Sheepskin Effects and the Returns to Education*

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Abstract

Sheepskin effects, also known as credential effects, refer to increases in labour market earnings associated with the completion of a diploma or degree — such as high school or university graduation. Most labour market studies assume that the only relevant educational variable is the total number of years of education. Alternatively, the literature on sheepskin effects considers that degrees have an independent effect on the returns to education. We examine here the empirical literature that finds evidence of significant credential effects in the U.S. and Canada. The magnitude of such effects is most relevant to understanding the nature of the relationship between education and economic success.

Introduction

The positive correlation between education and earnings is one of the most well established relationships in the social sciences. Summarized by the human capital earnings function associated with the work of Mincer (1974), it constitutes the foundation of much of the empirical research on the determinants of market earnings. According to his model, the logarithm of individual earnings can be expressed as a linear function of years of completed schooling and a quadratic function of labour market experience:

$$\text{Ln } w = a_0 + a_1 S + a_2 EXP + a_3 EXP^2 + a_4 X + u \qquad (1)$$

where w stands for wages, S for years of completed education, EXP for years of labour market experience and X is a vector of additional variables that may also influence earnings such as language, marital status, and province of residence. The parameters $a_1,..., a_4$ measure the marginal effect that each variable has on the logarithm of wages.

According to this view credentials or diplomas play no role in determining earnings; only years of education matter. One implication of this model is that there should be little difference in earnings between those who, with a similar number of years of education, complete a program and those who do not. This view has dominated much of the empirical literature on the determinants of labour market earnings. The alternative model, a `pure credentialist´ model, holds that only diplomas matter and that years of schooling have, in the absence of degree completion, no impact on economic achievement. This alternative 'credentialist model' implies that we should observe substantial increases in labour earnings associated only with degree completion. That is, we should observe large sheepskin effects.

Of course, the nature of the returns to human capital may be more complex than is implied by either of these simple theories. Both views are likely to have some validity. The value of a degree -- high school graduation for instance -- would partly come from the specific knowledge gained in each of the twelve years of the program and partly from the "package" of behavioral, intellectual and social experiences that only graduation from the whole program provides. This creates difficulties in studying the returns to human capital investments, as the data used in these studies does not generally allow taking these matters into account. Most data sets have only one measure of educational attainment -- either years of completed schooling or the highest degree obtained. With only total number of years of education as a measure of human capital, estimation of the returns to education may be biased because of the omission of

diploma, certificate or degree effects.[1] Additionally, it is reasonable to assume that the magnitudes of the contribution to earnings of years of schooling and credentials varies with the level of educational attainment, as well as across time and across countries.

Nowadays, investments in human capital are considered a key factor in fighting unemployment and poverty. Empirical studies of the competing views of the role of education in the labour market may help to better characterize the relationship between such investments and their economic returns. Such studies may also contribute to the question of how best to measure human capital and educational attainment over time and across countries. Assessing the value of credentials as well as years of education for different programs is an important tool for educational policies. It may not only help to establish the general structure of the schooling system but also, and more importantly, to design the adult educational programs aimed at the unemployed. Additionally, for immigrant recipient countries such as Canada, determining local differences in sheepskin effects by country of origin contributes to make admission criteria more efficient and facilitates the integration of foreign human capital.

Sheepskin Effects in the U.S. Labour Market

To evaluate the extent to which credentials have an economic reward over and above that of years of education, economists extend the Mincer equation to include dummy variables for different types of credentials:

$$\text{Ln } w = a_0 + a_1 \, S + a_2 \, EXP + a_3 \, EXP^2 + a_4 \, X + a_5 \, CD + u \qquad (2)$$

where CD is a vector of credential dummies and a_5 is a vector of parameters that measures the value of completing each degree. With this specification it is possible to determine if program completion has an independent value in earnings determination. Most of the papers examined here use a variation of this equation to obtain their estimates. Note that estimation of equation (2) requires information on both years of schooling and degrees, diplomas, and certificates received, information that is only available in a few data sets.

We begin with a summary of the results on sheepskin effects from the main studies of the U.S. labour market. Table 1 shows estimated sheepskin effects for high school graduation and university bachelor's degrees for white males, according to Hungerford and Solon (1987) (hereafter HS), Jaeger and

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[1] As discussed by Card (1999) there are other sources of econometric bias in the relationship between earnings and education. See also Kane, Rouse and Staiger (1999) and Ashenfelter and Krueger (1994).

