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Competent Pathways to Work: PISA Scores and Labour Market Returns

Abstract

An important societal and individual outcome of a country's education system is the level of success experienced by youth as they enter the labour market. In 2006, the point at which the latest data from YITS are available for this report, Canadian youth were 21 years old and many were only beginning the journey into the world of work. Hence, this chapter represents an initial analysis of the labour market outcomes of Canadian youth. It examines the associations between achievement in PISA 2000 and a number of background characteristics with respect to two key labour market outcomes: earnings and the likelihood of unemployment. By age 21, there is some evidence about the relationship between skills, as measured by PISA and labour market outcomes, but it is most likely still too early to tell whether any potential impact could strengthen the youths' careers. These results represent an important first look at these outcomes that can be built on as the results of YITS 2008 and 2010 become available.

INTRODUCTION

International evidence supports the assumption that PISA achievement matters, showing significant associations between cognitive skills and labour market outcomes. (See Drewes, 2009, for a review.) One limitation of much of the available research is that it relies on measures of competences and labour market outcomes that are taken at the same time. Hence, while the labour market recognises and rewards ability, it is not known whether prior levels of competence or are predictive of positive labour market outcomes, employability and earnings power.

In the combined PISA/YITS data, the achievement scores were measured well before any higher education or labour market experience. This mixture allows for an estimation of the impact of prior competencies. PISA scores will have been influenced by early parental investments in human capital and the quality of the individual's primary and early secondary school experiences, so adjustments to account for these are required.

Since there is generally a period of time between compulsory education and labour market entry, it is imperative to improve competencies and thereby improve later labour market outcomes. There is not yet any Canadian literature on the subject, so it is of considerable importance that the combined PISA/YITS data are the first to provide the capability to explore the link between early cognitive skills and later labour market outcomes.

As noted in Chapter 4, even at age 21 (*i.e.* in 2006, the latest available wave of YITS data collection available for this project), many individuals were still transitioning within and across education and work, so it is likely that an examination of early labour market outcomes at this point in Canadian's youth's lives will coincide with a period of relative instability. Nonetheless, the results presented in this chapter provide important baseline data on these outcomes. The next wave of data is likely to provide a better picture.

This chapter addresses the following research questions:

- Do early achievement measures of cognitive ability, such as PISA, predict earnings from work?
- Are any relationships between PISA and earnings robust and independent of other factors?
- Do measures of cognitive ability, such as PISA, reduce the risk of unemployment?
- Is the relationship between PISA scores and the probability of unemployment independent of other factors?

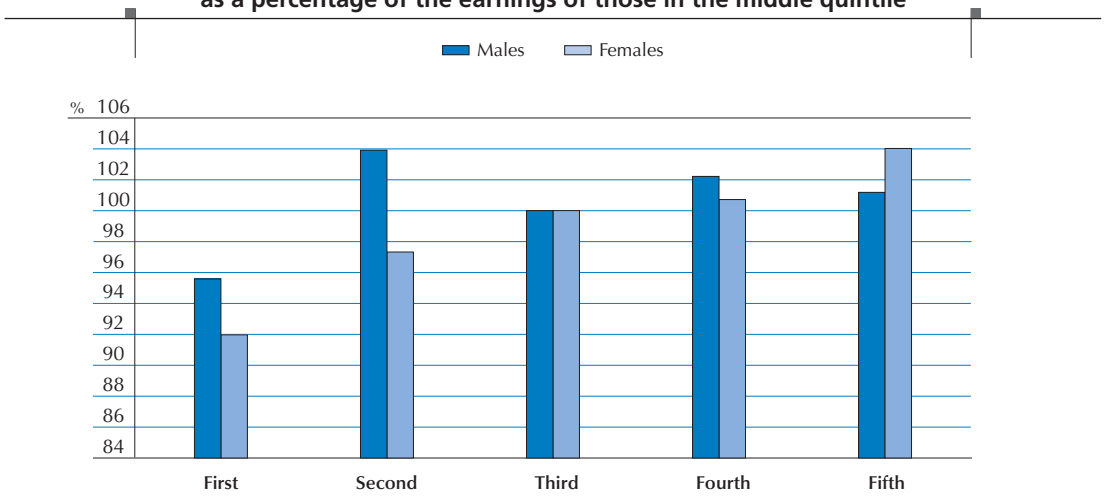
The results presented in this chapter are based on analyses conducted by Drewes (2009).

