E C O N O M I C S B U L L E T I N

The value of nursing education in Canada: the choice of diploma or baccalaureate degree

Heyung-Jik Lee
Graduate School of Economics and Business Administration, Hokkaido University

Abstract

This paper examines the annual earnings of two categories of higher education levels (baccalaureate, diploma) with age patterns of Canadian-trained female registered nurses in the human capital framework. It engages me in employing benefit-cost analysis to measure the value of baccalaureate degrees to Canadian registered nurses (RNs) and to assess whether the evidence is consistent with implications of human capital theory. While baccalaureate nurses need one more year of education compared to diploma nurses, the study suggests that both paid tuition and forgone earnings for the year of education in a university nursing program can be compensated sufficiently by exploring age-earnings profiles.

The first draft of this article was written while I was a Master of Arts student at the University of Saskatchewan in Canada. I am grateful to Professor Yukiko Abe for a number of helpful comments on this study and her encouragement. I also thank an anonymous referee for valuable comments and research lab colleagues including Atsushi Kusuki for their friendship. All remaining errors are my own.
Citation: Lee, Heyung-Jik, (2008) "The value of nursing education in Canada: the choice of diploma or baccalaureate degree." *Economics Bulletin*, Vol. 9, No. 23 pp. 1-14
Submitted: May 17, 2008. **Accepted:** July 26, 2008.
URL: http://economicsbulletin.vanderbilt.edu/2008/volume9/EB-08I00002A.pdf

1. INTRODUCTION

In recent decades initial education in nursing has been one of the most controversial policy issues in the Canadian registered nurses (RNs) system. The Canadian Institute for Health Information (2006) states that of the 251,675 RNs employed in Canada in 2005, 16.3% had earned a baccalaureate degree before entering practice. This rate continues to increase each year; in 2001, 12.5% of the RN workforce had earned a baccalaureate degree before entering practice. The percentage of RNs entering practice with a diploma decreased to 83.6% in 2005, while the percentage earning a master's degree before entering practice remained to 0.04%.

Basic nursing education is available in communities throughout Canada. Universities and diploma schools of nursing offer an initial program, which prepares candidates to write the Canadian Nursing Registration Exams (CNRE) which qualifies them to enter Canadian nursing workforce with the competence required to practice safely (CNA, 2007). In the provinces of Ontario, Saskatchewan, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland, new graduates are required to have a baccalaureate degree in nursing as the initial program. In all other provinces and the three territories, candidates have a choice of a diploma or a baccalaureate degree in nursing as the initial program. While degree programs take four years, diploma programs take only three years.

Based on this latest education trend of Canadian RNs, the main purpose of this study is to find the monetary returns from a baccalaureate degree compared to a diploma. Even though previous studies on returns to education based on the Canadian nursing workforce are scarce, there are still a number of empirical findings on earnings and nursing education with the U.S. survey data. In the United States, a RN license can be achieved with a 4-year baccalaureate degree; a 3-year diploma degree; or a 2-year associate degree, whereas the American Nurses' Association (ANA) has encouraged nursing students to study for a baccalaureate degree (Bayer and Schoenfeldt, 1970; Mennemeyer and Gaumer, 1983; Booten and Lane, 1985). Although ANA has long advocated the baccalaureate degree by nurses, several studies have found that there is no financial gain from obtaining the baccalaureate degree in nursing (Booten and Lane, 1985; Lehrer et al., 1991; Botelho et al., 1998; Spetz, 2002). However, other studies have suggested 6-7 percent of wage premiums for the baccalaureate RNs over less educated RNs by exploring wage-experience profiles (Mennemeyer and Gaumer, 1983; Link, 1988).

To yield the conclusions, two main criteria of making choices are considered in this paper with respect to human capital investments (Cohn and Geske, 1990). The first is the net present value rule: "Select all projects where the present value of benefits exceeds the present value of costs" (Prest and Turvey, 1965). The second is the internal rate of return rule: "Select all projects where the internal rate of return exceeds the chosen rate of discount" (Prest and Turvey, 1965).

