Earnings Differentials by Field of Study and Occupational Relatedness for Post-Secondary Education in Canada, 2001

by

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Abstract

This paper uses 2001 census data to present private rates of returns, and wage differentials associated with attaining a post-secondary education in Canada. The returns are calculated, using a Mincer human capital wage function, by level of post-secondary education, and by field of study for all combined levels of post-secondary education, for both males and females. The purpose is to compare the wage differentials between working in an occupation related, and an occupation unrelated, to an individual's major field study. The paper is divided into four main parts. The first part covers a brief review of the related literature. The second part describes the methodolgy and data employed. The third part discusses the results, and the final remarks are in the last part. The results suggest that there are clear disadvantages when individuals are employed in occupations that are unrelated to their field of study, and that these results vary by field and gender.

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1.0 Introduction

The decision to pursue a post-secondary education and the choice of the field of study can be considered to be the most important personal and financial decision an individual will encounter in the early stages of his or her life. Like most financial decisions, it can be assumed that as long as the benefits outweigh the costs the underwriting of this investment would be seen to hold a positive return to any rational investor; otherwise, that investor would have little interest in paying for a good or service that accrues no value or benefits. In terms of post-secondary education, a rational individual would be concerned with how much he or she can expect to earn after completion in his or her major field of study, as well as with the level of obtained education (i.e. college diploma or certificate, bachelors degree, masters etc.), and whether the expected earnings flow generates a positive return when the individual works in an occupation related to his or her field.

This decision becomes even more important when the investor understands that the average cost of annual undergraduate tuition in Canada has risen from $1,464 dollars in 1990/91 to $4,347 dollars in 2006/07[1], a rise of 196.9%, and from $4,558 to $4,724 between 2007/08 to 2008/09 alone, a rise of 3.6% [2]. The rising tuition trend is not expected to slow down any time soon as more and more individuals seek to acquire human capital in order to maintain a competitive edge inside a job market that is becoming more and more educated. The total number of earned university degrees between 1930 to 2001, as reported by Statistics Canada, has increased in total by 1,745%, or on average each year by 4%[3]. In fact, in a 2002 OECD report titled '*Education at a Glance: Education Indicators 2002*', out of 30 countries in the OECD,

[1] See Statistics Canada (2006)
[2] See Statistics Canada (2008)
[3] See Figure 11 in the appendix

Canada ranks at the top in terms of the total proportion of the labour force ages 25 to 64 who hold a post-secondary degree (see table 5). As well, Statistics Canada notes that total enrollment rates in Canadian Universities rose by 19.24% between 2001/02 to 2006/07, from 886,700 to 1,057,300[4]. The pressures of rising tution costs, a highly educated workforce and rising enrollment rates make the initial decision of which major field of study to enroll into that more important[5]. If a student pursues a major that is in over-supply, that individual will be incurring a large expense (including not only the tuition and textbook costs, but also the lost potential earnings and experience had he or she stayed in the work force) with a great risk of ending up underemployed.

This paper uses the 2001 Census Public Use Micro Data file to compare returns from a post-secondary education in Canada by fields of study and by considering whether an individual is or is not working in an occupation that is related to his or her field. This is done in an attempt to provide clearer signals for participants in post-secondary education and policy makers. It is expected that individuals not working in their field will be earning less than those working in their field. It should be noted that this paper makes no attempt to try and model the individual's choice as to their major field of study, but rather it tries to model the expected earnings flow generated by these choices using a Mincer human capital wage model approach to show the effects that field of study and related occupation have on wages[6]. However, this paper will contribute to the theory on field of study choices as it can better equip individuals who are faced with asymmetric information when choosing their initial fields of study; since it provides results as to what fields generate higher returns over others.

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[4] See Statistics Canada (2009)

[5] Riddell and Sweetman (2000) offer a good discussion between two contrasting views that try to explain the rise in post-secondary attainment in Canada—the "*relative demad shift*" view versus the "*over-education/under-employment*" view.

[6] Beffy, Fougère and Maurel (2009), Boudarbat and Lemieux (2003), Boudarbat (2004) and Boudarbat and Montmarquette (2007) are four studies that endogenously model an individual's choice as to his or her major field of study. The later study also considers the role of the level of education that the parents have on the child's decision.

The paper is divided into four main parts. Section 2 covers a brief review of related literature. Section 3 describes the methodolgy and data employed. Section 4 discusses the resluts and the final remarks are in section 5.

2.0 Literature Review

This section starts with a brief introduction to the body of literature devoted to human capital theory and then turns to a discussion on the literature behind the returns to education, spending more time on the literature related to Mincer's human capital wage model and returns to field of study and occupation.

2.1 Human Capital Theory

The pioneering literature on human capital theory can be traced back over four decades to Theodore Shultz (1961), Gary Becker (1964), and Jacob Mincer (1974). However, the main ideas can be traced even further back, over 230 years ago to Adam Smith's *The Wealth of Nations*, in which he wrote:

> *When any expensive machine is erected, the extraordinary work to be performed by it before it is worn out, it must be expected, will replace the capital laid out upon it, with at least the ordinary profits. A man educated at the expense of much labour and time to any of those employments which require extraordinary dexterity and skill, may be compared to one of those expensive machines. The work which he learns to perform, it must be expected, over and above the usual wages of common labour, will replace to him the whole expense of his education, with at least the ordinary profits of an equally valuable capital. (Smith, 1776, pg. 101)*

Schultz (1961) presented the counter argument that some individuals in society will view the theory of human capital as debasing to mankind and foul in literature that ultimately reduces man to a mere material component, or in other words, nothing more than a piece of equipment. This paper dismisses those critisims, since formally recognizing the abilities and skills of individuals only enhances their own welfare (whether it be economically or socially). Investing in human capital also benefits society on the whole by helping to increase overall wealth and playing a direct role in the growth of an economy. There are at least two ways the accumulation of human capital contributes to economic growth (Appleby, Fougere et al., 2002). The first is by recognizing that human capital is a factor of production and constitutes the stock of skilled labourers. The second is that the continuous accumulation of knoweldge and skills, related to the acquisition of human capital, is a source of innovation as these improvements equip workers with the abilities to handle technological changes more effectively. Thus, human capital can be defined formally as "*the knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity*[7]." It is this definition, or definitions similar to it, that motivates labour economists to measure the returns from human capital attainment, or more specifically in this paper, the 2001 returns to education by field of study in related and unrelated occupations for post-secondary education in Canada.

2.2 Returns to Education

2.2.1 Total, Private and Social Rates of Returns

There are three types of returns to education that are typically found in the literature. One is the private rate of return, which looks at the costs and benefits that directly accrue to the inidividual undertaking the investment in the education. This is the most common return calculated and is the one measured in this paper. This type of a return can be used to measure the additional benefits to higher levels of education, or across major fields of studies, for a particular individual.

[7] As defined in OECD (1998), pg. 9

The second rate of return, as defined by Appleby, Fougere et al. (2002), called the total (or public) rate of return, measures the benefits and costs of education from the viewpoint of the government. That is, how do the tax revenues collected on the additional incomes of the educated compared to the costs of subsidizing educational institutions[8]? This type of return is used to provide policy makers with a way to determine the optimal allocation of public resources to post-secondary education.

There are fewer studies done on a third return, called the social rate of return. The social rate of return, as defined by Stark (2007), considers all benefits and costs accruing to the government plus all externalities that accrues to society (i.e. crime reduction, healthcare improvements and longevity)[9].

There are at least three methods that have been used to measure these returns: the Mincer human capital wage model, the benefit-cost ratio, and the internal rate of return method (Appleby, Fougere et al., 2002).

The first method, the one used in this study, was first developed by Jacob Mincer in 1974. Mincer econometrically models the natural logarithim of earnings as a function of work experience, its square and the years of schooling to calculate the private returns to education[10].

$$\ln wage = \beta_0 + \beta_1 EXP + \beta_2 EXP^2 + \beta_3 SCH + \varepsilon \qquad (1)$$

Where, EXP = work experience (=age-sch-6)
EXP^2 = square of work experience
SCH = years of schooling

There are plenty of studies that use a Mincer function approach[11]. The popularity is that the basic model fits the distribution of earnings well, and since it is a log function it is a

[8] For further discussion see: Stark (2007), Appleby, Fougere et al. (2002), Vaillancourt and Bourdeau-Primeau (2002), Vaillancourt (1995), Stager (1996) and Douge and Stager (1972)
[9] See Usher (1997), Davis (2003), Lochner & Moretti (2004) and Moretti (2004).
[10] See section 3.1 for a more detailed explaination of the model framework.

relatively easy model to interpret, that is, the estimated coefficients on each variable represents approximate percentage returns.

However, the basic Mincer approach does have its limitations as outlined in Lemieux (2006), Appleby, Fougere and Rouleau (2002) and Ferrer and Riddell (2002). For instance, Lemieux points out that even thirty years after Mincer published *Schooling, Experience and Education*, the Mincer function "remains an accurate benchmark" for estimating the returns to education as long as some "fine-tuning" is made. That is, it may not be accurate to specify years of schooling as linear and the function could therefore include a quadratic term in years of schooling to capture the convex relationship between wages and schooling. As well, the Mincer function could include a quartic term (or higher order polynomials) for potential experience, since a quadratic term alone for potential experience tends to understate the growth of wages for the first 10-15 years of experience and finally it should also include a cohort effect.

Another limitation mentioned by Appleby, Fougere et al. (2002) with the Mincer function is that it assumes that the education variable is exogenous. However, according to Appleby, Fougere et al. (2002) there can be many other variables that are important in determining the level of education, such as the individual's abilities, aptitudes and other social characteristics, that if ignored can risk skewing the results.

Ferrer and Riddell (2002) note that credentials play no role in Mincer's model; only years of education matter. This omission can result in biased estimates on the returns to education. The view in which all credentials plays a determing role on the returns to education is known as the "*Sheepskin effect*". To correct for this, Ferrer and Riddell extend the basic Mincer equation by including a set of dichotomous variables to capture all credentials an individual has obtained.

[11] Refer to the literature summary in the appendix (table 1) for a list.

Finally, the Mincer equation assumes that education confers a permanent gain on individuals and takes no consideration into its depreciation. Like the realization that physical capital depreciates through normal wear and tear, the same principle should be applied when considering the returns to human capital. As the saying goes, "if you don't use it you will lose it"; then unless individuals are continuously upgrading themselves, it would not be unreasonable to consider incorporating an effective rate of depreciation to education into the model. In fairness to Mincer, this is a general omission in many studies on returns to education.

A second way to estimate returns to education is by computing the discounted ratio of after-tax benefits to total costs (known in Finance as a benefit-cost analysis). The method consists of taking the present value of the sum of after-tax benefits from obtaining a post-secondary education, and then calculating the present value of the sum of total costs of obtaining the post-secondary education (includes tuition, books and forgone earnings if applicable), then taking the ratio of the two.

$$B / C\ ratio = \left[\sum_{i=1}^{n} (B_i)/(1+r)^i\right] / \left[\sum_{i=1}^{n} (C_i)/(1+r)^i\right] \qquad (2)$$

Where, B_i = after-tax benefits of education for individual i
C_i = total costs of education for individual i
r = the discount rate

If the sum of the discounted after-tax benefits equals to the sum of the discounted total costs then the ratio would equal to 1 and the benefits would equal to the cost. If the ratio is greater than 1 the benefits exceeds the costs and the investment in the particular education is of economic value to the individual. One would typically choose to invest in a type of edcuation that has the maximum benefit-cost ratio. This type of anaysis is generally not preferred amongst economists as it is difficult to measure between two different types of education when the scale and time are different (i.e. comparing a bachelor's to a PHd). Another issue is how to determine the discount rate which can vary from researcher to researcher. Some might base it on the long-term government bond rates and others base it on a social discount rate[12]. The problem is that too high of a rate will favour present consumption over future consumption and that this could affect future investment flows[13]. Lastly, this method also shadows the bias of not capturing one's abilities or environment.

The third way to calculate returns on educational attainment is to use the Cost-Benefit approach or the Internal Rate of Return. This method is commonly used in calculating the profitability of a financial asset. To calculate, one will need the earnings for an individual based on age and level of education as well as income for an individual of similar age representing what would be earned without having the level of education (for example, a college graduate's earnings would be compared to a highschool graduate's earnings of similar age). The difference would then be taken between what could be earned with the education minus what would be earned without, as well as all the private costs associated with obtaining the education (tuition, books and lost earnings) and then solving for the discount rate (or rate of return), such that

$$0=\sum_{i=1}^{n}\left[(A_i - B_i - C_i)/(1+r)^i\right] \qquad (3)$$

Where, A_i = earnings stream with education for individual i
B_i = earnings stream without education for individual i
C_i = represents the private costs of education for individual i
r = the discount rate
N= number of years between when the educational investment begins and when individual i retires

[12] see Boardman, Greenberg et al. (2006) pp.236-268 for a discussion on social discount rates.

[13] Most of this discussion comes from Ofiara and Seneca (2001) pp. 125-127, also, see Boardman, Greenberg et al. (2006) pp. 15, 32 and 154-155, for a good discussion.

2.2.2 Level and Major Field of Study Returns

In Canada there is a vast amount of empirical research on the returns to the varying levels of education. Most of the research focuses on returns to the level of post-secondary education in Canada, that is, returns are generally calculated and compared amongst individuals who have obtained a college diploma, bachelor's degree, master's degree etc. (see Stark (2007), Emery (2004), Boothby and Drewes (2006), Vaillancourt and Bourdeau-Primeau (2002), Appleby, Fougere et al. (2002), Finnie and Frenette (2003), to name just a few).

Other research measures post-secondary returns by specific characteristics, such as by regions or provinces (see Heisz (2003a, 2003b), Stager (1968, 1996)), early labour returns and longitudinal (or by cohort) (see Finnie (1999, 2002a and 2002b)), or for immigrant or aboriginal returns to post-secondary education (see Boudarbat and Ibarguen (2006) and Jankwoski and Moazzami (1995)).

There are also a few studies done on the returns to post-secondary education in Canada by the major field of study (see Stark (2007), Boothby and Drewes (2006), Heisz (2001, 2003b), Appleby, Fougere et al. (2002), Boothby and Rowe (2002), Vaillancourt and Bourdeau-Primeau (2002), Finnie (1998, 2002a), (2001), Finnie and Frenette (2003), Vaillancourt (1995), Dodge and Stager (1972), Boothby (2000)), and for a few recent studies outside Canada, see Kelly, O'Connell et al. (2008), Yong, Heng et al. (2007)). Most of these studies are summarized in table 1 of the appendix. To my knowledge, there are no studies, inside Canada, that measure the earnings differentials to post-secondary education by major field of study and unrelated occupation. Therefore, it is my intention to expand the literature in Canada on this regard.

2.2.3 Field of Study and Occupation Relatedness

The concept of education and job mis-match was analyzed recently in the United States[14]. However, the studies typically focus on the effect of an individual being overeducated (or undereducated) in his or her occupation. This is determined by comparing how many years of education are required for a particular occupation and the actual years of education obtained by the individual. An individual is then determined to be either overeducated or undereducated for the particular occupation and the earnings differentials are then compared. For instance, Hartog (2000) finds that the returns to actual years of schooling tend to be lower than the required years of schooling for a specific occupation. Bauer (2002) has a similar finding and notes that overeducated workers earn less than undereducated workers; also, undereducated workers had higher returns than workers with the same levels of educational attainment but who worked in occupations that fully utilize their education.

The problem with this type of an approach is that it assumes that more years of education is better. It ignores the more likely possibility that some individuals may take longer to complete their degree requirements than others, which could also be an indication of one's ability. It is not likely that individuals who take longer to complete the same degree requirements would be considered to be more educated (or overeducated) than the others when comparing these individuals amongst similar occupations; since in both cases the same degree was obtained.

A recent study by Kelly, O'Connell et al. (2008) looks at the field of study returns to higher education in Ireland and considers the effects of job-related compentencies. In this study, a quantile regression (QR) is used in order to address the possible selection bias related to an individual's ability; that is, the coefficient estimates for field of study could be reflecting more

[14] See Bauer (2002), Hartog (2000), Kiker, Santos, and Oliveira (1997), Groot (1993), Hersch (1991)

an individual's ability rather than the pure field effects. By using a QR individuals are grouped into various quantiles of the wage distribution, and since in each quantile individuals have similar characterisitcs (such as: age, education and experience etc.) then it can be assumed that the only sorting mechanism along the wage distribution would be his or her ability.

The data comes from a postal survey of 1,470 graduates three years after completion of their studies. In this survey the individuals were asked to rank on a scale of 1 to 5 the extent to which they had developed a variety of job-related skills from their field of study (the skill categories being: communication, technical, team, leadership and ability to work under pressure). They find that the returns (relative to the base case, Arts & Humanities) are highest for Medicine & Veterinary (24.5%), Education (16.1%), Engineering & Architecture (13.3%), Science (9.9%) and Computers & IT (6.3%). They also note that there were no significant premiums to Business, Law and Social Sciences. In terms of compentencies, the technical skills yielded a positive premium of 4%.

Finally, a study by John Robst (2007) is the only paper that relates to the methodology used in this paper. Robst points out that most studies on education and job mis-match consider the *quantity* of schooling to determine an individual being over or undereducated. This is just one way to measure job mis-match. Like in this paper, Robst considers the link between the *type* of education and job mis-match, that is, if the major field of study is related or not to the individual's current occupation. The data were obtained from the 1993 National Survey of College Graduates (NSCG). Two of the survey questions asked respondents to determine how their major field of study relates to their current occupation (either related, somewhat related, or not related). Using the major field of study from the most recent degree, a standard wage regression was used to estimate the effects job-mismatch has on wages. Robst finds that for both men and women the returns to education are lower when individuals are employed in occupations that are unrelated to their major field of study.

Furthermore, the fields that had the largest wage penalities for working in an unrelated occupation for males were: the Health professions (-33.0%), Engineering (-24.6%), Business Management (-23.6%), Mathematics (-16.1%) and Engineering-related technologies (-13.5%). The fields that had the smallest losses were Agricultural sciences (-0.4%), Social sciences (-3.9%) and Liberal arts (-5.8%). For females, the fields that had the highest wage penalities for working in an unrelated occupation were: Engineering (-27.8%), Health professions (-22.8%), Business management (-22.6%), Agriculture (-18.3%), Engineering and related technologies (-17.1%) and Mathematics (-14.6%). The smaller losses were in Liberal arts (-1.9%) and Social sciences (-5.8%). Finally, the wage effects for working in unrelated occupations varied by field of study, with fields that concentrated in general skills more likely to be mismatched versus fields that concentrated in more specific skills.

A major distinction between this study and Robst is that this study proposes a systematic linkage between an individual's major field of study and related occupation, whereas Robst uses a subjective approach. Although it is reasonable to expect that an individual would know how close his or her major field of study relates to his or her occupation, using a subjective approach, which is commonly used in the literature on overeducation, can lead to errors, as there is no way to determine a valid response. Using a systematic approach can help to reduce the invalid response errors, and when used in conjunction with the survey approach, can help to better link the major field of studies to the related occupations that are less clear (such as management occupations).

3.0 Methodology and Data

This section explains the various model frameworks used in this analysis and their applications. An overview of the general assumptions underlying the framework are presented, followed by a detailed discussion of the data, a few of the variables used and the additional assumptions that apply.

3.1 Model Framework

Three models of human capital earnings functions are evaluated, starting with a basic model and finishing with a more complete model. All three models are calculated for both males and females, then seperately for each, for all levels of obtained education and fields of study. The benefit of this type of an approach is to see how the parameters change as more information is added.

