THE GENDER WAGE GAP IN THE PUBLIC AND PRIVATE SECTORS IN CANADA

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ABSTRACT

The Canadian labour market experienced a considerable decline in the male-female pay gap during years 1988 to 1992. After 1992, however, the gender wage gap decreased only slightly. This paper will study the issue of difference in the explained gender wage gap in both the public and the private sectors and will examine the components of change in the wage gap between 1991 and 1996. We measure and decompose the gender wage differentials into explained and unexplained parts separately for the public and private sectors in Canada for the census years 1991 and 1996, and compare changes in the earnings gap between 1991 and 1996 in both sectors. The analysis is based on Oaxaca decomposition and Juhn-Murphy-Pierce decomposition techniques.

Results show that gender wage differentials are present in both sectors, although at a lower level in the public sector than in the private sector. In 1996, 67 percent of the wage gap is attributable to the unexplained part in the public sector, while in the private sector, this figure is 76 percent. Generally, males tend to have higher return to experience and more favorable occupation and industry distributions, which can account for the gender wage gap. Our findings also show that the overall gender wage gap decreases in both the public sector and the private sector between 1991 and 1996. This decrease is mainly attributed to the diminishing of the unexplained portion. In both the public and the private sectors, improvements in women's wage-determining factors and ranking relative to those of men contributed to a narrowing of the gender wage gap.

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Chapter 1

Introduction

There currently exists a vast number of studies about unequal wages for different labour force groups in the labour market. Because women's role in the labour market over the past few decades has changed in many countries, increased attention recently has focused on male-female wage differentials. In Canada, variations in earnings between male and female workers are substantial. Using data from the 1970, 1980, and 1990 government of Canada Censuses, Gunderson (1998) found that the earnings of females relative to those of males increased consistently from 61.6 percent in 1970 to 66.6 percent in 1980, then to 71.4 percent in 1990. By using *Oaxaca decomposition*, he decomposed the differential into explained and unexplained portions; as a result, the unexplained portion then increased from 64.5 percent in 1970 to 70.5 percent by 1990. Some studies on wage differentials in Canada have focused on the public and private sectors. Many of those studies try to isolate the impact of working in the public sector. Using Labour Market Survey data from 1997, Gunderson *et al.* (2000) estimate that public sector workers earn a premium of about 9 percent. Gupta *et al.* (2000) analyze the Danish gender wage

gap with special emphasis on different developments in the private and public sectors. They indicate that one of the key explanations for a stagnating Danish gender wage gap may be the large public sector, which employs a substantial portion of the female work force at relatively low wages.

Most of the empirical studies from which the evidence on discrimination was derived use variants of Oaxaca decomposition, because it provides a quantitative assessment of the sources of male-female wage differentials. Juhn *et al.* (1991) extend Oaxaca decomposition to estimate the factors that influence the gender pay gap over time.

To the best of our knowledge, no Canadian study addresses the issue of difference in explained gender wage gap by public and private sectors, or studies the components of change in the wage gap between two time periods. The two main objectives of this study are to examine those two issues. It is important to study the gender wage differentials in Canada because while the Canadian labour market experienced a considerable decline in the male-female pay gap during years 1988 to 1992, after 1992 the gender wage gap has decreased only slightly. This study examines why the decline has decreased and also what happened to the gender wage gap during the period 1991 to 1996. Because the public sector is a not-for-profit sector and because above 40 percent of the female labour force is employed in this sector, comparisons between the public sector and the private

sector will be studied as well.

Specifically this study tries to:

- Measure and decompose the gender wage differentials into explained and unexplained parts separately for the public and private sectors in Canada, and
- Compare the changes in earnings wage between 1991 and 1996 in the private and the public sectors and identify the sources of change.

The first step in this research involves estimation of the Mincer's earnings function which allows us to identify effects of education, age, place of residence, language, occupation, and industry of employment on earnings. In the second step, results obtained in the first step are used to decompose the earnings wage gap into explained and unexplained parts using the Oaxaca decomposition technique. These first two steps have been repeated for two census years, namely 1991 and 1996. Finally, using the *Juhn-Murphy-Pierce decomposition* technique, the changes in wage gap between 1991 and 1996 have been separated into wage dispersion, wage structure, and human capital characteristics effects. While the explained gap is the result of gender difference in observed wage-determining factors, the remaining gap consists of effects of unobserved factors and/or discrimination. However, some differences in observed wage-determining factors, such as occupational distribution by gender, may be affected by discrimination as well.

Our results show that the unexplained portion is smaller in the public sector than in the private sector. These results also reveal that improvement in women's relative wage positions works to decrease the overall gender wage gaps in the public and private sectors over 1991 to 1996.

This paper is divided into five chapters. The next chapter presents trends in Canadian gender wage patterns and reviews previous research in this area. In the third chapter, the methodology is outlined and the data are described. Chapter 4 provides empirical estimates of the wage functions and their effects on the gender wage differentials that are later decomposed into explained and unexplained parts. The decomposing changes in the gender wage gap during the 1991—1996 period are covered in this chapter as well. Chapter 5 summarizes the findings of this paper, points out some shortcomings of the approaches used herein, and offers suggestions toward government policy that could eliminate the gender wages differentials.

Chapter 2

Facts and Literature Review

This chapter presents gender wage trends and female-male wage ratios in Canada since 1980, and briefly reviews some early studies regarding gender wage differentials.

2.1 Trends in the Canadian Wage Pattern by Gender

Women's role in the Canadian labour market has changed profoundly in recent decades. Figure 2.1 shows the trends in average annual real earnings in year 2002 dollars by gender, for full-time, full-year workers between 1980 and 2002. "Full-time worker" is defined as one working for at least 30 hours per week and "full-year worker" as one employed 50 to 52 weeks per year. All statistics presented in this section have been retrieved from CANSIM Table 2020102. From 1980 to 1990, the average real earnings for female workers remained stable at around $30,000 per year. After 1990 these earnings increased at a moderate rate to $36,000 per year in 2002. For males, earnings stayed relatively stable at around $46,000 until 1996 and then increased to $50,000 in 200l. The wage gap between the two

genders held steady until 1989; following that, the wage increase for females was greater than that of males, so the wage gap between them began to narrow slightly but this difference is still significant. With the males' earnings rising after 1996, the wage gap became steady again.