2. ANALYTICAL FRAMEWORK

The conception of a human capital investment decision in Canadian RNs workforce is portrayed graphically in Figure 1. Curve DD' represents the earnings profile if a nursing student decides not to attend 4-year baccalaureate program, but rather to enter into the labor market immediately on the completion of 3-year diploma at age 22. The BB' curve is a nursing student's cost-earnings profile if he or she decides to undertake a 4-year baccalaureate degree before entering the labor market. I note that area (a) below the horizontal axis represents the direct or out-of-pocket costs incurred in attending one more year of university program. Area (b) reflects the indirect or opportunity costs, that is, the earnings a baccalaureate student forgoes while attending the program. The sum of areas (a) and (b) shows the total cost in a 4-year baccalaureate education. Area (c) - the difference between the BB' and DD' curves over ages 23 to 65 - shows the gross incremental earnings which a RN will realize by obtaining a baccalaureate degree; it shows how much additional income a nurse will obtain as a baccalaureate RN over his or her work life as compared to what the nurse would have earned with just a 3-year diploma. His or her work life in this case is presumed to extend over the 42-year period from age 23 to age 65.

The analytical framework used in this paper assumes that those Canadian prospective nurses will acquire a four-year baccalaureate degree only if the benefits of doing so are greater than the costs, in terms of the net present value of expected benefits.[1]

3. DATA

The data used in this paper are from the 2001 Census Individual Microdata file, made available to researchers in February 2005 by Statistics Canada. There are 5,510 RN observations in the data set which are over 2 per cent sample of the total number of

[1] Denote annual benefits by B_n and annual cost by C_n; then, if the rate of discount to be used is i and the lifespan (horizon) of the decision N years, it simply implies that Canadian prospective nurses select a baccalaureate degree option for which $\sum_{n=0}^{N} (B_n - C_n)/(1+i)^n \geq 0$.

Canadian RNs employed in nursing. Table 2 presents the mean annual earnings of each age group with three education categories (Master's/Doctorate, Baccalaureate, Diploma) of sample observations. It indicates that generally more-educated (Master's/Doctorate, Baccalaureate) RNs obtain higher average annual earnings than less-educated (Diploma) RNs of the same age group. Also, a significant wage gap between baccalaureate RNs and diploma RNs can be detected by Table 2. The earnings of baccalaureate RNs exceed those of diploma RNs.

To minimize unexplainable effects other than educational effects on wage differentials, I restricted samples as non-residents of Northern Territories female RNs who were trained by Canadian nursing schools.[2] In other words, the sample excludes male, Northern Territories residents and immigrant RNs with foreign nursing certificates.

In particular, these data do not track the earnings of specific individual RNs through their lifetimes. Rather, these cross-sectional data show the earnings of different individuals of different ages in the particular year of 2001.

4. THE MODEL

This study utilizes the standard human capital earnings model (Mincer, 1974) to measure the wage premium received for higher nursing education in Canada. The earnings model is based on regression equations of the form:

$$lnW_n = f(s_n, x_n, z_n) + u_n, \qquad n = 1,2,\ldots, N$$

where lnW_n is the natural log of annual earnings for the 'n'th individual, s_n is a measure of schooling or educational attainment, x_n indexes the human capital stock of experience, z_n consists of the other factors affecting earnings such as race, gender, and/or geographical region of the individual, and u_n is a random disturbance term reflecting unobserved ability characteristics and the inherent randomness of earnings statistics.[3]

From this classic idea of human capital model, I begin with the following specification of the earnings functions.[4]

---

[2] According to Canadian Institute for Health Information (2002) reports, (a) 92.3% of the Canadian RN workforce is Canadian-trained and 6.8% is foreign-trained; (b) 95.0% is female and 5.0% is male RNs; and (c) Northern Territories (Yukon, Northwest Territories and Nunavut) RNs are no more than 0.5% (Y.T.: 282/252,913+N.W.T: 490/252,913+Nun: 302/252,913= 0.425%) in year 2001. (see Table 1)

[3] In my model specifications, the years of schooling s_n is assumed to be fixed for each education group and the difference in schooling years between diploma RNs and baccalaureate RNs is only a year.