The first model captures the pure field effects, regressing only the major field of studies (MFS) on the log of weekly wages. This simple model will give the pure returns for each major field of study.

$$\ln wage = \beta_0 + \beta_1 MFS \qquad (4)$$

The second model is a basic Mincer human capital wage model with the inclusion of the major field of study. This model adds work experience (EXP) and its square (EXP^2) to capture the relationship that work experience has on wages. Work experience is assumed to begin immediately after schooling and is therefore measured by taking the individual's current age and subtracting their total years of schooling as well as subracting their age when they started schooling (see the total years of schooling variable in table 4 of the appendix). The square of work experience is included to capture the observation that initially work experience has a positive nonlinear effect on earnings but at some point in time begins to plateau and eventually has a declining effect on earnings as additional increments of work experience is added (known as diminishing marginal returns to experience). This model also includes a variable that captures the level of completed schooling[15]. The estimated coefficient on this variable represents the returns to an additional level of schooling. In the Census there are two variables that will measure this. One way could be to use the *highest level of schooling* variable, but this variable does not take into consideration if an individual has completed his or her studies at the time of the Census. For this reason it is preferred to use the *highest degree, certificate or diplomas obtained* (DGREE) variable which corrects for the possibility of including individuals who dropped out of their studies after the Census date.

$$\ln wage = \beta_0 + \beta_1 EXP + \beta_2 EXP^2 + \beta_3 DGREE + \beta_4 MFS \qquad (5)$$

The last model is again the Mincer human capital wage model but with field effects and various control variables, including the interaction of major field of study with unrelated occupations.

$$\ln wage = \beta_0 + \beta_1 EXP + \beta_2 EXP^2 + \beta_3 DGREE + \beta_4 MFS + \beta_5 MFS * UNRELOCC + \beta_6 REGION + \beta_7 CMA + \beta_8 MARRIED + \beta_9 CHILD + \beta_{10} LFSTAT + \beta_{11} WKSWKD + \beta_{12} KNOFFLAN + \beta_{13} LGATWK \qquad (6)$$

The control variables used include: geographic (REGION, CMA), family (MARRIED, CHILD), labour (LFSTAT, WKSWKD) and language (KNOFFLAN, LGATWK) variables,

[15] For the interested reader, Hartog (2000) discusses how looking at years of schooling can be misleading as it doesn't necessarily mean more is better. This is because some individuals may take longer completing their education than others, which could be a sign of over-educated workers. For this reason I have decided to use the highest level of education obtained rather than total years of schooling. This is also in line with the recommendations made in the 1998 OECD report (pages 15-16).

which are all explained in table 4 of the appendix. The interaction of major field of study and unrelated occupations (MFS*UNRELOCC) allows for one to determine the earnings differential an individual can expect when he or she is not working in his or her field of study relative to individuals employed in occupations related to that same field of study. By specifying the model like this, one can easily determine the wage gap (as measured by the interaction coefficient) between individuals employed in occupations related to their field and to individuals employed in occupations unrelated to their field.

The gap can be either positive or negative depending on whether an individual earns more or less when he or she is working in an occupation unrelated to his or her field. If the gap is negative, then there are clear disadvantages to working in an unrelated occupation. This could also be an indicator on the levels of underemployment in the economy. If the gap is positive then it would show that an individual earns more working in an occupation unrelated to his or her field of study than when working within the field. Since in this case, an individual can earn more outside his or her field of study, then this could also be indicating a low market demand for that field and a possible signal to policy makers as how to better channel educational resources.

3.2 Assumptions and Hypotheses

In this section the various assumptions are outlined as well as a few hypotheses are also included that are intended to be addressed in this paper. These assumptions and hypotheses hold similar roots to those in the literature[16].

3.2.1 General Assumptions

Assumption 1.
An individual prefers to work in his or her related field of study as to maximize the educational returns.

It can be assumed that an individual with post-secondary credentials chooses to work in an unrelated field only if there are no available employment opportunities where he or she could employ the newly acquired specific skills. This is because an individual will invest time and money into a major field of study and understand from the onset that he or she can earn more from his or her education by using his or her creditentials than by not using them. Of course, it is entirely possible that an individual simply chooses not to work in his or her field of study due to a personal change in interests; however, due to a limitation in the Census questionaire, this issue cannot be addressed[17].

For example, a student of economics (no matter at what level) will only truly benefit from his or her teachings if that student is able to apply it in his or her career. The teachings of economics will probably have very little benefit if the individual works as a secretary. It is only

[16] See Robst (2007), pp. 400.
[17] Any future ammendments to the Census questionaire might want to ask a question used in the 1993 National Survey of College Graduates, reported in Robst (2007), pg. 400-401. The question asked "Thinking about the relationship between your work and your education, to what extent was your work on your principal job held during the week [Census Date] related to your ..." [major field of study?] ... "Was it closely related, somewhat related, or not related.", and could add "if not related, was this because of difficulty finding related employment or because of a change in career interests?"

when a student is able to transit into an occupation that is related to his or her major field of study that post-secondary education is truly operating at the optimum; anything less could potentially be a waste of resources, and a possible policy concern[18].

The returns to field of study are distorted (probably downwards) when no concern is given to whether the individual is working in an occupation that is related to his or her major field of study.

Hypothesis 1.
It is expected that when an individual works in an unrelated occupation, then the earnings differentials are lower than when an individual works in a related occupation with the same major field of study.

The decision to upgrade one's level of human capital is generally favoured as long as individuals come out being able to employ their new skills. However, if an individual ends up in an occupation unrelated to his or her field, and is therefore unable to utilize the specific training, then resources were not being allocated efficiently[19]. It can therefore be expected that the individual is economically disadvantaged by not being able to apply these new skills in a related occupation, since an employer hiring the individual would see no benefit in paying extra for specific skills that are unrelated to the work needing to be performed; however, that is not to say the employer would not compensate for the recognition of the individual holding a general level of skills above those without post-secondary.

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[18] It is worth noting that this assumption does not necessarily mean that individuals should be employing 100% of their specific training. It is merely stating that an occupation is determined to be related if the job performed most often is related to the individual's major field of study. For instance, some jobs ask potential employees to possess very specific educational requirements (like a degree in Finance). If the requirments are met then this would be an example of an occupation related to one's major field of study.

[19] See Rumberger (1987)

Take, for example, the teacher who just completed a bachelor's of education, after successfully completing a four year undergraduate university degree, only to discover that there is an over-supply of teachers in the job market and who is forced to take a temporary position unrelated to his or her studies. It would be expected that this individual would be earning less working in an unrelated occupation than if the individual was working as a teacher. This example of underemployment creates a fairly new concern to policy makers as it not only represents wasted resources but could lead to higher and longer levels of unemployment, lower tax revenues, greater turnover, disgruntled workers and possibly lower productivity levels. This is assuming that if workers are dissatisfied with being unable to work in their field they may only want to put in minimal labour inputs[20].

Assumption 2.
There are labour inefficiencies and wasted resources when individuals are unable to find employment related to their field.

There are at least three ways resources could be wasted. If governments channel public funds into programs that are in over supply in the labour force, then there is a greater chance that these skills will not be employed and therefore represent a wastage, as these funds could have been channelled into other educational programs that are in higher demand, or even into other sectors of the economy.

Another way resources could be wasted comes from the understanding that there is, at any given time in an economy, a fixed stock of labour (a type of resource), and if individuals are withdrawing themselves from the labour force (or even postponing their initial entrance to

[20] See Hartog (2000), Hersch (1991) and Rumberger (1987)

pursue post-secondary education) then this would come at the cost of lost production possibilities.

Finally, there are labour inefficiencies if skilled workers are unable to find related work and end up underutilizing their abilities in the work place (recall the teacher example above). This is because the individual could be employed in an occupation where his or her productive abilities are not as high as if the inidividual was employing the specific skills in a related occupation—since most or all the specific skills might not transfer between occupations.

Assumption 3.
There are two types of skill sets that can be acquired from a post-secondary education. A general skill set and a specific skill set.

A general skill set can include the most basic level of skills, such as, reading, writing, listening, critical and analytical thinking, time management, computer application, presentational, interpersonal (or group-interactive) and organizational skills, to name a few. These general skills can be, for the most part, used in any occupation, and contribute to the acquisition of human capital and aid in the knowledge-based economy. A second, and arguably more important, skill set that is acquired from a post-secondary education is the set of specific skills that are subject-based (especially including the applied skills like engineering, medical and nursing etc.), which can only be fully employed when an individual works in an occupation that allows for these skills to be implemented.

Hypothesis 2.
Individuals are more likely to end up in an unrelated occupation when their major field of study concentrates on more general skills than specific ones.

This states that fields that are more applied (such as engineering, medical and commerce) will be less likely to end up in an unrelated occupation than liberal arts fields like humanities, fine arts and social sciences. As Robst (2007) mentions, this is because occupational mobility is more likely when the cost of changing occupations is lower; since general skills can be applied in more occupations than specific skills, the cost of changing occupations is lower for general skill holders than for specific skill holders. Since the costs are lower, then it can be expected that general skill holders will be more likely to end up working outside their field.

It should be acknowledged that as an individual attains a higher-level of education it is reasonable to expect that, even if the individual concentrates in general skills, he or she will acquire more specific skills than previously learned at his or her lower level of education. However, an applied field is assumed to hold more of a concentration in specific skills than a liberal arts field at all levels of education.

Hypothesis 3.
The earnings differentials for when an individual works in an unrelated occupation will be lower in magnitude for individuals who are taught more general skills than those who are taught more specific skills.

It is assumed that individuals who concentrate more in general skills (or liberal arts fields) have more flexibility applying these skills amongst various occupations; that is, they have more occupational opportunities. Therefore, since the general skill holders are more versatile in the work place, then it can be expected that the losses for not working in the related field will be smaller in absolute terms when comparing against an individual who has concentrated in a specific skill (usually in applied fields). For example, a doctor has more to lose not working in his or her field than a general arts student, since the doctor has invested more time and money acquring specific skills.

3.2.2 Specific Assumptions

Finally, three additional specific assumptions are employed in the determination of related fields and occupations in this paper.

Assumption 1.
Every field of study is related to an occupation in teaching.

It is assumed that a teaching occupation is related to any field of study; since an individual can always teach in his or her field. This holds especially true the higher the individual's level of education (an individual with a PhD is more likely to end up teaching than an individual with a Bachelor's degree).

Assumption 2.
The management occupation is related only to a commerce field of study

The management occupation is a special case in the occupation-to-field relatedness. For all fields, except commerce related fields, there is no specific degree in management. Yet, there are still managers in fields other than just commerce. This makes the treatment of management difficult to measure, and demonstrates that not all fields link with an occupation, since it is always possible for an individual to become a manager with or without post-secondary. Since this paper intends to measure the relatedness of fields to occupation, it is therefore assumed that a management occupation is only related to either a business and commerce, financial management, industrial management, and marketing fields.

Assumption 3.
An occupational opportunity for a major field of study exists at all levels of education.

The last assumption is that when a field is determined to be related to an occupation, then this relationship is assumed to hold at all levels of education. That is, the same occupational opportunities (although different in scope and magnitude) exist for all individuals no matter what level of degree obtained (i.e. a college diploma has the same related occupations as a master's degree).

This assumption is not stating that individuals with varying degrees of education will hold the exact same job but that the job would fall within the same occupational category.

Hypothesis 4.
It is expected that the higher the individual's level of education is, the more likely he or she will be employed in an occupation related to his or her major field of study.

This states that as an individual accumulates a higher-level of education, then it is expected that he or she would be more likely to work in an occupation related to his or her major field of study; when compared amongst lower levels of education within the same field of study. Since, as an individual aquires more advanced skills, he or she becomes more specialized, or an expert, within his or her field of study, and will only be able to employ these skills if he or she works in his or her field.

The complete list of all fields that link to related occupations can be found in table 2 of the appendix. The main method, in determining this link, is based on a paper prepared by Statistics Canada, titled "*Proposed Linkage of Occupation and Major Field of Study For SLID*". The paper links Statistics Canada's 1991 major field of study classification to the 1980 standard occupational classification for the survey of labour and income dynamics. The survey asked respondents to list their occupation and their most recent major field of study held at that time, as well, up to six jobs held during the past year. The occupations and fields of study were then classified, using Statistics Canada's coding system, at the detailed level and then a link was determined to be either "related", "somewhat related" or "not related".

Since in this paper the public-use census data is at the braodest (or major) level a direct link can be difficult to determine using Statistics Canada's method only. A second method was used to complement the proposed linkage. The frequency distributions for each level of post-secondary education were examined for every individuals' major field of study and occupation in the Census, and were then sorted in decending order. The occupations that had high frequencies were then compared at the detailed level, using the SOC-1980 and the MFS classification. It was then determined that an occupation was related (or not) through a common-sense approach, as well by using the field to occupation link on the Job Futures website. A summary of these methods have been provided in table 3 of the appendix.

3.3 Data

As previously stated, the data used is from version two of Statistics Canada's 2001 Census Public Use Microdata File (PUMF)[21] and is based on a sample that represents approximately 2.7% of the population surveyed and contains 801,055 observations, with 140 variables. In order to protect the confidentiallity of the respondents various measures were taken by Statistics Canada. For instance, information is not disclosed for small rural areas, instead only provincial, territorial and Census Metropolitan Areas are made available. As well, certain

[21] Catelogue 95M0016XCB

records are surpressed and are replaced with a "Not Available" field. The only variables affected by this loss of information used in this paper are the Language variables discussed in table 4 of the appendix. For these two cases the "Not Available" records have been dropped.

The total sample size used in this paper is 90,023; however 25 observations were dropped since they fell below the minimum threshold. Observations were dropped if they fell below the minimum tresholds, which were determined as follows: a minimum of 10 observations, in total, for every related field-occupation at the college to university certificates above a bachelor's degree, and a minimum of 5 observations, in total, for every related field-occupation at the master's to doctoral level. After all filters have been applied, the adjusted sample size is 89,998 observations, with 18 variables, which have been grouped into 5 broader categories (education, geographic, family and language).

The following is a detailed discussion of the earnings variables, the major field of study, and the age variables; since some additional assumptions and filters were employed. All remaining variables are discussed in table 4 of the appendix.

3.3.1 Earnings

The wage variable is always positive and represents the individuals' gross earnings or salaries and has a maximum value of $200,000 where wages that exceed this amount were given this value by defalut. The self-employed variable ranges from –$50,000 to $200,000 with similar logic as with the wage variable.

For the purpose of this paper only positive earnings (sum of wages and self employed incomes) that were at least $7,500 or more were included and were then converted into weekly averages based on the number of weeks the individual worked, then the wage and self-employed incomes were added for all individuals and then the natural log was taken. The value of $7,500 was determined as a bare minimum of earnings an individual would have to earn based on reporting that they worked at least 30 hours and 30 weeks (two additional filters applied and discussed in table 4) at an average national minimum wage.[22]

3.3.2 Major Field of Study

This variable refers to the individual's predominant area of study at their highest and most recently obtained post-secondary education. The predominate area is then classified using Statistics Canada's Major Field of Study coding system. The Major Field of Study contains 11 major levels, 110 minor levels, and 449 unit levels (most detailed level). The Census PUMF has only 19 Major Field of Studies.

One field "All Other" was dropped as it includes post-secondary education without specialization and all other forms of post-secondary that were not elsewhere classified. As the focus of this paper is to link field with occupation it is necessary to have a field with a specialization in order to link the field to it's related (or unrelated) occupation. The field categories are as follows:

[22] This is done in an effort to exclude any anomolies with the data, i.e. an idividual who reported working full-time for the whole year and only earned $500. The average national wage was calculated by taking the average of all the provincial wages (30*30*8.75=7,874 which was rounded down to 7,500 due to the differences in provincial minimum wages).

Census PUMF Major Field of Study Category	Code
Liberal Arts	
Educational, Recreational and Counselling Services	(ERCS)
Fine and applied arts	(FAPA)
Humanities and related fields	(HRFG)
Social sciences and related fields	(SSRF)
Applied Fields	
Business and commerce	(BSCM)
Financial management	(FNMG)
Industrial and institutional management and administration	(IIMA)
Marketing, merchandising, retailing and sales	(MMRS)
Office administration, secretarial and clerical	(OASC)
Agricultural, biological, nutritional, and food sciences	(ABNF)
Engineering and applied sciences	(EAAS)
Building technologies	(BTEC)
Data processing and computer technologies	(DPCT)
Electronic and electrical technologies	(EAET)
Other engineering technologies, n.e.c.	(OETC)
Nursing	(NURS)
Alternative medicine/other health sciences	(AMHS)
Mathematics, computer and physical sciences	(MATH)

Furthermore, it has been assumed that the major field of study categories can be further broken down into liberal arts and applied fields. The liberal arts category includes: educational, recreational and couselling services, fine and applied arts, humanities and scocial sciences. All other fields fall into being either professional or vocational fields, which have been included in the 'applied fields' category.

3.3.3 Age

Only individuals of ages 25 to 55 as of the Census reference date (May 15, 2001) are included. The reason an individual is to be at least 25 years old is to better isolate for individuals who have completed a post-secondary education and have worked for at least a year after completing their studies. Theoretically, it is reasonable to expect that an individual, if welldisciplined and who continues post-secondary studies immediately after highschool[23] (age 17-18), could have either one or more of the following post-secondary levels of education: a college diploma at age 19-20, or a bachelor's degree at age 21-22, or a master's degree at age 22-23, or a PHd at age 26-27. Therefore, for some studious individuals, it is possible (although not always likely) to have acquired a bachelor's degree, followed with a master's degree and finally a phd by the time they reach the age 26 or 27. Acknowledging for this possibility, will give a minimum range of ages.

Similarly, the condition that an individual be at most 55 (or born 1946 as of the Census reference date) was chosen as to reduce the possibility of distorting the returns to education. This is because a post-secondary education today is not what a post-secondary education was in the 30's or early 40's. For example, in 2001 there were many more individuals who held a university degree than those in 1930.

As can be seen in figure 11, the total number of university degrees earned from 1930 to 2001 has risen from 8,665 to 159,855, a total increase of 1,745% or a yearly average of 4%. Therefore, when looking at returns generated from education, it should not be expected that one can easily compare two time periods that are structurally different in terms of individual's educational attainment.

[23] Note that for simplicity this ignores the fact that different provinces have different secondary requirements. Ontario's Secondary system went to grade 13th (OAC) from its introducation in 1984-1985 until it was phased out after the 2002-2003 school year and Quebec's Secondary system goes to grade 11, and then usually followed with CEGEP for two more years if intending to go on to university.

4.0 Results

This section presents the data results. The descriptive statistics are presented first, giving an overview of the data structure and the number of individuals in each level of education and field of study. Then the regression results are presented and analyzed for each of the three models.

4.1 Descriptive Statistics

Table 6 of the appendix shows the breakdown of males and females by each level of post-secondary education. In total there were 41,689 (46.3%) females and 48,309 (53.7%) males or 1.2 males to every female. For all lower-levels of post-secondary education males and females were evenly distributed. However, at the graduate and professional levels males dominated; with males making up 67% of the total holding a medical degree, 61% with a master's degree and 72% with a doctoral degree.

Figures 1 and 2 in the appendix show the total number of males and females for each field that had at least 3,000 individuals or more, any fields with less than 3,000 individuals were grouped into an "All Other Fields" category. According to figure 1, the five largest fields of studies for males were: social sciences (13%), education (12%), other engineering (10%), business management (9%) and mathematics, computer and physical sciences (8%). In Figure 2, the five largest fields for females were: education (17%), social science (14%), nursing (9%), humanities (8%) and alternative medicine/other health sciences (8%).

The distribution was relatively even in terms of the proportion of males and females that were in a related or unrelated occupation at the time of the census. Figure 3 in the appendix shows that males accounted for 53.7% and females 46.3% of the overall total for both males and females. Of these percent totals, 29.9% of males and 26.5% of females were in an occupation related to his or her major field of study; compared with 23.8% of males and 19.9% of females who were in an occupation that was unrelated to his or her major field of study. Figures 4 and 5 show the proportion of males and females who worked in a related or unrelated field of study for each level of post-secondary education, and by each field of study. What is interesting to note, is that figure 4 provides evidence to support hypothesis 4; which states that:

It is expected that the higher the individual's level of education is, the more likely he or she will be employed in an occupation related to his or her major field of study.

As can be seen in the figure, at the college level there were 53% of males and females working in a related field. This rises to 64% (males) and 73% (females) at the certificate level above a degree and even further to 91% (males) and 90% (females) at the medical degree level.

Figure 5 divides the major fields of studies into liberal arts and applied arts and further divides the fields into either an occupation that was related or unrelated to the individual's major field of study. It further provides evidence to support hypothesis 2; which states that:

Individuals are more likely to end up in an unrelated occupation when their major field of study concentrates on more general skills than specific ones.

As can be seen in the table, in most cases, the applied fields tended to end up working in an occupation related to the field of study. There was only one case, industrial and institutional management, where it doesn't hold for both males and females, five fields (agriculture, building tech., electronic and electrical tech., other engineering tech. and math, computer and physical sciences) where it did not hold for females and one case where it didn't hold for males (office admin). There could be a number of reasons for these results. One observation is that the five fields that did not hold for females, as well as the one field that didn't hold for males, had a limited amount of observations and represented a few of the lowest fields entered into by females and males. This lower popularity could represent some of the least demanded fields and could be a factor affecting the results. Also, note that one field didn't hold for both males and females in the liberal arts section (education). This could be a classification issue and could possible indicate more of an applied field rather than a liberal arts. However, since education has been coded in previous literature as a liberal field and not a professional or vocational field, it was kept in the liberal arts section[24].