Figure 2.1 Average Real Earnings for Men and Women in Canada (Full-Time, Full-Year Workers)

Source: Statistics Canada, CANSIM Table 2020102

Figure 2.2 shows the earnings ratio of females to males in the period 1980 to 2002. Overall, not much happened to the gender wage ratio before 1988 or after 1992.

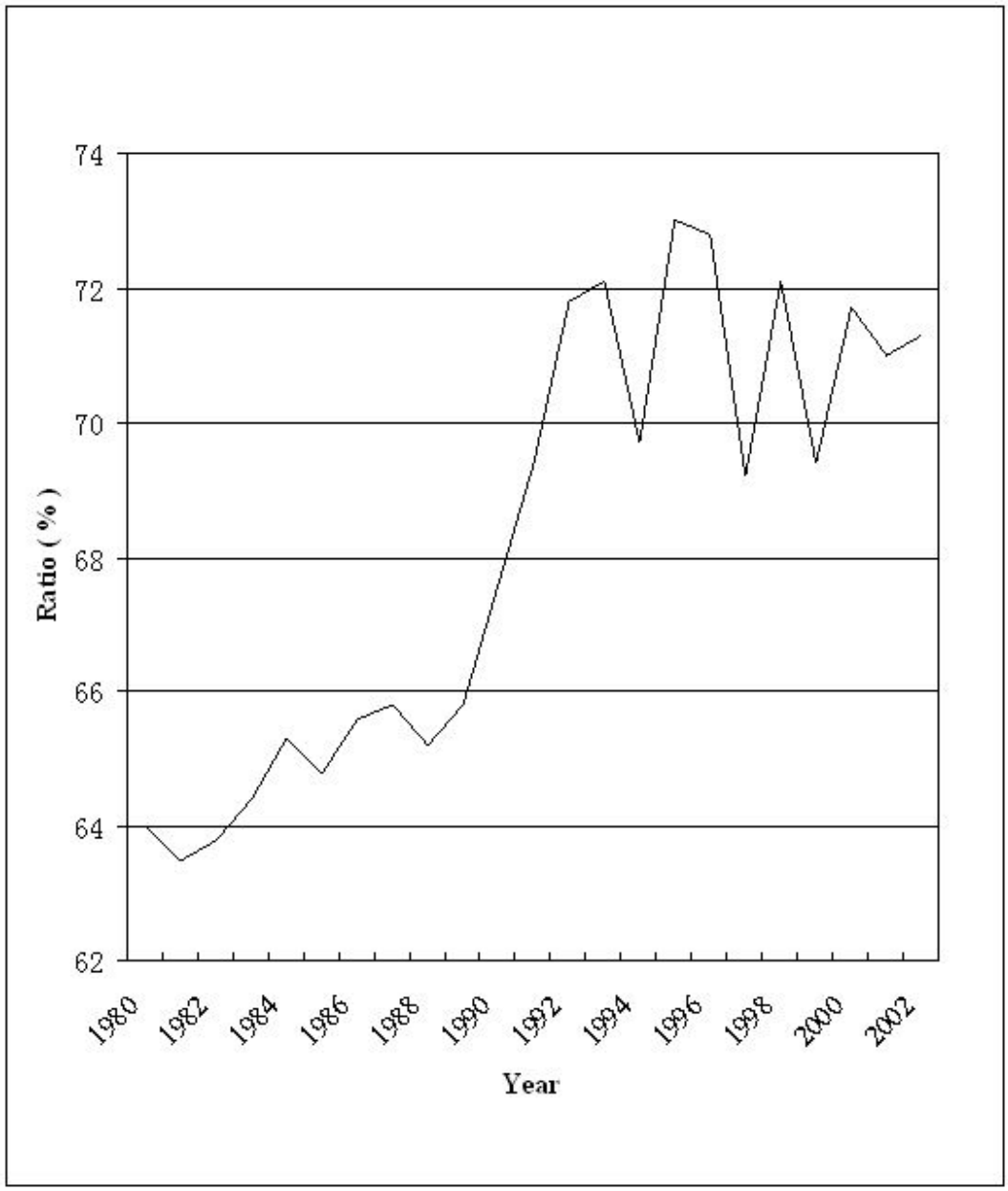

Figure 2.2 Female/Male Earnings Ratio
Source: Statistics Canada, CANSIM Table 2020102

The most rapid increase in the female-male earnings ratio happened during the period of 1988-1992. The ratio increased considerably, from 65.2 percent in 1988 to 71.8 percent in 1992; on average women went from earning 65.2 cents for every dollar earned by men in 1988 to 71.8 cents per "male" dollar in 1992. Females' earnings relative to those of males have risen because women have significantly improved their observed qualifications relative to those of men (such as educational levels and levels of job experience) and have successfully infiltrated many previously male-dominated occupations (Gunderson, 1998). However, despite women's increased role in the labour market, a wage gap between female and male still persists.

The ratio of female to male earnings is not the same across all groups. Long (1976) finds U.S. women in the public sector earned 74 percent of the male wage while women in the private sector earned 59 percent of the male wage in 1970. Fuller (2001) points out that the wage gap is smaller in the public sector than in the labour market as a whole in the Canadian labour market. In the educational and health and social services sectors (both generally considered part of the wider public sector), the gender wage ratio in 2000 was 84 percent and 92 percent respectively.

2.2 Literature Review

Earnings differentials between various labour force groups have been of interest to economists for a long time, and many empirical studies are available on this subject. From previous studies we know that male-female earnings differentials in Canada have always been substantial, and a variety of techniques have been used to estimate these gender earnings differentials and to see how much of these differentials is due to wage-determining factors and how much is due to unexplained portion. Because of the different data sources and methodologies used, and also due to varying emphases on different aspects of discrimination, the results of these studies are quite varied.

