Education, Skills, and Labour Market Outcomes

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1. I first examine the labour market consequences of education. The source of the correlation between education and economic success has long been controversial. Substantial recent progress has been made on this issue.

2. The second part discusses a new area of research opened up by advances in data collection: the linkages between education and literacy skills, and their labour market consequences.
Motivation and background

Several factors account for the increased attention being paid to human capital:

1. Technological change -- especially advances in information and computer technologies -- has resulted in growing demand for highly skilled workers and changes in the nature of skills needed in the workplace.
Motivation and background cont.

2. Growing concern about future skills shortages, in part due to the "baby boom" generation now approaching retirement age and being replaced by much smaller cohorts.

3. Resurgence of interest in the determinants of long-term economic growth. "New growth theory" emphasizes the importance of human capital in the creation of knowledge and in growth of living standards.
Human capital formation is also now viewed as a key component of social policy:

1. Shift away from "passive" income maintenance programs toward "active" labour market and social policies

2. Greater emphasis on individual responsibility and on providing those in need of assistance with the opportunity to improve their economic situation -- providing a "hand up" rather than a "handout".
3. Education and training may ameliorate pressures for widening inequality in economic and social outcomes.

4. Education may also promote equality of opportunity and social mobility.
Commenting on this emergence of a common emphasis on human capital formation in both economic and social policy, Courchene (2001) states that we are presented "... with an historically unprecedented window of opportunity...[in which]... a societal commitment to a human capital future is emerging as the principal avenue by which to promote both economic competitiveness and social cohesion."
Differing perspectives cont.

However, some observers disagree with the emphasis being placed on education and skill formation. Examples include:

- David Livingstone, *The Education Jobs Gap* 1999
- Gordon Lafer, *The Job Training Charade* 2002
- Alison Wolf, *Does Education Matter?* 2002
Education and labour market outcomes

• Education is one of the best predictors of “who gets ahead”

• Better-educated workers earn higher wages, have greater earnings progression over their lifetimes, experience less unemployment, and work longer
Education and labour market outcomes cont.

• Higher education is also associated with longer life expectancy, better health, reduced participation in crime, and greater civic participation

• The strong positive association between education and earnings is one of the most well established relationships in social science
The human capital earnings function

• The experience – earnings relationship is non-linear -- approximately concave

• However, the relationship between years of education and earnings is remarkably linear

(See Figure 1)
The human capital earnings function cont.

- This argues against a simple credentialist model in which earnings are a step function with discrete jumps associated with attainment levels.

- Nonetheless, there are discrete earnings gains associated with completing educational programs – so-called “sheepskin effects.”

- A “hybrid model” with both years of schooling and credential effects performs best.
Interpreting Sheepskin Effects

• Sheepskin effects may reflect:
  • Signaling via credentials
  • Educational programs may constitute a “package” of complementary activities
  • Barriers to entry in some fields
  • Measurement error in years of schooling
Figure 1

Average Log Weekly Earnings
Males and Females - FYFT - Aged 40 to 55 Years

<table>
<thead>
<tr>
<th>Years of Education</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>6.2</td>
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<td>12</td>
<td>6.4</td>
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<td>13</td>
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<td>15</td>
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<tr>
<td>23</td>
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</tr>
</tbody>
</table>
Figure 2(a)

Average Log Weekly Earnings vs. Average Years of Education by Credentials, Males
Figure 2(b)

Avg. Log Earnings vs. Avg. Years of Education by Credentials, Females
Figure 3(a)

Decomposition of Total Returns to Education, Males

Log Points (<5 years=0)

Years of Education

○ Total Return

△ Return to Years of Education
Figure 3(b)

Decomposition of Total Returns to Education, Females

Log Points (<5 years=0)

Total Returns

Return to Years of Education

Years of Education

Decomposition of Total Returns to Education, Females
Table 1
Estimates of the Private Returns to Education in Canada, With and Without Credential Effects

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Years of schooling</td>
<td>5.9</td>
<td>8.6</td>
</tr>
<tr>
<td>(without credential effects)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) Years of schooling</td>
<td>3.3</td>
<td>5.5</td>
</tr>
<tr>
<td>(with credential effects)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate</td>
<td>5.2</td>
<td>6.1</td>
</tr>
<tr>
<td>College diploma/trade certificate with high school</td>
<td>7.6</td>
<td>8.4</td>
</tr>
<tr>
<td>Marginal effect over high school:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College/trade with high school</td>
<td>6.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>22.8</td>
<td>25.2</td>
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<tr>
<td>Marginal effect over BA:</td>
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<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>34.1</td>
<td>30.0</td>
</tr>
<tr>
<td>Master's degree</td>
<td>4.6</td>
<td>7.0</td>
</tr>
<tr>
<td>Marginal effect over MA:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph.D.</td>
<td>4.2</td>
<td>0.8</td>
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</tbody>
</table>

Source: Ferrer and Riddell (2002)
Interpretation of education-earnings relationship