Figures 6 to 8 show the average gains and losses to working in an occupation that was related or unrelated to the individual's field of study. This was calculated by subtracting the average unrelated earnings for a specific field from the total average earnings for the specific field, and similarly, subtracting the average earnings in the related field from the total average earnings for the specific field. The net differences were then graphed to show how much more or less an individual earned on average working in a related field or not. These tables also provide evidence to support hypothesis 3, which states:

The returns to education when an individual works in an unrelated occupation will be lower in magnitude for individuals who are taught more general skills than those who are taught more specific skills.

For females, figure 7 shows the largest magnitudes (greatest change in absolute value) occurred in the following three applied fields: industrial and institutional management, financial management and alternative medicine. For males, alternative medicine, business management and financial management were the three largest magnitudes in the applied fields, as shown in

[24] See Lin, Z., Sweet, R. et al. (2003).

figure 8. When looking at both males and females, figure 6 shows the magnitudes were greatest for the 'all applied fields' when compared against the 'all liberal arts' fields; which supports hypothesis 3 in section 3.2.1.

Finally, figures 9 and 10 show an interesting relationship in terms of unemployment trends. Figure 9, shows the unemployment rates by level of post-secondary education. The unemployment rates were higher for both males and females when they were not working in an occupation related to their field of studies. Also, note the large rate of unemployment for females with a medical degree in a previously unrelated occupation. One explanation could be that this could reflect some female-educated immigrants who were having more difficulty finding related employment.

Figure 10, identifies the fields of studies for males and females that had the highest and lowest unemployment rates in an occupation related or not to his or her field of study. Males had the highest related-unemployment rates in the fields of: building tech.(4.1%), industrial and institutional management (2.0%) and other engineering tech (2.0%) and the highest unrelated-unemployment rates in: data processing (3.5%), nursing (3.3%) and financial management (2.9%). Females on the other hand, had the highest-related unemployment rates in: industrial and institutional management (4.1%), data processing (3.7%) and electronic and electrical tech. (2.4%), and the highest unrelated-unemployment rates in: data processing (4.1%), office administration (3.3%) and fine arts (3.2%).

4.2 Regression Results

The pure field returns can be seen from model 1, shown in the table below. The first thing to note is that the rates of returns vary depending on the field of study. All private returns are measured against the reference field, educational, recreational and counselling services. The largest losses for both males and females occurred in the office administration and fine and applied arts fields, with a loss of 34.2% and 23.9% respectively. The fields that had the greatest gains for both males and females were in the fields of engineering, medicine and business. Females typically had more losses, and in most cases, greater losses than males in the applied

Model 1
Pure Field Effects Model for All Levels of Post-Secondary Education in Canada, 2001

Levels and Fields of Education	Both	Females	Males
Liberal Arts			
Educational, Recreational and Counselling Services	N/A	N/A	N/A
Fine and Applied Arts	-23.9%	-24.5%	-28.5%
Humanities and Related Fields	-5.5%	-5.1	-12.4%
Social Sciences and Related Fields	7.1	-2.7%	9.0%
Applied Fields			
Business and Commerce	13.4%	-0.9%**	14.2%
Financial Management	6.2%	-8.0%	12.0%
Industrial and Institutional Management and Admin.	0.6%**	-5.1%	0.0%**
Marketing, Merchandising, Retailing and Sales	4.1%	-2.2%**	1.3%**
Office Administration, Secretarial and Clerical	-34.2%	-29.3%	-16.9%
Agricultural, Biological, Nutritional, and Food Sciences	-8.0%	-11.6%	-14.2%
Engineering and Applied Sciences	28.6%	5.9%	19.3%
Building Technologies	-0.6%**	-21.7%**	-12.5%**
Data Processing and Computer Technologies	-0.1%**	-9.5%**	-6.4%**
Electronic and Electrical Technologies	13.2%	-4.6%**	1.3%**
Other Engineering Technologies, n.e.c.	7.3%	-15.8%	-2.7%
Nursing	-0.2%**	5.5%**	-6.3%**
Alternative Medicine and Other Health Sciences	17.4%	2.1%	37.8%
Mathematics, Computer and Physical Sciences	22.3%	11.8%	15.7%
R^2	5.62%	3.84%	5.62%
Sample Size (n)	89,998	41,689	48,309

*Note: no stars indicates significance at the 5% level, * significance at the 10% level, and ** not significant at 10% level*
For the complete results refer to the regression results section of the appendix

fields (with exception to agriculture and nursing fields, and had all loses in the liberal arts fields. In terms of significance, three fields: building tech., data processing and nursing, failed the individual test of significance at both the 5% and 10% levels. For all fields that were significant at the 10% level they were also found to be significant at the 5% level.

Model 2 below, shows the Mincer model with field effects. It is noteworthy that the explantory power (R^2) has increased with the addition of more information. The returns to level

Model 2
Human Capital Wage Model with Field and Level Effects ,
For Post-Secondary Education in Canada, 2001

Levels and Fields of Education	Both	Females	Males
College certificate/diploma	N/A	N/A	N/A
University Certificate	6.4%	8.3%	2.0%*
Bachelor's Degree	30.6%	30.6%	25.0%
University Certificate above a Bachelor	38.9%	42.1%	30.2%
Medical Degree	88.1%	75.0%	77.6%
Master's Degree	47.5%	50.6%	38.7%
PHd	52.5%	58.0%	41.4%
Liberal Arts			
Educational, Recreational and Counselling Services	N/A	N/A	N/A
Fine and Applied Arts	-8.7%	-10.1%	-13.8%
Humanities and Related Fields	-3.6%	-4.8%	-8.2%
Social Sciences and Related Fields	9.6%	-0.1%**	12.4%
Applied Fields			
Business and Commerce	20.5%	9.1%	20.3%
Financial Management	16.2%	5.9%	19.1%
Industrial and Institutional Management and Admin.	13.9%	8.9%	11.7%
Marketing, Merchandising, Retailing and Sales	22.4%	16.1%	18.4%
Office Administration, Secretarial and Clerical	-10.4%	-5.9%	3.6%**
Agricultural, Biological, Nutritional, and Food Sciences	-3.8%	-8.8%	-8.1%
Engineering and Applied Sciences	25.3%	3.9%	19.4%
Building Technologies	23.7%	2.8%**	9.4%
Data Processing and Computer Technologies	27.5%	15.8%	19.8%
Electronic and Electrical Technologies	37.2%	19.6%	22.9%
Other Engineering Technologies, n.e.c.	32.1%	10.0%	19.6%
Nursing	14.2%	19.3%	9.6%
Alternative Medicine and Other Health Sciences	12.2%	8.7%	19.3%
Mathematics, Computer and Physical Sciences	20.3%	11.5%	16.2%
R^2	18.3%	17.7%	15.0%
Sample Size (n)	89,998	41,689	48,309

*Note: no stars indicates significance at the 5% level, * significance at the 10% level, and ** not significant at 10% level*
For a list of all controls used, and the complete results refer to the regression results section of the appendix

of education, when measured against the reference level (college), were positive for all levels of post-secondary education and increased with each additional level; the returns increased with a medical degree earning as high as 88.1% for both males and females.

The field returns, when measured against the reference group, educational, recreational and counselling services, were mostly all postive in all cases except for fine arts, humanities, social sciences, office admin. and in agriculture fields. Males had higher returns (relative to the reference group) than females in all fields, except in Nursing. Liberal arts again had all returns lower than the reference group, except for males in social sciences. The top three returns for females were in: electronic and electrical tech. (19.6%), nursing (19.3%) and marketing (16.1%) fields. For males the top three returns were in: electronic and electrical tech. (22.9%), business and commerce (20.3%) and data processing and computer tech. (19.8%).

Model 3 below shows the returns to level of education relative to the reference level (college) and the returns to all fields relative to educational, recreational and counselling services field, with an interaction term estimating the earnings differentials (or gap) for working in unrelated occupations for each field. For example, at the bachelor's level, females had a negative wage penality of 5.9% working in an unrelated occupation relative to females working in related occupations; compared to males who had a wage penalty of 5.1% working in an unrelated occupation relative to males in related occupations. Also, males with a social science major had a wage penalty of 14.8% from working in an unrelated occupation relative to other males in the social science field who worked in a related occupation; whereas females had a wage penalty of 9.8% working in an unrelated occupation relative to females working in a social science related occupation. Finally, note that the explanatory power has further increased with the additional information added.

The private returns increase by level of education and there were minor wage penalties (except for medical and doctoral degrees) when looking at all cases for each level where an individual was associated with working in an occupation unrelated to his or her field. The wage penalties were greatest for individuals with a medical degree when working in an unrelated field (between -33.0% to 47.9%). This would be expected, since individuals with a medical degree have invested more time and money to attain a very specific skill and have more to lose when he or she is unable to employ that skill.

Model 3
Human Capital Wage Model with Field and Level Effects and Controls, with Unrelated Field-Occupations For Post-Secondary Education in Canada, 2001

Levels and Fields of Education	Both	Unrelated	Females	Unrelated	Males	Unrelated
College certificate/diploma	N/A	N/A	N/A	N/A	N/A	N/A
University Certificate	8.3%	-5.8%	10.0%	-4.8%	4.8%	-6.3%
Bachelor's Degree	27.6%	-5.8%	29.0%	-5.9%	23.6%	-5.1%
University Certificate above a Bachelor	33.4%	-8.4%	37.7%	-9.8%	26.0%	-5.8%
Medical Degree	76.8%	-42.8%	70.9%	-33.0%	75.2%	-47.9%
Master's Degree	39.0%	-2.4%*	43.5%	0.6%**	33.2%	-4.1%
Doctoral Degree	40.5%	4.3%**	48.1%	7.9%**	34.4%	2.5%**
Liberal Arts						
Educational, Recreational and Counselling Services	N/A	-8.4%	N/A	-12.3%	N/A	-0.4%**
Fine and Applied Arts	-15.4%	-4.0%	-9.4%	-13.6%	-20.2%	7.8%
Humanities and Related Field Groups	-10.8%	-0.7%**	-8.0%	-5.2%	-10.7%*	3.9%
Social Sciences and Related Field Groups	8.1%	-12.2%	-0.1%**	-9.8%	19.4%	-14.8%
Applied Fields						
Business and Commerce	16.7%	-23.5%	10.0%	-18.2%	25.1%	-26.7%
Financial Management	15.2%	-28.1%	9.6%	-25.7%	24.0%	-30.1%
Industrial and Institutional Management and Administration	17.5%	-20.1%	15.6%	-19.8%	22.3%	-20.6%
Marketing, Merchandising, Retailing and Sales	17.5%	-21.2%	16.3%	-18.6%	21.1%	-24.4%
Office Administration, Secretarial and Clerical	-8.8%	-7.2%	-9.6%	-9.5%	-7.4%**	11.6%**
Agricultural, Biological, Nutritional, and Food Sciences	-15.4%	5.8%	-9.9%	-5.6%	-15.2%	13.9%
Engineering and Applied Sciences	9.2%	-3.4%	4.1%*	-14.0%	16.7%	-3.0%**
Building Technologies	2.8%**	-0.4%**	8.1%**	-15.8%**	5.3%*	0.7%**
Data Processing and Computer Technologies	15.7%	-13.8%	14.6%**	-18.5%	19.8%	-12.0%
Electronic and Electrical Technologies	17.4%	-4.8%	15.1%	-7.1%**	20.8%	-5.0%**
Other Engineering Technologies, n.e.c.	16.1%	-8.8%	14.1%	-19.5%	19.0%	-7.5%
Nursing	20.7%	-27.4%	21.0%	-28.9%	13.1%	-10.8%*
Alternative Medicine and Other Health Sciences	12.2%	-21.9%	9.3%	-22.7%	19.8%	-18.3%
Mathematics, Computer and Physical Sciences	6.9%	-1.4%**	9.5%	-7.6%	13.1%	-0.2%**
R^2	26.3%		24.1%		20.9%	
Sample Size (n)	89,998		41,689		48,309	

*Note: no stars indicates significance at the 5% level, * significance at the 10% level, and ** not significant at 10% level*
For a list of all controls used, and the complete results refer to the regression results section of the appendix

Finally, individuals with a doctoral degree and male individuals with a master's degree still had a postive wage differential when working outside his or her field. This result may seem somewhat counterintuitive, however, this could be a reflection of the higher abilities assocatiated with individuals with higher levels of education relative to individuals with lower levels of education. Therefore, they are less likely to be penalized (as much) when working outside his or her field.

When looking at the private returns to field of study, there were usually larger returns found in applied fields then in liberal arts fields. As well, the wage differentials for working in an unrelated occupation tended to be lower overall for liberal fields when compared to the applied fields. This observation supports hypothesis 3, which states:

The wage differentials for when an individual works in an unrelated occupation will be lower in magnitude for individuals who are taught more general skills than those who are taught more specific skills.

Social science had the only positive return in the liberal arts fields, and was positive only for males. In the applied fields, office admin and agriculture were the only two fields that had negative private returns. This could be an indication that they should be considered more of a liberal arts field as they may concentrate in more general skills. Some of the larger private returns were in business and related fields, nursing, alternative medince and data processing and computer tech fields.

The earnings differentials to field of study and unrelated occupations are negative across all fields when looking at only females, almost all fields when looking at both males and females (except agriculture) and for most fields when looking at only males (except fine arts, humanities, office administration, agriculture and building tech.). This observation supports hypothesis 1, which states:

It is expected that when an individual works in an unrelated occupation, then the returns to education are lower than when an individual works in a related occupation with the same major field of study.

The positive wage differentials associated with working in an unrelated field may again seem counterintuitive but it is also entirely possible that there are some fields of study that have an inherited loss associated with them; most likely due to the lack of demand for these skills in the labour market. For instance, males and females both had large private losses associated with humanities and fine arts. Looking at the wage differentials associated when working outside these fields, males are able to generate positive earnings where females still incur losses. Similarly, males who's majors were in office admin. or agriculture fields were able to earn positive earnings working outside their field when the private returns were negative; where females, in these fields, earned negative earnings regardless of working in or out of their field.

When comparing the earnings differentials between liberal arts fields and applied fields, there are clear disadvantages when working outside one's major field of study in applied fields. Most applied fields had larger losses than liberal arts; which again supports hypothesis 3. The largest losses, when looking at both males and females, occurred in the fields of: financial management (-28.1%), nursing (-27.4%), business (-23.5%), alternative medicine (-21.9%) and marketing (-21.2%). Females had the largest losses in the following applied fields: nursing (-28.9%), financial management (-25.7%), alternative medicine (-22.7%), industrial and institutional management (-19.8%) and other engineering tech. (-19.5%). The largest losses in the applied fields for males occurred in: finanial management (-30.1%), business (-26.7%), marketing (-24.4%), industrial and institutional management (-20.6%) and alternative medicine (-18.3%).

When comparing the results found in Robst (2007) to the results fround in this study, it is interesting to see some similar findings. Robst (2007) identifed some of the same fields for females and males as also having the largest losses in the United States. For instance, alternative medicine (or health professions in Robst) had a loss of 22.8% and a loss of 33.0% for females and males respectively in the United States, which for females is almost exactly the same loss as found in Canada in this study. Also, business and commerce (or business management in Robst) had a loss of 23.6% for males in the United States, which again was close to the loss observed in Canada , a loss of 26.7%. However, there were some major differences between the losses incurred working in an unrelated occupation in Canada and working in an unrelated occupation in the United States. For instance, Robst finds that females and males both had large losses in mathematics, -16.1% and -14.6% respectively, whereas in this study the losses in mathematics, computer and pyscial sciences were –7.4% and –0.2% for females and males respectively. Finally, males had larger losses in social sciences in Canada, -14.8%, where in the United States Robsts finds that males had a loss of –3.9%.

5.0 Conclusion and Final Remarks

Overall, there are benefits to attaining a post-secondary education in Canada, as all levels of education show positive returns. However, this is generally when individuals work inside their field of study. There are clear disadvantages when an individual works outside of his or her major field of study, earning negative wage differentials in almost all cases, which supports hypothesis 1 of section 3.2. As well, the magnitude of the losses varied by field and were typically greater in the applied fields, supporting hypothesis 3 of section 3.2.

There were several fields where males tended to be better off working outside their field then working within their field; however, women in these same fields were worse off either way (see fine arts, humanities, office admin., agriculture and building tech. fields in Model 3). This seems somewhat counterintuitive, as it is hard to believe that one can do better than another working outside his or her field. It is possible, for instance, that in two particular fields, fine arts and humanities, women show more dedication than males. That is, even though they are unable to find related employment, they take whatever they can in order to continue pursing their writing, music, painting or theatrical career; whereas males could be leaving the industry all together to seek better paying careers and save their interest in arts and humanities to satisfy their past-time extracurricular activities. Another possible explanation could be related to the underlying dataset. For instance, there were significantly fewer females in building technologies than compared to males, and there were significantly fewer males in office administration than females.

Both males and females working in occupations related to their field of studies, in most cases, had large positive private field returns relative to individuals in the educational, recreational and counselling services fields (see Model 3). Of these postive returns, males tended to have larger field returns than females in almost every field except for nursing and building technologies, suggesting a still evident wage gap between males and females, across fields. However, it should be noted that women tended to earn more of a return from higher levels of education than males. There is also evidence that supports the likelihood of an individual working in an occupation unrelated to his or her field of study (hypothesis 2), with the higher likelihood occuring in liberal arts fields that concentrate on more general skills. Finally, there was further evidence that suggested that the higher the individual's level of education, the more likely he or she will work inside his or her field of study (supporting hypothesis 4).

Another interesting result had to do with unemployment trends. Males and females both tended to have higher levels of unemployment when their previous occupations were unrelated to their major field of study. This could be related to job satisfaction, and that by not working in an occupation related to one's field of study could lead to more persistent and frequent turn-over, creating a higher and longer level of unemployment (see Hersch 1991).

In terms of the overall efficiency of the post-secondary education system, policy makers need to realize the importance of creating a strong link between the education system and the labour markets. Without a strong link between an individual's major field of study and occupation, then it can be difficult to determine the future demands of the labour market, therefore, creating either an oversupply or shortage of skills required. This presents a concern for all participants in the educational process as it can represent a waste of scarce resources. This paper has attempted to address those concerns by presenting a methodological framework for future research. Possible extensions to this framework could be to take the proposed concordance table presented by Statistics Canada to the more detailed level, thereby eliminating potential errors and creating a more defined linkage.

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Appendix

Table 1
Summary of Canadian Literature on Returns to Education

Author (year published)	Year / Area studied	Rates / Level / Field of Studies	Method: MHCEF, IRR or B/C	Data Used	Results
Stark (2007)	1995, Canada	PR / UB, UM, UP and MD / detailed MFS	MHCEF	1996 Census, Full 20% sample	Bachelor's Level = 9.9% (men) and 12.1% (women); Considerable variation across field. Highest returns are to buisness and commerce and enginnering fields. Master's Level = postive but somewhat less than bachelor's, 4.1% (men) and 8.6% (women). Again variation across field, with greater returns accruing to women. Returns to a non-science field exceeds the science fields. PHd Level = positive but less than returns to a Master's, 1.3% (men) and 4.3% (women).
Boothby and Drewes (2006)	1980-2000, Canada	PR / TC, CD and UB / No MFS	MHCEF	1981-2001 Censues	Earnings premium for college diploma approx 1/3 of a bachelor's for both men and women. Men have seen an increase in the earnings premium to all educational paths, especially younger men.
Emery (2004)	1960-2000, Canada	PR / TC, UB	IRR	Comparison of the literature	Both the PR (10%) and TR (6%) are high for UB education for the entire period. There appears to be a slight reduction in the returns in the late 70's and early 80's.
Heisz (2003)	1974-1996, British Columbia	PR / UB / MFS	Variation of MHCEF	Admin data, 1974-1996	Similar results as below
Appleby, Fougere et al. (2002)	1981-1996, Canada	PR / CD / UB / UM / UP	IRR	CFS	By Level: CD, women's PR peaked at 16% in '84 and then trended down to a low of 8.9% in '93 and ended at 10.6% in '96. Men's rates were much more stable, ranging between 5.3% and 6.5% and ended up at 6% in '96. At the UB women's rates are still higher than men reaching a peak of 12.8% ('92) and low of 10.9% ('90). Men's rates peaked at 10.3% ('89) and hit a low of 8% ('95).
Boothby and Rowe (2002)	1991, Canada	PR / CD / UB / MFS	Simulated Life Paths Model	1991 Simulations of Census medians and also raw data used	Median rates for UB were 12% for men and 13% for women; CD median rates were 16% (men) and 18% (women). There were large variations in the returns by field. Women had higher rates when measuring across fields but had longer lifetime earnings. The results shows large variability for CD and UB PR. The median return for women by field ranges from 9% to 20%. For Men the mediam rates range from 9-10%, Law has 13-15% and Medicine 20%.
Vaillancourt and Bourdeau-Primeau (2002)	1990 & 1995, Canada	PR & TR / UB & MFS / UM and UP	IRR	1991 and 1996 Censues	By Level: PR for a UB are high in absolute and relative terms (16-20% in 1990 & 1995). The TR for UB are about half PR due to high level of subsidies. Returns for UM and UP are substantially lower than UB which is consistent with other research findings. By Field: lowest returns in Humanities and highest in science, math, engineering and commerce.

