

Adding another perspective to the literature, Fourage, Schils, and de Grip, (2010) use information from a Dutch dataset on economic preferences and personality traits to explain a worker's willingness to participate in training. They find that while the economic returns to training for low-educated workers are positive and not significantly different from those for high-educated workers; low-educated workers are significantly less willing to participate in training. This lesser willingness to participate in training is driven by economic preferences (future orientation, preference for leisure), as well as personality traits (locus of control, exam anxiety, and openness to experience).

Note that despite the consistently high earnings premiums found in this literature, we are not aware of any studies that evaluate higher education in the context of a cost-benefit analysis framework.

Apprenticeship and vocational training

The literature on apprenticeship training is underdeveloped largely because of a lack of data. In Canada, the mean starting age for apprenticeship training is about 25 for men, and over 30 for women (Boothby and Drewes, 2010). Some recent evidence on the wage impact of apprenticeship training has been made possible in Canada as a result of newly available data.

The 2006 Census is the first data source to identify apprenticeship certificates (separate from vocational training) that can be used in a wage premium study. Gunderson and Krashinsky (2010) decompose the raw weekly earnings gap between holders of an apprenticeship certificate and those with other highest levels of educational attainment in two components: a portion that is explained by differences in observed characteristics and the remainder (the unexplained component). An important methodological point about their study is that they control for years of schooling. As a result, the unexplained component represents an estimate of the "sheepskin" (or certification) effect of obtaining the qualifications, as opposed to obtaining additional human capital (i.e., years of schooling). The findings suggest that males in full-time employment benefit substantially from obtaining an apprenticeship certificate (by about 23% over a high school diploma). For this group, obtaining an apprenticeship certificate provides about the same benefit as obtaining a college certificate. For women in full-time jobs, the story is quite different. An apprenticeship certificate is associated with about 2% lower earnings than a high school diploma, and about 20% lower earnings than a college certificate. Among all workers (full and part-time), the results are more or less the same.

Using the same data, Boothby and Drewes (2010) adopt a different approach. They estimate the weekly earnings premium but do not control for years of schooling. Their estimates thus capture both sheepskin and human capital effects. They also focus on full-year, full-time workers, and adopt a slightly different econometric specification. Nevertheless, their results are quite close to those of Gunderson and Krashinsky. This may suggest that apprenticeship training mainly generates a sheepskin effect, as opposed to a human capital effect. However, it is difficult to conclude this with certainty, since the two studies differ somewhat in their methodology.

Boothby and Drewes also identify estimates for vocational certificates. Recall that they estimate the "full" impact of trades certificates (what we call vocational certificates), including human capital and

sheepskin effects. They find that holders of a vocational certificate generally earn no more than high school graduates without additional qualifications. In fact, the premium is slightly negative for women. This is in stark contrast to apprenticeship certificate holders (particularly men), who earned far more than high school graduates.

Individual non-financial outcomes

Individual non-financial gains are outcomes experienced by the learner and/or the learner's family that are not directly expressed in financial terms, such as improved health or increased life satisfaction. We are not aware of any studies that directly investigate the relationship between adult participation in higher education and individual non-financial outcomes. There are however, numerous studies that examine non-financial outcomes associated with participation in higher education in general (regardless of whether it is pursued later in life). Key indicators in this literature include self-reported health behaviour such as smoking and intergenerational effects such as children's health and educational outcomes.

Health status

There is a large literature on the effects of education on health. As several reviews of this literature have concluded, there is considerable empirical evidence that the relationship between education and health outcomes is causal. (For detailed reviews of this literature, see Wolfe and Haveman, 2001; Riddell, 2006.) There is also some evidence that it is increasing over time (Meara, Richards, and Cutler, 2008).

While much of this literature exploits exogenous variation associated with changes in compulsory education, and is therefore discussed in the section on foundational learning, there are several studies that focus specifically on higher education. For example, Currie and Moretti (2003) show that women living in US counties where college is more readily available have healthier babies than women living in other counties. Chen and Lange (2008) consider whether more highly educated people are more responsive to individual risk factors related to breast cancer. Using the 2005 *National Health Interview Survey*, the authors are able to determine an individual's objective risk factors as well as their subjective assessment of this risk. They find that highly educated individuals (those with 16 years of education or more) are significantly more responsive to risks than less educated individuals (those with 12 or less years of education).

In a recent study, de Walque (2010) tests the hypothesis that education improves health and increases life expectancy using data from the *National Health Interview Survey* in the US between 1978 and 2000. He finds that after 1950, when information about the dangers of tobacco started to diffuse, the prevalence of smoking declined earlier and most dramatically for college graduates. He constructed panels based on smoking histories in an attempt to isolate the causal effect of smoking from the influence of time-invariant unobservable characteristics. The results suggest that, at least among women, college education has a negative effect on smoking prevalence, and that more educated individuals responded faster to the diffusion of information on the dangers of smoking.

Cutler and Lleras-Muney (2010) draw on several US and UK data sources to investigate competing explanations for the education gradient associated with various health behaviours.¹⁶ They start by estimating the education gradient for various health behaviours. They find that a college graduate is 8% less likely to smoke than is a high school graduate (i.e., at a reduction in likelihood of 2% per additional year of education). Each additional year of education is also correlated with a decrease in the probability of obesity (1.4%) and heavy drinking (1.5%) and an increase in the probability of wearing a seatbelt (2.6%). They estimate that 30% of the education gradient is accounted for by income, health, insurance and family background. This includes access to material resources, such as gyms and smoking cessation methods. Another 30% is accounted for by differences in cognitive ability and the how individuals process knowledge. Some of the differences by education are indeed due to differences in specific factual knowledge. They estimate that knowledge of the harms of smoking and drinking accounts for about 10% of the education gradient in those behaviours. However, they find that how one thinks is more important than specific knowledge. For both the US and UK, about 20% of the education effect is associated with general cognitive ability. This seems to be driven by the fact that education raises cognition which in turn improves behaviour. Social networks account for another 10%. Interestingly, various proxies for discounting, risk aversion, or the value of the future do not account for any of the education gradient, and neither do personality factors, such as a sense of control of oneself or sense of control over one's life. However, the authors recognize that in many cases, the mechanisms they are testing require the use of proxies which can be very noisy, causing them to dismiss potentially important theories. Although the authors are not able to make causal claims, and some measures are imprecise, this paper is an important systematic exploration of possible mechanisms, and suggests directions for future research.

Intergenerational effects

Several studies explore the effect of education on the next generation. In a review of the early literature, Riddell (2006) concludes that higher parental education levels are associated with a wide range of outcomes related to their children including: increased efficiency of contraception, older average age of marriage and first pregnancy, lower incidence of teenage childbearing, decreased incidence of child abuse and neglect, higher levels of time and money invested by parents into their children, lower education costs, lower incidence of juvenile crime, and improved health. Interestingly, a recent Canadian study by Sen and Clemente (2010) using the Canadian *General Social Survey* finds that the association between parents' education and the educational attainment of their children is weakening over time. In 1986, the effect of paternal education on the probability of children attaining a similar level of education was 0.27; the maternal effect was 0.20. But by 2001, these effects were just 0.15 and 0.13 respectively.

Social final outcomes

Social outcomes are outcomes that accrue to those beyond the individual learner, their family or their employer. We are not aware of any studies that directly investigate the relationship between adult

¹⁶ The National Health Interview Survey, the National Longitudinal Survey of Youth, the National Survey of Midlife Development in the United States, the Health and Retirement Study, the Survey on Smoking, and the National Childhood Development Study

participation in higher education and social outcomes. There are, however, numerous studies that examine social outcomes associated with participation in higher education in general (regardless of whether it is pursued later in life). Key outcomes in this literature include savings to the tax and transfer system, savings to the health care system, reductions in crime; improved civic engagement and social cohesion; and knowledge spillovers which may generate increased wages and productivity even for those with post-secondary credentials.

Taxes and transfers

Levin et al. (2006) use the US *Current Population Survey* (2005) to estimate how lifetime tax contributions differ by educational attainment. Relative to high school dropouts, over the course of a lifetime, male college graduates contribute an additional \$503,000–\$674,000 in tax payments. Female college graduates contribute an additional \$348,000–\$407,000. Trostel and Gabe (2007) use the same dataset to estimate annual tax revenues and transfer costs at the state and local level. They estimate that compared to high school dropouts, individuals with a bachelor's degree contribute \$2833 more in taxes annually, and they cost the government \$46 less in unemployment compensation, \$31 less in public cash assistance, \$470 less in Medicaid, and \$69 less in worker's compensation.

Khatiwada, McLaughlin, and Sum (2007) provide estimates specifically for individuals residing in Massachusetts. They estimate not only how much individuals pay into the federal and state tax systems and take from the transfer system, but also how much they cost the government in other dimensions (primarily incarceration). They estimate that over the average lifetime, the fiscal gap between a high school dropout and an individual with a Bachelor's degree amounts to more than \$1.1 million.

As these studies suggest, perhaps not surprisingly, individuals who earned a higher education degree pay significantly more into the tax system and take less from the transfer system. If these results hold for adult learners as well, this alone would provide a compelling reason to invest more in adult learning at the higher education level.

Health and crime

Levin et al. (2006) also use the US *Current Population Survey* (2005) to estimate costs associated with health care. They estimate that the total present value of lifetime public health care costs per capita for white males who drop out of high school is \$43500 versus \$12900 for those with some college and just \$3100 for an individual with a Bachelor's degree. Among black men, these figures are \$82400, \$25100, and \$6000; for Hispanic men, these figures are \$59000, \$16700, and \$4000.

Groot and van den Brink (2010) look at how property crime rates vary relative to levels of educational attainment. The data for the empirical analyses are taken from the Netherlands *Survey on Criminality and Law Enforcement* (1996). The surveys were conducted in the form of face-to-face interviews and written questionnaires. The authors examine the association between participation in higher education and five categories of crime. They find that the probability of shoplifting, vandalism and violent crimes decrease with one further year of education at a rate of 0.3%, 0.2%, and 0.2% respectively, with the probability of tax fraud increasing by 0.4%. Ultimately, they calculate the social fiscal net savings (after taking fraud increases into account) of increasing average education level of population by 1 year at €578 million.

Civic engagement and social cohesion

Dee (2004) uses community accessibility of two-year colleges (in terms of proximity and number of colleges) and child labour laws as instruments for understanding the effect of higher education on voting behaviour and other measures of civic engagement. Using follow-up interview data collected in 1984 and 1992 for the US *High School and Beyond* longitudinal study and the 1972-2000 *General Social Survey*, the authors estimate that college entrance increases voter participation by 17-22%. They also estimate that one additional year of schooling generates a small increase in newspaper readership and a small increase in support for free speech.

Helliwell and Putnam (2007) also use data from the US *General Social Survey* (1972-1996) as well as from the *DDB-Needham Life Style Survey* (1975-1997) to test whether education affects levels of trust and social engagement. The authors consider an individual's own level of educational attainment as well as the average level for the region in which they live. They estimate that an additional year of education increases the probability an individual is trusting by 4.4%. An additional year in average level of education in one's region increases the probability an individual is trusting by 2.4%.

Burden (2009) uses the *American National Election Study* (1952-2004) to investigate the dynamic relationship between formal education and voter turnout. He addresses the question of why rising education levels did not produce higher voter turnout. He shows that the effect of college education started to increase in the 1980s, which magnified the ability of educational attainment to predict turnout. In contrast, the effect of education on political knowledge has remained relatively constant over time.

Knowledge spillovers

Several studies investigate whether education creates spillover effects that help to foster a more capable, knowledgeable and innovative society. For example, Rauch (1993) shows that higher educational attainment of workers within a city is associated with higher average wages and housing prices. Similarly, Glaeser, Scheinkman, and Shleifer (1995) found that income per capita grew faster in US cities with high educational attainment in the post-war period. While these studies suggest education generates knowledge spillovers, it is possible that cities with higher than average educational attainment have higher wages for other reasons. Moreover, these studies are not able to establish the direction of the relationship. In fact, it could be higher incomes that lead to more schooling. As with other areas, recent studies have used "natural experiments" and instrumental variables methods to assess whether there is evidence of knowledge spillovers that is causal in nature.

Several studies (Moretti, 2003, 2004; and Ciccone and Peri, 2002) find stronger evidence of externalities associated with post-secondary education (graduates of four-year colleges in US). These studies use a variety of data sources and focus on spillovers at the city level. For example, Moretti (2004) considers whether manufacturing plants in cities which experience higher influxes of college graduates see higher output than plants in cities with lower influxes of graduates. Controlling for "plant's own skill level, plant fixed effects, and industry-specific transitory shocks," and based on firm-worker datasets compiled from the *Census of Manufacturers* and *Census of Population* the author finds

that an increase of 1% in the population of a city with a college degree is associated with a 0.5-0.7% increase in productivity.

Firm final outcomes

We are not aware of any studies exclusively focused on the outcomes experienced by firms as a result of their employees participating in higher education learning opportunities versus other types of learning.

Summary of state of knowledge for higher education

Table 2 provides a high level summary of the state of knowledge with respect to higher education.

Table 2 State of knowledge summary for higher education

Component	State of knowledge summary
Inputs and outputs	- Few rigorous studies on which inputs matter. But numerous exploratory studies suggest existing system inputs create experiences not responsive to needs of working age adults. - Exploratory studies suggest higher learning systems that create more seamless and modular career pathways are associated with more positive outcomes. The efficacy of these new approaches is a promising area for further research. - Typical PSE output indicators like credits obtained are likely relevant.
Intermediate outcomes Human, social and psychosocial capital	- We are not aware of any studies that investigate the relationship between any of the intermediate outcomes in our model and desired final outcomes such as career mobility or increased earnings. - A promising area for further research could be to explore the extent to which intermediate outcomes are mechanisms by which final outcomes are achieved. Do adults who pursue higher learning benefit from increased earnings in part because the experience enables them to expand their social networks or increase their self-confidence? This research could also explore the extent to which intermediate outcomes explain variation across the distribution of final outcomes. Do variations in literacy practices or social networks explain part of the variation in earnings outcomes of adults who pursue higher education later in life?