2.2.1 Wages by Gender

Gender wage differentials have been the subject of a number of studies (e.g., Gunderson, 1979; Robb, 1978). In Gunderson's study (1979) of male-female earnings differentials, he calculates the annual earnings of females relative to those of males to be 60 percent by using data from the 1971 Canadian Census. The individual sample is restricted to persons who were civilian members working full-time and full-year in 1970. The observations were excluded if persons did not work for pay or profit, had a major source of income not from wages and salary, or were employed in religion, primary construction, or "other" occupations or

industries. Earnings equations are estimated for males and females separately and the results are used to calculate the percentage of earnings differentials attributable to different productivity and discrimination by Oaxaca decomposition.

In Gunderson's paper, the dependent variable is the natural log of annual earnings and the independent variables are education, experience, training, marital status, language, residence, province, hours worked, occupation, and industry. Gunderson finds the female earnings are approximately 60 percent of male earnings, with about 63 percent of the gap attributable to wage discrimination and about 37 percent attributable to differences in productivity-related characteristics. He also finds that males tended to have higher returns on the basis of productivity-related characteristics, especially with respect to experience, and a more favorable occupational and industrial distribution. Males also receive considerably higher earnings even when they have the same productivity-related characteristics as those of females. We call this wage discrimination. Between genders, pay differences for the same characteristics are especially prominent for education, experience, and marital status.

In many studies, researchers use age or "age minus total years of schooling minus 6" as a proxy for the experience variable due to a lack of data on work experience. This might provide a reasonable experience proxy for males, but it may overstate the work experience of females. Robb (1978) tries to deal with this

experience problem in his study. Two comparisons are presented: all males versus single females thirty years of age and over, and all males versus all females. The former comparison is made on the grounds that single women aged thirty and over are as a group perhaps more like males in terms of career motivation and labour force attachment, so that the age variable will be a more appropriate proxy for their work experience. He too used the Oaxaca decomposition methodology. He finds that 15 percent of the logarithmic earnings differential between males and single females is due to discrimination. However, for comparison of all males with all females, 75 percent of the logarithmic earnings differential is derived from this source.

Baker and Fortin (2000) study the effect of femaleness of occupation on wage structure using the Canadian Labour Market Activity Survey and from the US Current Population Survey data for 1987 and 1988. Their study controls for a number of human capital variables which are likely to affect wages. The results show that women working in female-dominated occupations in the United States suffered a wage penalty relative to women in mixed and male dominated occupations. In Canada, however, this penalty was absent when calculated for women as a whole, a difference they attribute to the relatively high wages earned by certain “public goods” occupations in Canada, such as those in the educational and health sector, and to unionization effects. Relatively well-paid,

female-dominated occupations in the Canadian public sector essentially "drive-up" the overall wages for female-dominated occupations.

Fortin and Huberman (2002) study the effects of occupational changes and intra-occupational gender differentials on the gender pay gap in Canada over the twentieth century. They introduce an approach that divides the gender wage gap into between-occupation and within-occupation class components. They find that the largest contribution to the gender wage gap in the first half of the century came from the between-occupation class component because women moved out of domestic and manufacturing work into clerical work. Since 1990 the contribution of the within-occupation classes has become predominant.

2.2.2 Wages in the Public and Private Sectors

Choudhury (1994) tries to uncover the wage differentials between the public and the private sectors in the United States. She uses data from the March 1991 Current Population Survey. The sample group includes 6,391 male workers and 5,601 female workers in the private sector and 1,235 male workers and 1,514 female workers in government employment, all aged between 18 and 65 years, and excluded agricultural workers, non-civilians, and the self-employed. She also estimates the log wage equations separately for the public and private sectors and decomposes that by the Oaxaca method. The dependent variable in her study is the

natural logarithm of the hourly wage and the independent variables include schooling, experience (age-schooling-6), experience squared, marital status, race, union membership, part-time/full-time status, occupation, and a set of regional dummy variables. Choudhury finds that on average, public sector workers are better paid than private sector workers and that females can earn more in the public sector than in the private sector. She also finds that in the public sector, higher educational levels and more experience mean higher wages but the return to experience for female is considerably lower than that for males in both the public and private sectors.

However, Choudhury's study does not take into account selection bias. If the labour force participation rate increases during the observation period for one of the groups, this may affect the results concerning the development of the gender wage gap. Falaris' (2004) study corrects the selection bias by using Heckman's two-step estimation technique. He uses 1995 Bulgarian data to estimate private and public sector wage equations for men and women and finds that the probability for employment in the private sector decreases with potential work experience and higher education and also that ethnic Bulgarians are less likely than are other Bulgarian to be employed in the private sector. In addition, wages of women in the private sector increase with experience at a higher rate than in the public sector and increase with higher education at comparable rates in both sectors.

2.2.3 Changes in the Wage Gap

Juhn *et al.* (1991) analyzes black-white wage trends in the United States to estimate the contribution of gender-specific factors versus wage structure in explaining trends in racial wage differentials. The data they used come from 1964 through 1988, and they extend Oaxaca decomposition by decomposing the residual differential into two parts: one according to differences in relative ranking within the residual wage distribution and the second according to wage dispersion. This decomposition, which can also been used to study factors that influence the gender pay gap over time, has been called Juhn-Murphy-Pierce decomposition. (The technique will be described further in Chapter 3.)

Using Juhn-Murphy-Pierce decomposition, Blau *et al.* (1992) find that, relative to the high-wage sectors, the United States labour market places larger penalties on those employed in low-wage sectors and on those with lower-measure or unmeasured labour-market skills. They conclude that the U.S. gap would be lower if the wage-setting process in the United States resembled more closely that of the European industrialized economies.

Gupta *et al.* (1998) examine gender wage differentials and wage determination in the private and public sectors in the Danish labour market from 1976 to 1994. They use a decomposition technique that combines the Juhn-Murphy-Pierce decomposition and the Oaxaca-Ransom-Neumark generalized

wage decomposition methodologies. Unlike other previous decomposition techniques, this *Oaxaca-Ransom decomposition* is based on the estimation of a common distribution instead of on male wage distribution. They find that there is a stagnation of the Danish gender wage gap in both the public and the private sectors during the period 1983—1994. In the public sector the male-female wage gap decreases by less than one percent and in the private sector the gender wage gap increases by about one percent; this stagnation, however, is due to different explanations in the two sectors. In the private sector, the relative productivity–related characteristics of women have increased but the effect is counteracted by the returns to observed human capital. In the public sector, women also experienced an improvement in their qualifications but this effect was cancelled out by the "unexplained" factors, by wage dispersion, and by the ranking effects, so the overall gender wage gaps were relatively stable in both sectors. Gupta *et al.* also point out that if the public sector "market" prices are applied to the private sector in their wage-setting, the overall gender wage gap would decrease.