Page (1996) (hereafter JP) and Park (1999). A first look at these results reveals what appears to be substantial variation in the magnitude and existence of sheepskin effects. It is, however, the result of the different data sources and methodologies underlying the studies. Early studies had only one measure of human capital (usually years of education) and lacked information on program completion. The usual strategy in these cases is to assume that completion coincides with the normal number of years required for completing elementary school (8), high school (12) and college (16). As subsequent studies have shown, this method tends to understate sheepskin effects because it misses information coming from the variation in the number of years that it takes to complete a program and at the same time will typically overstate the number of degrees completed.[2]

Early studies find little or no evidence of sheepskin effects. For instance, Layard and Psacharopoulos (1974) survey earlier U.S. studies that compare rates of return to education for dropouts to those for program completers. According to their findings earnings of those completing a degree do not exceed those of program dropouts. However, the data used in these studies does not allow the researcher to directly relate the earnings of dropouts and completers to their years of education. Another example is HS (1987), who use micro data on white males from the May 1978 CPS. As shown in Table 1, they find no evidence of sheepskin effects at the high school level but they do find that university bachelor's degree graduates experience around a 9% wage increase that can be attributed to diploma effects. In a similar study, Belman and Heywood (1991) use the same data and strategy to examine sheepskin effects for women and minorities. Both the returns to years of schooling and the estimated discontinuities associated with years at which completion of a degree is common differ across the four groups they study (white males, white females, minority males and minority females). The overall pattern of their results is that sheepskin effects associated with elementary and high school completion are smaller for women and minorities than those estimated for white males, whereas the discontinuities associated with college and graduate school are larger than those for white males. These differences are, however, not formally tested in the paper. As mentioned above, the problem seems to be in the type of data these studies are based on. By focusing on a derived measure of program completion, they failed to find evidence of substantial sheepskin effects or these are understated.

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[2] For example, those who drop out in the final year will be mistakenly classified as degree holders using this methodology.

In 1992, a change in the CPS questionnaire gave further impetus to the literature on sheepskin effects.[3] In their 1996 paper, JP obtain data on both program completion/degree receipt and years of schooling by matching individuals who completed both the pre-1992 and revised post-1992 CPS questionnaires. They compare results obtained when using years of education only, and those obtained when using information on both measures of human capital (See columns 2 and 3 in Table 1). With the additional information on program completion, diploma effects associated with high school graduation for white men are about 13%, whereas the estimated effect of a high school diploma was negligible when graduation was assumed to occur at 12 years. Also, estimated sheepskin effects at the bachelor's level rise substantially from 12% to 28%. They conclude that years of completed education is an imperfect measure of degree completion and that estimated sheepskin effects are much larger when information on degree receipt is available. Another important consequence of using data on both years of completed schooling and program completion is that now there seems to be little evidence of statistically significant differences between minorities and whites or between males and females.

Subsequent studies find similar evidence. Kane and Rouse (1995) analyze the returns to two-year community colleges and four-year colleges using data from the National Longitudinal Study of the High School Class of 1972 (NLS72). Using the extensive data in this study, they find that course credits at two-year and four-year colleges have similar payoffs and that credential effects associated with graduation (over and above the value of the course credits received) are generally small. The strongest evidence for sheepskin effects was that for associate's degrees for women (around 12%) and bachelor's degrees for men (24%). In their study using CPS data, JP (1996) also examine credential effects associated with graduation from community colleges. They find large sheepskin effects for associate's degrees for white men (9% for occupational associate's degrees and 21% for academic associate's). Diploma effects of associate's degrees for blacks are not statistically significant but sheepskin effects for bachelor's degrees are large and significant for all four demographic groups. The differences in results between these two studies may be due to the larger CPS sample size and its representative nature, or due to the richer set of controls in the NLS72 data. Both concur in estimating sheepskin effects in excess of 20% for bachelor's degrees for both white males and females and for associate's degrees for white women. Park (1999) offers complementary evidence using data from the February 1990 CPS that asked both the old and new CPS education

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[3] Prior to January 1992 the CPS questionnaire asked respondents their number of years of completed schooling, whereas the revised CPS asks about the highest level of education attained. Because of the rotation group feature of the CPS, some individuals responded to both sets of questions about education outcomes.

questions. Park's specification is more general than that of JP and allows for a full set of interactions between years of education and degree receipt/program completion. Estimated sheepskin effects are similar in magnitude to those of JP (See column 4 in table 1).

In summary, most of the U.S. research finds an increase in individual earnings with the receipt of a high school diploma and bachelor's degree, after taking into account the effect of years of completed schooling. The magnitudes of these sheepskin effects are non-trivial: an earnings premium of 9-13% usually accompanies high school graduation and an increase of 9% - 28% in wages is associated with a bachelor's degree, relative to those with the same years of education but no diploma. However, very few studies of education and earnings are able to take such effects into account because widely used data sets do not provide information on both years of schooling and degrees, certificates or diplomas received. As we have noted, assuming that program completion occurs at normal times such as 12, 14 and 16 years results in substantial underestimation of the importance of degree receipt. The lack of adequate data may be the reason that sheepskin effects have been so easily dismissed in the past.