PR = Private Return
CD = College Diploma
UP = University: PHd
B/C = Benefit-Cost Ratio
MHCEF = Mincer's Human Capital Earnings Function
TR = Total (public) Return
UB = University: Bachelor's Degree
MD = Medical Degree
NGS = National Graduate Survey
TC = Trades certificate
UM = University: Master's Degree
MFS = Major Field of Study
CFS = Consumer Finance Survey
IRR = Internal Rate of Return

Table 1 continued
Summary of Canadian Literature on Returns to Education

Author (year published)	Year / Area studied	Rates / Level / Field of Studies	Method: MHCEF, IRR or B/C	Data Used	Results
Finnie (2002)	1982, 1986 and 1990, Canada	Early PR / UB / MFS	Mean Comparison	NGS 1984/87, 1988/91 and 1991/95	All fields mean incomes ranged from mid-30,000s to mid-40,000s for men and from 30,000 to 36,000 for women. Medical, Law, Veterinary Sciences, engineering, computer sci and other health disciplines also where high. The next rank included Teacher, Economics and Commerce with the lowest earnings in other education, arts and humanities, agriculture and other social sciences.
Finnie (1998)	1982, 1986 and 1990, Canada	Early PR / MFS	MHCEF with controls and dummies	NGS 1984/87, 1988/91 and 1991/95	The highest earning fields out of the three cohorts for males and females were Other Health (29% males and 24% females), Engineering and Computer Science (17% males and 18% females), Commerce (7% males and 9% females) and Mathematics/Physics (7% males and 12% females) . The lowest earnings fields were Arts and Humanities (-30% males and -19% females), Agricultural/Biological Sciences (-15% males and -15% females) and Other Social Sciences (-13% males and -16% females), Education and Economics had average returns.
Heisz (2001)	1974-1996, British Columbia	PR / UB / MFS	Variation of MHCEF	Admin data, 1974-1996 and new dataset from 1982-1997 tax records	Average real earnings for male graduates were lower for more recent cohorts than past cohorts in the first years following graduation, but rate of growth was higher. Earnings differed by field and favoured Teachers, Commerce, Engineering, Nursing and Medical Sciences but not significantly across cohorts.
Finnie and Frenette (1999)	1982, 1986 and 1990, Canada	PR / UB / UM / UP / MFS	MHCEF	NGS 1984/87, 1988/91 and 1991/95	Three models were used, the more complete model indicates that the unadjusted earnings were highest for Health, Engineering, Computer Science, Math/Physics and Commerce, and lowest for Arts and Humanities, Other Social Science and Agriculture while Economics and Education gernerally were in the middle. As well there were large magnitudes between MFS and that some early cohorts saw their earnings decline over the two to five years following graduation (Education for both males and females).
Vaillancourt (1995)	1995, Canada	PR / TR / UB, UM, UP and MD / MFS for UB	IRR	1986 Census	Results show PR are higher than TR. Also, the returns for high school are higher than post secondary and there is a tendency for the returns to decline with the level of education. There were higher rates of returns for post-secondary education for women. Finally, by MFS at the UB, the highest private returns were for helath degrees, while the lowest were for humanities and rates of returns vary across fields.
Dodge and Stager (1972)	1966, Canada	PR / TR / UM / UP / MFS	IRR	1967, Survey of Highly Qualified Manpower	There were large variations on the fields at the graduate level when compared amongst the TR and PR. The PR for the MBA compared with the UB in engineering exceeds the PR for the PHD in physics. In one case the reate of return exceeds 5%, this is for the MBA when compared with a UB in science. The estimated TR to UB in pure science and engineering are 9.6% and 10.5% compared to -5.5% to 2% for graduate degrees in these fields. Returns to graduate degrees in the States appear to exceed returnds in Canada.

PR = Private Return | TR = Total (public) Return | TC = Trades certificate
CD = College Diploma | UB = University: Bachelor's Degree | UM = University: Master's Degree
UP = University: PHd | MD = Medical Degree | MFS = Major Field of Study
B/C = Benefit-Cost Ratio | NGS = National Graduate Survey | CFS = Consumer Finance Survey
MHCEF = Mincer's Human Capital Earnings Function | IRR = Internal Rate of Return

Table 2
Field of Study and Related Occupation

Major Field of Study	Related Occupations
Educational, recreational, counselling services (ERCS)	Teachers and professors Social science,government,religion
Fine and applied arts (FAPA)	Art,culture,recreation,sport Teachers and professors
Humanities and related fields (HRFG)	Social science,government,religion Art,culture,recreation,sport Teachers and professors
Social sciences and related fields (SSRF)	Social science,government,religion Protective services Teachers and professors
Business and commerce (BSCM)	Senior management Other management Professional business and finance Financial, secretarial,administrative Wholesale,technical,insurance,real estate Teachers and professors
Financial management (FNMG)	Senior management Other management Professional business and finance Financial, secretarial,administrative Teachers and professors
Industrial and institutional management and administration (IIMA)	Senior management Other management Professional business and finance Teachers and professors
Marketing, merchandising, retailing and sales (MMRS)	Senior management Other management Social science,government,religion Wholesale,technical,insurance,real estate Retail trade Teachers and professors
Office administration, secretarial and clerical (OASC)	Financial, secretarial,administrative Clerical occs/supervisors Social science,government,religion Teachers and professors
Agricultural, biological, nutritional, and food sciences (ABNF)	Natural and applied sciences Social science,government,religion Prof health,registered nurses,supervisors Chefs and cooks, etc Occ unique to primary industries Teachers and professors
Engineering and applied sciences (EAAS)	Natural and applied sciences Teachers and professors

Table 2 continued
Field of Study and Related Occupation

Major Field of Study	Related Occupations
Building technologies (BTEC) (college only)	Trades and transportation Construction trades Other trades occupations Occ unique to primary industries Manufacturing supervisors, operators, etc Teachers and professors
Data processing and computer technologies (DPCT) (college only)	Clerical occs/supervisors Natural and applied sciences Teachers and professors
Electronic and electrical technologies (EAET) (college only)	Natural and applied sciences Other trades occupations Manufacturing supervisors, operators, etc Teachers and professors
Other engineering technologies, n_e_c_ (OETC)	Natural and applied sciences Other trades occupations Manufacturing supervisors, operators, etc Teachers and professors
Nursing (NURS)	Prof health,registered nurses,supervisors Technical,assisting,related health occs Teachers and professors
Alternative medicine/other health sciences (AMHS)	Natural and applied sciences Prof health,registered nurses,supervisors Technical,assisting,related health occs Teachers and professors
Mathematics, computer and physical sciences (MATH)	Natural and applied sciences Social science,government,religion Teachers and professors

Table 3
Four Methods to Determine Field-Occupation "Relatedness" or "Unrelatedness"

1) The first resource used was a 1996 paper prepared for the Survey of Labour and Income Dynamics (SLID) by Statistics Canada that proposed a linkage between the Major Field of Study and the National Occupation Classification (both of these variables are discussed in more detail below). This paper determines a related, unrelated and somewhat related field for every job held, at the time of the SLID, by each individual, while considering all credentials simultaneously (a limitation embedded within the Census).

2) A second resource used to determine the relatedness was by comparing the frequency distributions for all occupations, fields and levels of education. Then the data were sorted in decending order to pull the highest frequencies to the top. This method helps to show the most common and reoccurring occupations for each field at each level, which can give an indication as to whether or not there is a relation.

3) The third method used was to then to take the sorted data and self-determine the relatedness of the Major Field of Study and Occupations by manually looking through Statistics Canada's classification system and determining the relatedness by use of commonsense.

4) The last method was to use a career linking service website such as the Job Futures website offered by the Government of Canada . On this site you can select what you want to be (which is linked to the National Occupational Classification system) and then it will tell you what major field of study (taking from the Major Field of Study Classification) required for the particular occupation (or vice versa). The site also gives interesting statistics and expected earnings and unemployment levels.

Table 4
List of Variables

Education Variables
Total Years of Schooling:
This variable represents the sum of an individuals total schooling and in this paper only includes individuals with 13 years of schooling or more. This variable is used to estimate an individual's years of work experience, which is calculated as: $EXP_i = AGE_i - TOTSCH_{Pi} - 6$
Highest Degree, Certificate or Diploma (DGREE):
Only individuals who have completed the following levels of post-secondary schooling were included: College (OBTCDIPL), University Certificate (OBTANUCT), Bachelor's Degree (OBTAINBA), University Certificate greater than a Bachelor's (OBTCTABA), Medical Degree (OBTAINMD), Master's Degree (OBTAINMA) and PHd Degrees (OBTANPHD).
School Attendance:
Only individuals who were reported as not attending school were included. This is to give a better reflection of the expected returns to education and allows for the individuals to have completed their studies and be in the labour force.

Geographic Variables
Province:
Contains all provinces and territories which have then been converted into regions. The regions used are defined as: Atlantic (NL, PE, NS, NB), Quebec, Ontario, Western (MN, SA, AB), Pacific (BC) and Territories (NT, YT, NU).
Census Metropolitan Area:
as defined by Statistics Canada

Family Variables
Legal Marital Status (MARRIED):
as defined by Statistics Canada
Presence and combination of children at home (CHILD):
as defined by Statistics Canada
Sex:
as defined by Statistics Canada

Labour Variables
Labour Force Activity (LFSTAT):
This variable classifies the individual as either employed, unemployed or not in the labour force as of the Census reference date. This paper only considers those individuals who were classified as active in the Labour Force a week before the Census reference date (either employed or unemployed).
Full-time or Part-time:
In this paper only individuals who worked "mainly full-time" or at least 30 hours or more in a week in 2000 were included.
Weeks Worked in 2000 (WKSWKD):
Only individuals who worked a minimum of 30 weeks or more in 2000 are included. The reasoning to focus on individuals who work mainly full-time for most of the year is to concentrate on individuals who were not in between jobs
Occupation, NOC 2001:
There are 25 broad occupational categories in the Census PUMF. They were determined based on the main activities the inidviduals were doing in their job during the week prior to the Census reference date. The occupations were then classified according to Statistics Canada's National Occupation Classification for Statistics. The National Occupation Classification (NOC-S) is comprised of 10 broad occupational categories with 47 major groups that are further subdivided into 140 minor groups which contain approximately 520 detailed occupations. It should be noted that in the Census PUMF only the aggregagted (or broadest) occupational categories are provided in an effort to protect the privacy of individuals. The occupational categories are as follows:

- Senior management
- Other management
- Professional business and finance
- Financial, secretarial,administrative
- Clerical occs/supervisors
- Natural and applied sciences
- Prof health,registered nurses,supervisors
- Technical,assisting,related health occs
- Social science,government,religion
- Teachers and professors
- Art,culture,recreation,sport
- Wholesale,technical,insurance,real estate
- Retail trade
- Chefs and cooks, etc
- Protective services
- Childcare and home support workers
- Travel,accommodation,recreation, sport
- Trades and transportation
- Construction trades
- Other trades occupations
- Transport and equipment operators
- Trades helpers,labourers etc
- Occ unique to primary industries
- Manufacturing supervisors, operators, etc
- Manufacturing, utilities, etc labourers

Language Variables
Knowledge of Official Languages (KNOFFLAN):
Refers to the ability of an individual to converse in either english, french or both. The not available field has been dropped due to lack of information.
Language Used Most Often at Work (LGATWK):
This variable refers to the language used regularly at work at the time of the Census reference date. Only english, french, both and no official language were included. The multiple responses and not availabe fields were dropped due to lack of information.

Table 5
Post-Secondary Educational Attainment of the Labour Force in 2001
(proportion of the labour force ages 25 to 64 by highest level of education)

Country	Non-university Post-secondary		University Graduates		Total Post-Secondary	
	%	% (+/-) Average	%	% (+/-) Average	%	% (+/-) Average
Canada	**36**	**24**	**22**	**5**	**58**	**29**
Ireland	25	13	17	-	42	13
United States	10	-2	31	14	41	12
New Zealand	23	11	15	-2	38	9
Iceland	16	4	20	3	36	7
Finland	19	7	17	-	36	7
Japan	14	2	22	5	36	7
Switzerland	18	6	17	-	35	6
Belgium	19	7	15	-2	34	5
Norway	6	-6	28	11	34	5
Sweden	15	3	18	1	33	4
Australia	11	-1	22	5	33	4
Netherlands	8	-4	24	7	32	3
Germany	16	4	16	-1	32	3
Denmark	22	10	9	-8	31	2
United Kingdom	9	-3	20	3	29	-
Spain	8	-4	21	4	29	-
Greece	13	1	16	-1	29	-
France	13	1	13	-4	26	-3
Korea	7	-5	19	2	26	-3
Luxembourg	11	-1	14	-3	25	-4
Austria1	16	4	8	-9	24	-5
Hungary	6	-6	18	1	24	-5
Mexico	2	-10	17	-	19	-10
Poland	4	-8	14	-3	18	-11
Italy	2	-10	13	-4	15	-14
Czech Republic	-	-12	13	-4	13	-16
Slovak Republic	1	-11	12	-5	13	-16
Turkey	-	-12	12	-5	12	-17
Portugal	3	-9	8	-9	11	-18
OECD Average	**12**	**-**	**17**	**-**	**29**	**-**

Source: OECD 2002

Summary Statistics

Table 6
Summary of Males and Females by Level of Post-Secondary Education in Canada, 2001

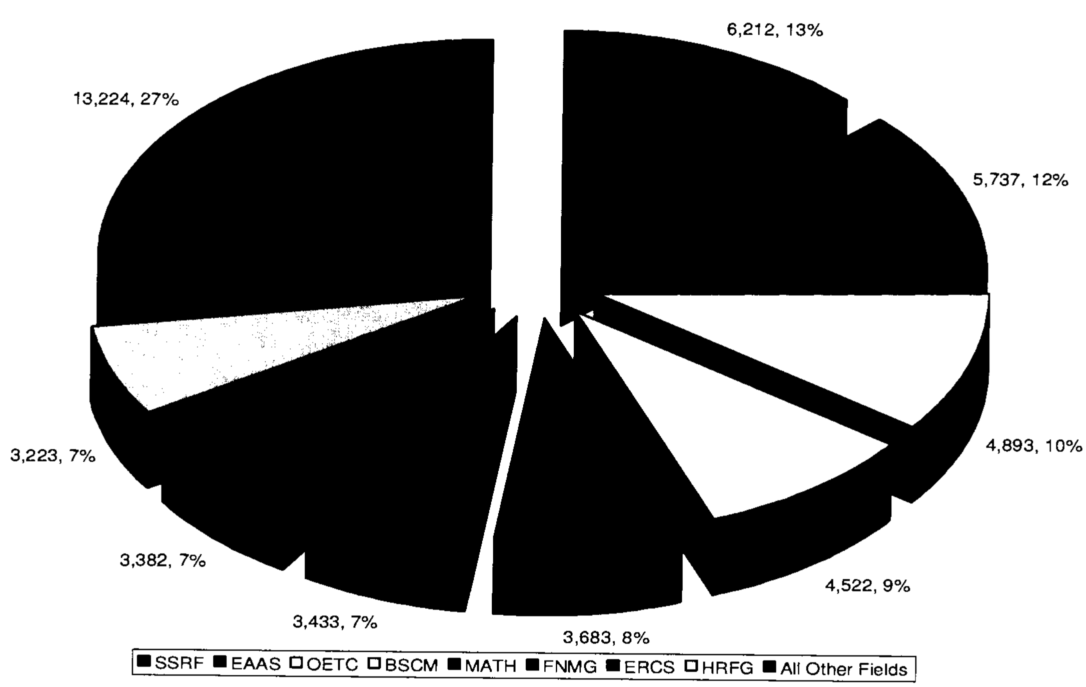
Level of Post-Secondary	Females	% Total Included	Males	% Total Included	Total Included	Total Excluded	Overall Total
College certificate/diploma	18,327	49%	19,047	51%	37,374	-	37,374
University certificate/diploma <bachelor level	2,810	51%	2,669	49%	5,479	-	5,479
University degree: Bachelors degree	14,197	45%	17,164	55%	31,361	3	31,364
University degree: certificate >bachelor level	2,244	50%	2,260	50%	4,504	-	4,504
University degree: Medical degree	514	33%	1,058	67%	1,572	5	1,577
University degree: Masters degree	3,154	39%	4,967	61%	8,121	4	8,125
University degree: Earned doctorate	443	28%	1,144	72%	1,587	13	1,600
Total	**41,689**		**48,309**		**89,998**	**25**	**90,023**

Males and Females	Included	Excluded	Overall Total
Females	41,689	7	41,696
Males	48,309	18	48,327
Total	**89,998**	**25**	**90,023**

% Females	46.3%
% Males	53.7%
Male-Female Ratio	1.2

Source: Author's Calculations, 2001 Canadian Census

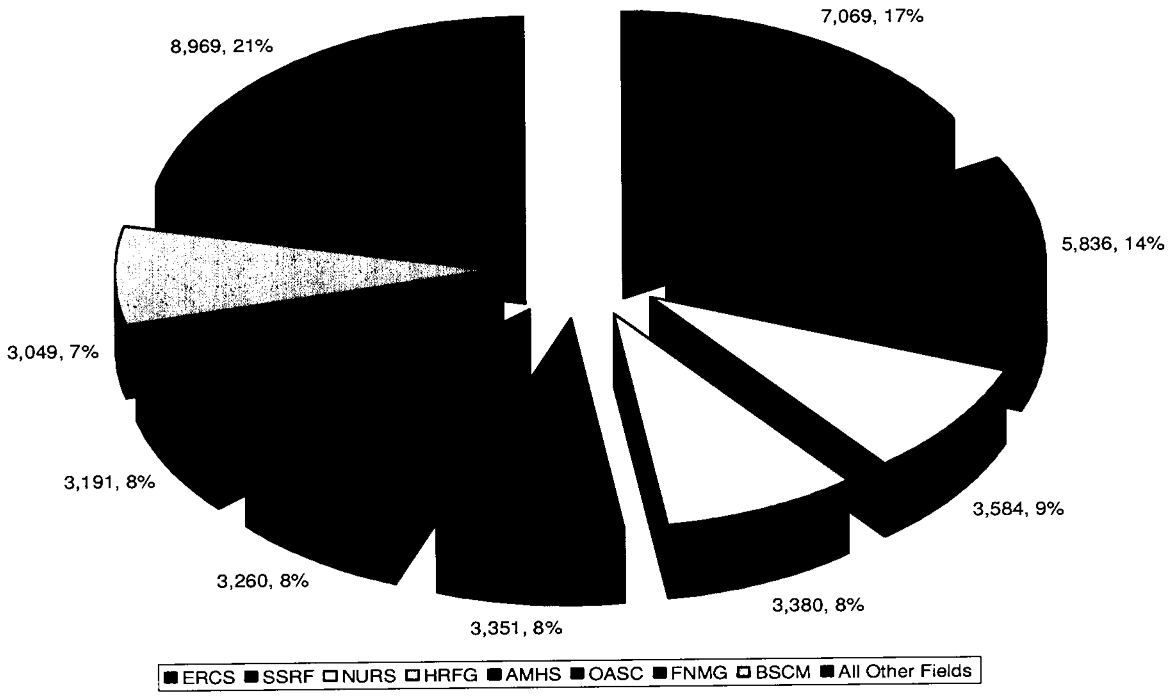
Figure 1
Occupational Distribution for Males;
by All Fields and All Levels of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