Chapter 3

Methodology and Data

This chapter will introduce the human capital theory, earnings functions, and two kinds of techniques for wage decomposition. It will also cover the source, characteristics, and some explanations of the data.

3.1 Earnings Function

The earnings function provides a convenient framework for summarizing the relationship between wages and observed productivity-related characteristics. The simplest form is the *Mincer human capital earnings equation* (1974), which states that the individual (logged) wage depends on the education (years of schooling), labour market work experience, and a random unobservable component. More generally, since wages also depend on other characteristics, this equation can be made richer by adding additional variables such as region, industry, and occupation.

The following section will describe the earnings function in more detail.

3.1.1 Human Capital Theory and the Mincer Earnings Equation

The most prominent western economist addressing issues of human capital is Adam Smith. In his book *The Wealth of Nations*, he points out:

> *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. (p.101)*

In the 1960s, Becker, G. S. advanced Adam Smith's human capital theory in his book *Human Capital* (1975, 2nd ed.). In this book, human capital theory is defined as activities that increase future consumption possibilities by increasing people's personal resources. Through his analysis of census data, he provided empirical "rate of return" data demonstrating that an investment in education and training to increase one's human capital was as important as an investment in other forms of capital. A significant aspect of this theory is that acquisition of knowledge and skill not only raises the value of a person's human capital—which thereby increases his/her employability, income potential, and productivity—but it can also increase an employer's or country's human capital resource pool and potential productivity.

The human capital theory, which states that investments in human capital

are considered similar to other types of investments, leads to one of the most successful empirical equations: the *Mincer earnings function* (the standard human capital model).

The derivation of the standard earnings function can be explained in the following way. Assume an individual's earnings with zero years of schooling to be W_0. With r rate of return from schooling, earnings after 1 year of schooling can be written as,

$$W_1 = (1+r)W_0 . \tag{3.1}$$

If we assume that the rate of return to schooling r remains the same for different levels of education ($r = r_1 = r_2 = ... = r_s$), earnings after S years of schooling can be written as

$$W_s = (1+r)^s W_0 . \tag{3.2}$$

After taking natural logarithms of both sides, the human capital earnings function is given by:

$$\ln W_s = \ln W_0 + S\ln(1+r) \approx \ln W_0 + rS , \tag{3.3}$$

since for small r, $\ln(1+r)$ is approximately equal to r.

The standard model is extended by adding on-the-job training and expressing earnings as a quadratic function of experience (EXP).

$$\ln W_s = \alpha + \beta_1 S + \beta_2 EXP + \beta_3 EXP^2 . \tag{3.4}$$

The regression coefficient on years of schooling (β_1) measures the rate of

return to schooling. The coefficient on labour market experience also can be interpreted as the rate of return to the experience. Since actual work experience is rarely available in data sets, Mincer uses the transformation *Experience equals Age minus Schooling minus 6,* $EXP = A - EDU - 6$ as a proxy for the experience variable.

The Mincer earnings function is the simplest and most common form for stating that individual (logged) wages depend on schooling and work experience. But wages actually depend on many other characteristics such as region, occupation, industry, and so on. Thus the general wage equation may be written as

$$\ln W_j = \mathbf{X}_j \mathbf{B} + \varepsilon_j, \tag{3.5}$$

where W_j is individual j ' s earnings, $\mathbf{X}_j$ is a row vector of explanatory variables for the j th individual, $\mathbf{B}$ is a column vector of coefficients, and ε_j is a normally distributed error term.

This paper will use equation (3.5) to estimate wage equations for males and females, separately. Several separate wage equations will be estimated including equations for males who are in the public sector and in the private sector, for females who are in the public sector and in the private sector, for males who are in educational services and in health and social services, and for females who are in educational services and in health and social services. All of the equations will be estimated for the years 1991 and 1996.

3.1.2 The Oaxaca Technique for Decomposition of the Wage Gap

The most popular technique used in many previous studies originally was presented by Oaxaca (1973) and Blinder (1973). This technique usually is called Oaxaca decomposition. Earnings functions are estimated for each group (male and female or public sector and private sector, etc.) and the results are used to calculate the percentages of the logarithmic earnings differentials attributable to explained portion and unexplained portion. In this paper, we will also use this technique to decompose the gender wage differential in Canada.

Suppose the standard human capital models of average earnings, in logarithmic form, for males and females are

$$\overline{\ln W_m} = \bar{\mathbf{X}}_m \mathbf{B}_m \quad \text{and} \tag{3.6}$$

$$\overline{\ln W_f} = \bar{\mathbf{X}}_f \mathbf{B}_f , \tag{3.7}$$

where W_i is the earnings for group i ($i = m, f$), $\mathbf{B}_i$ is a column vector of regression coefficients including the constant for group i, and $\bar{\mathbf{X}}$ a row vector of average explanatory variables that determine earnings such as education and experience.

If females retain their productivity-related characteristics $\bar{\mathbf{X}}_f$ but are paid according to the male pay structure $\mathbf{B}_m$, their hypothetical average earnings without wage discrimination would be

$$\ln W_f^* = \bar{\mathbf{X}}_f \mathbf{B}_m . \tag{3.8}$$

The difference between the females' actual earnings and this hypothetical income indicates the extent of wage discrimination (the unexplained part of the wage gap):

$$\ln W_f^* - \overline{\ln W_f} = \bar{\mathbf{X}}_f \mathbf{B}_m - \bar{\mathbf{X}}_f \mathbf{B}_f = \bar{\mathbf{X}}_f (\mathbf{B}_m - \mathbf{B}_f) . \tag{3.9}$$