Table 2 State of knowledge summary for higher education

Component	State of knowledge summary
Individual final outcomes Financial and non-financial	- Several rigorous studies report that individuals who pursue higher education later in life benefit from earnings premiums roughly similar to those enjoyed by individuals who complete their schooling continuously. Note that although none of these studies successfully control for selection bias, results are strikingly consistent across datasets, using different estimation strategies and for different sub groups of learners - A question for further research is the extent to which earnings premiums vary for sub-groups of learners and based on type of degree/diploma. Another promising avenue may be research to identify a host of individual factors that predict success. - We are not aware of any studies that specifically address whether adult higher education is associated with positive non-financial individual outcomes. But several rigorous studies aim to quantify non-financial benefits associated with PSE in general (regardless of whether it is obtained later in life). Similar to the literature on high school diplomas there are strong health and intergenerational effects.
Social final outcomes Financial and non-financial	- We are not aware of any studies that specifically address whether adult higher education is associated with positive social outcomes. - But several rigorous studies aim to quantify social financial benefits associated with PSE in general (regardless of whether it is obtained later in life). Similar to the literature on high school diplomas, findings indicate PSE is associated with higher tax revenues, lower dependence on welfare or social assistance, and lower health care and crime related costs. Higher education is also associated with social trust, civic knowledge and voter participation.
Firm final outcomes Financial and non-financial	We are not aware of any studies that differentiate firm financial or non-financial outcomes based on whether employees participated in higher education versus other types of learning.

Workplace learning

Workplace learning is learning that is related to the firm in which the learner is employed and that is supported at least to some extent by their employer, but that is not foundational or higher education. Learning is undertaken for the purpose of learning a new job, improving their job performance, for professional development, as an employee benefit or because it is required by legislation.

Inputs and outputs for workplace learning

*Inputs are the financial and non-financial resources employed to provide/participate in the learning activity.
Outputs are the immediate, tangible products of learning activity.*

Inputs

In terms of workplace learning, inputs include various costs associated with designing and delivering the training program. The major cost is usually employee release time to participate in the training, which is why workplace learning tends to be short in duration. We are not aware of any studies that systematically investigate the relationship between inputs and outcomes. However, there is a consensus among training and development theorists and expert practitioners that the most important activity required to generate positive returns on investment from a workplace training intervention is to ensure that the intervention is *aligned to the business needs of the organization*. This was a major finding of the recent *Investing in People* project conducted by the Canadian Society for Training and Development (CSTD, 2010) and funded by HRSDC. Of the twelve participating employers, only five achieved a positive return on their training investments. In the seven cases where positive ROI could not be established, there were three key barriers: training was not aligned to the needs of the business; program design was not aligned to needs of learners; and learners lacked the opportunity to apply their new skills back in the workplace. The CSTD concluded that if workplace training is to deliver lasting value, training must be considered as an integral part of the “*organizational ecosystem*.” For learning programs to deliver value, the CSTD argues that *training must evolve directly from the organization’s key business priorities*.

A fundamental challenge to aligning training with business needs lies in the inherent complexity of organizations. A performance problem may be due to a multitude of causes, only one of which may be workers’ skills. If a skills gap is not the cause of the performance gap, training to improve skills will not help to close the gap and may even result in negative return on investment. To address this challenge, the training and development literature recommends a systematic approach that starts by identifying business and performance gaps and then analyzing the various causes of these gaps. This approach is informed by what is called the field of human performance improvement (HPI), which draws on a range of disciplines including behavioural psychology, instructional systems design, organizational development, and human resources management.

Outputs

We are not aware of any studies that systematically investigate the relationship between training outputs and outcomes of interest but again, there is general consensus in the training literature on which outputs matter, such as the costs per learner for design and delivery and learner reaction and satisfaction (see Bersin, 2008 for a discussion of training metrics).

Intermediate outcomes of workplace learning

Intermediate outcomes are outcomes which are not usually of value in themselves but are valued because they support the attainment of final outcomes of interest.

We are not aware of any research that systematically investigates the extent to which participation in workplace-related training is associated with gains in human, social, or psychosocial capital. In-house evaluations of workplace training sometimes attempt to measure the extent to which participants achieved the learning objectives of a particular course. But from an employer standpoint, the more important question is typically whether learners can apply the skills and knowledge they learned on the job. According to the corporate training and development literature, it is all too common for workplace training to bring about changes in knowledge but not changes in behaviour. Robinson and Robinson (1995) argue that between 80% and 90% of the investment in learning is lost as people do not apply what they have learned to the job. One of the most significant barriers to learning transfer cited by training participants in the CSTD's Investing in People Project (2010) was that their job situations provided few "relevant opportunities to apply the new learning." Lack of early opportunities to apply learning presents a serious risk to positive business outcomes, since the likelihood of participants forgetting much of the new skills and knowledge increases sharply as time passes. Another critical and commonly encountered barrier is lack of time or other job priorities that prevent the participants from reinforcing or consolidating the new learning. Participants cited a need for a "nesting period" following training. The "nesting period" is a block of "protected" time which would free trainees from some of their regular responsibilities and allow them to focus on integrating and applying their new learning to their jobs.

Final outcomes of workplace learning

A final outcome is an outcome that is related to the fundamental purpose of implementing, providing, funding, or participating in the learning activity. We distinguish between types of final outcomes depending on to whom they accrue (individuals, firms, society). We also distinguish between outcomes depending on whether they are financial or non-financial.

In terms of workplace-related training, there are two key final outcomes that are of interest: individual hourly wages and productivity. Considered as an investment in human capital, training is expected to raise the productivity of the worker (Becker, 1964; Mincer, 1974). If wages are equal to productivity, then one could assess the impact of training on productivity by measuring wages before and after the human capital investment. Most studies attempting to measure returns to training make this assumption and use wages as an outcome measure. The main technical challenge is then to deal with the fact that workers receiving training are not chosen randomly by the workplace: it is expected that more productive workers are more likely to receive training. If other determinants of productivity are unobserved or difficult to measure, a simple look at changes in wages following training will not provide an estimate of the real impact of training. It is usually the case, then, that true returns to

training will be lower than one would expect based on this simple comparison – this is the so-called unobserved ability bias. A second difficulty in estimating the impact of training on wages is due to the fact that the training history of the worker is rarely observed. The omission of past training episodes, if they are correlated with current training and wages, will also lead to an upward bias in the estimated returns to training.

Individual financial

Individual financial outcomes are those outcomes experienced by individual learners and their families that can be expressed directly as dollar figures such as earnings. There are numerous studies that investigate the extent to which individuals benefit financially from participating in workplace learning. Most studies use the worker's hourly wage as the outcome, and whether the worker received training in the past year as a measure of human capital investment. However, some datasets contain information on training intensity (hours or days of training) and the subject of firm-sponsored training. The subject of training seems important, as it would be expected that training in general subjects would have a bigger impact on wages than firm-specific training (Becker, 1964 and Mincer, 1974). In what follows, we focus on articles from the recent literature, which mostly use representative national data.

Lynch (1992), using data from the US *National Longitudinal Survey of Youth* (NLSY) of 1980 and 1983, is the first study to take into account the complete training history of the worker since entry on the job market as well as detailed information on the intensity of training. She finds a positive and statistically significant impact of training on wages. To determine the relationship between training and wages, the author regresses the log-wages of young workers on a function of tenure, work experience, schooling, and training. She finds that the impact on wages is different depending on whether training was acquired through previous employers or the current employer. For example, in the case of training obtained from previous employers, she finds no impact of on-the-job training on current wage, while the opposite is true for classroom training. In that case, one week of additional training raises wages by 0.2%. In the case of training from the current employer, Lynch (1992) finds a positive impact of on-the-job training on wages (1 week of training increases wages by 0.2%) but no impact for classroom training. In all cases, the fact that trained employees are self-selected is taken into account using Heckman's correction for sample selection.

Veum (1995) extends Lynch's (1992) study by making further distinctions on the types of training received by the employee. He uses the 1986 and 1990 versions of the NLSY and is able to distinguish on-the-job training from apprenticeship training. In the case of classroom training, he is able to distinguish between (1) company training programs, (2) vocational or technical institutes, (3) correspondence courses, and (4) seminars outside the workplace. Like Lynch, Veum also uses a log wage specification, and measures the effects of training on wages by regressing 1990 log wages on the number of hours invested in training over the five year span between 1986 and 1990, and a variety of individual characteristics. He finds that only on-the-job training and classroom training received through company training and seminars outside work have a significant impact on wages.

Loewenstein and Spletzer (1998) obtain results similar to Lynch (1992) using waves 1988 through 1991 of the NLSY, but they take into account unobserved differences among workers with fixed effects instead of Heckman's sample selection correction. However, contrary to Veum (1995), in addition to

finding positive returns to seminars outside work, they find similar positive returns to attending training in vocational or technical schools. For a worker who undertook such training, wages can be as much as 14% higher than for a worker who did not. For other types of training, the wage premium varies between 2.8% and 4.5%. Another study by the same authors (Loewenstein and Spletzer, 2000) matches data from the 1993 NLSY to those of the *Employer Opportunity Pilot Project* (EOPP). They distinguish between specific and general training, assessing the specificity of the training received with questions to the employee as to whether the received training would be useful with other employers. They cannot reject the hypothesis that returns to specific training are the same as the returns to general training, although both have a positive impact on wages.

Frazis and Loewenstein's (2005) study contains detailed estimates of the magnitude of the impact of training on wages. Employing a variety of wage equations, they find cube root estimates to be the most fitting: they show that training for 60 hours raises wages by 3-4% using data from the NLSY and training for 38 hours (on average) raises wages by 5% using data from the EOPP.

Among recent studies using data from outside the US, Booth, Francesconi, and Zoega (2003) show that returns to training are higher among British unionized (3%) than non-unionized workers (0%). Goux and Maurin (2000), using French data, find that returns to training fall close to zero once the selectivity of the firm's training practices is taken into account. For Norway, Schone (2004) finds wage-returns of 1% (although they could be as high as 5% when unobserved heterogeneity in wage levels is not taken into account). Bassanini (2006), using data from the European Community Household Panel (ECHP) estimates returns for the incidence of training of about 1% on average (although estimates vary by country, see Arulampalam, Booth, and Bryan (2010)). In Belgium, recent research by Leuven and Oosterbeek (2008) shows that taking into account the desire to participate in training leads to near-zero wage-returns.

Not much work has been done on whether returns depend on workers' characteristics. Havet (2007) finds that wage-returns to firm-sponsored training do not differ between men and women among Canadian workers. However, with the same data, Dostie and Léger (2011) find that returns diminish with age: the wage returns to classroom training for older workers are dramatically smaller than for younger workers.

Dostie and Léger use the Canadian *Workplace Employee Survey*, between the years 1999 and 2005, with a sample of 75,644 individuals between the ages of 35 to 65, to estimate the incidence of training by age groups. Compared to workers between the ages of 35 to 39, workers who are 50 to 54 are 5.7% less likely to receive firm-sponsored classroom training, workers aged 55 to 59 are 6.4% less likely, and workers aged 60 to 64 are 7.9% less likely. To estimate the effect on wages, they use a typical log-wage specification but take into account both individual and workplace heterogeneity, using a two-factor analysis of covariance with repeated observations. Estimated wage increases are relatively small for all workers and decline by age group. Workers between the ages of 35 and 44 saw an hourly wage increase of 1.2% if they had participated in firm sponsored classroom training; just 0.9% for workers aged 45 to 54; and just 0.7% for workers 55 to 64.

In summary, the literature is consistent in finding positive wage-returns to workplace-related training. As expected, returns are lower once self-selection into training is taken into account: recent studies using more sophisticated statistical methods to take endogenous training decisions into account thus

find much lower wage-returns than earlier studies. A case could also be made that returns to training seem lower outside the US. We think that, since the average duration of training is very short, one should be sceptical of high returns to training. Therefore, our best estimate would be that wage-returns to training are positive but small. Still, even at these low levels, in-company training can explain most of a worker's within-firm wage growth (Loewenstein and Spletzer, 2000).

Individual non-financial

Most of the literature related to non-financial outcomes has focused on the impact of education and skills on job satisfaction rather than the effect of training as such. We discuss two notable exceptions. Siebern-Thomas (2005) analyzes 13 countries in the *European Community Household Panel* (ECHP) 1994-2001 and finds that job satisfaction tended to be higher where there was access to workplace training. Jones et al. (2009) use the British 2004 *Workplace Employee Relations Survey* (WERS) to address the same question. To measure job satisfaction, the employees are asked their level of satisfaction – relative to a five point scale ranging from 1, “very dissatisfied,” to 5, “very satisfied” – with respect to: 1) their sense of achievement in their work; 2) the scope for using their own initiative; 3) the influence they have over their job; 4) the amount of training they receive; 5) the amount of pay they receive; and 6) how they find the work itself. The authors find that having received training within the last year is positively and significantly correlated with all five job satisfaction measures. They also find that individuals who receive less training than their co-workers are *less* satisfied at work. Also, individuals who receive only a short amount of training (i.e., less than one day) have lower levels of satisfaction than those who did not participate in any training at all. Note that although both studies find large and highly significant relationships, neither study is able to shed light on the causal nature of relationship. It is unclear whether training causes satisfaction or satisfaction causes training, or even whether the relationship is spurious with a third unidentified factor causing both outcomes.

Firm final outcomes

Productivity

In order to obtain an objective measure of a worker's productivity, most recent studies on the returns to training use firm-level data containing information on value-added or sales per worker. There are still relatively few studies measuring the impact of training on an objective measure of a worker's productivity, although this number is rising fast. As such, we can afford to be more exhaustive in our review of the literature. This dearth of studies is most likely due to the fact that there are relatively few datasets containing both the information on the firm's productivity and its training practices (Black and Lynch, 1996; Barrett and O'Connell, 2001). Moreover, many studies that do so use relatively small samples, meaning that their results are not necessarily generalizable. This is the case with Holzer, Block, Cheatham, and Knott (1993) who use data from 390 applicants to the *Michigan Job Opportunity Bank-Upgrade* program from 1987-1989, Bartel (1994) who use data from 495 American firms, and Ballot and Taymaz (2001) who have data on only 90 firms in France and 270 firms in Sweden.

Also, most of the earlier studies from the 1990s do not attempt to take into account the fact that only workplaces that perceive positive net benefits for undertaking training will do so.¹⁷ The difficulties in obtaining the causal impact of training on productivity are similar to those one faces when using wages as an outcome measure: it is possible that more productive workplaces are also investing more in human capital - causing an upward bias in estimated returns to training. Taking into account endogenous training decisions is important. For example, Black and Lynch (2001) use US data from two points in time and find that significant effects of training on productivity in the cross-section disappeared in their firm fixed effects estimations. While ground breaking, their study is limited by small sample size, high attrition and the partial-panel nature. Moreover, their methodology only controls for endogeneity due to time-invariant variables.