Note: see table on page 31 for definitions of field abbreviations

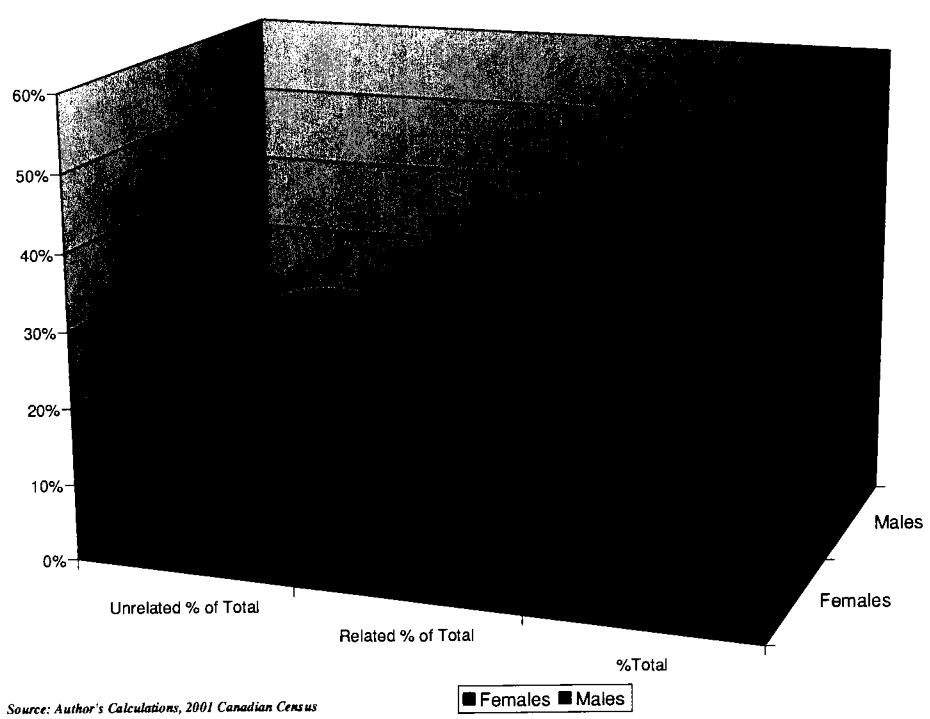
Figure 2
Occupational Distribution for Females;
by All Fields and All Levels of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

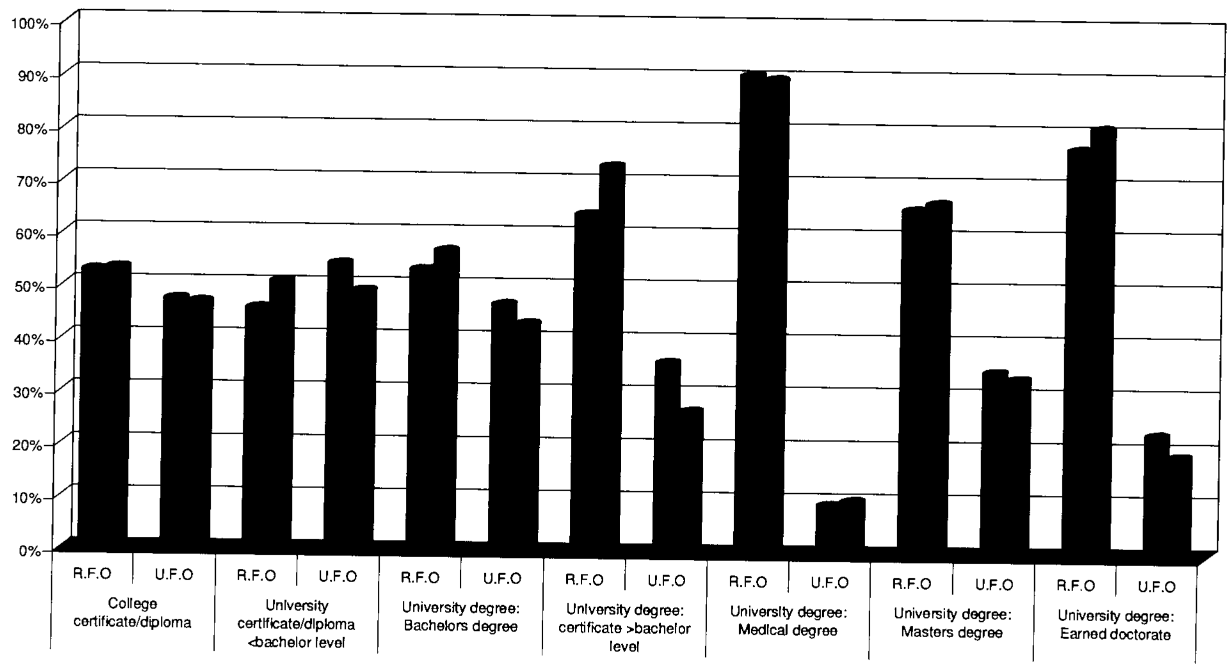
Note: see table on page 31 for definitions of field abbreviations

Figure 3
Proportion of Related and Unrelated Field-Occupations to Overall Total;
for Males and Females in All Levels of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

Figure 4
Proportion of Related and Unrelated Field-Occupations by Level of Post-Secondary Education; For Males and Females by Major Field of Study In Canada, 2001

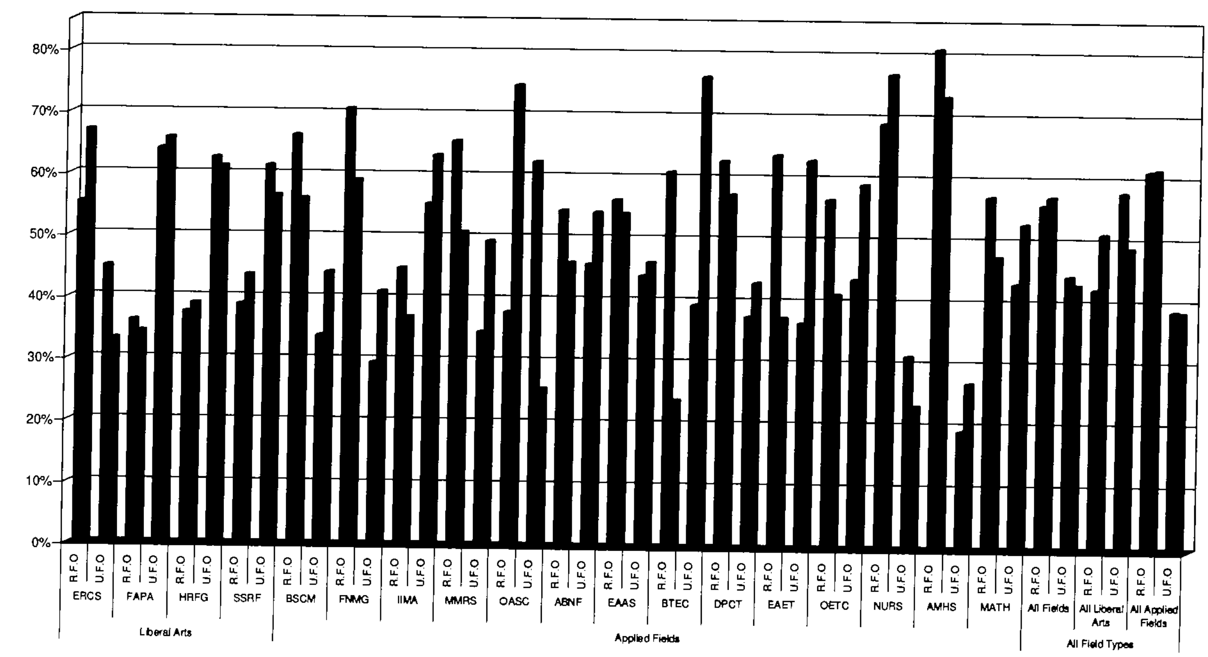


Source: Author's Calculations, 2001 Canadian Census

■ Male ■ Female

Note: R.F.O = Related Field-Occupation & U.F.O = Unrelated Field-Occupation

Figure 5
Proportion of Related and Unrelated Field-Occupations To Field Totals; For Males and Females by Major Field of Study In Canada, 2001

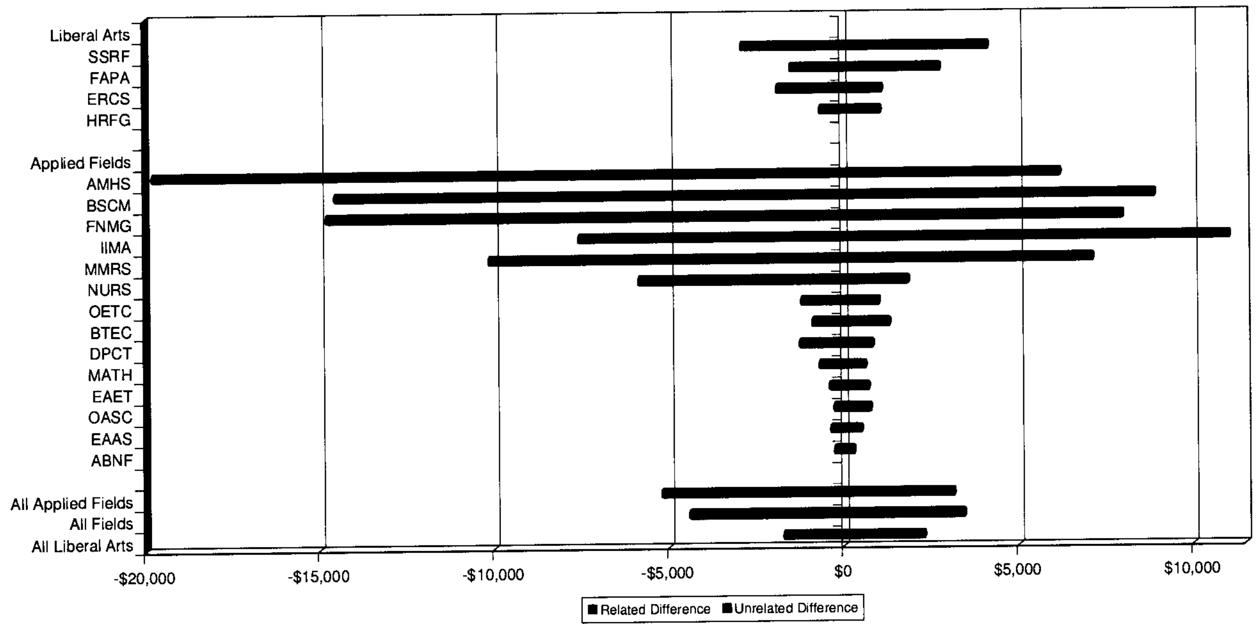


Source: Author's Calculations, 2001 Canadian Census

■ Male ■ Female

Note: see table on page 31 for definitions of field abbreviations
R.F.O = Related Field-Occupation &
U.F.O = Unrelated Field-Occupation

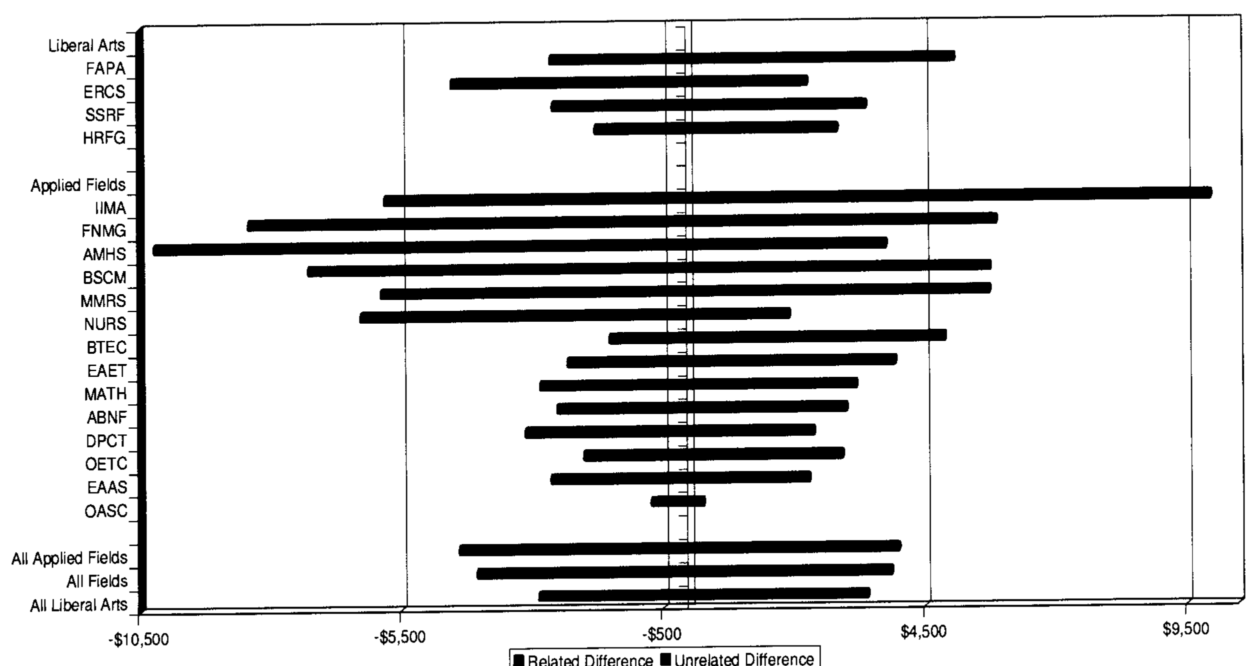
Figure 6
Average Related and Unrelated Earnings Differentials For Both Males and Females; by Each Field and All Levels of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

Note: see table on page 31 for definitions of field abbreviations

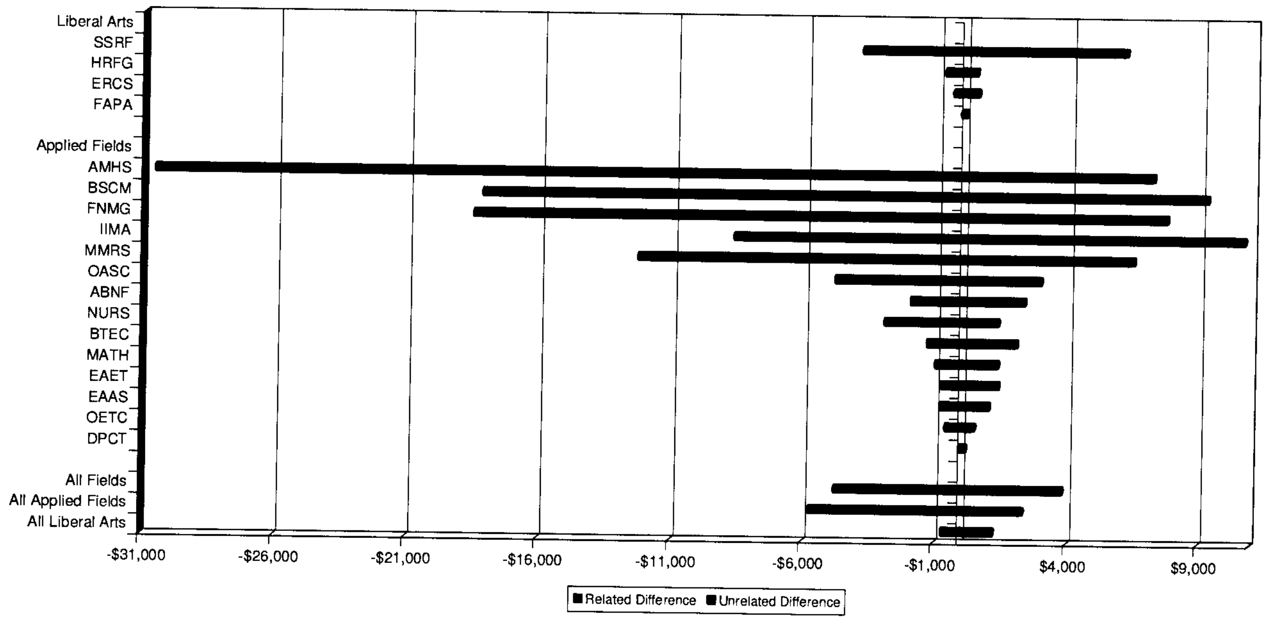
Figure 7
Average Related and Unrelated Earnings Differentials For Females; by Each Field and All Levels of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

Note: see table on page 31 for definitions of field abbreviations

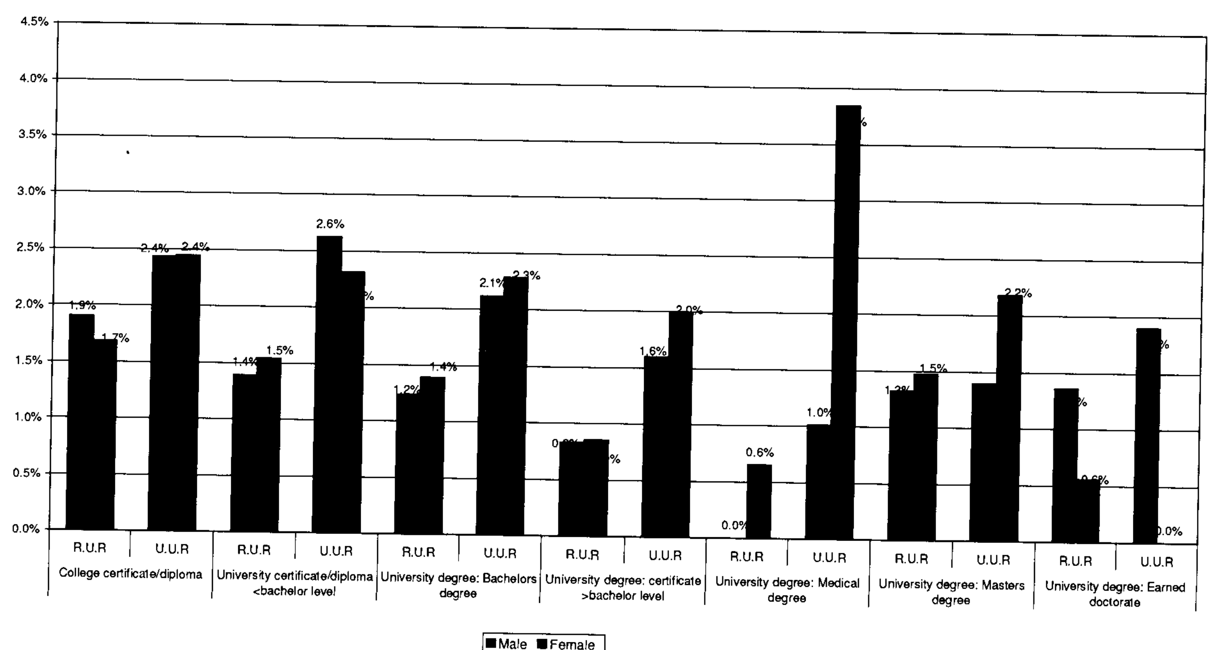
Figure 8
Average Related and Unrelated Earnings Differentials For Males; by Each Field and All Levels of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

Note: see table on page 31 for definitions of field abbreviations

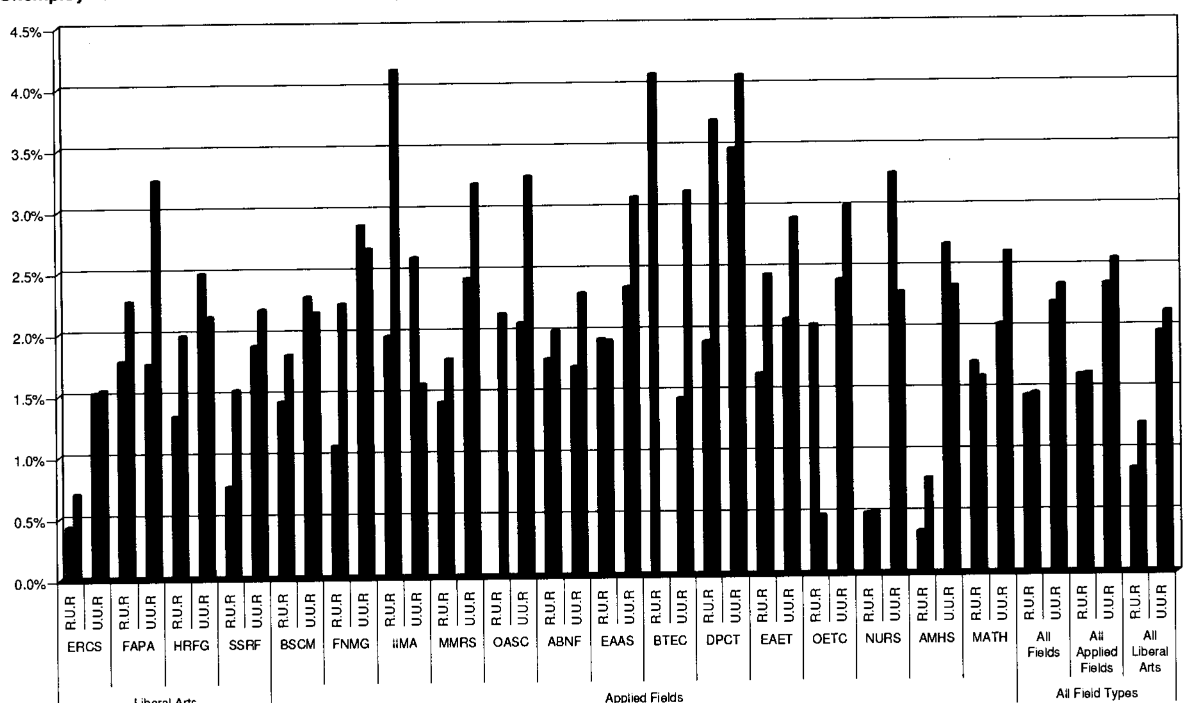
Figure 9
Unemployment Rates for Males and Females by Level of Post-Secondary Education in Canada, 2001



