ARE COLLEGE GRADUATES GIVING OPTIMAL SIGNALS?
A Case Study of the Saskatchewan Province*

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ABSTRACT

The purpose of this paper is to explore how education affects earnings in the Province of Saskatchewan. The paper is divided into three parts. The first part includes the introduction and the theoretical background for the study. The economic model used for this study and a brief description of data make up the second part. The results shown in the appendix, the analysis, and conclusion make up the third part. Overall, the results show that higher education has a significant effect on income in Saskatchewan, however obtaining a college diploma seems to have very little effect on income. It should be noted that 1991 prices were used throughout the paper.

INTRODUCTION

"Most observers would agree that, at least up to a very large amount, more education is probably better than less. As the old expression goes, if you think education is expensive, try ignorance"

There has been debate in the literature about the value and cost of education to the individual and the society at large. Some policy makers tend to argue that more public support for education in the elementary schools is crucial, but in the higher levels of education, there is no justification for added public support since most of the gains from education at higher levels are privately oriented. For instance, in the recent Canadian federal budget, there was a reduction of federal transfers to the provinces in support of higher education. These continued reductions in federal government support for higher education is reflected by increased tuition fees. In a recent publication of the Sheaf (3/11/99, Issue 27), a University of Saskatchewan Student Publication, there was a caption which read, "Students band together against tuition increases", where grave disapproval was expressed by the student body against a proposed 8 - 9% tuition increase in the 1999/2000 academic year. In the same article, a reference was made to Newfoundland where students have endured a 250% tuition increase over the past nine years.

These facts raise the question of how much the public is prepared to support higher education. The conception is that there is diminishing returns to investment in education, hence there is no reason for society to continue to invest its scarce resources

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in education. The return of investment in education to the society is the social rate of return. It is measured by the total contribution to a nation's output produced by an individual relative to the total cost incurred in providing the individual with that education. The private rate of return, on the other hand, is personal, after tax income earned by the individual relative to the cost incurred as a result of the educational investment.(West 62) If the social rate of return exceeds the private rate of return, then society has incentive to provide individuals with higher education. However, if the private rate of return is higher, then the tax payer has no incentives to invest money in something that has no benefits.

THEORETICAL BACKGROUND

Investments in Education: The Ben-Porath Model

Ben-Porath argues that the decision to invest in education is an intra-marginal decision, where individuals consider the cost and benefit of an extra unit of education.(Polachek,1993, p.22) He adopted 'eds' as a measure of human capital. Eds represent skill units acquired by an individual throughout life. These skill units can be acquired by on the job experience, formal education, or through natural talents. An individual's human capital stock is related to the number of eds purchased at each age. The current stock of human capital is the sum of human capital purchased in all prior years. An individual's earnings are proportional to his human capital stock, with the factor of proportionality being the wage rate, also known as human capital rental rate per ed. The greater one's human capital accumulation are, the higher will be one's earnings.

The Signaling Model :

Another approach used to examine education is the Signaling model.(Spence,1986, p.591) This model assumes that individuals are borne with different levels of productivity. It is difficult for employers to tell who is more productive. If the employer knows the level of productivity of each individual, then he can easily identify the type of worker wanted and will pay that worker accordingly. The difficulty for the employer is that there is no indicator of a worker's productivity, hence the employer must rely upon a signal from the worker to convince the employer that the worker has the desired characteristics. Workers also supply signals to prove to the employer that certain characteristics are fulfilled. For example, the job applicant who has a university degree, tells the employer that he can work with minimal supervision, meet deadlines, and has certain analytical and managerial skills which warrant a higher salary. This is a signal to the employer of the applicant's higher productivity.

THE MODEL

The model used for this study is Mincer's earnings function.(Mincer, 1974, p.7) Generically, the term 'earnings function' has come to mean any regression of individual wage rates or earnings on a vector of personal, market, and environmental characteristics that are thought to influence the wage rates.(Spence, 1986, p. 525) The prime application of the earnings function is to study the effects of investment in schooling and on-the-job training on the level, pattern, and interpersonal distribution of the life cycle earnings.