An additional problem in using firm-level data is that it is also possible that demand conditions affect both productivity and training simultaneously. If firms react to positive demand shocks by lowering their human capital investments, training could be correlated with lower productivity even though the impact of training on productivity is positive. Not surprisingly, given the small sample sizes and various empirical strategies used, early results were inconsistent. Bartel (1994) and Black and Lynch (2001) find no impact of training on productivity or only a deferred impact. Many other studies find a positive impact, but the magnitude of the impact is very hard to compare across studies. Some studies do not even attempt a precise quantification.¹⁸

A number of recent studies have overcome some of these limitations. Dearden, Read, and Reenen (2006) use a panel dataset from the UK, and although their training measure is aggregated at the industry level, they are able to control for the endogeneity of training in a very general way using GMM methods to find a significant positive effect of training on productivity. In another recent study Zwick (2006) uses a large panel of German workplaces and, correcting for endogeneity of training decisions using fixed effects and instrumental variables, he finds that increasing the proportion of employees receiving training by 1% increases output per employee by 0.76%.¹⁹ Almeida and Carneiro (2009) use a first-difference IV approach based on Blundell and Bond (2000) for a large panel of Portuguese firms and find that while workplaces that do not provide training would obtain negative returns if they were to start, among firms that do provide training, returns are estimated at 24%.

While most of these studies look at training in general, some recent studies distinguish between on-the-job and classroom training, or between informal and formal training. Many studies find positive effects of general (classroom) training on productivity but no effect for specific (on-the-job) training (see Black and Lynch (2001) and Barrett and O'Connell (2001).). It therefore seems important not to aggregate all kinds of training in one single measure. Dostie (2010) investigates why returns to on-the-job training are lower than returns to classroom training, using Canadian employee-employer data from 1999-

¹⁷ That is the case for Holzer, Block, Cheatham, and Knott (1993), Bartel (1994), Black and Lynch (1996) and Barrett and O'Connell (2001).

¹⁸ That is the case for example with Holzer, Block, Cheatham, and Knott (1993), Black and Lynch (1996) or Ballot and Taymaz (2001).

¹⁹ Zwick (2006) uses three survey questions that indicate expected skill gaps and the reaction of the personnel department on skill shortages as identifying variables for the decision on how many employees are trained.

2006, which is both longitudinal and linked. To do so, he employs a standard production function, and using panel GMM methods to control for endogenous training decisions, finds that labour turnover explains a large fraction of the difference since a fair share of on-the-job training is related to reducing turnover, not enhancing productivity. The remainder of the difference seems mostly due to the fact that some productivity-enhancing subjects are more likely to be taught in a classroom setting.²⁰

Interestingly, Dostie and Léger (2011) find that the impact of training on productivity is much lower for older workers than for younger workers. They use what is called a Cobb-Douglas production function to determine productivity. This function is based on value-added defined as gross operating revenue minus expenses on intermediary inputs, training expenses and additional labour costs. They find that training raises the productivity of workers younger than 35 by 37%; between 35-44 by 20.3%; and over 55 by just 5.4%.

Even using the most sophisticated econometric techniques to take into account endogenous training decisions at the firm level, studies are pretty consistent in finding sizable returns to training. In particular, the impact of training on productivity appears at least as big, if not much higher than its impact on wages. In fact, estimating how the surplus generated by training activities is divided between firms and workers is the exact focus of a crop of recent working papers that, using firm-level data, replicate the findings of Barron, Berger, and Black (1999), Loewenstein and Spletzer (1998), Barron, Black, and Loewenstein (1989) and Bishop (1991). In Italy, Conti (2005) finds that the firm reaps more of the returns to training. For Germany, Kuckulenz (2007) finds that the impact of training on productivity is three times higher than the one on wages. Lopes and Teixeira (2010) use data from Spain and find that two thirds of the productivity gains from training are captured by firms. In the study described above, Dostie and Léger (2011) find that firms reap most of the benefits of classroom training.

While the impact of training on productivity does appear to be higher than its impact on wages, the exact magnitude of the returns remains in doubt, as estimates vary a lot over the different studies. It is also the case that very few studies compare the benefits of training to its cost. As such, speaking in terms of returns to training is misleading, as the reported numbers do not represent a true return on the investment (ROI).

Innovation

At the firm level, a current outcome of interest is the innovation performance of the workplace. Zeytinogly and Cooke (2009), use the *Canadian Workplace and Employment Survey* from which they were able to gather data for 20,377 workers at 6,223 firms. They find a strong relationship between on-the job training and innovation. The authors measure technological progress or advancement in terms of the extent to which the following are adopted or experienced in a workplace: entirely new software and hardware; new goods, services and processes; and competition from other firms within the same business. Their multivariate regression analyses offer several findings. At workplaces which have implemented new technology (i.e., software and hardware) 37% of employees received training versus just 30% at those firms which have not. At workplaces in which there has been innovation (i.e., new

²⁰ This is the case, for example, with Professional training.

goods, services and processes), 38% of employees received training versus 27% at those firms which have not. And where there is little business competition, just over 25% receive training, versus around 33% for those facing regional competition, and 36% for those who face global competition. Evidently, those firms which implement new technology, generate more innovation and face more significant competition deliver more on-the-job training. Notably the relationship between training and technological implementation is only significant at the 10% level, while the relationship between training and innovation is noted as being strong and significant. Importantly, the authors do not claim the association can be interpreted as causality. Bauernschuster, Falck, and Heblich (2009) also find a strong association between training and innovation. However, using instrumental variables, they argue that the link is causal, i.e., that increasing human capital investments at the firm-level will lead to a higher probability of innovation, but it is hard to quantify the effect.

In summary, firm-sponsored investments in human capital do yield positive returns. For workers, this shows through consistently higher wages. For firms, the key measure is productivity. In the latter case, though, estimated returns vary considerably. There are mainly two reasons for this. First, the vast majority of the articles on the subject are more recent, and it usually takes time for the literature to reach a consensus. Second, measuring the magnitude of human capital investments at the firm level is more difficult, as it requires information on episodes of training for all employees. Moreover, firm-level decisions with respect to training are potentially correlated to many other firm-level decisions with respect to human resources management and other re-organisational changes, as well as many other characteristics of its workforce (mobility, education) that are difficult to take into account.

The main shortcoming of the literature on both wage and productivity returns to firm-sponsored training is a lack of attention to the cost of training. This is mainly due to the fact that while direct costs are theoretically easy to measure, indirect costs, mostly due to lost production during training episodes, are much more difficult to take into account. As such, these studies do not provide estimates of the ROI of training. Further work on estimating the ROI of human capital investments would be more appropriate for the design of policies for the promotion of firm-sponsored training. Finally, the literature is still in its infancy when it comes to estimating the impact of firm-sponsored training on other measures of firm-level performance, such as innovation. There is a lot of emphasis on the role of innovation as a determinant of living standards. But factors leading to innovation are not well understood. Preliminary research seems to indicate that human capital investments are an important determinant of the innovation performance of the firm.

Summary of state of knowledge for workplace learning

Table 3 provides a high level summary of the state of knowledge with respect to workplace learning.

Table 3 Workplace learning state of knowledge summary

Component	State of knowledge summary
Inputs and outputs	- We are not aware of any rigorous studies that investigate the relationship between inputs and outcomes. But, there is broad consensus in the corporate training literature on which inputs matter (e.g., training aligned with business needs, supervisor engagement). - Also no studies on outputs, but general consensus in the training literature on which outputs matter (e.g., costs per learner).
Intermediate outcomes Human, social, psychosocial capital	We are not aware of any studies that investigate the relationship between any intermediate outcomes specified in our model and desired final outcomes such as increased earnings or productivity.
Individual final outcomes Financial and non-financial	- Large body of peer-reviewed literature. Numerous studies report that workplace training is associated with increased wages and earnings, but estimates vary dramatically. - Few studies successfully control for selection bias or other factors that may affect wages. Nor are they able to determine causal direction of the relationship between training and earnings. - The same body of literature also reports that training is associated with non-financial measures such as increased job satisfaction, but the same caveats also apply.
Social final outcomes Financial and non-financial	We are not aware of any studies that address whether adult workplace learning is associated with positive social outcomes.
Firm final outcomes Financial and non-financial	- Large body of peer-reviewed literature. Most studies use productivity as the key indicator (earlier studies used wages as proxy, more recent studies use firm level outcomes such as sales revenue). More recent studies also attempt to measure innovation. - Reported outcomes are generally positive but again, estimates vary dramatically. - Few studies are able to control for selection bias or other factors that may affect wages. Nor are they able to determine the direction of the relationship between earnings and training. - An area for further research is exploring methodological strategies for dealing with the heterogeneous and episodic nature of training activities.

Summary – State of knowledge, gaps, and avenues for further research

State of knowledge, gaps, and avenues for further research

This report has provided an analysis of the empirical evidence on the outcomes associated with participation in adult learning. Consistent with our conceptual framework (see Appendix A), this review considered the literature on three types of adult learning – foundational, higher education and workplace – for a wide range of financial and non-financial outcomes, for individuals, firms and society.

The purpose of the review was not to provide an exhaustive review of the field but rather to provide a conceptual map to the field that helps to consolidate knowledge and to identify gaps and areas for further policy relevant research. In general, studies were only included in this review if they met the quality criteria outlined in the *Practical Guide*. In cases where the literature is sparse, however, studies that did not meet the criteria were included if we felt that they add to our knowledge base.

This section summarizes the state of knowledge for each of the three types of learning. We summarize our knowledge base according to components of our conceptual framework, as well as highlight knowledge gaps and suggest potential areas for further research. Table 4 provides a brief, further condensed summary.

Foundational learning

Inputs – Little systematic evidence exists on the relationship between inputs and outcomes. However, there is emerging exploratory evidence to suggest that quality in terms of the program design and instructional delivery matters. Examples of inputs that may matter include whether learning activities include a work experience component, the opportunity to earn a credential that is recognized by employers in the local labour market, and whether instruction promotes learning transfer by using authentic workplace materials.

Outputs – We are not aware of any studies that rigorously investigate the relationship between outputs and outcomes. The existing literature is overly dependent on one-dimensional output measures, and there is general agreement among expert practitioners that typical output indicators such as contact hours are only weakly if at all associated with outcomes of interest. Moreover, given that most studies do not account for self-paced study outside the classroom, what is officially reported as contact hours may only be part of the story.

Intermediate outcomes – In terms of intermediate outcomes, evidence on human capital gains is mixed, and no clear patterns emerge by country or by provider. There is some evidence for psycho-social capital as an outcome of adult learning; for instance, several studies report gains in self-esteem and self-efficacy using standardized instruments. Evidence on social capital is weak. While several studies report gains, they do not usually meet the quality standards of evidence. In general, we do not know whether intermediate outcomes are related to final outcomes of interest.

Individual final outcomes – Evidence on the relationship between adult learning and financial outcomes is mixed: while some interventions are evaluated with random assignment and show modest impacts, other interventions using observational measures show small employment impacts but no earnings impacts. Although we usually think of positive selection as an issue, in the case of foundational

learning, negative selection may be a more important issue. Negative selection may be an important factor in observational studies.

Very few studies look at non-financial outcomes of foundational learning specifically. There is a large literature on the impact of obtaining a high school diploma in general. Although causality was an issue in early studies, more recent studies take advantage of exogenous changes in compulsory schooling laws and find significant impacts related to health and wellbeing. However, we do not know if similar impacts would apply to high school obtained later in life or if they would apply to other types of foundational learning.

Firm final outcomes – There is little academic literature specifically on foundational training as it relates to firms. The literature that does exist is based largely on exploratory case studies providing anecdotal evidence. In general studies fail to investigate actual outcomes such as skills gained, and reduced error rates. Several case studies exist that employ quantitative methods report large returns on investment (ROI), these studies contribute to our knowledge base but some have notable methodological limitations.

Social final outcomes – Virtually no studies look at social outcomes of foundational learning specifically – only high school in general. Similar to studies on private non-financial outcomes, early studies suffered from causality issues but more recent studies take advantage of exogenous changes in compulsory schooling. These studies find significant impacts related to civic engagement (e.g., voting), taxes and transfers, and crime. However, it is unclear whether the same benefits would be associated with obtaining a diploma later in life or if similar benefits would be associated with other types of foundational learning such as literacy and essential skills training.

Promising areas for further research

Inputs – Which inputs matter most for adult learning activities and what is their relationship with adult learning outcomes? Further research could investigate which design features matter by comparing program models.

Outputs – How much learning time is spent outside of the formal classroom environment, and how does this affect learning outcomes? Future research could try to capture this type of learning and explore its effect on outcomes.

Intermediate outcomes – What is the relationship between intermediate outcomes and final outcomes of interest?

Final outcomes – How do financial outcomes for adult learners vary by type of foundational learning and why? What dimensions of learning activities are most important for realizing financial returns? Do foundational learning activities result in similar non-financial and social outcomes as those reported in the wider K-12 education literature? Which types of foundational learning and to what extent?

Higher education

Inputs – Although there is no systematic evidence, there is considerable exploratory evidence suggesting that higher education inputs matter for outcomes. There is growing recognition by policy

makers and other experts that standard measures of inputs such as expenditure per student are only weakly if at all associated with desirable outcomes for adult learners. There is emerging evidence to suggest that design features are a key input, and that the current higher education system is not responsive to the needs of adult learners.

Outputs – We are not aware of any studies that investigate the relationship between outputs and outcomes of higher education, but standard output indicators like credits obtained are likely relevant.

Intermediate outcomes – We are not aware of any research that systematically examines intermediate outcomes associated with participation in higher education.

Individual final outcomes – There is strong evidence to suggest that in general, adult learners who engage in higher education experience financial gains such as earnings gains. The returns are roughly the same as when the schooling is acquired earlier in life, which are fairly large and have been estimated using convincing methods. Though selection bias is not accounted for in these studies, findings are consistent across a variety of datasets and studies are strengthened by longitudinal designs and well-defined measures. Despite the consistently high earnings premiums found in this literature, we are not aware of any studies that evaluate higher education in the context of a cost-benefit analysis framework.