RELATIONSHIP BETWEEN PISA SCORES AND EARNINGS AT AGE 21

Figure 7.1 (Table 7.1) shows the relationship between hourly earnings in 2006 and achievement in PISA reading in 2000. It should be noted that the average earnings of males was about 23% higher than that of females. The figure shows that, in the case of females, there was a steady increase in earning power with increases in achievement. In fact, already by age 21, females in the top quintile were earning 12% more than their peers scoring in the bottom quintile. The pattern is not clear for males, since earnings are similar for the second to the fifth quintiles. Nevertheless, males scoring in the top quintile had hourly earnings about 5.5% higher than males in the lowest quintile.

These gender differences indicate that it is appropriate to analyse the earning patterns separately for males and females.

Figure 7.1
Hourly earnings of males and females in 2006 by achievement quintile expressed as a percentage of the earnings of those in the middle quintile



Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

What characteristics predict hourly earnings of young Canadians at age 21?

To address this question, males and females were examined separately using multilevel regression techniques (Raudenbush, Bryk and Congdon, 2004). Along with PISA reading scores, a number of characteristics were included in the model. The analysis was done in multiple stages: first, examining the association with PISA reading scores on their own and then adjusting for background and educational variables. This approach allowed for an analysis of whether the association between PISA reading scores and earnings is occurring independently from the background characteristics.

Thus, the model included hourly earnings as the outcome, with the following explanatory variables: PISA reading score, family factors (parental income, parental education), school factors (physical infrastructure, educational resources, student-teacher ratio), employment factors (total time in labour force, time in current job), demographic factors (immigrant status, language group), early work exposure (hours worked during secondary school, hours worked during post-secondary education), educational attainment and province of residence.

Table 7.1 shows the results of multilevel regression models for hourly earnings for males and Table 7.2 shows the results for females.

Taking the model for males with no adjustments for background characteristics first, there was a weak association between PISA scores and hourly earnings. However, when adjusting for background characteristics, the relationship disappears. The model that includes all variables indicated that, at least at age 21, males with more total time in the labour force who worked during secondary school and who had graduated from college, accrued an earning advantage. Some provincial variations were evident and these may be related to differences in local labour markets (*e.g.* sectoral differences in occupational opportunities), GDP and unemployment rates. Anglophones, not Francophones, in Québec, had lower predicted hourly earnings. However, the explanatory power of the model is weak as it accounts for 12% of the total variance in hourly earnings.

Table 7.1

Results of multilevel regression model for hourly earnings – Males

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	0.021	0.018	0.008
Parental income (in thousands of CAD)		0.003	0.003
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.026	-0.028
College		0.027	0.022
University		-0.017	-0.024
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.016	-0.021
College		-0.026	-0.031
University		-0.017	-0.013
School's physical infrastructure index		0.018	0.014
School's educational resources index		-0.011	-0.011
Student teaching staff ratio		0.003	0.003
Time in labour force (months)		0.002	0.003
Tenure in current job (months)		-0.001	0.000
1st generation immigrant		-0.076	-0.068
1st gen. immigrant * PISA score		-0.016	0.001
2nd generation immigrant		0.014	0.012
2nd gen. immigrant * PISA score		-0.024	-0.017
Anglophones in Québec		-0.133	-0.137
Anglophones * PISA score		-0.044	-0.042
Francophones Outside Québec		0.079	0.064
Francophones * PISA score		0.04	0.036
Hrs. worked while in secondary school		0.022	0.022
Sec sch hours * PISA score		-0.001	-0.001
Hrs. worked while in post-secondary education		0.003	0.002
Hrs. worked while in post-secondary education * PISA score		0.000	0.001
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		-0.205	-0.213
Prince Edward Island		-0.191	-0.200
Nova Scotia		-0.155	-0.152
New Brunswick		-0.173	-0.174
Québec		-0.007	0.011
Manitoba		-0.096	-0.086
Saskatchewan		-0.022	-0.031
Alberta		0.212	0.214
British Columbia		0.094	0.091
Educational attainment (ref. group: sec sch)			
Secondary school graduate			0.079
College leaver			0.062
University leaver			0.026
College graduate			0.178
University graduate			0.187
R^2	0.003	0.11	0.12
Number of observations	2 988	2 988	2 988