The models to be estimated by ordinary least squares regression are of the form

$$LnY_m = a + b_1Age + b_2Age^2 + \rho_1Prim + \rho_2Sec + \rho_3Col + \rho_4Bach + \rho_5Mas + \rho_6Ph.D + \varepsilon$$
$$LnY_f = a + b_1Age + b_2Age^2 + \rho_1Prim + \rho_2Sec + \rho_3Col + \rho_4Bach + \rho_5Mas + \rho_6Ph.D + \varepsilon$$

where the subscripts m and f on the dependent variables are male and female respectively.

The parameter ρ_i is the earnings power and it represents the amount by which the ith level of education obtained is able to improve earnings. Thus, it is the differential coefficient intercept because it tells by how much the value of the ith dummy differs from the base category. The prim dummy variable will be dropped when estimating the model in order to avoid the dummy variable trap. Thus, prim will be used as the base or benchmark category, and it's effect will be captured by the common intercept.(Gujarati, 1995, p. 506)

Also, the age-sex earnings profiles by levels of education will be estimated by the equation:

$$LnY_{mi} = a + b_1Age + b_2Age^2$$
$$LnY_{fi} = a + b_1Age + b_2Age^2$$

A priori expectations are that,
$a>0$, $b_1>0$, $b_2<0$, $\rho_i>0$ where $i = 1, 2, 3, 4, 5, 6$.

THE DATA

Data is obtained from the Canadian Census Analyzer's 1991 Public Use Microdata Files (PUMFs). A random sample drawn from the Saskatchewan Provincial records consisting of a total of 5818 individuals made up of 2267 females and 3551 males with positive earnings (wages and salaries) are used in this study. Earnings from individuals who have completed primary school (6years of school), high school diploma (12years of school), college diploma (15years of school), Bachelors Degree (16years of school), Masters Degree (18years of school), and Ph.D Degree (22years of school) are obtained with their ages and sexes.

ANALYSIS AND CONCLUSIONS

The results shown in Table 1 indicate that there is a large increase in earning power as one invests in schooling after the primary level. Thus, education has a significant positive effect on earnings, tapering off with age due to the negative coefficient on Age^2. This tapering off means that fewer old age people will purchase education in an attempt to increase future earnings. Rather, they will pursue higher education purely for the joy of learning.

There is a greater increase in earning power for women who go further in school than for men. For instance, women with Ph.D degrees have more earning power than men with the same education in the Saskatchewan. This seems out of the ordinary, since women typically have interrupted labour market participation, thus, one might expect lower earning power for women than for men.

One explanation for this behaviour is that men have traditionally been in the labour market and have accumulated more wealth than women. One might expect more wealth effect and thus increased leisure from men than for women. This explains why, with the integration of women into the labour market, more schooling from women increases their earning power.

The results also indicates that the maximum earnings for men begin at 46 years for the primary school graduate, and increases to 53 years for the Ph.D graduate, with the exception of the secondary school graduate which have a ditch from the primary school graduate's maximum years of earnings. This is in contrast with the women's years of maximum earnings which is about 46 years for the primary, secondary, and the bachelor graduates, and 47 years for the college, masters and the Ph.D graduates.

Another interesting result here, is that even though women generally have greater earning power than men, they reach their maximum earnings at a lower income than for men. Is there a contradiction in this result? Why would women receive higher earning raises than men and yet hit their maximum earnings at a lower income than men. As explained earlier, women normally have interrupted labour market participation, so one would expect such behaviour from the representative woman's earnings function.

From Table 2 in the appendix, it can be seen that the earnings gap between men and women lessens as women are educated beyond the bachelor level. The reason is that few women continue above the bachelor level so higher demand for females with advanced degrees increases their earnings capacity. Another reason, for the narrowing wage gap is that women with advanced degrees tend to be single and have high labour market participation. These traits all contribute to the higher earnings capacity, however, there is no such pattern in the pre-university level.