We are not aware of any studies that directly investigate the relationship between adult participation in higher education and individual non-financial outcomes. There are numerous studies that examine non-financial outcomes such as health practices and intergenerational effects associated with participation in higher education in general (regardless of whether it is pursued later in life). However, we do not know if similar outcomes are associated with participation in higher education later in life.

Firm final outcomes – We are not aware of any studies exclusively focused on the outcomes experienced by firms as a result of their employees participating in higher education learning opportunities versus other types of learning.

Social outcomes – We are not aware of any studies that directly investigate the relationship between adult participation in higher education and social outcomes. There are however, numerous studies that examine social outcomes associated with participation in higher education in general (regardless of whether it is pursued later in life). Key outcomes in this literature include savings to the tax and transfer system, savings to the health care system, reductions in crime; improved civic engagement and social cohesion; and knowledge spillovers which may generate increased wages and productivity even for those with postsecondary credentials. Again, we do not know whether similar outcomes are experienced by adults who participate in higher education later in life.

Promising areas for further research

Inputs – The extent to which various approaches to transforming inputs to higher education make a difference for educationally disadvantaged adults is an important area for further investigation.

Intermediate outcomes – What are the intermediate outcomes associated with participation in higher education? A better understanding of the intermediate outcomes associated with higher education may

help us to understand the mechanisms by which well-established final outcomes like earnings are achieved, and thus help explain variations in outcomes experienced by learners.

Final outcomes – Further research could test how earnings premiums vary by sub-groups, individual factors, the credential/institution, and whether design is more responsive to adult needs.

Workplace learning

Inputs – We are not aware of any studies that systematically investigate the relationship between inputs and outcomes. However, there is a consensus among training and development theorists and expert practitioners that the most important activity required to generate positive returns on investment from a workplace training intervention is to ensure that the intervention is aligned to the business needs of the organization.

Outputs – We are not aware of any studies that systematically investigate the relationship between training outputs and outcomes of interest but again, there is general consensus in the training literature on which outputs matter, such as the costs per learner for design and delivery and learner reaction and satisfaction.

Intermediate outcomes – We are not aware of any research that systematically investigates the relationship between participation in workplace-related training and gains in human, social, or psychosocial capital. Some in-house evaluations of workplace training attempt to measure skills gains, but from an employer standpoint, the more important question is typically whether learners improve their workplace practices/performance as a result of training. Corporate training and development experts and practitioners point to the need for opportunities to apply new skills on the job and a “nesting period” to consolidate and reinforce new skills in order for learning transfer to occur.

Individual final outcomes – There are numerous studies that investigate the extent to which individuals benefit financially from participating in workplace learning. The literature is consistent in finding positive wage-returns to workplace-related training but estimates vary dramatically. As expected, returns are lower once self-selection into training is taken into account. Recent studies using more sophisticated statistical methods to take endogenous training decisions into account thus find much lower wage-returns than earlier studies. Our best estimate would be that wage-returns to training are positive but small. Still, even at these low levels, in-company training may explain most of a worker’s within-firm wage growth.

Most of the literature related to non-financial outcomes has focused on the impact of education and skills on job satisfaction rather than the effect of training as such. There is emerging evidence that workplace-related training is also associated with non-financial outcome like job satisfaction. Note that although studies find large and highly significant relationships, they are unable to shed light on the causal nature of relationship. It is unclear whether training causes satisfaction or satisfaction causes training or even whether the relationship is spurious with a third unidentified factor causing both outcomes.

Firm outcomes – There are relatively few studies measuring the impact of training on an objective measure of a worker’s productivity. Many studies that do so use relatively small samples, so their results are not necessarily generalizable. Also, most of the earlier studies from the 1990s do not

attempt to take into account the fact that only workplaces that perceive positive net benefits for undertaking training will do so, and that demand conditions may affect both productivity and training simultaneously. A number of recent studies have overcome some of these limitations. Estimates from these studies are generally quite large (larger than wage effects) but estimates vary dramatically. Very few studies compare the benefits of training to its cost.

Finally, the literature is still in its infancy when it comes to estimating the impact of firm-sponsored training on other measures of firm-level performance, such as innovation. Factors leading to innovation are not well understood, although preliminary research seems to indicate that human capital investments are an important determinant of the innovation performance of the firm.

Promising areas for further research

Firm final outcomes – A promising area for further research is to explore various methodological strategies for dealing with the heterogeneous and episodic nature of workplace-related training activities.

Table 4 Knowledge gaps and avenues for further research

Component	Foundational learning	Higher education	Workplace learning
Inputs and outputs	- No rigorous studies, but exploratory studies suggest design and delivery matter - Promising area for further research - No studies on outputs	- No rigorous studies, but exploratory studies suggest design and delivery not suited to adults - Promising area for further research - No studies on outputs	- No rigorous studies but inputs well understood in corporate HR & training literature - No studies on outputs
Intermediate outcomes Human, social, psychosocial capital	- A few studies with mixed evidence for human capital, some evidence for psychosocial capital and very weak evidence for social capital. - Future research could explore if intermediate outcomes are associated with final outcomes	- No studies - Further research could explore whether intermediate outcomes are mechanisms by which well-established final outcomes like earnings are achieved and thus explain part of variation in outcomes	No rigorous studies

Table 4 Knowledge gaps and avenues for further research

Component	Foundational learning	Higher education	Workplace learning
Individual final outcomes Financial and non-financial	- A few rigorous studies report outcomes ranging from modest to no effect on wages - Anecdotal evidence to suggest poor outcomes related to both small doses and poor design - Further research could test this by comparing program models - Several rigorous studies find non-financial benefits for high school in general but unclear if same benefits would apply to adults or other types of foundational learning	- Several rigorous studies report adult higher education increases earnings - Further research could test how earnings premiums vary by sub-groups, individual factors credential/institution, and whether design is more responsive to adult needs - Several rigorous studies find non-financial benefits for PSE in general but unclear if same benefits would apply to PSE earned later in life	- Numerous studies report training is associated with increased wages, but estimates vary dramatically. - A few studies also report training is associated with non-financial outcomes like increased job satisfaction, but again estimates vary dramatically.
Social final outcomes Financial and non-financial	Studies find benefits for high school diploma in general but unclear if the same benefits would apply to adults or other types of foundational learning	Studies find benefits for PSE in general but studies do not specify if effects apply to PSE obtained later in life	
Firm final outcomes Financial and non-financial	- Numerous case studies report a range of positive outcomes but cases are usually selected post hoc overstating benefits - OLES is currently conducting a large scale demonstration project to investigate impact of workplace learning on a wide range of outcomes.	We are not aware of any studies that differentiate firm outcomes based on whether employees participated in higher education versus other types of learning	- Reported outcomes are generally positive but estimates vary dramatically - An area for further research is exploring methodological strategies for dealing with the heterogeneous and episodic nature of training activities

Definitions of key terms

Absenteeism: Refers to the rate at which workers are absent from work, such as number of days absent per year. Of particular interest within the context of adult learning is whether there is a relationship between workers' participation in adult learning and an increase or decrease in absenteeism.

Bonding social capital: Refers to relatively homogenous social networks connected primarily by close or strong ties.

Bridging social capital: Refers to networks that include important connections with those unlike oneself, usually characterized by distant or weak ties. Our framework conceptualizes the development of bridging social capital in particular as a key intermediate outcome of adult learning that may play an intervening role in the realization of socio-economic long-term outcomes.

Civic engagement: A broad concept that includes a variety of social (societal) outcomes related to connecting with society and active citizenship, such as political awareness, voting, volunteering, newspaper readership, and participation in community meetings and events.

Contact hours: Refers to the number of hours a learner participates in an adult learning program/course.

Criminal activity: Within the context of this report, criminal activity is considered both in terms of crime rates and the public good associated with decreases in crime, as well as the social fiscal costs generated by criminal activity which may be lowered as a result of a more highly educated population.

Earnings: Fundamentally, earnings are an individual's wages multiplied by the labour supply – i.e., the amount of time worked. We are interested in whether earnings gains are associated with participation in adult education. Annual earnings, for example, can be affected both by changes in wages, or number of hours or weeks worked, or by changes in an individual's salary.

Employment: The condition of having paid work. A key question in the adult learning field is whether individuals who participate in adult education improve their chances of being employed and, if it is the participation that causes this improvement, do rates of unemployment decrease as participation in adult learning increases?

Health behaviours: This report considers studies which examine whether education is associated with improved health choices and health status related to health choices. Such choices include whether one smokes, the frequency with which they exercise and the incidence of obesity, whether the more highly educated are more or less likely to adopt new medical technology and whether they are more or less responsive to potential health risks they may face.

Health outcomes: This report considers studies which examine whether higher levels of education are associated with improved health outcomes. Health outcomes may be measured using indicators such as incidence of depression, mortality and hospitalization rates.

Labour force attachment: A concept often measured by calculating the number of weeks or hours an individual spends working in a year. Whether someone participates in adult learning or whether or not

they experience substantial gains from doing so may be a matter of the degree to which they are attached to the labour force. Some studies considered in this report investigate whether participation in learning activities is correlated with an increase in the number of hours or weeks a participant works per year, over and above what they would have worked had they not participated. For workers whose pay is wage-based, an increase in the amount of time worked can contribute to an increase in overall earnings.

Innovation/technological progress: Within the context of this report, innovation/technological progress are considered as measures of firm outcomes. In particular, some studies explore whether there is a relationship between workers' participation in workplace-related training and the implementation of new hardware and software or the introduction of new goods, services and processes at the firm who is offering the training to its employees.

Intergenerational effects: Refers to the possibility that a parent's level of education has effects on the outcomes of their children. The intergenerational effects of a parent's level of education can be measured in terms of a child's own level of education, as well as a child's health outcomes, probability of a child participating in criminal activity and various other outcomes.

Job satisfaction: With respect to workplace-related training, there is a question about whether such training can generate increases in the level of satisfaction one feels with their job, which can be measured in terms of the sense of achievement their job provides them with, how much control they feel they have over their job and the pay they receive, among other things.

Knowledge spillovers: Viewed as a potential social outcome, knowledge spillovers refer to the possibility that increased education for some portion of the population creates spillover effects that help to foster a more capable, knowledgeable and innovative society overall. For example, some studies consider whether firms in cities which experience an increase in the proportion of college graduates are more productive than firms in cities in which there is no such influx.

Life satisfaction: Refers to how satisfied people feel with their life generally.

Wellbeing: A broad concept that encompasses a range of non-financial outcomes such as life satisfaction and perceived quality of life, as well as mental health outcomes such as depression, anxiety, or stress.

Productivity: In general terms, productivity is the level of output generated relative to the level of input invested. Increased productivity – i.e., a higher ratio of output to input – is a desirable firm outcome which may be associated with increased levels of education or participation in adult learning. It has often been measured as being proportionate to workers' wages. More recently, value-added/sales per worker have been seen as more reliable measures of productivity.

Self-confidence/self-esteem/self-efficacy: A potential psychosocial intermediate outcome of participation in adult learning, improved self-confidence and self-esteem refer to an improved sense of self worth and belief in one's abilities.

Skills tests/scores: Skills tests and pre- and post-learning activity test scores are used as a measure of increases of human capital which participants may experience as a result of participation in adult

learning. Skills tests are different from IQ tests for example, insofar as they test proficiencies rather than raw intelligence.

Social cohesion: A broad concept that encompasses a variety of possible social outcomes associated with higher levels of education, such as levels of trust among individuals and a region, whether there is support for political authority and racial tolerance, and whether individuals are involved in their communities as part of groups or through volunteering.

Social networks: Measuring changes in an individual's social network – in terms of quality and size – is an indicator of whether an individual has experienced increased social capital as a result of participation in adult learning. For example, social networks can be measured in terms of growth of one's social circle, which can be divided into inner, middle and outer circles which denote social relationships at varying levels of closeness.

Tax and transfer system: In this report, the tax and transfer system is discussed as consisting of the tax payments government makes to individuals by way of social assistance and welfare of different varieties and the revenue it generates from workers through taxes. We discuss it within the context of understanding how individuals with varying levels of education contribute money into or receive money from the system.

Turnover: Refers to the rate at which an employer gains or loses employees. A key question in the workplace training literature is whether workplace training may increase turnover as a result of employees becoming more employable through adult learning activities. Firms in particular are interested in this outcome: if it turns out that workers are likely to receive training from the firm for which they work, and then move on to work elsewhere, this is a bad investment on the part of firms. Conversely, if employer sponsored training is correlated with decreased levels of turnover, then it is a good investment insofar as firms are fostering more capable and productive workers who will contribute more toward their own goals.

Value-added/sales per worker: A measure of firm productivity, which can be calculated as gross operating revenue minus expenses on intermediary inputs, training expenses and additional labour costs.

Voter behaviour: A social outcome that may include indicators such as voting registration and voter turnout. A question considered in this review is whether higher levels of education are associated with improved voting behaviour. In particular, are more educated individuals more likely to register to vote and to vote? If so, there is a further question about whether participation in adult learning would also increase voting participation.

Wages: Wages are the price of labour paid to workers by the firms for which they work. Increased wages are a potential individual financial outcome associated with participation in adult learning.