Canadian Evidence

A number of previous Canadian studies, including Freeman and Needels (1993), Bar-Or et. al. (1995), Vaillancourt (1995) and Parent (1999) have examined aspects of the returns to education by comparing earnings of those with different levels of educational attainment (e.g. high school drop outs versus graduates and high school graduates versus university graduates). None of these studies, however, distinguishes between the contribution to earnings of years of completed education and that of degree completion. Information on both years of schooling and degree receipt is likely to be even more important in Canada than in the U.S. because of the diversity of Canada's provincial education systems[4].

To our knowledge, Ferrer and Riddell (2001) is the only study to examine the role of credentials in the Canadian labour market by combining information on years of completed schooling with data on receipt of a degree, certificate or diploma. We use data from the 1996 Canadian Census. In contrast to the U.S. CPS, the Canadian Census provides information on both years of

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[4] High school graduation may require 11, 12 or 13 years depending on the province and whether the student is pursuing a technical/vocational or an academic program. At the university level there exist both 3 and 4 year programs leading to a bachelor's degree. Many community college programs are two years in length, but in these institutions considerable diversity in program duration is also a feature of the Canadian system.

education and receipt of credentials. In addition, it reports all credentials received rather than just the highest degree and also the individual's field of study. These features, together with large sample sizes[5], confer important advantages to this Canadian evidence. In particular, it is possible to test for additional hypotheses, such as differences in returns to credentials by field of study or the consequences of combining degrees, with more reliability than in the previous U.S. studies.

Table 2 offers a summary of the distribution of credentials, average years of education and mean weekly earnings of our sample of full-time, full-year (FYFT) workers. Over 80% have a high school diploma or above, while approximately 25% possess a high school diploma but no additional educational credentials. Individuals whose highest degree is a high school diploma average 12.5 years of education, two years more than those who did not graduate from high school. Additionally, around 36% of the workers in our sample have a non-university post-secondary certification, either in the form of a college diploma or trades certificate. This percentage is considerably higher than the 1995 OECD average of 9%[6]. Another feature of the diversity of educational attainment in Canada is the extent to which individuals combine a community college or trade school program with a university degree. About one quarter of those with university degree also report a college diploma or trades certificate. Those who report both a university degree and a trades certificate or college diploma also have close to one additional year of completed schooling, but lower earnings than those with a university degree alone. Without controlling for other factors that may influence earnings, the college/trade versus high school wage differential is approximately 11-12%. However, the equivalent university versus high school wage gap is 49% for males and 59% for females. For both sexes together, on average university educated workers earn 54% more than high school graduates and 37% more than college/trade school graduates.

Table 3 cross-tabulates the highest degree received and the completed years of education. Note the considerable variation between both measures of human capital. For example, although 12 years is the modal number of years of schooling for those whose highest degree is a high school diploma, 11% have less than 12 years of education, while 43% of this group has more than 12 years of education. As we anticipated given the education system of both countries, there is considerable more variation in Canada than in the US in the number of years of education reported by those whose highest degree is a high school

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[5] Our sample of full year full time workers consists of approximately 150,000 observations. Jaeger and Page (1996) and Park (1999) results are based on samples of approximately 18,700 and 12,000 respectively.
[6] According to OECD (1998), the fraction of the adult Canadian population that were non-university post-secondary graduates was 30% in 1995, triple the OECD average.

diploma[7]. Similarly, among those whose highest degree is a bachelor's degree (and who do not also have a college diploma or trade certificate), 7% report less than 16 years of schooling, 30% have 16 years, 36% have 17 years and 28% report more than 18 years of education. The fraction of Canadians taking more than 16 years to complete a bachelor's degree is much larger than that observed in the US[8]. This variation is much larger if we combine all individuals whose highest degree is a bachelor's diploma regardless of other post-secondary degrees they may have.

Table 4 summarizes our main findings regarding the magnitude of sheepskin effects for Canadian workers.[9] These estimates measure the impact on earnings of the degree, diploma or certificate after controlling for years of completed schooling and the influence of other factors. High school graduation increases male earnings by 4% relative to those who do not graduate from secondary school; female earnings increase approximately by 6%. A college diploma or trades certificate (C/T) after high school graduation increases earnings by a further 3.5% and 5.1% for females and males respectively. The most significant increases, however, occur at the university level. Individuals with a bachelor's degree increase earnings by more than 20%. Additionally, a degree in Medicine implies an additional 39%-45% over the bachelor's degree premium, whereas a master's degree implies an additional 8-10% (males and females respectively) over the typical bachelor's degree holder's earnings. Credentials over a master's degree have little or no effect on earnings.