Similarly, the difference between their hypothetical earnings without wage discrimination and the actual earnings of males would reflect the differences in the productivity-related characteristics (the explained part of the wage gap):

$$\overline{\ln W_m} - \ln W_f^* = \bar{\mathbf{X}}_m \mathbf{B}_m - \bar{\mathbf{X}}_f \mathbf{B}_m = (\bar{\mathbf{X}}_m - \bar{\mathbf{X}}_f) \mathbf{B}_m . \tag{3.10}$$

Wage discrimination and productivity differences account for the overall average earnings differential between males and females. That is, adding (3.9) and (3.10) yields

$$\overline{\ln W_m} - \overline{\ln W_f} = (\bar{\mathbf{X}}_m - \bar{\mathbf{X}}_f) \mathbf{B}_m + \bar{\mathbf{X}}_f (\mathbf{B}_m - \mathbf{B}_f) . \tag{3.11}$$

So far, the difference in earnings between males and females has been decomposed into two parts: one portion due to productivity-related characteristics and the other due to wage discrimination. Figure 3.1 is the graphical illustration of the Oaxaca decomposition:

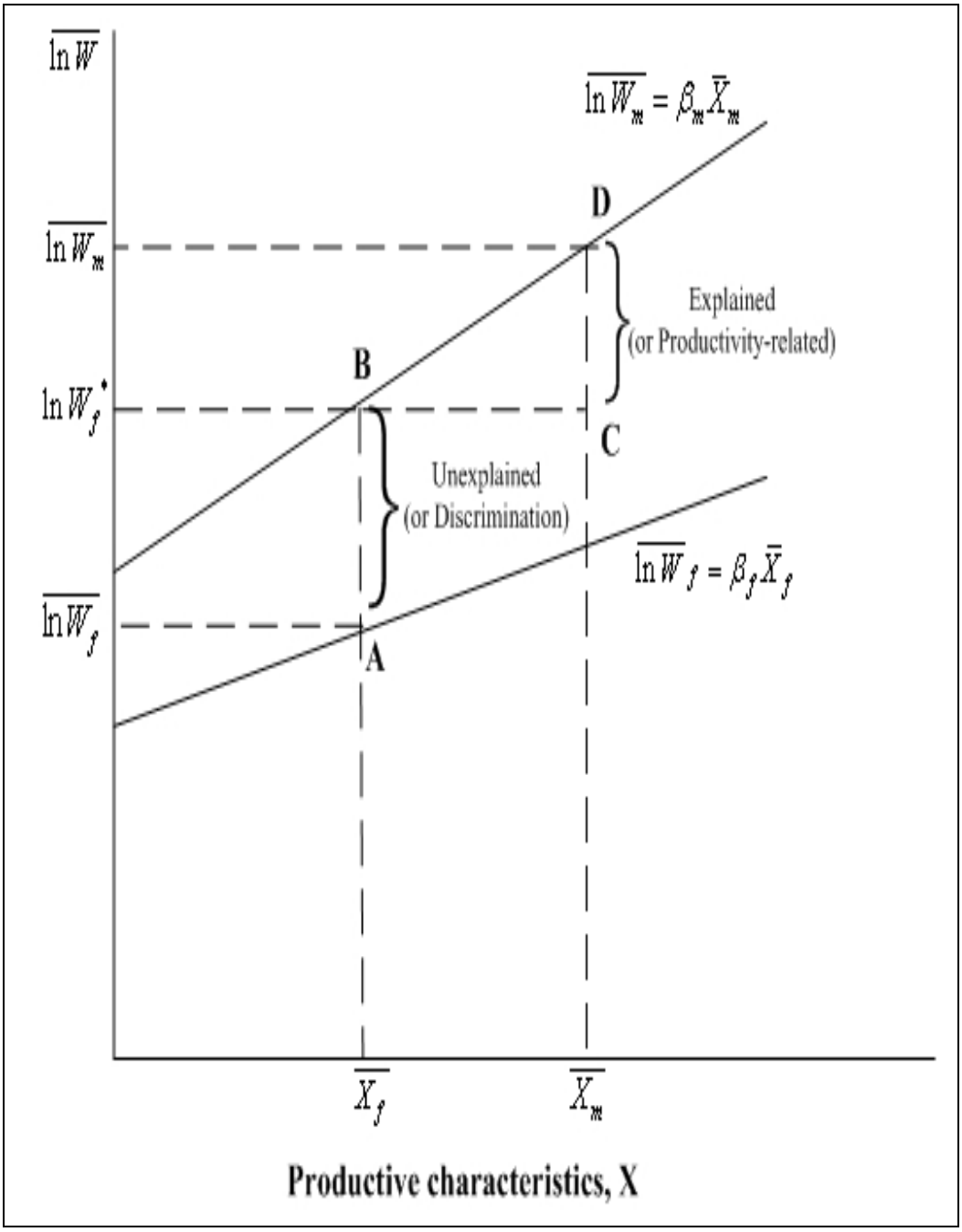

Figure 3.1 Graphical Illustration of the Oaxaca Decomposition

This figure indicates the relationship between wage and productivity characteristics for males and females. Assuming different average values of a

productivity characteristics, such as $\bar{\mathbf{X}}_f < \bar{\mathbf{X}}_m$, but the same returns to $\mathbf{X}$, wage gap between $\overline{\ln W_m}$ and $\ln W_f^*$ (distance between points D and C) shows the explained part of the wage gap. On the other hand, for any given productivity characteristics, such as $\bar{\mathbf{X}}_f$, the distance between points A and B shows the effects of omitted variables and/or wage discrimination. This latter is denoted as the unexplained part.

However, it is hard to tell which factors can be used as the explanatory variables, and most models do not include all the variables that can have an affect on the wage rate and therefore, the second term reflects not only discrimination but also omitted variables bias. So the first term is called explained portion and the second term is called unexplained portion. Much of the literature (see, for instance, Robb 1978) has discussed and effectively proven that the unexplained portion of wage differentials decreases if more explanatory variables are included in the regression model. Because of this caveat, the Oaxaca decomposition technique should be viewed as providing only a broad indication of the bases of pay differences.