[4] Normally when the human capital earnings function is estimated, since actual work experience is rarely included in data sets, it is usually approximated by potential experience, equal to 'Age-schooling-5', and

$$\ln W_{ne} = \beta_{0e} + \beta_{1e} X_{ne} + \beta_{2e} X_{ne}^2 + \gamma'_e Z_{ne} + u_{ne}, \quad (1)$$

where lnW_{ne} is the natural logarithm of average annual earnings of individual n with educational background e; X_{ne} and X^2_{ne} are individual's age and its square; Z_{ne} is a vector of labour market characteristics comprised of gender and geographical area; the β's represent coefficients to be estimated, and γ'_e is a vector of parameters to be estimated; and u_{ne} is a normally distributed disturbance term reflecting unobserved characteristics affecting wages. In this specification, the age-earnings profile is assumed to be concave, with a positive coefficient for the linear term and a negative coefficient for the quadratic term.[5]

Since the goal is to obtain estimated wage functions that yield the wage differentials for baccalaureate RNs and diploma RNs, I estimate the equation (1) for each education group separately:

$$\ln W_n^b = \beta_0^b + \beta_1^b X_n^b + \beta_2^b X_n^{b\,2} + \gamma'^b Z_n^b + u_n^b, \quad (2)$$

$$\ln W_n^d = \beta_0^d + \beta_1^d X_n^d + \beta_2^d X_n^{d\,2} + \gamma'^d Z_n^d + u_n^d, \quad (3)$$

where the b superscript indicates the baccalaureate RNs group and the d superscript indicates the diploma RNs group.

Regression Results

The earnings functions have been estimated with ordinary least squares for individual RNs to test whether those functions differ for Canadian nursing education groups. The regression results for each group of diploma, baccalaureate, and master's/doctorate are displayed in Table 3. Table 3 shows considerable differences among education groups in several of the coefficients, not always in the expected directions. Table 3 also represents regional and gender premiums. Male nurses receive higher wages than

---

an estimate of the number of years an individual was working, but not at school. Therefore, if I apply work experience to my models then the 'experience variable' for diploma RNs is equal to 'Age-22' and for baccalaureate RNs, equal to 'Age-23'.

[5] As Benjamin et al. (1998) point out, the 'age' variable alone might be a poor proxy variable for labor market 'experience' variable, since individuals who do not attend school can obtain additional human capital through work experience. They also mentioned that comparing earnings by education level would involve comparing individuals who differed not only by education, but also systematically by work experience. Therefore, in my specifications, the difference in earnings due to one year difference in Canadian nursing education between baccalaureate RNs and diploma RNs would be understated, since baccalaureate RNs also had lower work experience.

women significantly in diploma and baccalaureate education groups, but not in master's/doctorate group. In addition, Northern Territories nurses receive notable wage premiums in both diploma and baccalaureate education groups.

The principal interest in this analysis is to test the wage differentials for baccalaureate RNs and diploma RNs, so that it is restricted to only those two education groups. Also, I will discard male and Northern Territories observations to avoid gender-based or regional premiums other than the wage premium received on higher nursing education.[6] Table 4 presents the results of earnings regressions with not only restricted sample but also restricted model specifications after the vector Z_{ne} is excluded thanks to the restriction of sample from equation (1).