These estimates provide a simple decomposition of the total returns to education into components associated respectively with years of schooling and credentials[10]. Figure 1(a) and 1(b) plot these decompositions for men and women respectively. Note that the importance of credentials increases with years of education. For both genders, sheepskin effects explain about 30% of the total returns to completing 16 years of education. For males, diploma effects account for over one-half of the marginal effect of completing 19 years versus 12 years of schooling and three quarters of the marginal effects of completing 19 years versus 16 years. The comparable marginal effects for women are lower but

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[7] JP (1996) report that those whose highest credential was a high school diploma 91% had 12 years of education, 5% took more than 12 years and 4% less than 12.

[8] According to JP (1996), 78% of Americans with a bachelor's degree have 16 years of education and 14% have more than 16 years.

[9] Education is generally associated with more work activity (hours per week, weeks per year) and higher wage rates. In order to focus mainly on the impacts on wages, we use as our measure of earnings the weekly wage for full-time, full-year workers.

[10] The estimates from regressions with and without credentials are used. The difference between these two sets of estimates is the proportion of the total return that is due to credentials. See JP (1996) and Ferrer and Riddell (2001) for details.

nonetheless substantial, 39% for 19 years versus 12 years and 57% for 19 years versus 16 years.

Hypothesis Testing

One of the strengths of our Canadian study is that large sample sizes and more exhaustive information about educational attainment allows further hypothesis testing than in other studies. In particular, we are able to explore three interesting issues concerning the value of diplomas: is there a difference between accumulating and combining degrees? What is the role of high school graduation on earnings? And which is the role of the field of study on earnings?

Accumulating versus Combining Degrees. As mentioned above, a variety of combinations of credentials is evident in the Canadian labour market. Some individuals proceed in a "linear" fashion from a lower to a higher degree, but this is not always the case. Almost 30% of those with some completed post-secondary education have not graduated from high school. Also, about one quarter of those graduating from a university have additional post-secondary degrees in the form of a trades certificate or college diploma. A natural question to ask is whether the market rewards only the highest credential or if it is the combination of degrees that matters. We conclude that this depends on the degree considered. Those with a trades certificate or college diploma who also graduated from high school do earn more than those who completed their college degree without high school. This result suggests that the high school diploma may have an independent effect on the earnings of this group. In contrast, we cannot reject the hypothesis that individuals with a university degree earn the same as individuals who also have a trade's certificate or college diploma.[11]

The question then remains, why are the returns to a bachelor's degree holders similar to those of an individual that holds both, a bachelor's degree and a trades certificate or college diploma? As the number of years of education is being held constant, this seems to imply that the market values differently those years spent in a trade school or college and those spent in a university. Table 5, panel A, shows the results from testing this hypothesis. For males, years spent in college or trade school have no value if the individual has also completed university. This is not the case for females, for whom time spent in both educational programs has market value. Note, however, that when females also spent time in university, the value of the time spent in college or trade school is about half the value of years spent in the university.

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[11] An exception is the case of female bachelor graduates, for whom significant differences exist between those with and without a C/T. See Ferrer and Riddell (2001).

Taken together, these findings suggest that there may be gains from greater integration of the community college and university systems in Canada. This does not imply that attending community college and university is a poor choice. Many individuals who did so may not have attended university at all had they not first attended college.

The Dual Role of Credentials. Receipt of a certificate or diploma seems to play two distinct roles in the labour market. One is to distinguish those with the credential and those without (the "credentialist" effect). The second is to open the door to further education (the "opening-opportunities" effect), since graduation from one level is often a prerequisite for moving on to a higher level. Partial evidence of this feature is provided by Parent (2000) who finds that in Canada the return to graduating from high school alone is very similar to that of high school dropouts. The evidence in our paper further supports this finding. We estimate that while the credentialist effect of high school is about 4%, the "opening doors" effect is more than twice as large[12], around 10% (See panel B in Table 5).

The Role of the Field of Study. Credential effects may also reflect monopoly rents, which differ across fields of study. These rents are associated with barriers to entry. For example, in fields like medicine or engineering, there may exist legal constraints to practicing without specific degrees. According to our analysis, important differences are evident in the magnitudes of degree effects across fields of study. Table 6 summarizes our main findings. In the humanities and social sciences, credentials are important from the bachelor's level and above. In contrast, in fields like engineering and health there are considerable returns to college graduation whereas trade school diplomas and degrees above the bachelor's level have negative or no impact on earnings. In the field of business most degrees positively affect earnings and in sciences only bachelor's degrees have a significantly positive effect. Despite these differences, bachelor's degrees are the credentials that produce the highest returns in all fields. Additional degrees beyond the bachelor's level have small or no effects on earnings.