Table.1 indicates that the college certificate is under-valued on the market

since there are few improvements in earning power. Actually, the male secondary school graduate who proceeds to college for three years receives a reduction in their earning power while his female counterpart seems to have no change in earnings. In contrast the secondary school graduate, who proceeds to complete a four year university bachelor degree, experiences about a fifty percent increase in earning power, even though there is only one year difference between the college and bachelor graduate attendance years.

The question that can be raised here is, why is the college diploma undervalued in the labor market? One explanation is that most jobs that the college graduate is qualified to do could be efficiently fulfilled by the bachelor graduate, hence the employer would rather hire a more productive graduate and pay him high wages than to employ the college graduate. In the same sense, the employer may choose the high school graduate and pay a lower wage to him rather than to employ a college graduate and pay him a higher wage. The end result is college diplomas being undervalued due to employer preference.

This phenomenon clearly demonstrates the signaling hypothesis which says that, workers may be of either low or high productivity and that employers are able to identify these individuals through educational attainment. Hence, if the less productive worker gives more signaling by obtaining more education, he will end up losing as shown in the case of the college graduate.

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APPENDIX

TABLE. 1

Regression results for earnings power

Variables	Men	Women
Constant	6.3495	6.59211
	(41.73)	(36.00)
Age	0.1632	0.1253
	(20.32)	(13.12)
Age^2	-0.00177	-0.00135
	(-17.93)	(-11.45)
Sec	0.2121	0.2614
	(4.36)	(5.02)
Col	0.197	02669
	(4.3)	(4.62)
Bach	0.5341	0.7702
	(10.84)	(13.93)
Mast	0.5875	0.9552
	(6.26)	(6.79)
Doct	0.8806	1.1824
	(5.67)	(3.33)
R^2	0.188	0.176
F	118.21	69.89
N	3551	2267

Source: Calculations by the author

Values in parentheses are t-statistics

TABLE. 2

Maximum Age-Earnings Profile

	Men		Women	
	Age	Earnings	Ages	Earnings
Primary	46	25,635	46	14,185
Secondary	44	28,673	46	15,778
College	49	27,019	47	16,345
Bachelor	48	46,145	46	31,342
Masters	51	52,063	47	41,522
Doctorate	53	58,234	47	53,798

These figures were obtained using the 1991 prices

Source: Calculations by the author

TABLE. 3
Regression results, by levels of education, employment income, men and women

	Men					
Variable	Primary	Secondary	College	Bachelor	Masters	Doctorate
Constant	6.016	6.625	7.873	6.339	4.743	7.231
	(26.40)	(19.94)	(17.06)	(17.64)	(3.65)	(2.84)
Age	0.1808	0.164	0.096	0.185	0.241	0.141
	(15.16)	(8.93)	(3.96)	(10.07)	(4.08)	(1.35)
Age^2	-0.00198	-0.00189	-0.00099	-0.00194	-0.00238	-0.00133
	(-13.69)	(-7.77)	(-3.28)	(-8.64)	(-3.63)	(-1.27)
R^2	0.160	0.141	0.045	0.224	0.193	0.061
F	137.91	57.98	16.55	77.39	13.89	1.23
N	1449	708	693	546	119	41
			Women			
Constant	6.115	7.618	7.533	6.631	3.896	4.324
	(20.45)	(25.21)	(14.63)	(13.74)	(1.47)	(3.47)
Age	0.149	0.088	0.092	0.162	0.288	0.281
	(9.56)	(5.62)	(3.37)	(6.16)	(2.26)	(5.11)
Age^2	-0.00161	-0.00096	-0.00097	-0.0018	-0.0031	-0.003
	(-8.48)	(-4.95)	(-2.88)	(-5.19)	(-2.05	(-5.19)
R^2	0.119	0.069	0.042	0.142	0.122	0.78
F	60.66	19.99	9.18	37.45	4.26	13.53
N	878	517	387	443	48	8

Sources: Calculations by author.
Values in parentheses are t-statistics