5. RETURNS TO CANADIAN NURSING EDUCATION

The costs of an additional year of education for a baccalaureate in nursing are considered as an investment based on human capital theory. Now, to measure the wage premium of baccalaureate RNs using the present-value method with various interest rates, I start with following three assumed conditions:[7]

1. Yearly direct cost for university education in nursing is calculated as $5,014 over Canada in 2001-02 and opportunity cost of the period is the income forgone during the extra year of university education which is equivalent to $19,763 of the average annual earnings of 22-year-old diploma RNs.[8]
2. A baccalaureate RN enters the nursing profession at the age of 23 after 4 years of university while a diploma RN starts at the age of 22 after 3 years of college.
3. All nursing school students are assumed to be full-time students without any part-time earning opportunities, and all RNs are assumed to retire at age 65 (Mennemeyer and Gaumer, 1983).

PDV of Benefits and Return to a Baccalaureate Degree

[6] Data for individuals whose annual wage is under $10,000 are also dropped.

[7] In this paper, at least four different interest rates i = 0.03, 0.05, 0.07, 0.09 are considered based on Bank of Canada monthly interest rate report ($2.25 \leq i \leq 8.47$ from 01/1995 till 01/2005) without regarding inflation rate.

[8] In this paper, for consistency of timeline with given census year of 2001, I can approximately calculate that the direct cost equals to $5,014 because the average annual tuition fee for nursing education across Canada is reported as $4,011 which is 80% of course load, and the rest of 20% which corresponds to books, supplies & student fees can be calculated $1,003 ($1,003/($4,011+$1,003)=0.2). It is based on the report by University of Saskatchewan Board Announces 2001-02 Operating Budget.

The opportunity cost is driven by the simple mean of 22 year diploma RNs' annual earnings, which is provided by 2001 census microdata, equals to $19,763.

Considering present discounted value (PDV), the estimating equation for net PDV of benefits which is calculated as PDV of benefits minus PDV of costs can be expressed in (4) as follows:[9]

$$\text{Net PDV} = \underbrace{\sum_{n=23}^{65} \frac{B_n}{(1+i)^{n-23}}}_{PDV\ of\ Benefits} - \underbrace{(C_0 + E_0)}_{PDV\ of\ Costs}, \tag{4}$$

where E_0 denotes the initial earnings which is forgone for one more year of education in nursing; C_0 is direct monetary costs for the education; i is the discount rate; B_n represents the wage differentials between baccalaureate RNs and diploma RNs.

The net PDV of benefits can be rewritten as (5) by obtaining the baccalaureate-diploma wage premium B_n from the regression results of earnings functions (i.e. $B_n = \text{Exp}(\ln \hat{W}_n^b) - \text{Exp}(\ln \hat{W}_n^d)$).

$$\text{Net PDV} = \sum_{n=23}^{65} \frac{\text{Exp}(\ln \hat{W}_n^b) - \text{Exp}(\ln \hat{W}_n^d)}{(1+i)^{n-23}} - (C_0 + E_0). \tag{5}$$

The numerical results of PDV and Net PDV for my model with various interest rates are displayed in Table 5. At the discount rates between 3% and 10% (corresponding to the reported interest rate by the Bank of Canada 1995-2005), there is an advantage to investing in a baccalaureate degree nursing program which is approved by my model specifications (the break-even interest rate which is the so-called "internal rate of return" is 10.2%).[10] Table 6 shows the maximum point on the age-estimated wage profile of the model for each education group which is obtained by regression results of Table 4.[11] Also, Table 6 indicates that the age at which baccalaureate RNs reach the

[9] Net present discounted value is defined as the dollar difference between streams of future costs and benefits of an investment which have been discounted to the present at some appropriate rate of interest. To calculate Net PDV in this paper, the PDV of costs can be substituted by $C_0 + E_0$ because it is the initial year of costs so that it can be considered as it is already calculated by discounting.

[10] By definition, the internal rate of return (IRR) is that rate of discount at which the net present value of human capital investment will be zero. In my model, IRR equals to 10.1995 %. (see Table 5)

[11] It is based on the quadratic relationship between age and estimated annual wages. For example, the diploma RNs group, as the RN's age increases up to 46, the estimated wage also increases. Upon reaching the age of 46, the estimated wage reaches its maximum at $37,608 and at the given age condition of 46, estimated wage differential between a baccalaureate RN and a diploma RN is $4,369. Over the age of 46, the estimated wage begins to lower.

maximum point of estimated wage is higher than it is for diploma RNs, which might be one of the main causes of the financial benefits from investing in a baccalaureate degree in nursing.