The Role of Credentials in Immigrant Earnings

An important issue for immigrant recipient countries is the extent to which foreign human capital is recognized. The literature on immigrant earnings

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[12] The relative importance of these two effects has been changing over the years. Using data from the 1981 to 1996 censuses, we estimate that the credentialist effect has remained quite stable since 1986, while the "opening doors" effect has been increasing in importance since 1981.

concludes that immigrants have lower wages and occupational status than otherwise similar Canadians, although some assimilation occurs over time.[13] Part of these differences can be attributed to difficulties that immigrants may encounter in getting their credentials recognized in the host country. Li (2001) studies the market worth of Canadian immigrant credentials using data from the 1996 Census. He concludes that the disadvantage due to holding a foreign degree is most important for immigrants that are part of a visible minority (non white).

Ferrer and Riddell's (2001b) study of the role of credentials on immigrant earnings reveals that credentials are, in general, more important in determining immigrant than native earnings. We use data from the 1981, 1986, 1991 and 1996 censuses to construct a synthetic panel data set that follows cohorts of immigrants through time. This methodology permits us to control for quality effects across cohorts.[14] Table 7 shows the percentage increment in earnings due to different measures of human capital for natives and immigrants. While experience and years of education have less weight on immigrant earnings, the effect of degrees above high school is substantially higher: almost double for a trades certificate or college diploma and around a third higher for university degrees.

Additionally, we find important differences in the assimilation process of different immigrant cohorts depending on their credentials. Figures 2(a), 2(b) and 2(c) follow the evolution of the earnings of immigrants without high school graduation, with a high school diploma and with a university degree respectively. In general, immigrants with university degrees not only have a higher level of entry earnings, they also assimilate faster than immigrants with lower levels of educational attainment. This is particularly true for recent immigrant cohorts.

Conclusion

There are substantial earnings gains associated with receipt of a degree, certificate or diploma after controlling for years of completed schooling, in both the U.S. and Canadian labour markets. It appears that the previous dismissal of these effects was due to the lack of sufficiently detailed data to estimate the magnitude of credentials, specifically the fact that few data sets provided information on both years of completed schooling and degrees, diplomas and certificates received..

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[13] See Grant (1999) and Green (1999) for recent studies on the earnings and assimilation of Canadian immigrants, and Ferrer and Riddell (2001b) for research on the role of credentials on Canadian immigrant assimilation.

[14] See Borjas (1985) for a formal description of this method.

For Canada, high school graduation is associated with an increase in weekly earnings of 4% to 6% relative to those who did not complete high school, holding constant years of schooling. Post-secondary programs have additional impacts on the earnings of high school graduates. The marginal effect of a college diploma or trade certificate is 5% for men and 3% for women, while that for a bachelor's degree is approximately 21% for both groups. For those who go on to more advanced degrees, there are significant additional impacts on earnings over the bachelor's degree for master's degrees (7% to 10%) and medical and related professional degrees (over 30%). Completion of university diploma programs above the bachelor's level and doctoral programs does not have a statistically significant additional impact on earnings. These findings complement those obtained in studies with U.S. data carried out by JP (1996) and Park (1999). These two studies had access to unique data sources that contained information on both years of schooling and degrees received. Estimated sheepskin effects for Canada are generally smaller than those reported in these U.S. studies. However, the general pattern of the estimates is similar, with the largest diploma effects being those estimated for medical and professional degrees and next largest for university bachelor's degrees (four year college degrees in U.S.). Positive and statistically significant sheepskin effects are also obtained for community college diplomas or degrees in both countries.

For immigrants, credentials seem to have even more importance in determining earnings. A college diploma or trades certificate increases immigrant earnings by 5.4% versus an estimated 2.8% increase in native earnings. University degrees increase immigrant earnings by 27% versus 20% for natives. Furthermore, degrees seem to greatly influence the assimilation process of immigrants. However, anecdotal evidence seems to indicate that immigrants are often at a disadvantage compared to similarly educated natives. Both results indicate that foreign human capital may be underutilized. Further research is necessary to fully address this issue.

These results indicate that both years of completed schooling and credentials are important determinants of earnings. When both measures of educational attainment are available, both the restricted human capital earnings function -- in which earnings depend only on years of schooling and experience -- and the pure credentialist model -- in which earnings are a function only of experience and degrees, certificates and diplomas received -- are clearly rejected by the data. This provides a rationale for including both dimensions of human capital in economic and labour market surveys. To the extent possible, both measures should also be incorporated in comparisons of human capital investments over time and across countries.