References

- Acemoglu, D. and J. Pischke (1998). "Why do firms train? Theory and evidence." *Quarterly Journal of Economics*, 113(1): 79–118.
- Acemoglu, D. and J.-S. Pischke (1999a). "The structure of wages and investment in general training." *Journal of Political Economy*, 107(3): 539– 572.
- Acemoglu, D. and S. Pischke (1999b). "Beyond Becker: Training in imperfect labor markets." *The Economic Journal*, 119, F112–F142.
- Acemoglu, D. and J.-S. Pischke (2000). "Certification of Training and Training Outcomes." *European Economic Review*, 44(4-6): 917-927.
- Ahlstrand, Amanda L., Laurie J. Bassi, and Daniel P. McMurrer (2003). "Workplace Education for Low-Wage Workers." Michigan: W.E. Upjohn Institute for Employment Research.
- Almeida, R. and P. Carneiro (2009). "The return to firm investments in human capital." *Labour Economics*, 16(1): 97–106.
- Ananiadou, K., Jenkins, A., and Wolf, A. (2003). "The benefits to employers of raising workforce basic skill levels: a review of the literature." London: National Research and Development Centre for Adult Literacy and Numeracy.
- Anderson, D. Mark. (2010) "In School and Out of Trouble? The Minimum Dropout Age and Juvenile Crime." Job market paper.
- Anderson, T., R. Dorsett, J. Hales, S. Lissenburgh, C. Pires and D. Smeaton (2004). "Work-Based Learning for Adults: An Evaluation of Labour Market Effects." Department for Work and Pensions Working Age Research and Analysis Research Report no. 187.
- Apps, J.A. (1989). "Providers of adult and continuing education framework." In, I Merriam, S. M. and Cunningham, P. M. (eds.) *Handbook of Adult and Continuing Education*, pp 275-286. San Francisco: Jossey-Bass.
- Arendt, J.N. (2008). "In Sickness and in Health—Till Education Do Us Part: Education Effects on Hospitalization." *Economics of Education Review*, 27(2): 161-72.
- Arulampalam, W., A. L. Booth, and M. L. Bryan (2010). "Are there asymmetries in the effects of training on the conditional male wage distribution?" *Journal of Population Economics* 23: 251–272.
- Bailey, A. (2007). "Connecting the Dots: Linking Training Investment to Business Outcomes and the Economy." Ottawa: Canadian Council on Learning. Canadian Council on Learning. Available at: http://www.ccl-cca.ca/NR/rdonlyres/F6226BEA-0502-4A2D-A2E0-6A7C450C5212/0/connecting_dots_EN.pdf.
- Bakis, Ozan, Nurhan Davutyan, Haluk Levent and Sezgin Polat (2009). "Social Returns to Higher Education in Turkey: A Quantile Regression Approach." Economic Research Forum, 16th Annual Conference: "Shocks, Vulnerability and Therapy."

- Balatti, J., S. Black and I. Falk (2006). "Reframing adult literacy and numeracy course outcomes: A social capital perspective." National Centre for Vocational Education Research. Available at: <<http://www.ncver.edu.au/research/proj/nr4L05.pdf>>.
- Balatti, J. and I. Falk (2002). "Socioeconomic Contributions of Adult Learning to Community: A Social Capital Perspective." *Adult Education Quarterly*, 52(4): 281-298.
- Ballot, G. F. and E. F. Taymaz (2001). "Firm's human capital, R&D and performance: A study on French and Swedish firms." *Labour Economics*, 8(4): 443-462.
- Barrett, A. and P. O'Connell (2001). "Does training generally work? The return to in-company training." *Industrial and Labor Relations Review*, 54(3): 647-663.
- Barro, R.J. (2001). "Human Capital and Growth." *American Economic Review*. 91(2): 12-17.
- Barron, J., M. Berger, and D. Black (1999). "Do workers pay for on-the-job training?" *Journal of Human Resources*, 34(2): 235-252.
- Barron, J. M., D. A. Black, and M. A. Loewenstein (1989). "Job matching and on-the-job training." *Journal of Labor Economics*, 7(1): 1-19.
- Bartel, A. P. (1994). "Productivity gains from the implementation of employee training programs." *Industrial Relations*, 33(4): 411-425.
- Bartel, A.P. (1995). "Training, Wage Growth, and Job Performance: Evidence from a Company Database." *Journal of Labor Economics*, 13(3): 401-425.
- Bassanini, A. (2006). "Training, wages and employment security: an empirical analysis on European data." *Applied Economics Letters*, 13(8): 523-527.
- Bassi and Belfiore (2001).
- Bauernschuster, S., O. Falck, and S. Heblich (2009). "Training and innovation." *Journal of Human Capital*, 3(4): 323-353.
- Becker, G. S. (1964). "Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education." Cambridge: National Bureau of Economic Research.
- Becker, G.S. (1975). "Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education." New York: National Bureau of Economic Research.
- Bedard, Kelly and Chris Ferrall (2003). "Wage and Test Score Dispersion: Some International Evidence", *Economics of Education Review*, 22(1): 31-43.
- Behrman, Jere R. and Nancy Birdsall (1983). "The Quality of Schooling: Quantity alone is misleading." *American Economic Review*, 73(4): 928-946.
- Bélanger, P. and Tuijnman, A.C. (eds.) (1997). *New patterns of Adult Learning: A six-country comparative study*. Oxford: Pergamon Press.
- Benjamin, D. J., S.A. Brown and J. M. Shapiro (2006). "Who is 'behavioral'? Cognitive ability and anomalous preferences." Available at SSRN: <http://ssrn.com/abstract=675264>

- Benseman, J. and R. Tobias (2003). "First Chance for a Real Education' – An Impact Study of Adult Literacy. Follow-up Study of Training Opportunities and Youth Training Adult Literacy Students in Christchurch, New Zealand." New Zealand: Tertiary Education Commission. Available at: <<http://www.tec.govt.nz/Documents/Publications/ace-first-chance.pdf>>.
- Bernhardt, Annette, Laura Dresser, and Erin Hatton (2003). "The Coffee Pot Wars: Unions and Firm Restructuring in the Hotel Industry." In Richard Murnane (ed.) *Low-wage America: How employers are reshaping opportunity in the workplace*, pp. 77-117. New York: Russell Sage Foundation.
- Bersin, J. (2008). *The Training Measurement Book: Best Practices, Proven Methodologies, and Practical Approaches*. San Francisco: John Wiley & Sons.
- Betts, J. R. (1996). "Is There a Link between School Inputs and Earnings? Fresh Scrutiny of an Old Literature." In G. Burtless (ed.) *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success*. Washington, DC: Brookings.
- Betts, J.R, McFarland, L.L. (1995), "Safe port in a storm. The impact of labour market conditions on community college enrolment." *Journal of Human Resources*, 30(4): 741-65.
- Bingman, M.B., O. Ebert, and M. Smith (1999). "Changes in Learners' Lives One Year After Enrollment in Literacy Programs : An analysis from the Longitudinal Study of Adult Literacy Participants in Tennessee." The National Center for the Study of Adult Learning and Literacy, Harvard Graduate School of Education. URL: < <http://www.ncsall.net/fileadmin/resources/research/report11.pdf>>.
- Bishop, J. (1991). "On the job training of new hires." In D. Stern and J. Rizzo (eds.), *Market Failure in Training? New Economic Analysis and Evidence on Training of Adult Employees*, pp. 61–96. New York: Springer-Verlag.
- Black, S.E. and L.M. Lynch (1996). "Human-Capital Investments and Productivity." *American Economic Review Papers and Proceedings*. 86(2): 263-267.
- Black, S. and L. Lynch (2001). "How to compete: The impact of workplace practices and information technology on productivity." *The Review of Economics and Statistics* 83(3): 434–445.
- Blank, Rebecca M., Sheldon H. Danziger, and Robert F. Schoeni (2006). *Working and Poor: How Economic and Policy Changes Are Affecting Low-Wage Workers*. New York: Russell Sage Foundation.
- Bloom, H.S., Orr, L.L., Bell, S.H., Cave, G., Doolittle, F., Lin, W. & Bos, J. (1997). "The benefits and costs of JTPA Title II-A programs: Key findings from the National Job Training Partnership Act study." *Journal of Human Resources*, 32(3).
- Bloom, M., Burrows, M., Lafleur, B., & Squires, R. (1997). "The economic benefits of improving literacy skills in the workplace." Ottawa: The Conference Board of Canada.
- Bloom, M., and Campbell, A. (2002). "Success by design: What works in workforce development." Ottawa: The Conference Board of Canada.

- Blundell, R. and Bond, S. (2000). "GMM Estimation with persistent panel data: an application to production functions," *Econometric Reviews*, Taylor & Francis Journals, vol. 19(3), pages 321-340.
- Booth, A. L., M. Francesconi, and G. Zoega (2003). "Unions, work-related training, and wages: Evidence for British men." *Industrial and Labor Relations Review*, 57(1): 68–91.
- Boothby, D. and T. Drewes (2010). "Returns to Apprenticeship in Canada." Canadian Labour and Skills Researcher Network Working Paper. Working Paper No. 70.
- Borghans, L., Duckworth, A. L., Heckman, J. J. & Weel, B. T. (2008). "The Economics and Psychology of Personality Traits." IZA Discussion Paper No. 3333.
- Bos, J., Scrivener, S., Snipes, J., & Hamilton, G. (2002). "Improving basic skills: The effects of adult education in welfare-to-work programs." U.S. Department of Health and Human Services, Administration for Children and Families and Office of the Assistant Secretary for Planning and Evaluation; and U.S. Department of Education. Washington, DC.
- Bossort, P., B. Cottingham, and L. Gardner (1994). "Learning to Learn: Impacts of the Adult Basic Education Experience on the Lives of Participants." British Columbia Ministry of Skills, Training and Labour. Available at: <http://www.nald.ca/library/research/pat/L2L/cover.htm> (accessed Jan. 10, 2010)
- Bourdieu, P., and J.-C. Passeron (1970) *Reproduction in Education, Society and Culture*. (Translated by R. Nice, 1977). London: Sage.
- Bratsberg, Bernt, and Dek Terrell (2002). "School Quality and Returns to Education of U.S. Immigrants." *Economic Inquiry*, 40(2): 177-98.
- Brooks, Greg, Carole J. Torgerson and Jill Porthouse (2003). "A systematic review and meta-analysis of randomised controlled trials evaluating interventions in adult literacy and numeracy." *Journal of Research in Reading*, 26(3): 234-255.
- Bryson, L. (1936). *Adult education*. New York: American Book
- Burden, Barry C. (2009). "The dynamic effects of education on voter turnout." *Electoral Studies*, 28: 540-549.
- Business in the Community (2007). "Fowler-Welch Coolchain – Language Skills for Migrant Drivers." Available at: http://www.bitc.org.uk/resources/case_studies/afe1391_sfl_fwc.html (accessed Jan. 10, 2010).
- Bynner, John., Samantha Parsons (2006). "New Light on Literacy and Numeracy." National Research and Development Centre for adult literacy and numeracy. Institute of Education, University of London.
- Cameron, S.V. and J.J. Heckman (1993). "The Nonequivalence of High School Equivalents." *Journal of Labor Economics*, 11(1) (Part 1: Essays in Honor of Jacob Mincer): 1-47.

- Canadian Society for Training and Development (CSTD). (2010). "ArcelorMittal Dofasco: Measuring the Impact of Essential Skills Training." Case study of the Investing in People Project. Available at: <http://www.cstd.ca/LinkClick.aspx?fileticket=C%2f5bjs%2bQPG8%3d&tabid=81>
- Canadian Society for Training and Development (CSTD) (2010). Investing in People Project. Available at: <http://www.cstd.ca/ResearchandResources/InvestinginPeople/tabid/81/Default.aspx?PageContentID=66>
- Caponi, Vincenzo, Cevat Burc Kayahan, and Miana Plesca (2010). "The Impact of Aggregate and Sectoral Fluctuations on Training Decisions." Mimeo, University of Guelph.
- Card, David (1994). "Earnings, Schooling and Ability Revisited." National Bureau of Economic Research Working Paper No. 4832.
- Card, David (1995). "Earnings, Schooling, and Ability Revisited." In Solomon Polachek (ed.), *Research in Labor Economics*, vol. 14. Greenwich Connecticut: JAI Press.
- Card, David (1999). "The Causal Effect of Education on Earnings." In O. Ashenfelter and D. Card. (eds.) *Handbook of Labor Economics*, vol. 3A, pp 1801-64. Amsterdam: North Holland.
- Card, David (2001). "Estimating the Returns to Schooling: Progress on Some Persistent Econometric Problems." *Econometrica*, 69(5): 1127-60.
- Card, David, and Alan B. Krueger (1992). "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States." *Journal of Political Economy*, 100(1): 1-40.
- Carneiro, Pedro and James Heckman (2003). "Human Capital Policy." In J. Heckman and A. Krueger (eds.) *Inequality in America: What Role for Human Capital Policy?* Cambridge, Mass: MIT Press.
- Carneiro, P., Crawford, C. and Goodman, A. (2007). "Which skills matter?" In D. Kehoe (ed.), *Practice Makes Perfect: The Importance of Practical Learning*, The Social Market Foundation, pp. 22-38.
- Chapman, B., T.F. Crossley, and T. Kim (2003). "Credit Constraints and Training after Job Loss." Australia National Univesity. Centre for Economic Policy Research. Discussion Paper No. 466.
- Charette, M.F., and R. Meng (1998). "The Determinants of Literacy and Numeracy, and the Effect of Literacy and Numeracy on Labour Market Outcomes." *Canadian Journal of Economics*, 31(3): 495-517.
- Chen, Keith and Fabian Lange (2008). "Education, Information, and Improved Health: Evidence from Breast Cancer Screening." IZA Discussion paper No. 3548
- Chevalier, Arnaud (2004), "Parental Education and Child's Education: A Natural Experiment", *IZA*. Discussion Paper No. 1153
- Chevalier, A., & Feinstein, L. (2006). "Sheepskin or Prozac: The Causal Effect of Education on Mental Health." London: Centre for Research on the Wider Benefits of Learning Discussion Paper. Available at: <http://cee.lse.ac.uk/cee%20dps/ceedp71.pdf>.
- Chowhan, J. (2005). "Who trains? High-tech Industries or High-tech Workplaces?" Ottawa: Statistics Canada. Catalogue no.11-622-MIE no. 006.