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

In contrast, higher reading scores were related to higher hourly earnings in the model for females. The relationship between reading achievement and hourly earnings is present even after accounting for background characteristics, again confirming the need for separate gender analysis. Also, the estimated strength of the relationship between reading achievement and earnings was largely independent of the other characteristics and remained apparent even with adjustments for both background and educational characteristics. The results for females showed some consistency with those for males in other respects. Like males, females who had been longer in the labour force had higher expected hourly earnings, indicating a return for work experience. Also, graduations from both college and secondary school were associated with higher hourly earnings. However, similar to the model for males, its explanatory power is not strong since the model explains just 10% of the total variance in hourly earnings.

Table 7.2
Results of multilevel regression model for hourly earnings – Females

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	0.050	0.048	0.041
Parental income (in thousands of CAD)		0.004	0.003
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.089	0.088
College		0.009	0.006
University		0.021	0.026
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.102	-0.112
College		-0.005	-0.009
University		0.015	0.021
School's physical infrastructure index		0.002	0.005
School's educational resources index		0.009	0.009
Student teaching staff ratio		0.003	0.002
Time in labour force (months)		0.000	0.002
Tenure in current job (months)		-0.001	-0.001
1st generation immigrant		0.079	0.084
1st gen. immigrant * PISA score		0.069	0.055
2nd generation immigrant		-0.035	-0.039
2nd gen. immigrant * PISA score		0.002	0.007
Anglophones in Québec		-0.064	-0.070
Anglophones * PISA score		-0.057	-0.076
Francophones Outside Québec		0.032	0.003
Francophones * PISA score		-0.058	-0.060
Hrs. worked while in secondary school		0.002	0.001
Sec sch hours * PISA score		0.000	0.000
Hrs. worked while in post-secondary education		0.003	0.002
Hrs. worked while in post-secondary education * PISA score		-0.002	-0.002
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		-0.239	-0.245
Prince Edward Island		-0.156	-0.161
Nova Scotia		-0.169	-0.166
New Brunswick		-0.107	-0.109
Québec		0.01	0.028
Manitoba		-0.004	0.005
Saskatchewan		-0.033	-0.030
Alberta		0.068	0.071
British Columbia		-0.019	-0.017
Educational attainment (ref. group: sec sch)			
Secondary school graduate			0.077
College leaver			0.054
University leaver			0.050
College graduate			0.219
University graduate			0.157
R^2	0.020	0.070	0.100
Number of observations	2 380	2 380	2 380

$p < 0.05$
$p < 0.01$
$p < 0.001$

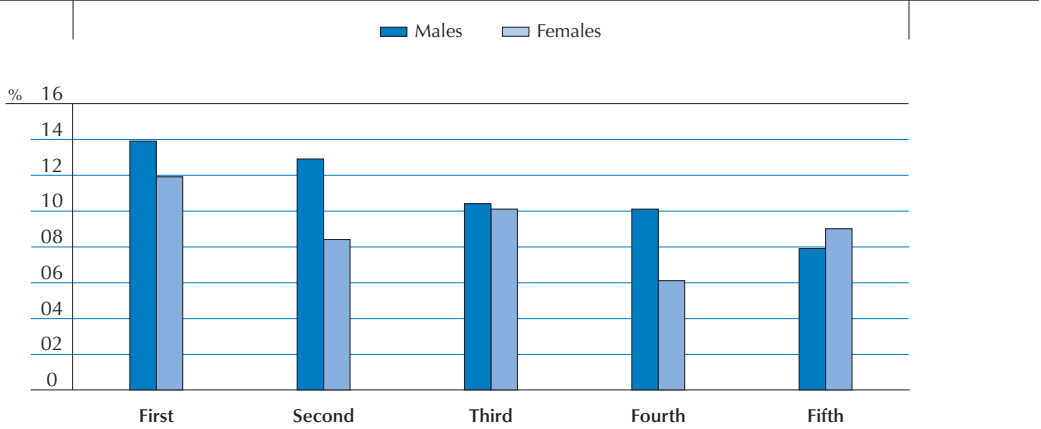
Source: OECD PISA and HRSDC.