The empirical results suggest that both years of schooling and credentials appear to be important determinants of success in the labour market. However, caution needs to be exercised in giving a causal interpretation to these results. An alternative explanation of these findings is that there are unobserved factors such as ability or ambition that affect both earnings and credentials received. Richer data will be required to obtain convincing estimates of the causal effects of credentials and years of schooling on earnings.

Table 1. Returns to Credentials of White Males in the US

	Hungerford & Solon[1]	Jaeger & Page[2]	Jaeger & Page[3]	Park[4]
	(1987)	(1996)	(1996)	(1999)
High School	0%	0%	13%	9%
Bachelor's Degree	9%	12%	28%	24%

(1) Using May 1978 CPS (years of education only)
(2) Using March 1991 and 1992 CPS (years of education only)
(3) Using March 1991 and 1992 CPS (years of education and degree completed)
(4) Using Feb 1990 CPS (years of education and degree completed)

Table 2. Educational Credentials, Years of Schooling and Weekly Earnings, FYFT Workers, Canada, 1995

	Both Sexes			Females			Males		
	%	Avg. Weekly Wage	Avg. Years of Education	%	Avg. Weekly Wage	Avg. Years of Education	%	Avg. Weekly Wage	Avg. Years of Education
No Degree	19.43	612	10.2	16.38	468	10.4	21.55	688	10.0
High School grad	24.95	657	12.5	27.19	535	12.5	23.88	757	12.6
College/Trade w/o HS	10.17	713	13.1	8.78	493	13.3	11.15	780	12.9
College/Trade with HS	25.75	748	14.3	27.51	525	14.3	24.51	856	14.4
All College/Trade	35.92	738	13.9	36.29	597	14.0	35.66	838	13.9
Univ BA w/o College/Trade	10.03	966	16.9	10.33	808	16.9	9.83	1082	17.0
Univ BA+ w/o College/Trade	1.71	1039	17.5	2.02	911	17.5	1.50	1158	17.6
Medicine w/o College/Trade	0.26	1573	18.4	0.17	1199	18.4	0.33	1708	18.4
Univ MA w/o College/Trade	2.55	1189	18.4	2.11	1017	18.4	2.86	1277	18.4
PhD w/o College/Trade	0.45	1311	18.6	0.22	1099	18.6	0.61	1364	18.5
Univ BA with College/Trade	3.44	896	17.8	3.97	781	17.7	3.07	1000	17.9
Univ BA+ with College/Trade	0.41	970	18.3	0.46	856	18.3	0.37	1071	18.2
Medicine with College/Trade	0.06	1221	19.0	0.07	954	18.6	0.05	1458	19.3
Univ MA with College/Trade	0.71	1067	19.3	0.74	959	19.2	0.69	1147	19.3
PhD with College/Trade	0.08	1184	19.7	0.05	1101	19.5	0.10	1215	19.8
All Univ Degrees	19.71	1010	17.5	20.13	849	17.4	19.41	1127	17.6
All credentials	100.00	747	13.6	100.00	610	13.7	100.00	843	13.5

Source: Authors' calculations based on the 1996 Census of Population, PUMF on Individuals, Ottawa, Statistics Canada

Table 3. Cross-Tabulation of Highest Degree Received by Completed Years of Education

Years of School	No Degree	HS Only	Some Post-Sec	Coll/Trade w/o HS	Coll/Trade with HS	BA w/o Coll/Trade	BA with Coll/Trade	BA+ w/o Coll/Trade	BA+ with Coll/Trade	Med. w/o Coll/Trade	Med. with Coll/Trade	MA w/o Coll/Trade	MA with Coll/Trade	PhD w/o Coll/Trade	PhD with Coll/Trade	Year Total	% Year Share
0 to 5	522	0	0	60	8	0	0	0	0	0	0	0	0	0	0	590	0.40
5 to 8	4133	0	0	414	17	0	0	0	0	0	0	0	0	0	0	4564	3.09
9	3226	372	0	373	52	0	0	0	0	0	0	0	0	0	0	4023	2.72
10	6207	816	39	981	140	1	0	0	0	0	0	0	0	0	0	8184	5.53
11	5535	2759	149	1624	551	1	0	0	0	0	0	0	0	0	0	10619	7.18
12	6781	16160	716	2289	2980	0	1	0	0	0	1	0	1	0	0	28929	19.56
13	1744	4052	4903	2888	7516	23	2	6	1	0	0	4	0	0	0	21139	14.29
14	369	0	3795	2561	8750	135	35	25	7	0	0	7	4	1	1	15690	10.61
15	133	0	1826	1981	7667	810	125	63	16	1	1	35	8	2	0	12668	8.57
16	57	0	862	1559	6408	4476	720	305	40	7	4	84	22	6	0	14550	9.84
17	19	0	320	315	2662	5289	1287	836	113	36	7	482	64	44	4	11478	7.76
18	3	0	100	0	881	2701	1425	826	166	182	13	1421	189	260	13	8180	5.53
19	0	0	24	0	306	1077	876	358	138	124	30	1401	288	302	32	4956	3.35
20	0	0	2	0	95	235	421	81	75	18	16	211	273	24	31	1482	1.00
21	0	0	1	0	35	78	155	30	32	15	11	87	150	18	32	644	0.44
22	0	0	0	0	7	11	39	5	10	1	4	26	45	5	3	156	0.11
23	0	0	0	0	1	3	6	0	2	2	0	13	10	2	1	45	0.03
Degree Total	28729	24159	12737	15045	38076	14840	5092	2535	600	386	87	3771	1054	664	117	147892	100
% Degree Share	19.43	16.34	8.61	10.17	25.75	10.03	3.44	1.71	0.41	0.26	0.06	2.55	0.71	0.45	0.08	100	