- Ciccone, A., and Peri, G. (2002). "Identifying Human Capital Externalities: Theory with an Application to US Cities," IZA Discussion Papers 488, Institute for the Study of Labor (IZA).
- Conti, G. (2005). "Training, productivity and wages in Italy." *Labour Economics*, 12(4): 557–576.
- Coulombe, S. and J.F Tremblay (2006). "Literacy and Growth." *Topics in Macroeconomics*. 6(2): 1-32.
- Craddock, T. and A. Muttu (2010). "Return on Investment in Literacy and Essential Skills Training: Canadian and International Experience." Human Resources and Skills Development Canada.
- Currie, J. (2001). "Early childhood education programs." *Journal of Economic Perspectives*, 15(2): 213-238.
- Currie J., & Moretti, E. (2003). "Mother's education and the intergenerational transmission of human capital: evidence from college openings." *Quarterly Journal of Economics*, 118(4), 1495–1532.
- Cutler, D., & Lleras-Muney, A. (2010). "Understanding differences in health behaviours by education." *Journal of Health Economics*, 29(1): 1-28.
- Darkenwald, G. and Merriam, S. (1982). *Adult education: Foundations of practice*. New York: Harper and Row.
- DataAngel, (2009). Addressing Canada's Literacy Challenge: A Cost/Benefit Analysis. Ottawa: Data Angel.
- De Broucker, Patrice (1997). "Job-related training—who has access?" *Education Quarterly Review*. 4: 10-31.
- De Coulon, Augustin, Elena Meschi and Anna Vignoles (2008). "Parents' Basic Skills and Children Cognitive Outcomes." Available at:
<http://www.abdn.ac.uk/business/uploads/files/Parents%20Basic%20Skills%20and%20Children%20Cognitive%20Outcomes.pdf>
- De Walque, D. (2010). "Education, information, and smoking decisions: Evidence from smoking histories in the United States, 1940-2000." *Journal of Human Resources*, 45(3): 682-717.
- Dearden, L., H. Read, and J. V. Reenen (2006). "The impact of training on productivity and wages: Evidence from British panel data." *Oxford Bulletin of Economic and Social Research* 68(4): 397–421.
- Decker, Paul T. (2010). "Ten Years of the Workforce Investment Act (WIA): Interpreting the Research on WIA and Related Programs." Revised version of 2009 paper for conference: "What the European Social Fund Can Learn from the WIA Experience."
- Dee, T.S. (2004). "Are There Civic Returns to Education?" *Journal of Public Economics*, 88(9-10): 1696-1712.
- DellaVigna, S. (2009). "Psychology and economics: Evidence from the field." *Journal of Economic Literature*, 47(2): 315-372.
- Desjardins, R., Rubenson, K., and Milana, M. (2006). "Unequal Chances to Participate in Adult Learning: International Perspectives." Paris: UNESCO IIEP Fundamentals of Educational Planning Series.

- Dostie, B. and M.-P. Pelletier (2007). "Les Rendements de la Formation en Entreprise." *Canadian Public Policy*. 33(1): 21–40.
- Dostie, B. (2010). "Estimating the returns to firm-sponsored on-the-job and classroom training." IZA Discussion Paper No.5258.
- Dostie, B. and P.T. Léger (2011). "Firm-sponsored training: Is it worth it for older workers?" Working Paper, HEC Montréal.
- Drewes, Torben (2008). "Adult Education and Training from a Longitudinal Perspective." Ottawa: Human Resources and Skills Development Canada, Strategic Policy and Research.
- Duckworth, A. and Seligman, M. (2005). "Self-discipline outdoes IQ in predicting academic performance of adolescents." *Psychological Science*, 16: 939-944.
- Duckworth, A., Peterson, C., Matthews, M. and Kelly, D. (2007). "Grit: Perseverance and Passion for Long Term Goals." Working paper.
- Eckel, C., K. Johnson, C. Montmarquette and C. Rojas (2007). "Debt Aversion and the Demand for Loans for Post-Secondary Education." *Public Finance Review*, 35: 233-62.
- Elias, Peter. (1994). "Job-Related Training, Trade Union Membership, and Labour Mobility: A Longitudinal Study." *Oxford Economic Papers*, 46: 563-578
- Ely, M.L. (ed.) (1948). Handbook of adult education. New York: Institute of Adult Education.
- Esping-Andersen, G. (2001). Why We Need a Welfare State. Oxford: Oxford University Press.
- Esping-Andersen, G. (2004). "Untying the Gordian Knot of Social Inheritance." In A. L. Kalleberg, S. Morgan, L., J. Myles, and R. A. Rosenfeld (eds.) *Inequality: Structures, Dynamics and Mechanisms: Essays in Honor of Aage B. Sorensen*, vol. 21, pp. 115-138. Oxford: Elsevier Ltd.
- Estevez-Abe, Margarita, Torben Iversen, and David Soskice. (2001). "Social Protection and the Formation of Skills: A Reinterpretation of the Welfare State." In P. Hall and D. Soskice (eds.) *Varieties of Capitalism*. Oxford: Oxford University Press.
- European Commission (2005). Task force report on adult education survey. Brussels.
- Feinstein, L., & Hammond, C. (2004). "The contribution of adult learning to health and social capital." *Oxford Review of Education*, 30(2): 199-221.
- Feinstein, Leon., Ricardo Sabates, Tashweka M. Anderson, Annik Sorhaindo and Cathie Hammond (2006). "What are the effects of education on health?" *Measuring the Effects of Education on Health and Civic Engagement: Proceedings of the Copenhagen Symposium*, OECD.
- Ferrer, Ana., Alicia S. Menendez (2009). "The Returns to Flexible Post-secondary Education in Canada." Canadian Labour Market and Skills Researcher Network, Working Paper No. 20.
- Ferrer, Ana, Craig Riddell (2008). "Economic Outcomes of Adult Education and Training." In *International Encyclopedia of Education*, third edition. Oxford: Elsevier.

- Ferrer, A., D.A. Green, and W.C. Riddell (2006). "The Effect of Literacy on Immigrant Earnings." *Journal of Human Resources*, 41(2): 380-410.
- Fersterer, J., J.-S. Pischke, R. W.-E. (2008). "Returns to Apprenticeship Training in Austria: Evidence from Failed Firms." *Scandinavian Journal of Economics*. 110(4): 733-753.
- Ford, D.J. (1994) "Three Rs in the Workplace: Magnavox Electronic Systems Company" in ASTD Case Studies: Measuring Return on Investment. J.J. Phillips (ed.). Alexandria, Virginia: American Society for Training and Development, pp. 85-104.
- Forth, J. and R. McNabb (2008). "Workplace performance: a comparison of subjective and objective measures in the 2004 Workplace Employment Relations Survey." *Industrial Relations Journal*, 39(2): 104-123.
- Fourage, Didier., Trudie Schils, and Andries de Grip (2010). "Why Do Low-Educated Workers Invest Less in Further Training?" IZA Discussion Paper No. 5180
- Frazis, H. and M. A. Loewenstein (2005). "Reexamining the returns to training: Functional form, magnitude, and interpretation." *Journal of Human Resources*, 40(2): 453-476.
- Frederick, S. (2005). "Cognitive reflection and decision making." *Journal of Economic Perspectives*, 19(4): 25-42.
- Frenette, M., R. Upward, and P. Wright (2010). "The Long-Term Earnings Impact of Education Following Job Loss". Mimeo.
- Gilbert, T. F. (1978). *Human Competence: Engineering Worthy Performance*. New York: McGraw-Hill (Tribute edition published by HRD Press and ISPI Publications, Washington, D.C., 1996).
- Gillespie, John (2004). "The "Skills for Life" national survey of adult numeracy in England. What does it tell us? What further questions does it prompt?" Topic Study Group 6 Adult and Lifelong Education, 10th International Congress on Mathematical Education. Available at: <http://www.icme-organisers.dk/tsg06/Papers/GillespieJ.pdf>
- Giloth, Robert P. (2004). "Comparative Local Workforce Politics in Six Cities." In R. P. Giloth (ed.) *Workforce Development Politics: Civic Capacity and Performance*. Philadelphia.
- Giloth, R. (2001). "Getting Results: Outcome Management and the Annie E. Casey Foundation Jobs Initiative." *Innovating*, 8(1): 215-219.
- Glaeser, E., Scheinkman, J., Shleifer, A. (1995) "Economic Growth in a Cross-Section of Cities." *NBER Working Paper No. 5013*
- Glied, S., & Lleras-Muney, A. (2008). "Health inequality, education and medical innovation." *Demography*, 45(3): 741-761.
- Goux, D. and E. Maurin (2000). "Returns to Firm-Provided Training: Evidence from French Worker-Firm Matched Data." *Labour Economics*. 7(1): 1-19.

- Granovetter, M. (1985). "Economic Action and Social Structure: The Problem of Embeddedness". *American Journal of Sociology*, 91(3): 481.
- Green, David, and W. Craig Riddell (2003). "Literacy and Earnings: An Investigation of the Interaction of Cognitive and Unobserved Skills in Earnings Generation" *Labour Economics*, 10(2): 165-84.
- Green, D.A., and W.C. Riddell (2002). "Literacy Skills, Non-Cognitive Skills and Earnings: An Economist's Perspective," In Patrice de Broucker and Arthur Sweetman (eds.) *Towards Evidence-Based Policy for Canadian Education/Vers des politiques canadiennes d'éducation fondées sur la recherche*. Montreal and Kingston: McGill-Queen's University Press.
- Greenwood, D. T. (1997). "New developments in the intergenerational impacts of education." *International Journal of Education Research*, 27(6): 503-512.
- Groot, W., & van den Brink, H. M. (2010). "The effects of education on crime." *Applied Economics*, 42(3): 279-289.
- Grossman, Michael., Robert Kaestner (1997). "Effects of Education on Health." In Jere Behrman and Nevzer Stacey (eds.) *The Social benefits of Education*. Ann Arbor: University of Michigan Press.
- Grossman, M. (2006). "Education and nonmarket outcomes." In E. Hanushek & F. Welch (eds.), *Handbook of the Economics of Education*, vol. I, pp. 578-563. Amsterdam, NL: Elsevier B.V.
- Gunderson, M. and H. Krashinsky (2010). "Returns to Apprenticeship: Analysis Based on the 2006 Census." Canadian Labour and Skills Researcher Network Working Paper. Forthcoming.
- Hall, P.A.; Soskice, D. (2001). "An Introduction to Varieties of Capitalism." In: Hall, P.A.; Soskice, D. (eds.): *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*, pp. 1-68. Oxford: Oxford Univ. Press.
- Hallebec K, W. (eds.) (1997). *Adult education: Outlines of an emerging field of I S C E D*. Paris: Author.
- Hamilton, G., Freedman, S., Genntian, L. Michalopoulos, C. Walter, J., Adams-Ciardully, D., Gassman-Pines, A., McGroder, S., Zaslow, M., Ahluwalia, S., Brooks, J. (2001) "National Evaluation of Welfare-to-Work Strategies: How effective are different welfare-to-work approaches?. New York. MDRC
- Hammond, C. (2004). "Impacts of lifelong learning upon emotional resilience, psychological and mental Health: Fieldwork evidence." *Oxford Review of Education*, 30(4): 551-568.
- Hammond, C., & Feinstein, L. (2005). "The effects of adult learning on self-efficacy." *London Review of Education*, 3(3): 265-287.
- Hammond, C., & Feinstein, L. (2006). "Are those who flourished at school healthier adults? What role for adult education?" London: Centre for Research on the Wider Benefits of Learning. Retrieved from <http://www.learningbenefits.net/Publications/ResRepIntros/ResRep17intro.htm>.
- Hankivsky, Olena (2008) "Cost Estimates of Dropping Out of High School in Canada." Canadian Council on Learning (CCL).

- Hanushek, Eric A. (1996). "The Economics of Schooling: Production and Efficiency in Public Schools." *Journal of Economic Literature*, 24 (3): 1141-77.
- Hanushek, E.A., and D.D. Kimko (2000). "Schooling, Labor-Force Quality, and the Growth of Nations." *American Economic Review*. 90(5): 1185-1208.
- Hanushek, Eric A. and Steven G. Rivkin (2003). "How to Improve the Supply of High Quality Teachers." Paper Prepared for the Brookings Papers on Education Policy.
- Hanushek, Eric A. and Ludger Woessmann (2008). "The role of cognitive skills in economic development" *Journal of Economic Literature*, 46 (3): 607-68.
- Havet, N. (2007). "La valorisation salariale et professionnelle de la formation en entreprise diffère-t-elle selon le sexe?" *Économie et Prévision*, 175-176(4-5): 147-161.
- Hayfron, J.E. (2001). "Language Training, Language Proficiency and Earnings of Immigrants in Norway." *Applied Economics*, 33(15): 1971-1979.
- Heckman, James J. (2000). "Policies to Foster Human Capital." *Research in Economics*, 54: 3-56.
- Heckman, J. Layne-Farrar, A. Todd, P. (1995a) "The Schooling Quality-Earnings Relationship: Using Economic Theory to Interpret Functional Forms Consistent with the Evidence" *NBER*. Paper no. w5288
- Heckman, J. Layne-Farrar, A. Todd, P. (1995b) "Does Measured School Quality Really Matter? An Examination of the Earnings-Quality Relationship" *NBER*. Paper no. w5274
- Heckman, James and Edward Vytlacil (2001). "Identifying the Role of Cognitive Ability in Explaining the Level of Change in the Return to Schooling." *Review of Economics and Statistics*, 83: 1-12.
- Heckman, J., L. Lochner and C. Taber (1998). "Explaining Rising Wage Inequality: Explorations With A Dynamic General Equilibrium Model of Earnings With Heterogeneous Agents." *Review of Economic Dynamics*, 1(1): 1-58.
- Heckman, J., J. Hsee and Y. Rubinstein (2001) "The GED is a Mixed Signal: The Effect of Cognitive and Noncognitive Skills on Human Capital and Labor Market Outcomes." Working Paper
- Heckman, J., Stixrud, J. and Urzua, S. (2006). "The effects of cognitive and noncognitive abilities on labour market outcomes and social behaviour." *Journal of Labor Economics*, 24: 411-482.
- Heckman, J.J., R.J. LaLonde, and J.A. Smith (1999). "The Economics and Econometrics of Active Labor Market Programs." In O. Ashenfelter and D. Card (eds.) *Handbook of Labor Economics*, vol. 3. North Holland, Amsterdam.
- Heinrich, Carolyn., Peter R. Mueser, Kenneth R. Troske, Kyung-Seong Jeon, and Daver C. Kahvecioglu (2009). "New Estimates of Public Employment and Training Program Net Impacts: A Nonexperimental Evaluation of the Workforce Investment Act Program." IZA DP No. 4569.
- Helliwell, John F., Robert D. Putnam (2007). "Education and Social Capital." *Eastern Economic Journal*, 33(1): 1-19