3.1.3 Juhn-Murphy-Pierce Decomposition

Juhn *et al.* (1991) have extended the Oaxaca decomposition, allowing us to further decompose the differences between two periods in the gender gap. This

technique is used in several studies by Blau *et al.* (1992) to compare gender earning differences across time and across countries. By using this technique, we can evaluate the effects of wage dispersion and of the relative rank-changing of females in the male residual wage distribution. Following Juhn *et al.*'s notation, suppose that we have a male wage equation for worker j in year t:

$$\ln W_{jt} = \mathbf{X}_{jt}\mathbf{B}_t + \sigma_t \theta_{jt} \ , \tag{3.12}$$

where $\ln W_{jt}$ is the logged wage rate in year t, $\mathbf{X}_{jt}$ is a vector of explanatory variables in year t for male worker j, $\mathbf{B}_t$ is a vector of coefficients for $\mathbf{X}_{jt}$, σ_t is the residual standard deviation of male wage in year t (i.e., its level of male residual wage inequality), and θ_{jt} is the standardized residual (with mean zero and variance 1 for each year).

In average terms and with m and f denoting male and female respectively, the gender log wage gap for year t is

$$D_t = \ln W_{mt} - \ln W_{ft} = (\mathbf{X}_{mt} - \mathbf{X}_{ft})\mathbf{B}_t + \sigma_t(\theta_{mt} - \theta_{ft}) = \Delta\mathbf{X}_t\mathbf{B}_t + \sigma_t \Delta\theta_t \, , \tag{3.13}$$

where $\Delta\mathbf{X}_t = (\mathbf{X}_{mt} - \mathbf{X}_{ft})$ is the average gender difference in wage-determining factors, and $\Delta\theta_t = \theta_{mt} - \theta_{ft}$ is the average gender difference in the standardized residual from the male equation.

Equation (3.13) decomposes wage difference into (1) a portion due to changes in wage-determining factors ($\Delta\mathbf{X}_t\mathbf{B}_t$) and (2) a portion due to changes in the wage inequality ($\sigma_t\Delta\theta_t$).

The wage gap difference between the two years 1 and 0 can then be decomposed as follows:

$$D_1 - D_0 = \Delta \mathbf{X}_1 \mathbf{B}_1 + \Delta \theta_1 \sigma_1 - \Delta \mathbf{X}_0 \mathbf{B}_0 - \Delta \theta_0 \sigma_0 \tag{3.14}$$

By adding and subtracting ($\Delta \mathbf{X}_0 \mathbf{B}_1 + \Delta \theta_0 \sigma_1$) and rearranging, we derive:

$$D_1 - D_0 = (\Delta \mathbf{X}_1 - \Delta \mathbf{X}_0)\mathbf{B}_1 + \Delta \mathbf{X}_0 (\mathbf{B}_1 - \mathbf{B}_0) + (\Delta \theta_1 - \Delta \theta_0)\sigma_1 + \Delta \theta_0 (\sigma_1 - \sigma_0) \tag{3.15}$$

The first term in (3.15) measures the "wage-determining factors effect" which reflects the contribution of changing male-female differences in wage-determining factors ($\mathbf{X}$) to trends in the gender gap ($D_1 - D_0$). For example, all else being equal, an increase in women's educational levels relative to men's would decrease the gender gap.

The second term, the "observed prices effect," reflects the impact of changes in the rate of return to wage-determining factors for males. For example, an increasing return to education for men from year 0 to year 1 would increase the gender wage gap.

The third term, the "ranking effect," measures the impact of changes in the relative positions of women in the male residual wage distribution after controlling for measured characteristics (that is, whether women rank higher or lower within the male residual wage distribution).

Finally, the fourth term of (3.15), the "dispersion effect", reflects the impact of differences in wage dispersion between the two years. Specifically, the changes

in the gender wage gap are due partly to the change in the extent of male wage dispersion, while the relative ranking of the female wage residuals is assumed to remain the same.

The first and third terms measure gender-specific factors, while the second and fourth terms measure "wage structure" effect. Within the framework of a traditional decomposition, the sum of the first and second terms represents the changes of the "explained" differentials, which is the effect of changes in the wage-determining factors and changes in the "prices" on wage-determining factors. The sum of the third and fourth terms represents changes in the "unexplained" differentials, which are the results from changes in the male wage dispersion and changes in the female ranking within the male wage distribution.

This paper will use the Oaxaca decomposition methodology to decompose the gender wage differentials in the public sector, private sector, educational services sub-group, and health and social services sub-group. All the decomposed results will be further disaggregated by Juhn-Murphy-Pierce decomposition to evaluate the development within these four sectors between the two periods.

3.2 Data and Variables

All data for this paper were obtained from the 1991 and 1996 Canada Census Individual Microdata Files. These Microdata Files are based on a sample of

809,654 individuals in 1991 and 792,448 individuals in 1996, representing between 1 to 3 percent of the Canadian population. The sample contains extensive demographic and economic variables such as earnings and income, sex, age, and years of schooling.

In order to deal with a homogeneous group of individuals, the sample used in this research was restricted to persons of 26—65 years of age who were born in Canada and worked full-time (30 hours per week and more), full-year (50 weeks per year and more) with earnings from wages and salaries (annual wage > $100). The selection of the sample is under empirical considerations. In reality, women are more likely to work part-time; hence their proxy experience variable[1] will be overstated. If part-time workers are included, the wage differential between males and females attributed to unexplained portion is likely to be overestimated. Because the sample sizes for people who live in Yukon and Northwest Territories and for people who do not speak either English or French are relatively small and thus are of little significance to the regressions, we subsequently ignore these data.

For 1991, the sample contains 19,431 observations of males and 23,087 observations on females in the public sector, including 5,693 males and 6,973 females in educational services, 2,688 males and 9,823 females in health and social services and the remainder in government and semi-government employment. The

[1] In this paper, we use age as a proxy experience variable.

sample from the private sector contains 63,514 observations on males and 33,123 observations on females.

For 1996, the sample contains 16,660 observations of males and 22,397 observations on females in the public sector, including 5,105 males and 6,741 females in educational services, 2,662 males and 10,194 females in health and social services, and the remainder in government and semi-government employment. The sample from the private sector contains 57,504 observations on males and 31,046 observations on females.

Table 3.1 shows the variables used in the estimation of wage equation and their description.