• Many social scientists have been reluctant to interpret this correlation as evidence that education exerts a causal effect on earnings

• The relationship may arise because both earnings and schooling are correlated with unobserved factors such as ability, perseverance, and ambition

• In signaling/screening theory, employers use education as a signal for productive characteristics that are difficult to observe prior to hiring
• In these circumstances, standard estimates of the return to schooling are likely to be biased upwards because they do not take into account unobserved “ability”

• Estimating the causal influence of education on earnings has been the subject of much recent research
• This issue is also crucial for economic and social policy relating to education

• If estimates of the return to schooling are biased upwards, they may over-predict the economic benefits that a less-educated person would receive from additional schooling

• Estimated rates of return in the population reflect both the causal effect of schooling on productivity and earnings and the return to unobserved ability
Addressing the empirical challenge

- The most reliable method would be to conduct a random assignment trial

- Those assigned to the treatment group would receive a larger “dose” of education
• The earnings of the treatment and control groups would be tracked over time

• Random assignment yields unbiased estimates because, on average, treatment and control groups are equally represented by “high ability” and “low ability” individuals
Natural and quasi-experiments

- In the absence of experimental evidence, labour economists have used “natural” or quasi-experiments

- These attempt to isolate the influence of education from effects of unobserved factors like ability and motivation

- If carefully done, quasi-experimental studies can provide convincing evidence
Evidence from quasi-experimental studies

- A large number of such studies have now been carried out in many countries

- A consistent result of these studies is that conventional OLS estimates tend to underestimate the causal impact of education on earnings
# OLS and IV Estimates of the Return to Education

<table>
<thead>
<tr>
<th>Study</th>
<th>Country, Instrument</th>
<th>Returns to Schooling</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OLS</td>
</tr>
<tr>
<td>Angrist &amp; Kreuger (1991)</td>
<td>US compulsory schooling laws</td>
<td>0.070</td>
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<tr>
<td></td>
<td></td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.052</td>
</tr>
<tr>
<td>Staiger &amp; Stock (1977)</td>
<td>US compulsory schooling laws</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.052</td>
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<tr>
<td>Harmon &amp; Walker (1995)</td>
<td>UK compulsory schooling laws</td>
<td>0.061</td>
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<tr>
<td>Kane &amp; Rouse (1993)</td>
<td>Tuition, distance to college, US</td>
<td>0.080</td>
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<tr>
<td></td>
<td></td>
<td>0.063</td>
</tr>
<tr>
<td>Card (1995)</td>
<td>US, distance to nearest college</td>
<td>0.073</td>
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</table>
OLS and IV Estimates of the Return to Education cont.

<table>
<thead>
<tr>
<th>Study</th>
<th>Country, Instrument</th>
<th>Returns to Schooling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OLS</td>
</tr>
<tr>
<td>Conneely &amp; Uusitalo (1997)</td>
<td>Finland, living in university town</td>
<td>0.085 0.083</td>
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<tr>
<td></td>
<td></td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.110 0.098</td>
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<tr>
<td>Lemieux &amp; Card (2001)</td>
<td>Canada, WWII veterans rehab act, Ont/Que</td>
<td>0.070 0.062</td>
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<td></td>
<td></td>
<td>IV</td>
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<tr>
<td></td>
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<td>0.164 0.076</td>
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<tr>
<td>Meghir &amp; Palme (2000)</td>
<td>Sweden education reforms</td>
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<td></td>
<td></td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.036</td>
</tr>
<tr>
<td>Sweetman (2000)</td>
<td>Canada, Nfld education reform females males</td>
<td>0.146 0.108</td>
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<tr>
<td></td>
<td></td>
<td>IV</td>
</tr>
<tr>
<td></td>
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<td>0.170 0.221</td>
</tr>
</tbody>
</table>
A puzzling pattern

• Why do conventional estimates generally understate the true return to schooling?

• Omitted ability bias should cause estimates to be upward biased

• There appear to be two explanations for this pattern
Measurement error

• One is the presence of measurement error in educational attainment (especially years of completed schooling)

• Downward bias due to measurement error acts in the opposite direction to upward bias associated with unobserved ability
What impact is estimated?

• Main reason: conventional (OLS) and quasi-experimental (IV) methods estimate effects of education for different groups

• OLS estimates the “average treatment effect” (ATE) -- the average return in the sample

• IV estimates the “local average treatment effect” (LATE) -- the average return among those affected by the intervention
Implications of heterogeneity

• If impacts of education differ across the population, ATE and LATE will differ

• Consider individuals with high potential returns who do not pursue higher education—perhaps because of low income or family background
• For such individuals, a policy intervention that increases educational attainment would have a substantial payoff.