- Hogan, D. (1978). "The Variable Order of Events in the Life Course." *American Sociological Review*, 43(3): 573-586.
- Hollenbeck, K. and W. Anderson. (1992). "Workplace Education Programs in Small- and Medium-Sized Michigan Firms." W.E. Upjohn Institute for Employment Research Working Paper No. 92-13. Available at: <http://research.upjohn.org/cgi/viewcontent.cgi?article=1025&context=up_workingpapers>.
- Hollenbeck, K. (1993). "A Framework for Assessing the Economic Benefits and Costs of Workplace Literacy Training." Paper presented at "Workplace Learning: The Strategic Advantage" Conference, Milwaukee, Wisconsin, April 29, 1996. W.E. Upjohn Institute for Employment Research. Kalamazoo, MI. Available at: http://research.upjohn.org/cgi/viewcontent.cgi?article=1059&context=up_workingpapers (accessed Jan. 10, 2010)
- Hollenbeck, K.M. and W.-J. Huang (1994). "Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington." W.E. Upjohn Institute for Employment Research. Upjohn Institute Technical Report No. TR06-020.
- Hollenbeck and Huang (2006). "Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State." W.E. Upjohn Institute for Employment Research. Upjohn Institute Technical Report No. TR06-020
- Hollenbeck, Kevin, and Bridget F. Timmeney (2009). "Lessons Learned from a State-Funded Workplace Literacy Program." Policy Paper No. 2009-004. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. Available at: http://research.upjohn.org/cgi/viewcontent.cgi?article=1003&context=up_policypapers (accessed Jan. 10, 2010)
- Holzer, H., R. Block, M. Cheatham, and J. Knott (1993). "Are training subsidies for firms effective? The Michigan effective." *Industrial and Labor Relations Review*, 46(4): 625-636.
- HRDC (1995). Evaluation of the Employability Improvement Program: Final Report. Ottawa: Human Resources Development Canada.
- HRDC (2000). Formative Evaluation of the Canada/Manitoba Labour Market Development Agreement. Ottawa: Human Resources Development Canada, Strategic Policy, Evaluation and Data Development.
- HRSDC (2004). Summative Evaluation of Employment Benefits and Support Measures under the Terms of the Canada/British Columbia Labour Market Development Agreement. Ottawa: Human Resources and Skills Development Canada, Strategic Policy and Planning, Program Evaluation.
- HRSDC (2005). Formative and Summative Evaluation of Nunavut Benefits and Measures Delivered Under the Canada/Nunavut Labour Market Development Agreement. Ottawa: Human Resources and Skills Development Canada, Strategic Policy and Planning, Audit and Evaluation.
- HRSDC (2006). Summative Evaluation of Employment Benefits and Support Measures Delivered Under the Canada/Newfoundland and Labrador Labour Market Development Agreement. Ottawa: Human

Resources and Skills Development Canada, Strategic Policy and Planning Branch, Audit and Evaluation.

HRSDC (2009a). Summative Evaluation of the Canada/Alberta Labour Market Development Agreement. Ottawa: Human Resources and Skills Development Canada, Strategic Policy and Research Branch, Evaluation Directorate.

HRSDC (2009b). Summative Evaluation of the Canada/Saskatchewan Labour Market Development Agreement. Ottawa: Human Resources and Skills Development Canada, Strategic Policy and Research Branch, Evaluation Directorate.

HRSDC (2009c). Summative Evaluation of Provincial Benefits and Measures Delivered Under the Canada/New Brunswick Labour Market Development Agreement. Ottawa: Human Resources and Skills Development Canada, Strategic Policy and Research Branch, Evaluation Directorate.

Jacobson, L., Robert LaLonde and Daniel G. Sullivan (2005a). "Estimating the returns to community college schooling for displaced workers" *Journal of Econometrics*, 125(1-2): 271-304.

Jacobson, L.S., R.J. LaLonde, and D.G. Sullivan (2005b). "The Impact of Community College Training on Older Displaced Workers: Should We Teach Old Dogs New Tricks?" Harris School Working Paper No. 04.12.

Jacobson, Louis, Robert LaLonde, & Daniel Sullivan (2005c). "Is Retraining Displaced Workers a Good Investment?" Federal Reserve Bank of Chicago: *Economic Perspectives*, 29(2): 47-66.

Jenkins, A. (2011). "Participation in learning and wellbeing among older adults." *International Journal of Lifelong Education*, 30(3), 403-20.

Jones, M. K., R. J. Jones, P. L. Latreille, and P. J. Sloane (2009). Training, job satisfaction, and workplace performance in Britain: Evidence from WERS 2004. *LABOUR*, 23(s1): 139-175.

Kambourov, Gueorgui & Iouri Manovskii (2009). "Occupational Mobility and Wage Inequality," *Review of Economic Studies*, 76(2), 731-759.

Kambourov, G., I. Manovskii and M. Plesca (2009). "Returns to Government Sponsored Training," Mimeo.

Kambourov, G., I. Manovskii, and M. Plesca (2010). "Occupational Mobility and the Returns to Training". Mimeo.

Kemple, J.J. (2008). "Career Academies Long-Term Impacts on Labor Market Outcomes, Educational Attainment, and Transitions to Adulthood." Manpower Demonstration and Research Corporation.

Kenkel, D. S. (1991). "Health behavior, health knowledge, and schooling." *Journal of Political Economy*, 99(2): 287-305.

Khatiwada, Ishwar., Joseph McLaughlin and Andrew Sum (2007). "The Fiscal Economic Consequences of Dropping Out of High School: Estimates of the Tax Payments and Transfers Received by Massachusetts Adults in Selected Educational Subgroups." Prepared for the Boston Private Industry Council.

- King, Ian and Arthur Sweetman (2002). "Procyclical Skill Retooling and Equilibrium Search" *Review of Economic Dynamics*, 5(3): 704-717.
- Kline, Ian (2009). "Essential Skills in instruction, final report." Vancouver: Skillplan.
- Kluge, J. D. Card, M. Fertig, M. Gora, L. Jacobi, P. Jensen, R. Leetmaa, L. Nima, E. Patacchini, S. Schaffner, C.M. Schmidt, B. van der Klaauw, A. Weber (2007). *Active Labor Market Policy in Europe: Performance and Perspectives*. Berlin: Springer.
- Konings, J. and S. Vanormelingen (2010). "The impact of training on productivity and wages: Firm level evidence." IZA Discussion Paper No.4731.
- Krueger, A. and C. Rouse (1998). "The effect of workplace education on earnings, turnover, and job performance." *Journal of Labor Economics* 16(1): 61-94.
- Kuckulenz, A. (2007). "Studies on Continuous Vocational Training in Germany." ZEW Economic Studies.
- Kuji-Shikatani, K and R. Zorzi (2007). "Impact of Workplace-Supported Literacy and Essential Skills Enhancement in Small and Medium Size Businesses in Canada." Ottawa: Strategic Policy Research Directorate, Department of Human Resources and Social Development
- LaLonde, Robert J (1995). "The Promise of Public Sector-Sponsored Training Programs." *Journal of Economic Perspectives*, 9(2): 149-68.
- Lapointe, Mario, Kevin Dunn, Nicolas Tremblay-Cote, Louis-Philippe Bergeron, and Luke Ignaczak (2006) "Looking-Ahead: A 10-Year Outlook for the Canadian Labour Market (2006-2015)," Labour Market and Skills Forecasting and Analysis Unit, Strategic Policy Research Directorate, Human Resources and Social Development Canada, SP-615-10-06E, October.
- Lechner, M. and C. Wunsch (2009). "Are Training Programs More Effective When Unemployment Is High?" *Journal of Labor Economics*. 27(4): 653-92.
- Lefebvre, Pierre and Philip Merrigan (2003). "Assessing Family Policy in Canada: A New Deal for Families and Children." *Choices* 9.
- Leigh, D.E. and A.M. Gill (1997). "Labor Market Returns to Community College: Evidence for Returning Adults." *Journal of Human Resources*, 32(2): 334-353.
- Lemieux, T. and D. Card (2001). "Education, Earnings, and the Canadian G.I. Bill." *Canadian Journal of Economics*, 34(2): 313-344.
- Leuven, E. and H. Oosterbeek (2008). "An alternative approach to estimate the wage returns to private-sector training." *Journal of Applied Econometrics*, 23(4): 423-434.
- Levin, Henry, Clive Belfield, Peter Muennig and Cecilia Rouse (2006). "The Costs and Benefits of an Excellent Education for All of America's Children." New York: Center for Benefit-Cost Studies in Education (CBCSE), Teachers College, Columbia University.
- Levin, Henry (2009). "The Economic Payoff to Investing in Educational Justice." *Educational Researcher*, 38(1): 5-20.

- Light, A. (1995). "The Effects of Interrupted Schooling on Wages." *Journal of Human Resources*, 30(3): 472-502.
- Lindeboom, Maarten., Ana Llena-Nozal, Bas van der Klaauw (2006). "Parental Education and Child Health: Evidence from a Schooling Reform." IZA Discussion Paper No. 2516.
- Lleras-Muney, A. (2004). "The Relationship Between Education and Adult Mortality in the United States." *University of California at Los Angeles Working Paper*
- Lleras-Muney, A. (2005). "The relationship between education and adult mortality in the United States." *Review of Economic Studies*, 72(1): 189-221.
- Lleras-Muney, Adrianna., Frank R. Lichtenberg (2002). "The Effects of Education on Medical Technology of Adoption: Are the More Educated More Likely to Use New Drugs?" National Bureau of Economic Research Working Paper No.9185.
- Lochner, L. & Moretti, E. (2004). "The effect of education on crime: Evidence from prison inmates, arrests and self-reports." *American Economic Review*, 94(1): 155-189.
- Loewenstein, M. A. and J. R. Spletzer (1998). "Dividing the costs and returns to general training." *Journal of Labor Economics*, 16(1), 142-71.
- Loewenstein, Mark A. And James R. Spletzer (1999). "General and Specific Training: Evidence and Implications." *Journal of Human Resources*, 34(4): 710-733.
- Loewenstein, M. and J. Spletzer (2000). "Formal and informal training: Evidence from the NLSY." In S. Polachek (ed.), *Research in Labor Economics*, vol. 18, pp. 403-38. Greenwich, Conn: JAI Press.
- Long, E. (1997). "The impact of basic skills programs on Canadian workplaces: Results of a national study for ABC Canada Literacy Foundation." Toronto, ON: ABC Canada.
- Lopes, A. S. and P. Teixeira (2010). "Productivity, wages, and the returns to firm-provided training: Who is grabbing the biggest share?" GEMF Working Papers 2010-05.
- Lynch, L. M. (1992). "Private-sector training and the earnings of young workers." *American Economic Review*, 82(1): 299-312.
- Machin, Stephen. Steven McIntosh, Anna Vignoles and Tarja Viitanen (2001). "Basic skills, soft skills and labour market outcomes: secondary analysis of the National Child Development Study." Department for Education and Employment, Centre for the Economics of Education.
- Machin, Stephen. Olivier Maria and Suncia Vujic (2011). "The Crime Reducing Effect of Education." *The Economic Journal*, 121: 463-484.
- MacLachlan, K., L. Tett and S. Hall. (2009). "'The More You Learn the Better You Feel' Research into Literacies, Learning and Identity in Scotland." In S. Reder and J. Bynner, (eds.), *Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research*, pp. 329-348. New York: Routledge.

- Marini, Margaret Mooney (1984). "Women's Educational Attainment and the Timing of Entry into Parenthood.." *American Sociological Review*, 49: 491-511.
- Marini, Margaret Mooney (1985). "Determinants of the Timing of Adult Role Entry." *Social Science Research*, 14: 309-50.
- Martin, John, P. and David Grubb (2001). "What Works and for Whom: A Review of OECD Countries' Experiences with Active Labour Market Policies." Paris: Organisation for Economic Co-operation and Development.
- Martinson, K., and Strawn, J. (2003). "Built to Last: Why Skills Matter for Long-Run Success in Welfare Reform." Washington, DC: The Center for Law and Social Policy and the National Institute for Literacy.
- Matrix Knowledge Group (2009). "Lifelong Learning and Well-being: An Analysis of the Relationship Between Adult Learning and Subjective Well-being." Inquiry into the Future for Lifelong Learning, Public Value Paper 3.
- Maynard, R. A., & McGrath, D.J. (1997). Family structure, fertility and child welfare. In J. Behrman & N. Stacey (eds.), *The Social Benefits of Education*, pp. 125-174. Ann Arbor, MI: University of Michigan Press.
- McCrary, Justin., and Heather Royer (2006). "The Effect of Female Education on Fertility and Infant Health: Evidence from School Entry Policies Using Exact Birth Date." National Bureau of Economic Research, Working Paper 12329.
- McDonald, B.A. and P.A. Scollay (2009). "Outcomes of Literacy Improvement: A Longitudinal View." In S. Reder and J. Bynner, (eds.), *Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research*, 312-328. New York: Routledge
- Meager, Nigel (2008). *The Role of Training and Skills Development in Active Labour Market Policies*. Institute for Employment Studies, Working Paper WP15.
- Meara, Ellen R., Seth Richards and David M. Cutler (2008). "The Gap Gets Bigger: Changes In Mortality And Life Expectancy, By Education, 1981–2000." *Health Affairs*, 27(2): 350-360.
- Merriam, S. and Brockett, R. (1997). *The Profession and practice of adult education*. San Francisco: Jossey-Bass.
- Merrifield, Smith, Rea, and Shriver (1993). "Longitudinal Study of Adult Literacy Participants in Tennessee. Year One Report." Centre for Literacy Studies. Tennessee University, Knoxville. URL: <<http://www.eric.ed.gov/PDFS/ED378449.pdf>>.
- Messer, Dolores., Guido Schwerdt, Ludger Woessmann and Stefan C. Wolter (2010). "Labor Market Effects of Adult Education Vouchers: Evidence from a Randomized Field Experiment." CES ifo Area Conference on Economics of Education.
- Metcalf, H. and P. Meadows (2009). "Outcomes for Basic Skills Learners: A Four Year Longitudinal Study." In S. Reder and J. Bynner, (eds.), *Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research*, pp. 225-241. New York: Routledge.