Source: authors' calculations from the 1996 Census of Population, PUMF on Individuals. Ottawa: Statistics Canada.

Table 4. Returns to Credentials in Canada[1]

	Males	Females
High School	4.1%	5.6%
College/Trade [2]	5.1%	3.5%
Bachelor's Degree [2]	23%	25%
University-Medicine [3]	45%	39%
University-Master[3]	8%	10%

(1) Using 1996 Census of Population.
(2) Relative to high school graduates
(3) Relative to a bachelor's degree

Table 5. Hypothesis Testing[1]

A. The Value of College Years

	Males	Females
High School / Elem.Years	3.1%	3.7%
College Years		
Without University Degree	3.7%	7.6%
With University Degree	0%	3.8%
University Years	4.1%	7.9%

B. The Dual Role of High School Graduation

	Males	Females
High School Grad. only	3.7%	4.4%
High School Grad. plus other diplomas	8.9%	10.2%

(1) Using 1996 Census of Population.

Table 5. Returns to Credentials by Field of Study[1]

		Social Science	Business	Engineering	Health	Sciences
High School	Males			5.3%		
	Females			6.4%		
College/Trade[2]	Males	0%	6%	10%	4%	-7.7%
	Females	0%	5.7%	15.4%	18%	0%
Bachelor's Degree[2]	Males	14%	33%	47%	34%	27%
	Females	25%	35%	55%	48%	32%
University-Master[3]	Males	6%	15%	0%	0%	0%
	Females	8%	13%	0%	0%	0%

(1) Using 1996 Census of Population
(2) Relative to high school graduates
(3) Relative to bachelor graduates

Table 7. Returns to Human Capital for Male Natives and Immigrants [1]

	Natives	Immigrants
Experience	3.9%	2.5%
Years of Education	3.8%	2.3%
High School	6.6%	5.0%
College/Trade [2]	2.8%	5.4%
University Degree [2] [3]	20.0%	27.3%

(1) Using 1996 Canadian Census of Population.
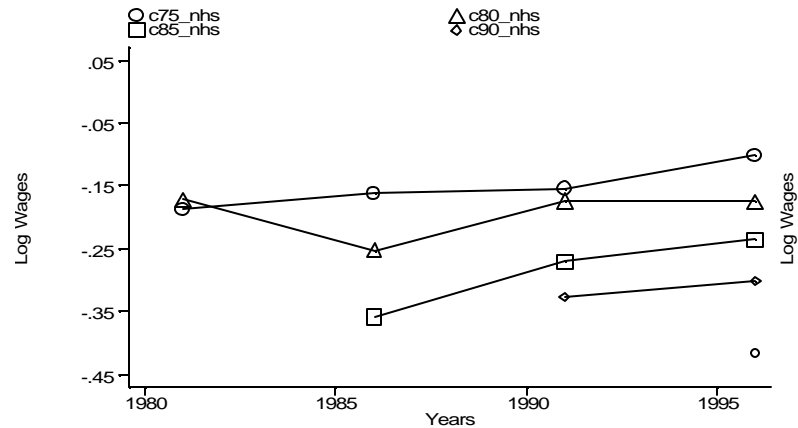(2) Relative to high school graduates.
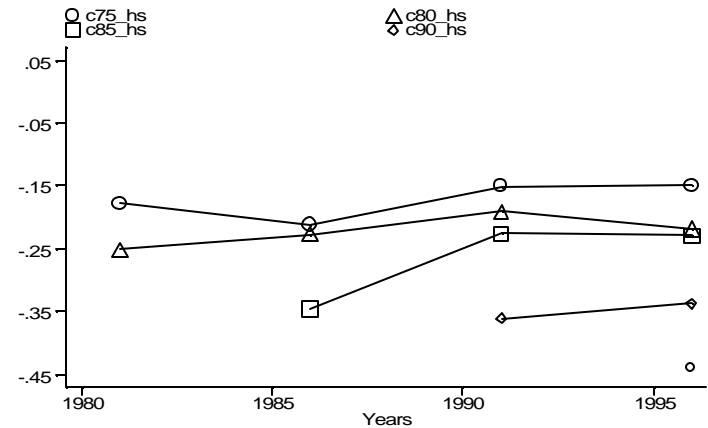(3) Includes Bachelor degree or higher.