THE RELATIONSHIP BETWEEN PISA SCORES AND UNEMPLOYMENT

In the fourth cycle of YITS, participants were asked whether they had looked for work in the last six months. This measure was taken as an indication of unemployment in the analyses presented in this section. In all, 12% of males and 9.3% of females were classified as unemployed (Table 7.2).

Figure 7.2 shows unemployment rates of males and females by PISA reading quintile. Results varied depending on gender. For males, there was a clear linear increase in unemployment rates as achievement decreased. In fact, the unemployment rate of males in the lowest quintile was 1.8 times greater than males scoring in the top quintile. In contrast, the relationship between achievement and unemployment was less clear-cut for females. Nonetheless, about 1.3 times as many low-achieving females (*i.e.* in the lowest quintile) reported being unemployed compared with those in the highest quintile.

Figure 7.2
Unemployment rates of males and females, by PISA reading achievement quintile



Source: Youth in Transition Survey, Special Analysis, Learning Policy Directorate, HRSDC.

What characteristics predict unemployment of young Canadians?

To address this question, a similar analysis technique was undertaken as was done with hourly earnings. The same set of background characteristics was included and results reported separately for males (Table 7.3) and females (Table 7.4).

The explanatory power of the models is weak (4% for males and 5% for females), so a large majority of the variation in unemployment rates was due to other characteristics that were not included in the models.

In the case of males, when PISA reading scores were considered on their own, a standard deviation increase in the score reduced the probability of unemployment by 2.5 per cent, but after adjusting for other background characteristics the relationship vanishes. The adjusted results for males showed a more pronounced provincial pattern in an expected way, with unemployment significantly lower in Québec and the Prairie provinces relative to Ontario. Also, working while in high school and while in post-secondary education (for those that go on to post-secondary education) was associated with a reduction in the unemployment probability, albeit a small one.

Table 7.3
Results of multilevel regression model for unemployment – Males

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	-0.025	-0.018	-0.020
Parental income (in thousands of CAD)		-0.017	-0.018
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.038	0.034
College		-0.001	0.000
University		-0.008	-0.009
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.036	0.037
College		0.009	0.006
University		-0.034	-0.036
School's physical infrastructure index		-0.011	-0.011
School's educational resources index		0.002	0.002
Student teaching staff ratio		0.000	0.000
Time in labour force (months)		0.000	0.000
1st generation immigrant		0.042	0.046
1st generation immigrant * PISA score		-0.038	-0.036
2nd generation immigrant		0.003	0.007
2nd generation iimmigrant * PISA score		0.033	0.034
Anglophones in Québec		0.109	0.106
Anglophones * PISA score		0.002	0.000
Francophones outside Québec		0.002	0.001
Francophones * PISA score		0.000	-0.001
Hrs. worked while in secondary school		-0.001	-0.001
Sec sch hours * PISA score		0.000	0.000
Hrs. worked while in post-secondary education		-0.002	-0.003
Hrs. worked while in post-secondary education * PISA score		0.000	0.000
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		0.011	0.010
Prince Edward Island		-0.036	-0.036
Nova Scotia		-0.038	-0.036
New Brunswick		-0.013	-0.013
Québec		-0.060	-0.059
Manitoba		-0.052	-0.051
Saskatchewan		-0.052	-0.051
Alberta		-0.067	-0.064
British Columbia		-0.027	-0.026
Educational attainment (ref. group: sec sch)			
Secondary school graduate			0.002
College leaver			0.026
University leaver			-0.004
College graduate			0.010
University graduate	0.010	0.040	0.203
R^2	0.010	0.040	0.040
Number of observations	3 809	3 809	3 809

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

Similarly, for females, the unadjusted advantage associated with higher PISA reading scores was significant, but it disappears after introducing the background characteristics. Provincial differences were not as marked as for males and there was no advantage of having worked while in secondary school or while in post-secondary education for females.