Source: Author's Calculations, 2001 Canadian Census

Note: R.U.R = Related Field-Occupation Unemployment Rate & U.U.R = Unrelated Field-Occupation Unemployment Rate

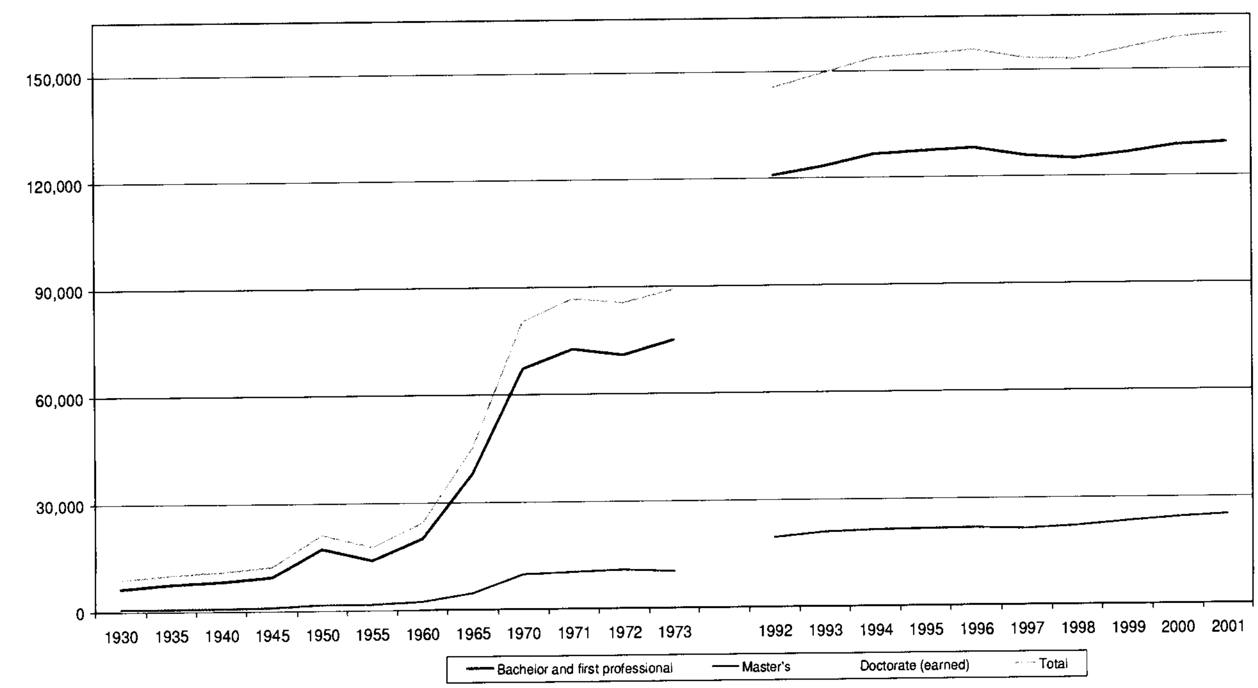
Figure 10
Unemployment Rates for Males and Females by Major Field of Study in Canada, 2001



Note: see table on page 31 for definitions of field abbreviations
R.U.R = Related Unemployment Rate &
U.U.R = Unrelated Unemployment Rate

Source: Author's Calculations, 2001 Canadian Census

Figure 11
Total University Degrees Earned in Canada, for both Males and Females, Between 1930-2001



note: data unavailable between 1973-1991

source: Statistics Canada, Series W504-512 (1930-1973) & CANSIM 4770014 (1992-2001)

Regression Results

```
Model 1
Both Females and Males
All Levels of Post-Secondary

OLS ESTIMATION
    89998 OBSERVATIONS     DEPENDENT VARIABLE= LNWAGE
 ...NOTE..SAMPLE RANGE SET TO:      1,  93618

  R-SQUARE =    0.0562     R-SQUARE ADJUSTED =    0.0560
 VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.30241
 STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.54992
 SUM OF SQUARED ERRORS-SSE=   27211.
 MEAN OF DEPENDENT VARIABLE =   6.7731
 LOG OF THE LIKELIHOOD FUNCTION = -73874.7

 MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
  AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.30247
     (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
  AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  -1.1958
  SCHWARZ (1978) CRITERION - LOG SC =              -1.1939
 MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
  CRAVEN-WAHBA (1979)
     GENERALIZED CROSS VALIDATION - GCV =          0.30247
  HANNAN AND QUINN (1979) CRITERION =              0.30264
  RICE (1984) CRITERION =                          0.30247
  SHIBATA (1981) CRITERION =                       0.30247
  SCHWARZ (1978) CRITERION - SC =                  0.30304
  AKAIKE (1974) INFORMATION CRITERION - AIC =      0.30247
```

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	1620.4	17.	95.320	315.205
ERROR	27211.	89980.	0.30241	P-VALUE
TOTAL	28831.	89997.	0.32036	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.41302E+07	18.	0.22946E+06	758765.584
ERROR	27211.	89980.	0.30241	P-VALUE
TOTAL	0.41574E+07	89998.	46.195	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 89980 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
FAPA	-0.23897	0.1170E-01	-20.42	0.000	-0.068	-0.0733	-0.0011
HRFG	-0.54632E-01	0.8645E-02	-6.320	0.000	-0.021	-0.0252	-0.0006
SSRF	0.70598E-01	0.7351E-02	9.604	0.000	0.032	0.0425	0.0014
BSCM	0.13389	0.8299E-02	16.13	0.000	0.054	0.0657	0.0017
FNMG	0.61573E-01	0.8636E-02	7.129	0.000	0.024	0.0284	0.0007
IIMA	0.57533E-02	0.1212E-01	0.4748	0.635	0.002	0.0017	0.0000
MMRS	0.40728E-01	0.1352E-01	3.011	0.003	0.010	0.0105	0.0001
OASC	-0.34164	0.1084E-01	-31.52	0.000	-0.105	-0.1153	-0.0019
ABNF	-0.79638E-01	0.1050E-01	-7.582	0.000	-0.025	-0.0280	-0.0005
EAAS	0.28556	0.8682E-02	32.89	0.000	0.109	0.1307	0.0031
BTEC	-0.60872E-02	0.1883E-01	-0.3233	0.746	-0.001	-0.0011	0.0000
DPCT	-0.12844E-02	0.1196E-01	-0.1074	0.914	0.000	-0.0004	0.0000
EAET	0.13200	0.1283E-01	10.28	0.000	0.034	0.0362	0.0005
OETC	0.73413E-01	0.9215E-02	7.967	0.000	0.027	0.0308	0.0007
NURS	-0.18333E-02	0.1034E-01	-0.1773	0.859	-0.001	-0.0007	0.0000
AMHS	0.17401	0.9159E-02	19.00	0.000	0.063	0.0737	0.0016
MATH	0.22269	0.9370E-02	23.76	0.000	0.079	0.0913	0.0019
CONSTANT	6.7229	0.5379E-02	1250.	0.000	0.972	0.0000	0.9926

Model 1
Females Only
All Levels of Post-Secondary

```
 OLS ESTIMATION
    41689 OBSERVATIONS     DEPENDENT VARIABLE= LNWAGE
...NOTE..SAMPLE RANGE SET TO:      1,  93618

 R-SQUARE =   0.0384     R-SQUARE ADJUSTED =   0.0380
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.24205
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.49199
SUM OF SQUARED ERRORS-SSE=   10087.
MEAN OF DEPENDENT VARIABLE =   6.6146
LOG OF THE LIKELIHOOD FUNCTION = -29575.3

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.24216
    (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  -1.4182
 SCHWARZ (1978) CRITERION - LOG SC =              -1.4144
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
 CRAVEN-WAHBA (1979)
    GENERALIZED CROSS VALIDATION - GCV =           0.24216
 HANNAN AND QUINN (1979) CRITERION =               0.24244
 RICE (1984) CRITERION =                           0.24216
 SHIBATA (1981) CRITERION =                        0.24216
 SCHWARZ (1978) CRITERION - SC =                   0.24306
 AKAIKE (1974) INFORMATION CRITERION - AIC =       0.24216
```

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	402.95	17.	23.703	97.925
ERROR	10087.	41671.	0.24205	P-VALUE
TOTAL	10490.	41688.	0.25162	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.18244E+07	18.	0.10136E+06	418737.448
ERROR	10087.	41671.	0.24205	P-VALUE
TOTAL	0.18345E+07	41689.	44.005	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 41671 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
FAPA	-0.24537	0.1381E-01	-17.77	0.000	-0.087	-0.0925	-0.0014
HRFG	-0.50526E-01	0.1029E-01	-4.911	0.000	-0.024	-0.0275	-0.0006
SSRF	-0.27245E-01	0.8702E-02	-3.131	0.002	-0.015	-0.0188	-0.0006
BSCM	-0.93998E-02	0.1066E-01	-0.8818	0.378	-0.004	-0.0049	-0.0001
FNMG	-0.79730E-01	0.1049E-01	-7.599	0.000	-0.037	-0.0423	-0.0009
IIMA	-0.51432E-01	0.1479E-01	-3.478	0.001	-0.017	-0.0179	-0.0002
MMRS	-0.21780E-01	0.1751E-01	-1.244	0.213	-0.006	-0.0063	-0.0001
OASC	-0.29333	0.1042E-01	-28.16	0.000	-0.137	-0.1570	-0.0035
ABNF	-0.11558	0.1388E-01	-8.325	0.000	-0.041	-0.0433	-0.0006
EAAS	0.59174E-01	0.1862E-01	3.179	0.001	0.016	0.0159	0.0002
BTEC	-0.21658	0.7614E-01	-2.844	0.004	-0.014	-0.0137	0.0000
DPCT	-0.95392E-01	0.1832E-01	-5.207	0.000	-0.025	-0.0261	-0.0003
EAET	-0.46207E-01	0.4727E-01	-0.9775	0.328	-0.005	-0.0047	0.0000
OETC	-0.15777	0.2258E-01	-6.988	0.000	-0.034	-0.0345	-0.0003
NURS	0.55227E-01	0.1009E-01	5.474	0.000	0.027	0.0309	0.0007
AMHS	0.21371E-01	0.1032E-01	2.071	0.038	0.010	0.0116	0.0003
MATH	0.11825	0.1417E-01	8.346	0.000	0.041	0.0432	0.0006
CONSTANT	6.6601	0.5852E-02	1138.	0.000	0.984	0.0000	1.0069

Model 1
Males Only
All Levels of Post-Secondary

OLS ESTIMATION
89998 OBSERVATIONS DEPENDENT VARIABLE= LNWAGE
...NOTE..SAMPLE RANGE SET TO: 1, 93618

R-SQUARE = 0.0562 R-SQUARE ADJUSTED = 0.0560
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.30241
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.54992
SUM OF SQUARED ERRORS-SSE= 27211.
MEAN OF DEPENDENT VARIABLE = 6.7731
LOG OF THE LIKELIHOOD FUNCTION = -73874.7

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
AKAIKE (1969) FINAL PREDICTION ERROR - FPE = 0.30247
(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -1.1958
SCHWARZ (1978) CRITERION - LOG SC = -1.1939
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
CRAVEN-WAHBA (1979)
GENERALIZED CROSS VALIDATION - GCV = 0.30247
HANNAN AND QUINN (1979) CRITERION = 0.30264
RICE (1984) CRITERION = 0.30247
SHIBATA (1981) CRITERION = 0.30247
SCHWARZ (1978) CRITERION - SC = 0.30304
AKAIKE (1974) INFORMATION CRITERION - AIC = 0.30247

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	1620.4	17.	95.320	315.205
ERROR	27211.	89980.	0.30241	P-VALUE
TOTAL	28831.	89997.	0.32036	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.41302E+07	18.	0.22946E+06	758765.584
ERROR	27211.	89980.	0.30241	P-VALUE
TOTAL	0.41574E+07	89998.	46.195	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 89980 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
FAPA	-0.23897	0.1170E-01	-20.42	0.000	-0.068	-0.0733	-0.0011
HRFG	-0.54632E-01	0.8645E-02	-6.320	0.000	-0.021	-0.0252	-0.0006
SSRF	0.70598E-01	0.7351E-02	9.604	0.000	0.032	0.0425	0.0014
BSCM	0.13389	0.8299E-02	16.13	0.000	0.054	0.0657	0.0017
FNMG	0.61573E-01	0.8636E-02	7.129	0.000	0.024	0.0284	0.0007
IIMA	0.57533E-02	0.1212E-01	0.4748	0.635	0.002	0.0017	0.0000
MMRS	0.40728E-01	0.1352E-01	3.011	0.003	0.010	0.0105	0.0001
OASC	-0.34164	0.1084E-01	-31.52	0.000	-0.105	-0.1153	-0.0019
ABNF	-0.79638E-01	0.1050E-01	-7.582	0.000	-0.025	-0.0280	-0.0005
EAAS	0.28556	0.8682E-02	32.89	0.000	0.109	0.1307	0.0031
BTEC	-0.60872E-02	0.1883E-01	-0.3233	0.746	-0.001	-0.0011	0.0000
DPCT	-0.12844E-02	0.1196E-01	-0.1074	0.914	0.000	-0.0004	0.0000
EAET	0.13200	0.1283E-01	10.28	0.000	0.034	0.0362	0.0005
OETC	0.73413E-01	0.9215E-02	7.967	0.000	0.027	0.0308	0.0007
NURS	-0.18333E-02	0.1034E-01	-0.1773	0.859	-0.001	-0.0007	0.0000
AMHS	0.17401	0.9159E-02	19.00	0.000	0.063	0.0737	0.0016
MATH	0.22269	0.9370E-02	23.76	0.000	0.079	0.0913	0.0019
CONSTANT	6.7229	0.5379E-02	1250.	0.000	0.972	0.0000	0.9926

Model 2
Both Males and Females
All Levels of Post-Secondary

OLS ESTIMATION
89998 OBSERVATIONS   DEPENDENT VARIABLE= LNWAGE
...NOTE..SAMPLE RANGE SET TO: 1,   93618

R-SQUARE =   0.1825   R-SQUARE ADJUSTED =   0.1823
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.26195
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.51181
SUM OF SQUARED ERRORS-SSE=   23569.
MEAN OF DEPENDENT VARIABLE =   6.7731
LOG OF THE LIKELIHOOD FUNCTION = -67408.6

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
AKAIKE (1969) FINAL PREDICTION ERROR - FPE =   0.26203
(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -1.3393
SCHWARZ (1978) CRITERION - LOG SC =   -1.3366
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
CRAVEN-WAHBA (1979)
GENERALIZED CROSS VALIDATION - GCV =   0.26203
HANNAN AND QUINN (1979) CRITERION =   0.26225
RICE (1984) CRITERION =   0.26203
SHIBATA (1981) CRITERION =   0.26203
SCHWARZ (1978) CRITERION - SC =   0.26274
AKAIKE (1974) INFORMATION CRITERION - AIC =   0.26203

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	5262.6	25.	210.50	803.587
ERROR	23569.	89972.	0.26195	P-VALUE
TOTAL	28831.	89997.	0.32036	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.41339E+07	26.	0.15899E+06	606956.323
ERROR	23569.	89972.	0.26195	P-VALUE
TOTAL	0.41574E+07	89998.	46.195	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 89972 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
EXP	0.35553E-01	0.8188E-03	43.42	0.000	0.143	0.5414	0.0904
EXP2	-0.67470E-03	0.2300E-04	-29.33	0.000	-0.097	-0.3655	-0.0370
OBTANUCT	0.63597E-01	0.7731E-02	8.227	0.000	0.027	0.0269	0.0006
OBTAINBA	0.30551	0.4756E-02	64.23	0.000	0.209	0.2572	0.0157
OBTCTABA	0.38926	0.8571E-02	45.42	0.000	0.150	0.1500	0.0029
OBTAINMD	0.88140	0.1466E-01	60.13	0.000	0.197	0.2040	0.0023
OBTAINMA	0.47545	0.6838E-02	69.53	0.000	0.226	0.2407	0.0063
OBTANPHD	0.52490	0.1353E-01	38.79	0.000	0.128	0.1221	0.0014
FAPA	-0.87483E-01	0.1106E-01	-7.911	0.000	-0.026	-0.0268	-0.0004
HRFG	-0.36233E-01	0.8082E-02	-4.483	0.000	-0.015	-0.0167	-0.0004
SSRF	0.95963E-01	0.6892E-02	13.92	0.000	0.046	0.0577	0.0019
BSCM	0.20456	0.7823E-02	26.15	0.000	0.087	0.1003	0.0025
FNMG	0.16175	0.8148E-02	19.85	0.000	0.066	0.0746	0.0018
IIMA	0.13913	0.1142E-01	12.18	0.000	0.041	0.0409	0.0006
MMRS	0.22413	0.1278E-01	17.54	0.000	0.058	0.0579	0.0007
OASC	-0.10430	0.1064E-01	-9.799	0.000	-0.033	-0.0352	-0.0006
ABNF	-0.38124E-01	0.9876E-02	-3.860	0.000	-0.013	-0.0134	-0.0002
EAAS	0.25303	0.8156E-02	31.02	0.000	0.103	0.1158	0.0027
BTEC	0.23663	0.1789E-01	13.23	0.000	0.044	0.0423	0.0004
DPCT	0.27549	0.1171E-01	23.52	0.000	0.078	0.0823	0.0012
EAET	0.37238	0.1247E-01	29.85	0.000	0.099	0.1022	0.0014
OETC	0.32121	0.9262E-02	34.68	0.000	0.115	0.1348	0.0028
NURS	0.14214	0.9854E-02	14.42	0.000	0.048	0.0510	0.0009
AMHS	0.12221	0.9382E-02	13.03	0.000	0.043	0.0517	0.0011
MATH	0.20258	0.8807E-02	23.00	0.000	0.076	0.0830	0.0017
CONSTANT	6.0911	0.8784E-02	693.4	0.000	0.918	0.0000	0.8993

Model 2
Females Only
All Levels of Post-Secondary

OLS ESTIMATION
41689 OBSERVATIONS DEPENDENT VARIABLE= LNWAGE
...NOTE..SAMPLE RANGE SET TO: 1, 93618

R-SQUARE = 0.1769 R-SQUARE ADJUSTED = 0.1764
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.20724
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.45523
SUM OF SQUARED ERRORS-SSE= 8634.1
MEAN OF DEPENDENT VARIABLE = 6.6146
LOG OF THE LIKELIHOOD FUNCTION = -26334.1

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
AKAIKE (1969) FINAL PREDICTION ERROR - FPE = 0.20737
(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -1.5733
SCHWARZ (1978) CRITERION - LOG SC = -1.5679
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
CRAVEN-WAHBA (1979)
GENERALIZED CROSS VALIDATION - GCV = 0.20737
HANNAN AND QUINN (1979) CRITERION = 0.20772
RICE (1984) CRITERION = 0.20737
SHIBATA (1981) CRITERION = 0.20737
SCHWARZ (1978) CRITERION - SC = 0.20849
AKAIKE (1974) INFORMATION CRITERION - AIC = 0.20737