1

Fig.2a: Returns to HS drop outs
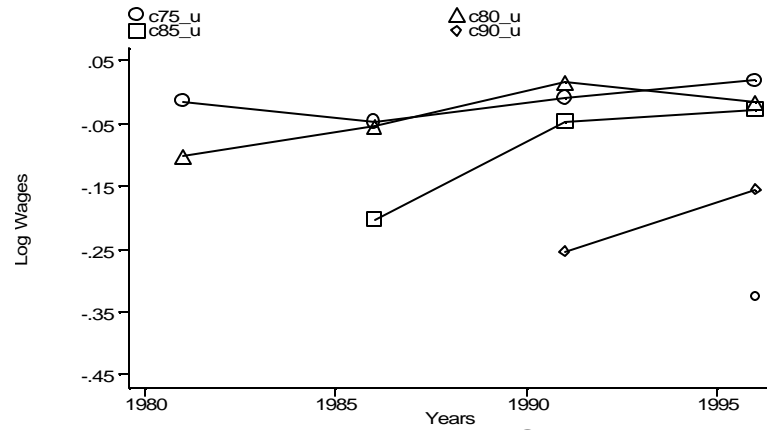

Fig.2b: Returns to HS Graduates

Fig.2c: Returns to University Graduates

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Figure 1(a)
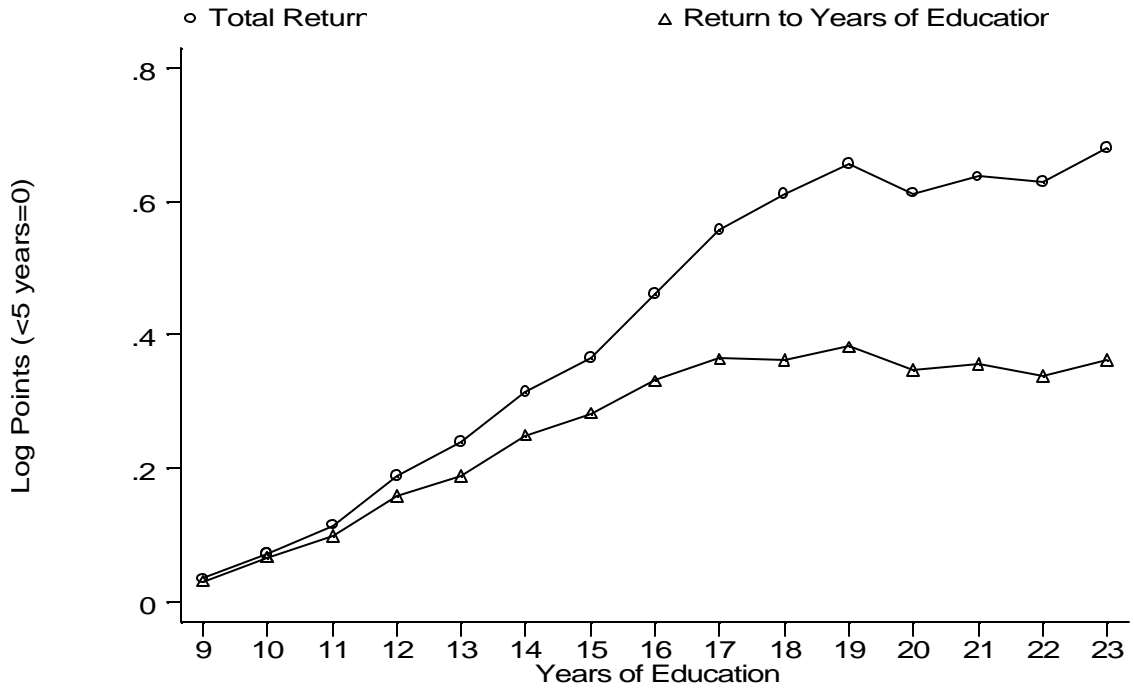
Decomposition of Total Returns to Education, Males

Figure 1(b)

Decomposition of Total Returns to Education, Females