- Metcalfe, H., P. Meadows, H. Rolfe, A. Dhudwar (2009). "Evaluation of the Impact of Skills for Life Learning: Longitudinal Survey of Adult Learners on College-based Literacy and Numeracy Courses, Final Report." Skills for Life Network.
- Milligan, K., E. Moretti, and P. Oreopoulos (2004). "Does Education Improve Citizenship? Evidence from the United States and the United Kingdom." *Journal of Public Economics*, 88(9-10): 1667-95.
- Mincer, J. (1974). *Schooling, Experience, and Earnings*. New York: NBER Press.
- Moretti, E. (2003). "Human capital externalities in cities," *NBER Working Papers* 9641, National Bureau of Economic Research, Inc.
- Moretti, E. (2004). "Workers' education, spillovers and productivity: Evidence from plant-level production functions." *American Economic Review*, 94(3): 656-690.
- Muehleman, S. (2010). "The Costs and Benefits of Apprenticeship Training: Evidence from Swiss Firms." *Canadian Apprenticeship Journal*, 1.
- Murnane, R.J., J.B. Willett, and K.P. Boudett (1995). "Do High School Dropouts Benefit from Obtaining a GED?" *Educational Evaluation and Policy Analysis*. 17(2): 133-147.
- Murnane, R.J., J.B. Willett, and J.B. Tyler (2000). "Who Benefits from Obtaining a GED? Evidence from High School and Beyond." *Review of Economics and Statistics*. 82(1): 23-37.
- Myers, K. (2009). "Does Skills Upgrading Pay Off for Less Educated Women and Men?" In *Taking a Risk: Does Human Capital Investment Pay Off for Educationally Disadvantaged Adults?* University of Toronto. Ph.D. Thesis.
- Myers, Karen and Patrice de Broucker (2006). "Too Many Left Behind: Canada's Adult Education and Training System." Ottawa: Canadian Policy Research Networks.
- Myers, Karen, Gyarmati, David., and Voyer, Jean-Pierre (2009). "Skills Upgrading for Ontario Working Age Adults: An Environmental Scan of Programs, Gaps, and Opportunities." Ottawa: Social Research and Demonstration Corporation.
- National Council of Welfare (1997). "Another Look at Welfare Reform." Minister of Public Works and Government Services, Canada.
- Newton, B., J. Hurstfield, L. Miller, K. Akroyd and J. Gifford (2005). "Training Participation by Age amongst Unemployed and Inactive People." Department for Work and Pensions Research Report No. 291.
- New Zealand Department of Labour (2006). "An Amazing Transformation: A workplace literacy case study from Rotaform Plastics Ltd, an Auckland plastics manufacturer." Available at: <http://www.dol.govt.nz/workplaceproductivity/case-studies/rotaform-plastics-full.pdf>. (accessed Jan. 10, 2010)
- OECD (1999). "Overcoming Exclusion through Adult Learning." Paris.
- OECD (2003a). "Education Policy Analysis - 2003 Edition." Paris.

- OECD. (2003b). "Beyond rhetoric: Adult learning policies and practices." Paris.
- OECD. (2005). "Promoting adult learning." Paris.
- OECD (2007). "Understanding the social outcomes of learning." Paris.
- Oreopoulos, P., & Salvanes, K.J. (2009). How large are returns to schooling? Hint: Money isn't everything. NBER Working Paper Number 15339. Retrieved from:
http://homes.chass.utoronto.ca/libaccess/lib.mcmaster.ca/~oreo/research/compositions/how_large_are_returns_to_schooling.pdf
- Orr, L. (1999). "Social Experiments: Evaluation Public Programs with Experimental Methods." Thousand Oaks, California: Sage.
- Ouimet, D. (1994). "The ROI of Work Process Analysis: Multi-Marques Inc." Discussed in "Return on Investment in Literacy and Essential Skills Training: Some Evidence", HRSDC (2008), CAF-FCA 2008 Conference, http://www.caf-fca.org/en/conference/2008/pdf/pres/Session_402_a_The_Return_on_Investment_in_Literacy_Essential_Skills_Training.pdf
- Parent, D. (1999). "Wages and mobility: The impact of employer-provided training." *Journal of Labor Economics*, 17(2): 298–317.
- Park, Norm; Power, Bob; Riddell, W. Craig; Wong, Ging (1996). "An assessment of the impact of government-sponsored training" *Canadian Journal of Economics*, Special Issue-Part 1, 29(1): S93-S98.
- Parker, A. M. and B. Fischhoff (2005). "Decision-making competence: External validation through an individual-differences approach." *Journal of Behavioral Decision Making*, 18: 1-27.
- Paserman, D.M. (2008). "Job search and hyperbolic discounting: Structural estimation and policy evaluation." *Economic Journal*, 118: 1418-1452.
- Peters, Valerie (2004). "Working and training: First results of the 2003 Adult Education and Training Survey." Ottawa: Statistics Canada.
- Phillips, J.J. (ed.). (1994). *Measuring Return on Investment*, vol. 1. Alexandria, VA: American Society for training and development.
- Pine, J. and J.C. Tingley (1993). "ROI of soft-skills training." *Training*, 2: 55–60.
- Pischke, J.-S. (2001). "Continuous Training in Germany." *Journal of Population Economics*, 14(3): 523-548.
- Powley, R.L., Kennedy, M.F. and Childs, E.C. (2005). *Developing an Adult Education Policy Framework: Terminology, Typology, and Best Practices*. Research completed by Innovative Training Solutions Inc. under contract to the Council of Ministers of Education, Canada: Toronto, ON. Available at:
http://www.cmec.ca/Publications/Lists/Publications/Attachments/76/AdultEd_Framework.en.pdf

- Prince, D. and D. Jenkins (2005). "Building Pathways to Success for Low-Skill Adult Students: Lessons for Community College Policy and Practice from a Statewide Longitudinal Tracking Study." Community College Research Center. Teachers College. Columbia University.
- Rauch, J. (1993). "Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities." *Journal of Urban Economics*. Elsevier. Vol 34 (3). 380-400
- Reder, Stephen (2009). "The Development of Literacy and Numeracy in Adult Life." In S. Reder and J. Bynner, (eds.), *Tracking Adult Literacy and Numeracy Skills: Findings from Longitudinal Research*, pp. 59-84. New York: Routledge.
- Reder, S. and Strawn C. (2006). "Broadening the concepts of participation and program support." *Focus on Basics*, 8(C): 6-10.
- Riccio, J., D. Friedlander, and S. Freedman (1994). "GAIN: Benefits, Costs, and Three-Year Impacts of a Welfare-to-Work Program." Manpower Demonstration Research Corporation.
- Riddell, W. Craig (2002). "Is There Under- or Over-Investment in Education?" In Patrice de Broucker and Arthur Sweetman (eds.) *Towards Evidence-Based Policy for Canadian Education*. Montreal and Kingston, pp. 473-96. McGill-Queen's University Press and John Deutsch Institute for Economic Policy.
- Riddell, W.C. (2006). "The Impact of Education on Economic and Social Outcomes: An Overview of Recent Advances in Economics." Paper for the workshop on An Integrated Approach to Human Capital Development sponsored by Canadian Policy Research Networks (CPRN), the School of Policy Studies at Queen's University and Statistics Canada.
- Riddell, Chris and Craig Riddell. (2006). "Educational Upgrading and Its Consequences Among Welfare Recipients: Empirical Evidence From the Self-Sufficiency Project." Ottawa: Social Research Demonstration Corporation.
- ROI Institute (2007). "Training in Basic Skills and IT Skills: a lesson in social partnership." Summary case study of the ROI Institute methodology in use for programme evaluation. Cambridge, UK : Abdi Ltd. Available at : <http://www.abdi.eu.com/pdfs/basicskills.pdf>.
- Robinson, D. G., and Robinson, J. C. (1995). *Performance Consulting: Moving Beyond Training*. San Francisco: Berrett-Koehler Publishers.
- Rubenson, K., R. Desjardins and E-S. Yoon (2007). "Adult Learning in Canada: A Comparative Perspective. Results from the Adult Literacy and Life Skills Survey." Ottawa: Statistics Canada. Catalogue no. 89-552-XIE, No. 17.
- Sabates, R. (2007). "The effects of adult learning on social and economic outcomes." Paper commissioned by NIACE for the Inquiry Public Value of Adult Learning.
- Schochet, P.Z., J. Burghardt, and S. McConnell (2008). "Does Job Corps Work? Impact Findings from the National Job Corps Study." *American Economic Review*. 98(5): 18-64.
- Schone, P. (2004). "Why is the return to training so high?" *LABOUR* 18(3): 363-378.

- Schroeder, W.L. (1980). "Typology of adult learning systems." In J.M. Peters and Associates, Building an effective adult education enterprise, San Francisco: Jossey-Bass.
- Selman, G. and Dampier, P. (1991). Adult education in Canada.
- Sen, Anundya., Anthony Clemente (2010). "Intergenerational correlations in educational attainment: Birth order and family size effects using Canadian data." *Economics of Education Review*, 29: 147-155.
- Siebern-Thomas, F. (2005) "Job quality in European labour markets." In S. Bazen, C. Lucifora and W. Salverda (eds.) Job Quality and Employer Behaviour, 31-66. Palgrave Macmillan, Basingstoke, Hants.
- Skillnets (2005). "Case Studies from the Skillsnet Pilot Project: Measuring the Impact of Training and Development in the Workplace." Available at:
http://www.skillnets.ie/sites/skillnets.ie/files/pdf/Measuring_the_Impact_-_Case_Studies.pdf
(accessed Jan. 10, 2010)
- Smaller, H. (2000). "Vocational Education in Ontario's Secondary Schools: Past, Present – and Future?" York University. Labour Education and Training Research Network. Training Matters: Works In Progress. WIP No. 2000-04.
- Smelser, Neil and Richard Swedberg (1994). Neil Smelser and Richard Swedberg (eds.), Handbook of Economic Sociology. New York and Princeton: Russell Sage Foundation and Princeton University Press
- Smith, R.M., Aker, G.F. and Kidd, J.R. (eds.) (1970). Handbook of adult education. New York: Macmillan.
- Smith, Jeffrey and Miana Plesca (2000). "Improving Public Employment and Training Programs." In Bruce Meyer and Gregg Duncan (eds.) "The Incentives of Government Programs and the Well Being of Families." The Joint Center for Poverty Research.
- Smith, Jeffrey., Alexander Whalley and Nathaniel T. Wilcox (2011). "Are Program Participants Good Evaluators?" W.E. Upjohn Institute for Employment Research.
- Smith, J. and A. Sweetman. (2001). "Improving the Evaluation of Employment and Training Programs in Canada." Mimeo.
- Sondheimer, Rachel Milstein and Donald P. Green (2010). "Using Experiments to Estimate the Effects of Education on Voter Turnout." *American Journal of Political Science*, 54(1): 174-189.
- Stubbfield, H.W. and Rachal, J.R. (1992). "On the origins of the term and meaning of 'adult education' in the United States." *Adult education Quarterly*, 42(2): 106-116.
- Sweetman, Arthur (2002). "Working Smarter: Productivity and Education." In Keith Banting, Andrew Sharpe and France St-Hilaire (eds.) The Review of Economic and Social Progress: Productivity. Montreal and Ottawa: CSLS and IRPP, 157-180.

- Sweetman, Arthur (2004). "Immigrant Source Country Educational Quality and Canadian Labour Market Outcomes" Ottawa: Statistics Canada Analytical Studies Branch research paper series No. 234.
- Thelen, Kathleen (2004). *How Institutions Evolve: The Political Economy of Skills in Germany, Britain, the United States and Japan*. New York: Cambridge University Press.
- Trostel, Philip A., Todd M. Gabe (2007). "Fiscal and Economic Effects of College Attainment." School of Economics Staff Paper No.556. Prepared for the Opportunity Maine.
- Turcotte, J. and L. Whewell-Rennison (2004). "Productivity and Wages: Measuring the Effect of Human Capital and Technology Use from Linked Employer-Employee Data." Department of Finance Working Paper 2004-01.
- Tyler, J.H., R.J. Murnane, and J.B. Willett (2000). "Estimating the Labor Market Signalling Value of the GED." *Quarterly Journal of Economics*. 115(2), 431-468.
- Tyler, J.H., R.J. Murnane, and J.B. Willett (2003). "Who Benefits from a GED? Evidence for Females from High School and Beyond." *Economics of Education Review*, 22(3), 237-247.
- UNESCO (2006). *International Standard Classification of Education*. University Studies, pp 27–39. Washington, DC: American Association for Adult and Continuing Education.
- Veum, J. (1995). "Sources of training and their impact on wages." *Industrial and Labor Relations Review*, 48(4): 812–826.
- Vorhaus, John. (2009). "Economic Impact of Training and Education in Basic Skills: Summary of Evidence." National Research and Development Centre for adult literacy and numeracy, Institute of Education, University of London. Department for Business Innovation and Skills, Research Paper No. 6.
- Warburton, W.P. (1996). "Estimating the Impact of Selected Programs on Participants' Subsequent Welfare Dependence and Employment in British Columbia." Ph.D. Thesis. University of London
- Warner, Jenny and John Vorhaus. (2008). "The Learner Study: The impact of the Skills for Life strategy on adult literacy, language and numeracy learners. Summary report." National Research and Development Centre for adult literacy and numeracy. Institute of Education, University of London.
- Washington State Board for Community and Technical Colleges (2005). "I-BEST: A Program Integrating Adult Basic Education and Workforce Training". Olympia, WA: Washington State Board for Community and Technical Colleges, Research Report No. 05-2.
- Williams, Joel, Sam Clemens, Karin Oleinikova and Karen Tarvin (2003). "The Skills for Life survey: A national needs and impact survey of literacy, numeracy and ICT skills." Department of Education and Skills, Research Report 490
- Wolf, A, Evans, K, Aspin, L, Waite, E & Jenkins, A . (2009). "Enhancing 'Skills for Life': Adult Basic Skills and Workplace Learning." End of award report to ESRC.

- Wolfe, Barbara., Robert Haveman (2001). "Accounting for the Social and Non-Market Benefits of Education." In John Helliwell (ed.) *The Contribution of Human and Social Capital to Sustained Economic Growth and Well Being*, 221-250. Vancouver: University of British Columbia Press.
- Wynne, Kathleen (2005). "Ontario Learns – Strengthening Our Adult Education System." Toronto: Ontario Ministry of Training, Colleges, and Universities.
- Zeytinogly, I. U. and G. B. Cooke (2009). "On-the-job training in Canada: Associations with information technology, innovation and competition." *Journal of Industrial Relations*, 51(1): 95–112.
- Zhang, Xuelin and Boris Palameta (2006). "Participation in Adult Schooling and its Earnings Impact in Canada." Ottawa: Statistics Canada.
- Zwick, T. (2006). "The impact of training intensity on establishment productivity." *Industrial Relations*, 45(1): 26–46.

Appendix A: A high-level conceptual framework for understanding adult learning outcomes