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	1855.5	25.	74.220	358.139
ERROR	8634.1	41663.	0.20724	P-VALUE
TOTAL	10490.	41688.	0.25162	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.18259E+07	26.	70226.	338869.429
ERROR	8634.1	41663.	0.20724	P-VALUE
TOTAL	0.18345E+07	41689.	44.005	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 41663 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
EXP	0.28518E-01	0.1034E-02	27.58	0.000	0.134	0.5005	0.0731
EXP2	-0.54289E-03	0.2931E-04	-18.52	0.000	-0.090	-0.3357	-0.0299
OBTANUCT	0.82711E-01	0.9445E-02	8.757	0.000	0.043	0.0413	0.0008
OBTAINBA	0.30551	0.5864E-02	52.10	0.000	0.247	0.2886	0.0157
OBTCTABA	0.42103	0.1074E-01	39.22	0.000	0.189	0.1894	0.0034
OBTAINMD	0.75037	0.2137E-01	35.11	0.000	0.170	0.1651	0.0014
OBTAINMA	0.50634	0.9286E-02	54.53	0.000	0.258	0.2669	0.0058
OBTANPHD	0.58014	0.2220E-01	26.13	0.000	0.127	0.1186	0.0009
FAPA	-0.10090	0.1298E-01	-7.772	0.000	-0.038	-0.0380	-0.0006
HRFG	-0.47678E-01	0.9567E-02	-4.984	0.000	-0.024	-0.0259	-0.0006
SSRF	-0.13065E-02	0.8142E-02	-0.1605	0.873	-0.001	-0.0009	0.0000
BSCM	0.91122E-01	0.1004E-01	9.074	0.000	0.044	0.0473	0.0010
FNMG	0.58686E-01	0.9961E-02	5.892	0.000	0.029	0.0311	0.0007
IIMA	0.89298E-01	0.1388E-01	6.434	0.000	0.032	0.0311	0.0004
MMRS	0.16143	0.1644E-01	9.821	0.000	0.048	0.0465	0.0005
OASC	-0.59023E-01	0.1044E-01	-5.655	0.000	-0.028	-0.0316	-0.0007
ABNF	-0.87932E-01	0.1296E-01	-6.786	0.000	-0.033	-0.0329	-0.0005
EAAS	0.39023E-01	0.1734E-01	2.250	0.024	0.011	0.0105	0.0001
BTEC	0.28396E-01	0.7058E-01	0.4023	0.687	0.002	0.0018	0.0000
DPCT	0.15752	0.1749E-01	9.007	0.000	0.044	0.0432	0.0005
EAET	0.19592	0.4395E-01	4.458	0.000	0.022	0.0200	0.0001
OETC	0.99862E-01	0.2130E-01	4.689	0.000	0.023	0.0219	0.0002
NURS	0.19290	0.9660E-02	19.97	0.000	0.097	0.1078	0.0025
AMHS	0.86641E-01	0.1017E-01	8.520	0.000	0.042	0.0470	0.0011
MATH	0.11470	0.1317E-01	8.706	0.000	0.043	0.0420	0.0006
CONSTANT	6.1085	0.1047E-01	583.7	0.000	0.944	0.0000	0.9235

Model 2
Males Only
All Levels of Post-Secondary

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OLS ESTIMATION
    48309 OBSERVATIONS     DEPENDENT VARIABLE= LNWAGE
 ...NOTE..SAMPLE RANGE SET TO:      1,  93618

  R-SQUARE =   0.1501     R-SQUARE ADJUSTED =   0.1496
 VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.28854
 STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.53716
 SUM OF SQUARED ERRORS-SSE=   13932.
 MEAN OF DEPENDENT VARIABLE =   6.9098
 LOG OF THE LIKELIHOOD FUNCTION = -38512.6

 MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
  AKAIKE (1969) FINAL PREDICTION ERROR - FPE =     0.28870
     (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
  AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  -1.2424
  SCHWARZ (1978) CRITERION - LOG SC =              -1.2376
 MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
  CRAVEN-WAHBA (1979)
     GENERALIZED CROSS VALIDATION - GCV =          0.28870
  HANNAN AND QUINN (1979) CRITERION =              0.28913
  RICE (1984) CRITERION =                          0.28870
  SHIBATA (1981) CRITERION =                       0.28870
  SCHWARZ (1978) CRITERION - SC =                  0.29007
  AKAIKE (1974) INFORMATION CRITERION - AIC =      0.28870
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ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	2460.2	25.	98.408	341.052
ERROR	13932.	48283.	0.28854	P-VALUE
TOTAL	16392.	48308.	0.33932	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.23090E+07	26.	88807.	307776.682
ERROR	13932.	48283.	0.28854	P-VALUE
TOTAL	0.23229E+07	48309.	48.084	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 48283 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
EXP	0.39508E-01	0.1215E-02	32.51	0.000	0.146	0.5731	0.0999
EXP2	-0.76687E-03	0.3382E-04	-22.68	0.000	-0.103	-0.3993	-0.0418
OBTANUCT	0.20306E-01	0.1190E-01	1.706	0.088	0.008	0.0080	0.0002
OBTAINBA	0.25021	0.7357E-02	34.01	0.000	0.153	0.2056	0.0129
OBTCTABA	0.30177	0.1289E-01	23.41	0.000	0.106	0.1094	0.0020
OBTAINMD	0.77575	0.2120E-01	36.59	0.000	0.164	0.1949	0.0025
OBTAINMA	0.38722	0.9752E-02	39.71	0.000	0.178	0.2019	0.0058
OBTANPHD	0.41393	0.1723E-01	24.02	0.000	0.109	0.1080	0.0014
FAPA	-0.13829	0.1807E-01	-7.655	0.000	-0.035	-0.0377	-0.0005
HRFG	-0.81781E-01	0.1329E-01	-6.152	0.000	-0.028	-0.0350	-0.0008
SSRF	0.12386	0.1154E-01	10.73	0.000	0.049	0.0712	0.0023
BSCM	0.20332	0.1234E-01	16.48	0.000	0.075	0.1017	0.0028
FNMG	0.19147	0.1312E-01	14.59	0.000	0.066	0.0845	0.0020
IIMA	0.11650	0.1799E-01	6.476	0.000	0.029	0.0318	0.0004
MMRS	0.18402	0.1915E-01	9.609	0.000	0.044	0.0466	0.0006
OASC	0.36183E-01	0.4433E-01	0.8162	0.414	0.004	0.0035	0.0000
ABNF	-0.80612E-01	0.1494E-01	-5.395	0.000	-0.025	-0.0288	-0.0005
EAAS	0.19399	0.1172E-01	16.55	0.000	0.075	0.1077	0.0033
BTEC	0.93596E-01	0.2114E-01	4.428	0.000	0.020	0.0216	0.0002
DPCT	0.19847	0.1669E-01	11.89	0.000	0.054	0.0654	0.0011
EAET	0.22879	0.1606E-01	14.25	0.000	0.065	0.0804	0.0015
OETC	0.19598	0.1337E-01	14.66	0.000	0.067	0.1015	0.0029
NURS	0.96204E-01	0.3282E-01	2.931	0.003	0.013	0.0129	0.0001
AMHS	0.19310	0.1740E-01	11.09	0.000	0.050	0.0684	0.0012
MATH	0.16176	0.1291E-01	12.53	0.000	0.057	0.0737	0.0018
CONSTANT	6.2107	0.1451E-01	427.9	0.000	0.890	0.0000	0.8988

Model 3
Both Males and Females
All Levels of Post-Secondary

OLS ESTIMATION
89998 OBSERVATIONS   DEPENDENT VARIABLE= LNWAGE
...NOTE..SAMPLE RANGE SET TO: 1,   93618

R-SQUARE =   0.2626   R-SQUARE ADJUSTED =   0.2619
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.23646
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.48628
SUM OF SQUARED ERRORS-SSE=   21260.
MEAN OF DEPENDENT VARIABLE =   6.7731
LOG OF THE LIKELIHOOD FUNCTION = -62770.4

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
AKAIKE (1969) FINAL PREDICTION ERROR - FPE =   0.23670
(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -1.4410
SCHWARZ (1978) CRITERION - LOG SC =   -1.4317
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
CRAVEN-WAHBA (1979)
GENERALIZED CROSS VALIDATION - GCV =   0.23670
HANNAN AND QUINN (1979) CRITERION =   0.23737
RICE (1984) CRITERION =   0.23670
SHIBATA (1981) CRITERION =   0.23670
SCHWARZ (1978) CRITERION - SC =   0.23891
AKAIKE (1974) INFORMATION CRITERION - AIC =   0.23670

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	7570.8	88.	86.032	363.828
ERROR	21260.	89909.	0.23646	P-VALUE
TOTAL	28831.	89997.	0.32036	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.41362E+07	89.	46474.	196536.337
ERROR	21260.	89909.	0.23646	P-VALUE
TOTAL	0.41574E+07	89998.	46.195	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 89909 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
EXP	0.30956E-01	0.8251E-03	37.52	0.000	0.124	0.4714	0.0787
EXP2	-0.59034E-03	0.2268E-04	-26.03	0.000	-0.086	-0.3198	-0.0323
OBTANUCT	0.82608E-01	0.1056E-01	7.822	0.000	0.026	0.0349	0.0007
NRELUNCT	-0.57620E-01	0.1471E-01	-3.918	0.000	-0.013	-0.0178	-0.0003
OBTAINBA	0.27590	0.6447E-02	42.80	0.000	0.141	0.2323	0.0142
NRELUNBA	-0.57559E-01	0.9143E-02	-6.296	0.000	-0.021	-0.0370	-0.0013
OBTCTABA	0.33429	0.1040E-01	32.13	0.000	0.107	0.1288	0.0025
NRELABBA	-0.84442E-01	0.1733E-01	-4.873	0.000	-0.016	-0.0186	-0.0002
OBTAINMD	0.76778	0.1548E-01	49.60	0.000	0.163	0.1777	0.0020
NRELUNMD	-0.42768	0.4329E-01	-9.879	0.000	-0.033	-0.0309	-0.0001
OBTAINMA	0.38988	0.8582E-02	45.43	0.000	0.150	0.1974	0.0052
NRELUNMA	-0.23960E-01	0.1356E-01	-1.766	0.077	-0.006	-0.0073	-0.0001
OBTANPHD	0.40501	0.1509E-01	26.85	0.000	0.089	0.0942	0.0011
NRELUPHD	0.43339E-01	0.3065E-01	1.414	0.157	0.005	0.0047	0.0000
NRELERCS	-0.83967E-01	0.1195E-01	-7.027	0.000	-0.023	-0.0300	-0.0005
FAPA	-0.15414	0.1691E-01	-9.118	0.000	-0.030	-0.0473	-0.0007
NRELFAPA	-0.40293E-01	0.1964E-01	-2.052	0.040	-0.007	-0.0100	-0.0001
HRFG	-0.10849	0.1155E-01	-9.389	0.000	-0.031	-0.0500	-0.0012
NRELHRFG	-0.69090E-02	0.1402E-01	-0.4928	0.622	-0.002	-0.0025	0.0000
SSRF	0.81263E-01	0.9328E-02	8.711	0.000	0.029	0.0489	0.0016
NRELSSRF	-0.12210	0.1119E-01	-10.91	0.000	-0.036	-0.0581	-0.0014
BSCM	0.16711	0.9666E-02	17.29	0.000	0.058	0.0820	0.0021
NRELBSCM	-0.23476	0.1263E-01	-18.59	0.000	-0.062	-0.0729	-0.0011
FNMG	0.15192	0.9827E-02	15.46	0.000	0.051	0.0701	0.0017
NRELFNMG	-0.28067	0.1330E-01	-21.10	0.000	-0.070	-0.0786	-0.0011
IIMA	0.17486	0.1646E-01	10.62	0.000	0.035	0.0514	0.0007
NRELIIMA	-0.20081	0.2009E-01	-9.996	0.000	-0.033	-0.0457	-0.0005

MMRS	0.17459	0.1598E-01	10.92	0.000	0.036	0.0451	0.0006
NRELMMRS	-0.21210	0.2252E-01	-9.417	0.000	-0.031	-0.0354	-0.0003
OASC	-0.87737E-01	0.1261E-01	-6.960	0.000	-0.023	-0.0296	-0.0005
NRELOASC	-0.72447E-01	0.1873E-01	-3.868	0.000	-0.013	-0.0129	-0.0001
ABNF	-0.15379	0.1300E-01	-11.83	0.000	-0.039	-0.0541	-0.0009
NRELABNF	0.58480E-01	0.1690E-01	3.460	0.001	0.012	0.0146	0.0002
EAAS	0.91510E-01	0.1047E-01	8.744	0.000	0.029	0.0419	0.0010
NRELEAAS	-0.33649E-01	0.1456E-01	-2.310	0.021	-0.008	-0.0105	-0.0002
BTEC	0.28370E-01	0.2247E-01	1.263	0.207	0.004	0.0051	0.0000
NRELBTEC	-0.40208E-02	0.3247E-01	-0.1238	0.901	0.000	-0.0005	0.0000
DPCT	0.15707	0.1477E-01	10.63	0.000	0.035	0.0469	0.0007
NRELDPCT	-0.13761	0.1938E-01	-7.102	0.000	-0.024	-0.0259	-0.0002
EAET	0.17361	0.1564E-01	11.10	0.000	0.037	0.0476	0.0006
NRELEAET	-0.47819E-01	0.2127E-01	-2.248	0.025	-0.007	-0.0081	-0.0001
OETC	0.16050	0.1228E-01	13.07	0.000	0.044	0.0674	0.0014
NRELOETC	-0.88358E-01	0.1331E-01	-6.638	0.000	-0.022	-0.0253	-0.0004
NURS	0.20748	0.1134E-01	18.30	0.000	0.061	0.0744	0.0013
NRELNURS	-0.27440	0.1866E-01	-14.71	0.000	-0.049	-0.0488	-0.0004
AMHS	0.12240	0.1097E-01	11.16	0.000	0.037	0.0518	0.0011
NRELAMHS	-0.21893	0.1664E-01	-13.15	0.000	-0.044	-0.0463	-0.0005
MATH	0.69335E-01	0.1136E-01	6.106	0.000	0.020	0.0284	0.0006
NRELMATH	-0.13647E-01	0.1560E-01	-0.8751	0.382	-0.003	-0.0038	-0.0001
FEMALE	0.21697	0.3718E-02	58.36	0.000	0.191	0.1912	0.0172
ATL	-0.15111	0.9182E-02	-16.46	0.000	-0.055	-0.0650	-0.0014
QC	-0.71381E-01	0.1063E-01	-6.717	0.000	-0.022	-0.0539	-0.0025
WST	-0.73088E-01	0.9576E-02	-7.632	0.000	-0.025	-0.0463	-0.0016
PAC	-0.24677E-01	0.1024E-01	-2.410	0.016	-0.008	-0.0141	-0.0004
TWT	0.22507	0.3078E-01	7.312	0.000	0.024	0.0213	0.0001
HAL	-0.21805E-01	0.1659E-01	-1.314	0.189	-0.004	-0.0046	0.0000
QUE	-0.51170E-01	0.1273E-01	-4.020	0.000	-0.013	-0.0154	-0.0002
MON	-0.36225E-01	0.9897E-02	-3.660	0.000	-0.012	-0.0215	-0.0007
SHE	-0.99479E-01	0.1858E-01	-5.353	0.000	-0.018	-0.0172	-0.0001
OTT	0.17573E-01	0.8154E-02	2.155	0.031	0.007	0.0070	0.0001
OSH	0.24914E-01	0.1615E-01	1.543	0.123	0.005	0.0045	0.0000
HAM	-0.12411E-01	0.1126E-01	-1.102	0.270	-0.004	-0.0033	0.0000
NIA	-0.11718	0.1643E-01	-7.132	0.000	-0.024	-0.0209	-0.0002
KIT	-0.31328E-01	0.1407E-01	-2.226	0.026	-0.007	-0.0066	-0.0001
LON	-0.69144E-01	0.1363E-01	-5.071	0.000	-0.017	-0.0150	-0.0002
WIN	-0.13954E-03	0.1652E-01	-0.8447E-02	0.993	0.000	0.0000	0.0000
SUD	-0.65614E-01	0.1797E-01	-3.652	0.000	-0.012	-0.0107	-0.0001
WPG	-0.86015E-01	0.1478E-01	-5.821	0.000	-0.019	-0.0228	-0.0003
REG	-0.63984E-01	0.1729E-01	-3.700	0.000	-0.012	-0.0130	-0.0001
CAL	0.75967E-01	0.1296E-01	5.859	0.000	0.020	0.0267	0.0005
EDM	-0.26337E-01	0.1373E-01	-1.918	0.055	-0.006	-0.0081	-0.0001
VAN	-0.39831E-01	0.1240E-01	-3.212	0.001	-0.011	-0.0182	-0.0004
VIC	-0.91884E-01	0.1896E-01	-4.846	0.000	-0.016	-0.0168	-0.0001
NTA	-0.99505E-01	0.6592E-02	-15.09	0.000	-0.050	-0.0782	-0.0040
DSW	-0.32406E-01	0.5319E-02	-6.093	0.000	-0.020	-0.0187	-0.0006
SIG	-0.71526E-01	0.4642E-02	-15.41	0.000	-0.051	-0.0567	-0.0030
NOCHILD	-0.14098E-01	0.3986E-02	-3.537	0.000	-0.012	-0.0124	-0.0009
UEMP	-0.14153	0.1233E-01	-11.48	0.000	-0.038	-0.0333	-0.0004
WK3034	-0.39891E-02	0.1228E-01	-0.3248	0.745	-0.001	-0.0009	0.0000
WK3539	-0.24896E-01	0.1234E-01	-2.018	0.044	-0.007	-0.0058	-0.0001
WK4044	-0.54246E-01	0.8136E-02	-6.667	0.000	-0.022	-0.0193	-0.0003
WK4549	0.38835E-01	0.5182E-02	7.494	0.000	0.025	0.0218	0.0007
FO	-0.93012E-02	0.9543E-02	-0.9747	0.330	-0.003	-0.0042	-0.0001
BOTHFE	0.79286E-01	0.5454E-02	14.54	0.000	0.048	0.0627	0.0032
NEOF	-0.13393	0.5465E-01	-2.451	0.014	-0.008	-0.0072	0.0000
FRN	-0.24667E-01	0.8242E-02	-2.993	0.003	-0.010	-0.0176	-0.0008
NOL	-0.44638	0.2321E-01	-19.23	0.000	-0.064	-0.0570	-0.0003
EAF	-0.92796E-01	0.1445E-01	-6.421	0.000	-0.021	-0.0200	-0.0002
CONSTANT	6.2598	0.1149E-01	544.8	0.000	0.876	0.0000	0.9242

Model 3
Females Only
All Levels of Post-Secondary

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OLS ESTIMATION
     41689 OBSERVATIONS      DEPENDENT VARIABLE= LNWAGE
 ...NOTE..SAMPLE RANGE SET TO:       1,  93618

  R-SQUARE =    0.2413      R-SQUARE ADJUSTED =    0.2397
 VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.19131
 STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.43739
 SUM OF SQUARED ERRORS-SSE=   7958.8
 MEAN OF DEPENDENT VARIABLE =   6.6146
 LOG OF THE LIKELIHOOD FUNCTION = -24636.6

 MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
  AKAIKE (1969) FINAL PREDICTION ERROR - FPE =      0.19172
     (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
  AKAIKE (1973) INFORMATION CRITERION - LOG AIC =  -1.6517
  SCHWARZ (1978) CRITERION - LOG SC =              -1.6335
 MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
  CRAVEN-WAHBA (1979)
     GENERALIZED CROSS VALIDATION - GCV =          0.19172
  HANNAN AND QUINN (1979) CRITERION =              0.19282
  RICE (1984) CRITERION =                          0.19172
  SHIBATA (1981) CRITERION =                       0.19172
  SCHWARZ (1978) CRITERION - SC =                  0.19525
  AKAIKE (1974) INFORMATION CRITERION - AIC =      0.19172
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ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	2530.8	87.	29.089	152.051
ERROR	7958.8	41601.	0.19131	P-VALUE
TOTAL	10490.	41688.	0.25162	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.18266E+07	88.	20756.	108493.886
ERROR	7958.8	41601.	0.19131	P-VALUE
TOTAL	0.18345E+07	41689.	44.005	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 41601 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
EXP	0.33152E-01	0.1056E-02	31.39	0.000	0.152	0.5818	0.0849
EXP2	-0.65422E-03	0.2939E-04	-22.26	0.000	-0.109	-0.4045	-0.0361
OBTANUCT	0.10019	0.1275E-01	7.855	0.000	0.038	0.0501	0.0010
NRELUNCT	-0.48276E-01	0.1814E-01	-2.661	0.008	-0.013	-0.0172	-0.0002
OBTAINBA	0.28974	0.7911E-02	36.63	0.000	0.177	0.2737	0.0149
NRELUNBA	-0.59044E-01	0.1141E-01	-5.173	0.000	-0.025	-0.0417	-0.0013
OBTCTABA	0.37655	0.1285E-01	29.31	0.000	0.142	0.1694	0.0031
NRELABBA	-0.97963E-01	0.2277E-01	-4.302	0.000	-0.021	-0.0233	-0.0002
OBTAINMD	0.70906	0.2232E-01	31.76	0.000	0.154	0.1560	0.0013
NRELUNMD	-0.33025	0.6530E-01	-5.058	0.000	-0.025	-0.0232	-0.0001
OBTAINMA	0.43459	0.1159E-01	37.51	0.000	0.181	0.2291	0.0050
NRELUNMA	0.60117E-02	0.1876E-01	0.3204	0.749	0.002	0.0019	0.0000
OBTANPHD	0.48123	0.2428E-01	19.82	0.000	0.097	0.0984	0.0008
NRELUPHD	0.79232E-01	0.5396E-01	1.468	0.142	0.007	0.0071	0.0000
NRELERCS	-0.12321	0.1356E-01	-9.084	0.000	-0.044	-0.0565	-0.0010
FAPA	-0.94445E-01	0.2031E-01	-4.651	0.000	-0.023	-0.0356	-0.0005
NRELFAPA	-0.13582	0.2390E-01	-5.682	0.000	-0.028	-0.0418	-0.0005
HRFG	-0.80459E-01	0.1381E-01	-5.828	0.000	-0.029	-0.0438	-0.0010
NRELHRFG	-0.51686E-01	0.1766E-01	-2.927	0.003	-0.014	-0.0224	-0.0004
SSRF	-0.12232E-02	0.1095E-01	-0.1117	0.911	-0.001	-0.0008	0.0000
NRELSSRF	-0.98252E-01	0.1414E-01	-6.950	0.000	-0.034	-0.0528	-0.0012
BSCM	0.99900E-01	0.1277E-01	7.820	0.000	0.038	0.0519	0.0011
NRELBSCM	-0.18244	0.1688E-01	-10.81	0.000	-0.053	-0.0642	-0.0009
FNMG	0.96208E-01	0.1238E-01	7.769	0.000	0.038	0.0510	0.0011
NRELFNMG	-0.25678	0.1636E-01	-15.70	0.000	-0.077	-0.0892	-0.0012
IIMA	0.15579	0.2115E-01	7.365	0.000	0.036	0.0542	0.0007
NRELIIMA	-0.19806	0.2566E-01	-7.719	0.000	-0.038	-0.0551	-0.0006

MMRS	0.16347	0.2203E-01	7.422	0.000	0.036	0.0471	0.0005
NRELMMRS	-0.18572	0.2959E-01	-6.277	0.000	-0.031	-0.0378	-0.0003
OASC	-0.95642E-01	0.1259E-01	-7.599	0.000	-0.037	-0.0512	-0.0011
NRELOASC	-0.95102E-01	0.1761E-01	-5.400	0.000	-0.026	-0.0265	-0.0003
ABNF	-0.98610E-01	0.1798E-01	-5.485	0.000	-0.027	-0.0369	-0.0005
NRELABNF	-0.56425E-01	0.2366E-01	-2.385	0.017	-0.012	-0.0157	-0.0002
EAAS	0.41157E-01	0.2251E-01	1.829	0.067	0.009	0.0111	0.0001
NRELEAAS	-0.13993	0.3309E-01	-4.229	0.000	-0.021	-0.0257	-0.0002
BTEC	0.80876E-01	0.1387	0.5831	0.560	0.003	0.0051	0.0000
NRELBTEC	-0.15777	0.1586	-0.9949	0.320	-0.005	-0.0087	0.0000
DPCT	0.14600	0.2244E-01	6.505	0.000	0.032	0.0400	0.0004
NRELDPCT	-0.18527	0.3122E-01	-5.935	0.000	-0.029	-0.0334	-0.0002
EAET	0.15079	0.6896E-01	2.187	0.029	0.011	0.0154	0.0001
NRELEAET	-0.70738E-01	0.8630E-01	-0.8197	0.412	-0.004	-0.0057	0.0000
OETC	0.14112	0.3155E-01	4.473	0.000	0.022	0.0309	0.0003
NRELOETC	-0.19531	0.3943E-01	-4.953	0.000	-0.024	-0.0329	-0.0002
NURS	0.21039	0.1128E-01	18.65	0.000	0.091	0.1176	0.0027
NRELNURS	-0.28947	0.1781E-01	-16.26	0.000	-0.079	-0.0806	-0.0009
AMHS	0.92816E-01	0.1200E-01	7.736	0.000	0.038	0.0503	0.0011
NRELAMHS	-0.22696	0.1794E-01	-12.65	0.000	-0.062	-0.0657	-0.0007
MATH	0.95252E-01	0.1803E-01	5.283	0.000	0.026	0.0348	0.0005
NRELMATH	-0.76274E-01	0.2464E-01	-3.096	0.002	-0.015	-0.0204	-0.0002
ATL	-0.13848	0.1161E-01	-11.92	0.000	-0.058	-0.0705	-0.0015
QC	-0.75781E-01	0.1381E-01	-5.486	0.000	-0.027	-0.0647	-0.0028
WST	-0.86475E-01	0.1235E-01	-7.000	0.000	-0.034	-0.0615	-0.0020
PAC	-0.45756E-01	0.1347E-01	-3.396	0.001	-0.017	-0.0292	-0.0008
TWT	0.27026	0.4077E-01	6.629	0.000	0.032	0.0287	0.0001
HAL	-0.67513E-01	0.2136E-01	-3.161	0.002	-0.015	-0.0166	-0.0002
QUE	-0.58108E-01	0.1666E-01	-3.488	0.000	-0.017	-0.0200	-0.0003
MON	-0.54390E-01	0.1302E-01	-4.177	0.000	-0.020	-0.0363	-0.0011
SHE	-0.15355	0.2458E-01	-6.246	0.000	-0.031	-0.0299	-0.0002
OTT	0.20532E-01	0.1102E-01	1.863	0.063	0.009	0.0091	0.0002
OSH	0.60718E-02	0.2119E-01	0.2866	0.774	0.001	0.0013	0.0000
HAM	-0.61160E-01	0.1491E-01	-4.102	0.000	-0.020	-0.0184	-0.0002
NIA	-0.12579	0.2171E-01	-5.794	0.000	-0.028	-0.0253	-0.0002
KIT	-0.74111E-01	0.1962E-01	-3.778	0.000	-0.019	-0.0166	-0.0001
LON	-0.10619	0.1778E-01	-5.972	0.000	-0.029	-0.0263	-0.0003
WIN	-0.79337E-01	0.2222E-01	-3.571	0.000	-0.018	-0.0156	-0.0001
SUD	-0.83544E-01	0.2280E-01	-3.664	0.000	-0.018	-0.0160	-0.0001
WPG	-0.70775E-01	0.1932E-01	-3.664	0.000	-0.018	-0.0213	-0.0002
REG	-0.82533E-01	0.2254E-01	-3.662	0.000	-0.018	-0.0192	-0.0002
CAL	0.14249E-01	0.1730E-01	0.8237	0.410	0.004	0.0054	0.0001
EDM	-0.61869E-01	0.1810E-01	-3.418	0.001	-0.017	-0.0211	-0.0003
VAN	-0.21498E-01	0.1641E-01	-1.310	0.190	-0.006	-0.0109	-0.0002
VIC	-0.36104E-01	0.2493E-01	-1.448	0.147	-0.007	-0.0075	-0.0001
NTA	-0.12232	0.8626E-02	-14.18	0.000	-0.069	-0.1101	-0.0053
DSW	0.46380E-02	0.6351E-02	0.7303	0.465	0.004	0.0033	0.0001
SIG	-0.18435E-01	0.5862E-02	-3.145	0.002	-0.015	-0.0168	-0.0008
NOCHILD	0.47079E-01	0.5111E-02	9.212	0.000	0.045	0.0467	0.0032
UEMP	-0.11755	0.1612E-01	-7.293	0.000	-0.036	-0.0315	-0.0003
WK3034	0.41259E-01	0.1523E-01	2.710	0.007	0.013	0.0117	0.0001
WK3539	0.21201E-01	0.1511E-01	1.403	0.161	0.007	0.0060	0.0001
WK4044	-0.26131E-01	0.1005E-01	-2.599	0.009	-0.013	-0.0112	-0.0002
WK4549	0.24524E-01	0.6781E-02	3.617	0.000	0.018	0.0157	0.0004
FO	0.10675E-02	0.1218E-01	0.8764E-01	0.930	0.000	0.0006	0.0000
BOTHFE	0.82096E-01	0.7119E-02	11.53	0.000	0.056	0.0729	0.0034
NEOF	-0.17345	0.7272E-01	-2.385	0.017	-0.012	-0.0104	0.0000
FRN	-0.16101E-01	0.1075E-01	-1.498	0.134	-0.007	-0.0132	-0.0005
NOL	-0.33204	0.3113E-01	-10.67	0.000	-0.052	-0.0469	-0.0003
EAF	-0.88984E-01	0.1878E-01	-4.738	0.000	-0.023	-0.0219	-0.0002
CONSTANT	6.2246	0.1382E-01	450.3	0.000	0.911	0.0000	0.9410

Model 3
Males Only
All Levels of Post-Secondary

OLS ESTIMATION
48309 OBSERVATIONS DEPENDENT VARIABLE= LNWAGE
...NOTE..SAMPLE RANGE SET TO: 1, 93618

R-SQUARE = 0.2094 R-SQUARE ADJUSTED = 0.2080
VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.26876
STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.51842
SUM OF SQUARED ERRORS-SSE= 12960.
MEAN OF DEPENDENT VARIABLE = 6.9098
LOG OF THE LIKELIHOOD FUNCTION = -36765.7

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
AKAIKE (1969) FINAL PREDICTION ERROR - FPE = 0.26925
(FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -1.3121
SCHWARZ (1978) CRITERION - LOG SC = -1.2961
MODEL SELECTION TESTS - SEE RAMANATHAN (1998,P.165)
CRAVEN-WAHBA (1979)
GENERALIZED CROSS VALIDATION - GCV = 0.26925
HANNAN AND QUINN (1979) CRITERION = 0.27060
RICE (1984) CRITERION = 0.26925
SHIBATA (1981) CRITERION = 0.26924
SCHWARZ (1978) CRITERION - SC = 0.27359
AKAIKE (1974) INFORMATION CRITERION - AIC = 0.26925

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	3432.2	87.	39.451	146.790
ERROR	12960.	48221.	0.26876	P-VALUE
TOTAL	16392.	48308.	0.33932	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.23099E+07	88.	26249.	97669.905
ERROR	12960.	48221.	0.26876	P-VALUE
TOTAL	0.23229E+07	48309.	48.084	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO 48221 DF	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
EXP	0.29918E-01	0.1242E-02	24.09	0.000	0.109	0.4340	0.0757
EXP2	-0.56852E-03	0.3377E-04	-16.83	0.000	-0.076	-0.2961	-0.0310
OBTANUCT	0.47990E-01	0.1697E-01	2.828	0.005	0.013	0.0188	0.0004
NRELUNCT	-0.63029E-01	0.2309E-01	-2.729	0.006	-0.012	-0.0185	-0.0003
OBTAINBA	0.23577	0.1033E-01	22.82	0.000	0.103	0.1937	0.0121
NRELUNBA	-0.50895E-01	0.1437E-01	-3.542	0.000	-0.016	-0.0325	-0.0012
OBTCTABA	0.26019	0.1639E-01	15.87	0.000	0.072	0.0943	0.0018
NRELABBA	-0.58303E-01	0.2580E-01	-2.260	0.024	-0.010	-0.0129	-0.0001
OBTAINMD	0.75217	0.2335E-01	32.22	0.000	0.145	0.1890	0.0024
NRELUNMD	-0.47927	0.5934E-01	-8.077	0.000	-0.037	-0.0372	-0.0001
OBTAINMA	0.33199	0.1266E-01	26.22	0.000	0.119	0.1731	0.0049
NRELUNMA	-0.40589E-01	0.1956E-01	-2.075	0.038	-0.009	-0.0129	-0.0002
OBTANPHD	0.34421	0.1991E-01	17.29	0.000	0.078	0.0898	0.0012
NRELUPHD	0.25324E-01	0.3870E-01	0.6543	0.513	0.003	0.0032	0.0000
NRELERCS	-0.42688E-02	0.2146E-01	-0.1989	0.842	-0.001	-0.0013	0.0000
FAPA	-0.20187	0.2773E-01	-7.281	0.000	-0.033	-0.0550	-0.0008
NRELFAPA	0.77779E-01	0.3113E-01	2.499	0.012	0.011	0.0170	0.0002
HRFG	-0.10675	0.1944E-01	-5.491	0.000	-0.025	-0.0457	-0.0010
NRELHRFG	0.38884E-01	0.2147E-01	1.811	0.070	0.008	0.0133	0.0002
SSRF	0.19378	0.1628E-01	11.90	0.000	0.054	0.1114	0.0036
NRELSSRF	-0.14771	0.1716E-01	-8.609	0.000	-0.039	-0.0683	-0.0017
BSCM	0.25135	0.1573E-01	15.98	0.000	0.073	0.1257	0.0034
NRELBSCM	-0.26704	0.1862E-01	-14.34	0.000	-0.065	-0.0802	-0.0012
FNMG	0.23986	0.1628E-01	14.73	0.000	0.067	0.1058	0.0025
NRELFNMG	-0.30085	0.2116E-01	-14.21	0.000	-0.065	-0.0739	-0.0009
IIMA	0.22277	0.2544E-01	8.757	0.000	0.040	0.0608	0.0008
NRELIIMA	-0.20569	0.3042E-01	-6.762	0.000	-0.031	-0.0420	-0.0004

MMRS	0.21131	0.2374E-01	8.901	0.000	0.040	0.0535	0.0007
NRELMMRS	-0.24359	0.3367E-01	-7.235	0.000	-0.033	-0.0365	-0.0003
OASC	-0.73994E-01	0.6910E-01	-1.071	0.284	-0.005	-0.0072	0.0000
NRELOASC	0.11584	0.8565E-01	1.353	0.176	0.006	0.0089	0.0000
ABNF	-0.15221	0.1978E-01	-7.694	0.000	-0.035	-0.0543	-0.0010
NRELABNF	0.13898	0.2385E-01	5.827	0.000	0.027	0.0340	0.0004
EAAS	0.16728	0.1537E-01	10.88	0.000	0.049	0.0929	0.0029
NRELEAAS	-0.30197E-01	0.1883E-01	-1.604	0.109	-0.007	-0.0115	-0.0002
BTEC	0.52568E-01	0.2705E-01	1.943	0.052	0.009	0.0121	0.0001
NRELBTEC	0.72841E-02	0.3568E-01	0.2041	0.838	0.001	0.0011	0.0000
DPCT	0.19793	0.2171E-01	9.118	0.000	0.041	0.0652	0.0011
NRELDPCT	-0.11969	0.2496E-01	-4.796	0.000	-0.022	-0.0244	-0.0002
EAET	0.20769	0.2083E-01	9.972	0.000	0.045	0.0730	0.0013
NRELEAET	-0.49780E-01	0.2344E-01	-2.124	0.034	-0.010	-0.0107	-0.0001
OETC	0.19023	0.1806E-01	10.53	0.000	0.048	0.0985	0.0028
NRELOETC	-0.74785E-01	0.1497E-01	-4.995	0.000	-0.023	-0.0264	-0.0005
NURS	0.13104	0.3888E-01	3.371	0.001	0.015	0.0175	0.0001
NRELNURS	-0.10805	0.6543E-01	-1.651	0.099	-0.008	-0.0081	0.0000
AMHS	0.19773	0.2094E-01	9.444	0.000	0.043	0.0700	0.0013
NRELAMHS	-0.18270	0.3234E-01	-5.650	0.000	-0.026	-0.0288	-0.0002
MATH	0.13065	0.1688E-01	7.741	0.000	0.035	0.0595	0.0014
NRELMATH	-0.19449E-02	0.2119E-01	-0.9178E-01	0.927	0.000	-0.0006	0.0000
ATL	-0.16546	0.1396E-01	-11.86	0.000	-0.054	-0.0660	-0.0014
QC	-0.64486E-01	0.1576E-01	-4.092	0.000	-0.019	-0.0472	-0.0022
WST	-0.57926E-01	0.1426E-01	-4.063	0.000	-0.018	-0.0359	-0.0013
PAC	-0.14493E-01	0.1498E-01	-0.9676	0.333	-0.004	-0.0081	-0.0003
TWT	0.18349	0.4475E-01	4.101	0.000	0.019	0.0169	0.0001
HAL	0.14203E-01	0.2477E-01	0.5735	0.566	0.003	0.0029	0.0000
QUE	-0.46322E-01	0.1870E-01	-2.477	0.013	-0.011	-0.0135	-0.0002
MON	-0.23033E-01	0.1449E-01	-1.590	0.112	-0.007	-0.0133	-0.0004
SHE	-0.57285E-01	0.2704E-01	-2.119	0.034	-0.010	-0.0097	-0.0001
OTT	0.16890E-01	0.1166E-01	1.449	0.147	0.007	0.0067	0.0001
OSH	0.37584E-01	0.2366E-01	1.589	0.112	0.007	0.0066	0.0001
HAM	0.24935E-01	0.1637E-01	1.524	0.128	0.007	0.0064	0.0001
NIA	-0.10454	0.2393E-01	-4.369	0.000	-0.020	-0.0181	-0.0002
KIT	0.73864E-03	0.1966E-01	0.3758E-01	0.970	0.000	0.0002	0.0000
LON	-0.38091E-01	0.2010E-01	-1.896	0.058	-0.009	-0.0079	-0.0001
WIN	0.67715E-01	0.2371E-01	2.856	0.004	0.013	0.0118	0.0001
SUD	-0.46461E-01	0.2719E-01	-1.709	0.088	-0.008	-0.0070	-0.0001
WPG	-0.98913E-01	0.2174E-01	-4.549	0.000	-0.021	-0.0254	-0.0003
REG	-0.46813E-01	0.2550E-01	-1.836	0.066	-0.008	-0.0092	-0.0001
CAL	0.11496	0.1881E-01	6.112	0.000	0.028	0.0409	0.0007
EDM	-0.51394E-02	0.2008E-01	-0.2559	0.798	-0.001	-0.0016	0.0000
VAN	-0.51017E-01	0.1806E-01	-2.825	0.005	-0.013	-0.0229	-0.0005
VIC	-0.13682	0.2775E-01	-4.931	0.000	-0.022	-0.0242	-0.0002
NTA	-0.75420E-01	0.9697E-02	-7.778	0.000	-0.035	-0.0568	-0.0028
DSW	-0.52603E-01	0.8732E-02	-6.024	0.000	-0.027	-0.0265	-0.0007
SIG	-0.11556	0.7094E-02	-16.29	0.000	-0.074	-0.0877	-0.0045
NOCHILD	-0.60321E-01	0.6070E-02	-9.938	0.000	-0.045	-0.0511	-0.0037
UEMP	-0.14898	0.1816E-01	-8.205	0.000	-0.037	-0.0338	-0.0004
WK3034	-0.34505E-01	0.1907E-01	-1.809	0.070	-0.008	-0.0074	-0.0001
WK3539	-0.62544E-01	0.1941E-01	-3.222	0.001	-0.015	-0.0132	-0.0001
WK4044	-0.74959E-01	0.1268E-01	-5.910	0.000	-0.027	-0.0242	-0.0004
WK4549	0.52683E-01	0.7616E-02	6.918	0.000	0.031	0.0284	0.0008
FO	-0.24878E-01	0.1454E-01	-1.711	0.087	-0.008	-0.0099	-0.0002
BOTHFE	0.74608E-01	0.8049E-02	9.270	0.000	0.042	0.0575	0.0030
NEOF	-0.66506E-01	0.7915E-01	-0.8402	0.401	-0.004	-0.0035	0.0000
FRN	-0.33086E-01	0.1218E-01	-2.716	0.007	-0.012	-0.0226	-0.0009
NOL	-0.54320	0.3341E-01	-16.26	0.000	-0.074	-0.0685	-0.0004
EAF	-0.10040	0.2139E-01	-4.693	0.000	-0.021	-0.0208	-0.0002
CONSTANT	6.4747	0.1964E-01	329.7	0.000	0.832	0.0000	0.9370