6. DISCUSSION AND CONCLUSION

The OLS estimates in this study may have yielded "ability bias" caused by the differences of individual RN's abilities or commitments to nursing and "cost bias" caused by family background as Griliches (1977) and Card (1995, 1999) pointed out. Unfortunately, I could not take those potential sample biases into account with a cross-sectional data set. The variables of family background - such as parents' occupation and parents' education - and/or individual qualities for nursing - such as IQ score and individual motivation - were unable to be obtained, which may allow me to address the bias issue. Furthermore, the direct private costs of nursing education borne by baccalaureate RNs might have been over-estimated owing to scholarships or fellowships (Becker, 1993; Lehrer et al., 1991). Again, I grant an assumption that the amount of overestimated cost can be negligible not to withdraw the obtained empirical results from this model specification with lifetime earnings framework. Also, to the best of my knowledge there are no data available on whether baccalaureate RNs are more likely than diploma RNs to have a better chance of receiving such scholarships or fellowships.

Nonetheless, considering the model specifications based on human capital theory and the quality of 2001 Canadian census data, the method developed in this research proves clearly that baccalaureate RNs are paid a premium over wages of diploma RNs taking into account the present discounted value in their lifetime earnings structure. Depending on the assumed interest rate, the estimated net benefits vary. However, as the Bank of Canada reports, the last 10 years (01/1995 – 01/2005) of monthly interest rates were between 2.25% and 8.47%. Within that range of interest rates, my model specifications lead to the following conclusion: that both paid tuition and forgone earnings for one more year of education in a university nursing program would be compensated sufficiently over their working life, therefore, the decision to invest in one more year of nursing education is economically rational.

REFERENCES

Bayer, A. E. and Schoenfeldt, L. F. (1970) "Student Interchangeability in Three-Year and Four-Year Nursing Programs" *Journal of Human Resources* 5(1): 71-88.

Becker, G. S. (1993) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, 3rd ed., Chicago: The University of Chicago Press.

Benjamin, D., Gunderson, M. and Riddell, W. C. (1998) *Labour Market Economics (4th edition) Theory, Evidence, and Policy in Canada*, Toronto: McGraw-Hill Ryerson.

Booton, L. A. and Lane, J. I. (1985) "Hospital Market Structure and the Return to Nursing Education" *Journal of Human Resources* 20(2): 184-196.

Botelho, A., Jones, C. B. and Kiker, B. F. (1998) "Nursing Wages and Educational Credentials: The Role of Work Experience and Selectivity Bias" *Economics of Education Review* 17(3): 297-306.

Canadian Institute for Health Information (2002) *Supply and Distribution of Registered Nurses in Canada, 2001*, Ottawa: CIHI.

Canadian Institute for Health Information (2006) *Workforce Trends of Registered Nurses in Canada, 2005*, Ottawa: CIHI.

Canadian Nurses Association (2007) *The CRNE Bulletin Number 10 – Statistics on CRNE Writers for Calendar Year 2006*, Ottawa: CNA.

Card, D. (1995) "Earnings, Schooling and Ability Revisited" in *Research in Labor Economics*, Volume 14, ed. by Solomon Polachek. Greenwich, CT, and London: JAI Press.

---------- (1999) "The Causal Effect of Education on Earnings" in *Handbook of Labor Economics*, Volume 3A, ed. by Orley Ashenfelter and David Card. Amsterdam and New York: North Holland.

Cohn, E. and Geske, T. G. (1990) *The Economics of Education*, 3rd ed., New York: Pergamon Press Inc.

Griliches, Z. (1977) “Estimating the Returns to Schooling: Some Econometric Problems” *Econometrica* 45: 1-22.