• Indeed, the average return for this group (LATE) may exceed the average return in the population (ATE).
Canadian evidence

• Several recent Canadian studies have pursued this “natural experiment” approach

• Lemieux and Card (2001) study the impact of the Veterans Rehabilitation Act

• To ease the return of World War Two veterans, the federal government provided financial incentives for veterans to attend university and other educational programs
• Young men from Ontario were significantly more likely to be eligible for these benefits than their counterparts from Quebec

• Lemieux and Card estimate that the VRA increased the education of the veteran cohort of Ontario men by 0.2 to 0.4 years

• They estimate the rate of return to schooling to be 14 to 16 percent, substantially higher than the OLS estimate with their data of 7 percent.
Newfoundland policy change

• Sweetman (2000) investigates the impact of the education policy change in Newfoundland that raised the number of years of schooling required for high school graduation from 11 to 12

• He estimates that this intervention increased educational attainment of affected Newfoundland cohorts by 0.8 to 0.9 years.
• Estimated rates of return to the additional schooling are substantial: 17.0% for females (versus an OLS estimate of 14.6%) and 11.8% for males (versus OLS estimate of 10.8%)
School Leaving Laws

• Compelling evidence on educational impacts comes from Oreopoulos (2003) study of changes in school leaving laws

• He estimates an extra year of schooling increased annual earnings by 12.3% (IV)

• OLS estimate is 11.2%
• Those with additional education were also more likely to speak two languages, and less likely to be unemployed and experience poverty

• As with evidence from elsewhere, Canadian studies conclude that conventional estimates of the return to schooling are, if anything, biased downwards, as opposed to being inflated by unobserved ability
Conclusions from this research

Canadian studies using conventional OLS methods obtain estimates of the “return to schooling” that are similar to those obtained in other developed countries: real rates of return of approximately 8-10%.

• Such estimates compare favourably with rates of return on physical capital investments.
Important recent advances have taken place in our understanding of the relationship between education and labour market success.

Conventional estimates of the return to schooling appear, if anything, to be biased downward—so the causal effect of education on earnings appears to be higher than previously believed.

Further, the return to incremental investments in education (LATE) often exceeds the average return from previous investments (ATE). Investments in schooling do not seem to be experiencing diminishing returns.
Education, skills and labour market outcomes

• Most research on the determinants of labour market success uses relatively crude indicators of human capital such as educational attainment and years of work experience.

• Individuals with the same education and years of experience may have substantially different skills.
Education, skills and labour market outcomes

• Education and experience are "inputs" into the production of human capital, not direct measures of the "outcomes" -- a set of skills, competencies and knowledge

• Relatively little is known about the relationship between direct measures of skills and labour market outcomes
• Green and Riddell (2003) use the International Adult Literacy Survey (IALS) to investigate the relationship between education, skills and earnings

• Conventional estimates of the returns to schooling and experience confound two effects
• The first is the impact of education and experience on skill production -- the relationship between human capital inputs and outputs such as literacy skills, or “skill production effect”

• The second is the value placed on various skills in the labour market -- the relationship between literacy skills and market earnings, or “market valuation effect”
• When skills are not directly observed, the best we can do is analyse the relationship between human capital inputs and labour market outcomes.

• Direct measurement of skills allows researchers to "unpack" these two effects, i.e. to estimate of the skill production and market valuation effects.
• Green and Riddell (2003) find that formal education exerts a substantial effect on the production of literacy skills in Canada.

• However, they conclude that labour market experience has essentially no net effect on literacy production.
• Results suggest that policies aimed at improving cognitive skills such as literacy should focus on formal schooling

• Policies designed to increase work experience can lead to earnings growth but appear unlikely to enhance the cognitive skills of the workforce
• Another important result is that the Canadian labour market places a high value on literacy skills

• A 20-point increase in the literacy score -- equivalent to 1/3rd of a standard deviation of the literacy score distribution -- produces an increase in earnings equal to that associated with an extra year of formal schooling
• Results imply that a significant amount of the "return to education" represents the combined effects of the contribution of schooling to producing literacy skills and the value placed on literacy in the labour market

• Indeed, Green and Riddell estimate that about one-quarter to one-third of the "return to education" is associated with these effects

• The remainder reflects the impact of education on the production of other (unobserved) skills
How is immigrant human capital rewarded?

• Several studies find that the work experience and schooling of immigrants in their country of origin is valued much less than the experience and education of comparable natives

• However, credential effects are generally larger for immigrants than natives (Ferrer and Riddell, 2004)
Rewards to immigrant skills

• Using Ontario data, Ferrer, Green and Riddell (2004) examine the impact of literacy on immigrant earnings

• They conclude that immigrants and natives receive similar returns to literacy skills, contrary to discrimination-based explanations of immigrant-native born earnings differentials
• Among university-educated, literacy differences account for about one-half of the earnings gap between immigrants and the native born

• However, low returns to foreign-acquired experience has a larger effect on the gap

• Low literacy among immigrants contributes to earnings differences but is not the dominant explanation
Selected references


• "The Effect of Literacy on Immigrant Earnings" TARGET Working Paper 010, April 2004 (with Ana Ferrer and David A. Green).