Table 7.4
Results of multilevel regression model for unemployment – Females

	Unadjusted	Adjusted for background characteristics	Adjusted for educational variables
PISA reading score	-0.019	-0.017	-0.012
Parental income (in thousands of CAD)		-0.042	-0.042
Mother's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		-0.033	-0.033
College		0.005	0.006
University		-0.002	-0.008
Father's education (ref. group: sec sch or less)			
Some post-secondary: incomplete		0.016	0.017
College		0.005	0.006
University		0.063	0.059
School's physical infrastructure index		0.021	0.021
School's educational resources index		-0.027	-0.027
Student teaching staff ratio		-0.003	-0.001
Time in labour force (months)		-0.001	-0.001
1st generation immigrant		0.081	0.081
1st generation immigrant * PISA score		-0.019	-0.017
2nd generation immigrant		0.034	0.039
2nd generation iimmigrant * PISA score		0.015	0.014
Anglophones in Québec		0.032	0.036
Anglophones * PISA score		-0.024	-0.019
Francophones outside Québec		-0.051	0.059
Francophones * PISA score		0.075	0.074
Hrs. worked while in secondary school		0.000	0.000
Sec sch hours * PISA score		0.000	0.000
Hrs. worked while in post-secondary education		-0.001	-0.001
Hrs. worked while in post-secondary education * PISA score		0.001	0.001
Province of job: (ref. group: Ontario)			
Newfoundland and Labrador		0.081	0.082
Prince Edward Island		0.087	0.096
Nova Scotia		0.000	-0.001
New Brunswick		0.001	0.01
Québec		-0.005	-0.004
Manitoba		-0.021	-0.021
Saskatchewan		0.016	0.018
Alberta		-0.002	0.001
British Columbia		0.028	0.032
Educational attainment (ref. group: sec sch)			
Secondary school graduate			-0.039
College leaver			-0.020
University leaver			0.000
College graduate			-0.036
University graduate			-0.014
R^2	0.006	0.050	0.050
Number of observations	3 198	3 198	3 198

$p < 0.05$
$p < 0.01$
$p < 0.001$

Source: OECD PISA and HRSDC.

CONCLUSION

The results presented in this chapter analysed the relationship between cognitive competencies acquired prior to completing compulsory schooling and labour market outcomes in the Canadian context. Specifically, the analyses examined the extent to which achievement on PISA 2000 predicted hourly earnings and likelihood of experiencing unemployment six years later. Males and females were examined separately.

The first research question addressed in this chapter was the extent to which achievement on PISA predicted hourly earnings. The results indicated that for females, higher scores on PISA did translate into higher hourly earnings (*i.e.* a 12% earnings advantage for females with a PISA score in the highest quintile relative to those scoring in the lowest one). In contrast, there was only a slight earnings advantage associated with PISA reading scores for males. Hence, in the absence of background characteristics, the predictive value of PISA competencies in earnings power was confirmed, particularly for females.

As an aside, it should be noted that at age 21, males were earning about 23% more than females. This gap may be monitored as further cycles of YITS are completed in the interest of identifying barriers to gender equity in distributions of earning.

The second research question was the extent to which the relationship between PISA scores and earnings were robust when considered in the context of background characteristics. In the case of males, the small earnings advantage associated with PISA competencies was no longer evident when other characteristics were included. The results suggest that the earnings advantage of PISA scores, at least at the age of 21, were associated with more experience in the workforce rather than higher competencies.

In contrast, the earnings advantage for females associated with reading competencies was robust in the presence of the other characteristics. Similar to males, more time in the labour force was associated with an earnings advantage.

The finding that competencies accrued an advantage for females but not for males is an extremely interesting finding that merits more in-depth research when more data from YITS becomes available.

The third research question examined the extent to which PISA competencies were associated with rates of unemployment. The results suggested that for males, lower reading scores were associated with increased rates of unemployment, while the relationship between competencies and unemployment rates was weak for females.

The final research question the chapter sought to examine was the extent to which reading competencies remained significant in the presence of other background characteristics. The results indicated that higher PISA reading scores did not significantly reduce the probability of unemployment in males or females. Overall, the analyses for unemployment explained only very small amounts of the variations in unemployment rates.

In conclusion, it is probably too early in these youths' labour market careers to be able to identify characteristics related to earnings and unemployment, since for many youth at age 21, patterns of employment are likely to be erratic. Revisiting this important issue when these youth are 23 and then 25 would be well worthwhile as employment patterns become more stable.