Gujarati, D. N. (2003) *Basic Econometrics*, 4th ed., New York: McGraw-Hill Inc.

Lehrer, E. L., White, W. D. and Young W. B. (1991) “The Three Avenues to a Registered Nurse License: A Comparative Analysis” *Journal of Human Resources* 26(2): 362-379.

Link, C. R. (1988) “Returns to Nursing Education: 1970-84” *Journal of Human Resources* 23(3): 372-387.

Mennemeyer, S. T. and Gaumer, G. (1983) “Nursing Wages and the Value of Educational Credentials” *Journal of Human Resources* 18(1): 32-48.

Mincer, J. (1974) *Schooling, Experience and Earnings*, New York: Columbia University Press for the National Bureau of Economic Research.

Prest, A. R. and Turvey, R. (1965) “Cost-Benefit Analysis: A Survey” *Economic Journal* 75: 683-735.

Spetz, J. (2002) “The Value of Education in a Licensed Profession: The Choice of Associate or Baccalaureate Degrees in Nursing” *Economics of Education Review* 21: 73-85.

Table 1

NUMBER OF REGISTERED NURSES BY HIGHEST LEVEL OF EDUCATION IN NURSING AND PROVINCE OF REGISTRATION, CANADA, 2001

Province	All RNs	Diploma	Baccalaureate	Master's/Doctorate
Nfld.	5,491	4,212	1,199	80
P.E.I.	1,314	1,027	272	15
N.S.	8,791	6,463	2,137	191
N.B.	7,755	5,076	2,542	137
Que.	63,103	47,027	15,232	844
Ont.	94,487	73,534	19,336	1,617
Man.	10,291	7,781	2,325	185
Sask.	8,549	6,570	1,902	77
Alta.	23,821	15,514	7,729	578
B.C.	28,237	19,840	7,709	688
Y.T.	282	161	116	5
N.W.T.	490	335	144	11
Nun.	302	183	108	11
Canada	252,913	187,723	60,751	4,439

Source: Canadian Institute for Health Information, Registered Nurses databases, 2001

Table 2

MEAN ANNUAL EARNINGS (Canadian $)

Age	Diploma	Baccalaureate	Master's/Doctorate
x≤24	23,472	19,944	n.a.
25≤x≤29	32,974	34,081	49,213
30≤x≤34	34,293	37,458	43,370
35≤x≤39	37,155	40,597	55,916
40≤x≤44	40,275	43,199	54,607
45≤x≤49	41,837	48,787	56,478
50≤x≤54	41,970	49,577	49,536
55≤x≤59	38,138	44,957	47,223
60≤x≤64	33,302	37,411	48,016
65≤x	19,573	26,268	n.a.

Source: Statistics Canada, 2001Individual Microdata Files

n.a. indicates not available or not applicable.

Table 3

EARNINGS REGRESSIONS BY EDUCATION GROUP

Variable	Description	Dependent Variable: log(Wage)		
		Diploma	Baccalaureate	Master's/Doctorate
Constant	Intercept	8.3066***	8.3073***	9.5385***
		(43.28)	(23.24)	(6.79)
Age	Age in years	0.0983***	0.0975***	0.0486
		(10.78)	(5.46)	(0.73)
Age^2	Age squared	-0.0011***	-0.0010***	-0.0005
		(10.36)	(4.71)	(0.69)
Male	=1 for male; =0 otherwise	0.2809***	0.1803*	-0.1030
		(5.04)	(1.76)	(0.33)
Atlantic	=1 for Atlantic Canada	-0.0694*	-0.1798**	0.1025
Canada	residence; =0 otherwise	(1.67)	(2.42)	(0.35)
Quebec	=1for Quebec residence;	0.0066	0.1535***	-0.2807*
	=0 otherwise	(0.23)	(2.93)	(1.62)
Ontario	=1 for Ontario residence;	0.0122	0.0333	0.3538**
	=0 otherwise	(0.50)	(0.70)	(2.39)
Prairies	=1 for Prairies residence;	-0.0132	-0.0997*	-0.3916*
	=0 otherwise	(0.41)	(1.76)	(1.95)
British	=1 for British Columbia	0.0259	-0.0299	0.0915
Columbia	residence; =0 otherwise	(0.71)	(0.48)	(0.41)
Northern	=1 for Northern Territories	0.3827	0.1678	n.a.
Territories	residence; =0 otherwise	(1.44)	(0.43)	
N	Sample size	3,966	1,244	147

(a) Dependent variable is the logarithm of annual wage rates.