Table 3.1 Variables definition

Variable Name	Variable definition
LnWage (LnW)	Natural logarithm of weekly earnings (in Canadian dollars)
Education (EDU)	Years of schooling
Education^2 (EDU^2)	Years of schooling squared
Age (AGE)	Age of workers over 26 years old and under 65 years old
Age^2 (AGE^2)	Age squared
Residence (RES)	Dummy variable=1 if the individual lives in a city, and "0" otherwise
Language (LAN)	3 dummy variables consisting of English, French, and both English and French, with English as the reference group
Province (PRO)	Dummy variables for Canada Census province, with Ontario as the reference group
Occupation (OCCU)	Dummy variables for the 1991 standard occupational classification, with professionals as the reference group

Industry (INDU) (public sector)	4 dummy variables consisting of government, semi-government, educational services, and health and social services, with health and social services as the reference group
Industry (INDU) (private sector)	Dummy variables for Canada Census 1980 standard industrial classification, with Manufacturing as the reference group

Following are some explanations of the variables. Firstly, weekly wages and salaries (wage) are derived from WAGESP/WKSWKP, where WAGESP is the gross annual wages and salaries before deducting income tax, pension, employment insurance, and other deductions in the past year and WKSEKP is the number of weeks in the past year during which an individual was working for pay. Secondly, educational levels are derived from years of schooling, where some of the years of schooling are ranges such as 1-4 years of schooling, 5-8 years of schooling, 14-17 years of schooling, and 18 or more years of schooling. Since what we need is the exact years of schooling, we chose the upper bound of each range as the value of the educational level.

Table 3.2 presents the average wages of both genders and their wage ratios in 1991 and 1996.

Table 3.2 1991 and 1996 female and male average weekly earnings and wage ratios

Sectors	1991	1996
	$\bar{W}_f / \bar{W}_m$ = Ratio	$\bar{W}_f / \bar{W}_m$ = Ratio
Private sector	481/757=0.64	560/845=0.66
Public sector	606/817=0.74	695/899=0.77
Public educational services	691/861=0.80	797/938=0.85
Public health and social services	543/697=0.78	626/769=0.82

From Table 3.2 we can deduce that:

- The gender wage ratio ($\bar{W}_f / \bar{W}_m$) is not the same across all groups in Canada in both years.
- In 1991, the wage ratio is 64 percent in the private sector and 74 percent in the public sector. That means that on average women earned 64 cents for every dollar earned by men in the private sector, while in the public sector women earned 74 cents for every dollar earned by men. Within the public sector, this ratio is 80 percent in educational services and 78 percent in health and social services. It is notable that women in the public sector have better pay than women in the private sector.
- In 1996, the wage ratio increases to 66 percent in the private sector and 77 percent in the public sector. The women's wage relative to that of men is still higher in the public sector than in the private sector. Within the public sector,

this ratio increases to 85 percent in educational services and 82 percent in health and social services.

- In the period 1991-1996, the relative wage ratios have risen in all the sectors, which mean the gender wage gap decreased during those 5 years.

Table 3.3a shows the gender wage ratios due to different educational levels.

Table 3.3a Wage ratios at different educational levels

Total years of schooling	1991		1996	
	$\bar{W}_f / \bar{W}_m$ = Ratio		$\bar{W}_f / \bar{W}_m$ = Ratio	
	Public	Private	Public	Private
Less than 8 years	369/553=0.67	324/595=0.55	405/585=0.69	384/638=0.60
9 years	389/585=0.67	361/637=0.57	445/628=0.71	401/687=0.58
10 years	423/632=0.67	388/651=0.60	475/662=0.72	436/720=0.61
11 years	460/695=0.66	432/677=0.64	506/708=0.72	481/720=0.67
12 years	499/724=0.69	460/716=0.64	549/765=0.72	522/787=0.66
13 years	511/755=0.68	481/740=0.65	574/805=0.71	544/801=0.68
14-17 years	661/842=0.79	575/856=0.67	746/912=0.82	657/949=0.69
18+	813/1012=0.80	739/1029=0.72	905/1102=0.82	818/1138=0.72

From Table 3.3a we can observe that:

- Wage levels increase with the rise of educational levels, and individuals with more than 18 years of schooling earn the highest average wages.
- The gender wage ratio is higher among more educated workers.
- In the 1991 public sector, women with less than 8 years of schooling earned

67 percent of the wages of men and this ratio climbed to 80 percent for those women with more than 18 years of education. The ratios in the private sector range from 55 percent to 72 percent.

- In the 1996 public sector, women with less than 8 years of education earned 70 percent of the wages of men and this ratio climbed to 82 percent for those women with more than 18 years of schooling. The ratios in the private sector range from 60 percent to 72 percent.
- With the same educational level, women in the public sector can earn more than women in the private sector.

To this point, it is evident that education is an important factor that greatly affects wage level. Differences in the educational levels between male and female could be a reason for gender wage differential. Next, we will compare the average years of schooling for male and female and see whether that difference does exist between the two genders. Table 3.3b will show the average years of schooling by sex for the years 1991 and 1996.

Table 3.3b Average years of schooling by sex, 1991 and 1996

	1991			1996		
	Male	Female	Gap	Male	Female	Gap
Private sector	13.280	12.986	0.294	13.687	13.517	0.170
Public sector	15.058	15.006	0.052	15.560	15.378	0.182
Public educational services	16.622	16.333	0.289	16.856	16.691	0.165
Public health and social services	14.628	14.566	0.062	15.080	14.872	0.208

* Gap = Male-Female

Table 3.3b presents the average years of schooling of males and females in both the public and the private sectors and the public sector sub-groups of educational services and health and social services in 1991 and 1996. From Table 3.3b we find:

- Males' average years of schooling is a little higher than that of females in both the public and private sectors in both years.
- People in the public sector have higher average educational levels than do people in the private sector, in both years.
- People in educational services have the highest educational levels in both years.
- The educational gap varies significantly between the public sector and the private sector, especially in 1991; in that year, the gap in the private sector is almost six times that of the public sector.
- Changes in the educational gap are different in the two sectors. In the private sector, the educational gap increased from 0.294 in 1991 to 0.170 in 1996, while in the public sector, it decreased from 0.052 in 1991 to 0.182 in 1996.