(b) Absolute t-statistics are in parentheses below the coefficients.

(c) *** Statistically significant at the 0.01 level; ** at the .05 level; * at the 0.1 level (two-tailed tests).

(d) The sample excludes nurses with zero annual wages.

(e) Atlantic Canada includes the four provinces of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Prairies region is the three prairie provinces of Alberta, Saskatchewan, and Manitoba. Northern territories are the northernmost region of Canada which includes Yukon, Northwest territories, and Nunavut.

(f) n.a. indicates not available or not applicable.

Table 4

EARNINGS REGRESSIONS WITH RESTRICTED SAMPLE

Variable	Dependent Variable: log(Wage)	
	Diploma	Baccalaureate
Constant	8.2496***	8.4613***
	(36.36)	(19.17)
Age	0.0994***	0.0890***
	(8.99)	(3.95)
Age^2	-0.0011***	-0.0009***
	(8.27)	(3.27)
R^2	0.0359	0.0425
F	53.23	22.55
N	2,862	1,019

(a) Absolute t-statistics are in parentheses below the coefficients.

(b) *** Statistically significant at the 0.01 level (two-tailed tests).

(c) Regarding encountered low R^2s, Gujarati (2003) explains: "In cross-sectional data involving several observations, one generally obtains low R^2 because of the diversity of the cross-sectional units…. What is relevant is that the model is correctly specified, that the regressors have the correct (i.e. theoretically expected) signs, and that (hopefully) the regression coefficients are statistically significant."

Table 5

PDV AND NET PDV OF WAGE DIFFERENTIALS

Interest rate (i)	PDV	Net PDV
i = 0.03	$87,925	$63,148
i = 0.05	$57,259	$32,482
i = 0.07	$39,661	$14,884
i = 0.09	$29,092	$4,315
i = 0.10	$25,405	$628
i=0.101995	*$24,777*	*$0*
i = 0.11	$22,447	-$2,330
i = 0.12	$20,047	-$4,730
i = 0.13	$18,079	-$6,698

Source: Statistics Canada, 2001Individual Microdata Files

Table 6

ESTIMATED MAXIMUM WAGES

	Diploma	Baccalaureate
Age*	46.0005	49.2846
Wage*	37607.8	42387.8
Wage differential	4369.222	5215.569

(a) The maximum points are obtained by the slope, or derivative, of estimated wage variable with respect to age variable in equations (2) and (3) with restricted sample ($\frac{d \ln \hat{W}_n}{dX_n}$).

(b) From the equation of $\boldsymbol{lnW}_n = \beta_0 + \beta_1 X_n + \beta_2 X_n^2 + u$, the maximum conditions that slope equals to zero as follows:

$$\frac{d \ln \hat{W}_n}{dX_n} = \hat{\beta}_1 + 2\hat{\beta}_2 X_n = 0 \quad , \quad X_n^* = -\frac{\hat{\beta}_1}{2\hat{\beta}_2}$$

The coefficients of ***Age*** and $\boldsymbol{Age}^2$ which is notated by β_1 and β_2 are given in Table 4.

(c) Once I found the maximum condition of age variable (Age*) then by the regression results of each equation in Table 4, I can obtain maximum estimated wages (Wage*) and wage differentials with the age condition as well.

Figure 1

AGE-EARNINGS PROFILES WITH A BACCALAUREATE DEGREE AND DIPLOMA IN THE CANADIAN RN PROFESSION