Now we will take a look at the variable age.

Table 3.4a Wage ratios for different ages (1991, 1996)

Age	1991		1996	
	$\bar{W}_f / \bar{W}_m$ = Ratio		$\bar{W}_f / \bar{W}_m$ = Ratio	
	Public	Private	Public	Private
26-35	563/687=0.82	476/667=0.71	623/747=0.83	538/722=0.75
36-45	640/850=0.75	503/817=0.62	713/893=0.80	591/904=0.65
46-55	625/918=0.68	469/850=0.55	747/1006=0.74	562/950=0.59
56-65	575/842=0.68	440/771=0.57	665/981=0.68	505/839=0.60

Table 3.4a gives us the wage ratios for different age groups in the public and the private sectors in 1991 and 1996. From this table we find:

- Average wage increases with aging but when age reaches a certain point, the average wage will decrease.
- Generally speaking, younger workers have a higher gender wage ratio. The smaller pay gap for younger workers may reflect the fact that these workers are new entrants to the labour marker, and hence have less variation in labour market experience.
- In the 1991 public sector, young women between 26 and 35 years of age earned 82 percent of the wages of young men of the same age group, and this ratio dropped to 68 percent for women workers between 56 and 65 years of age. In the private sector, this ratio ranges from 71 percent to 57 percent.
- In the 1996 public sector, young women between 26 and 35 years of age on average earned 83 percent of the wages of young men of the same age group,

and this ratio drops to 68 percent for women workers between 56 and 65 years of age. In the private sector, this ratio ranges from 75 percent to 60 percent.

- Within the same age groups, women in the public sector earn more than those in the private sector.

Here, age is used as a proxy of experience and this is another important variable that could affect wage. The pay differences between males and females could possibly be due to their different labour market working experiences. We will now compare the average ages in the labour market between the two genders. Table 3.4b shows the average ages by sex in 1991 and 1996.

Table 3.4b Average age (experience) by sex (1991, 1996)

	1991			1996		
	Male	Female	Gap	Male	Female	Gap
Private sector	39.684	39.022	0.662	40.405	39.705	0.700
Public sector	41.505	40.231	1.274	42.57	41.837	0.733
Educational services	43.245	41.187	2.058	44.559	42.928	1.631
Health and social services	39.814	40.268	-0.454	41.183	41.706	-0.523

*Gap = Male-Female

The average ages (experience) in the two sectors are different. In the public sector, males have more (by approximately one year) experience than do females and the gap decreases between 1991 and 1996. In the sub-groups of public sector, males who work in educational services have much higher (by roughly two years) experience levels than do females while males in health and social services

have less (by around 0.5 year) experience than do females. The experience gap in the private sector is relatively small.

Next, we will look at the percentages employed in a census metropolitan area (CMA) by sex. Usually people who work in cities earn higher wages than those working in rural areas. Table 3.5 shows the percentages employed in a CMA by sex in the years 1991 and 1996. The numbers in this table are percentages of people who are employed in cities.

Table 3.5 Percentage employed in a CMA by sex (1991, 1996)

	1991			1996		
	Male	Female	Gap	Male	Female	Gap
Private sector	60.3%	65.6%	-5.3%	59.9%	64.8%	-4.9%
Public sector	59.9%	61.3%	-1.4%	60.4%	61.1%	-0.7%
Educational services	56.6%	60.4%	-3.8%	57.1%	60.4%	-3.3%
Health and social services	59.4%	57.6%	1.8%	60.1%	57.5%	2.6%

* Gap = Male-Female

From Table 3.5 we can see that only in the public health and social services sub-groups is the CMA percentage of males higher than that of females in the same group. This can be used to explain the gender wage differential in the health and social services sub-group. In the other sectors, the percentage gaps between male and female are negative, which means that more females been employed in cities in those sectors. We also find that the gaps of percentage in a CMA in the private sector are higher than those in the public sector in both years.

The language proficiency by sex in year 1996 is shown in Table 3.6. The numbers in this table are percentages of males and females who can speak only French and percentages of males and females who are English-French bilingual.

Table 3.6 Language proficiency by sex, 1996

	French only			Both English and French		
	Male	Female	Gap	Male	Female	Gap
Private sector	11.9%	12.8%	-0.9%	21.1%	21.4%	-0.3%
Public sector	11.0%	13.4%	-2.4%	29.8%	23.9%	5.9%
Educational services	10.5%	13.6%	-3.1%	28.9%	26.9%	2.0%
Health and social services	20.6%	14.9%	5.7%	24.9%	17.6%	7.3%

* Gap = Male-Female

From Table 3.6, we can calculate the percentages of males and females who speak only English, e.g., in the private sector, the percentage of males who speak only English is "$1-11.9-21.1=67.0$." That is, 67 percent of males speak only English. Although both English and French are official languages of Canada, more than 50 percent of the workers studied speak only English no matter the sector. Therefore, studying the effect of English proficiency on wage could be very important. Except for those from the health and social services sub-group, fewer males speak only French compared to females in all sectors. With regard to bilingualism, in the public sector more males can speak both official languages than can females. The difference in language proficiency between the two genders in the private sector is relatively small.

Resident province appears to be another factor affecting gender wage differential. Table 3.7 shows the province of residence by sex in 1996.

Table 3.7 Province of residence by sex, 1996

	Public sector			Private sector		
	Male	Female	Gap	Male	Female	Gap
Newfoundland	2.8%	2.4%	0.4%	1.4%	1.4%	0.0%
Prince Edward Island	0.6%	0.7%	-0.1%	0.4%	0.4%	0.0%
Nova Scotia	5.0%	3.9%	1.1%	3.0%	3.1%	-0.1%
New Brunswick	3.3%	3.0%	0.3%	2.5%	2.3%	0.2%
Quebec	28.4%	25.7%	2.7%	26.4%	27.2%	-0.8%
Ontario	33.0%	35.8%	-2.8%	37.4%	37.8%	-0.4%
Manitoba	4.4%	4.4%	0.0%	4.0%	3.8%	0.2%
Saskatchewan	3.7%	4.3%	-0.6%	3.3%	3.1%	0.2%
Alberta	8.4%	9.0%	-0.6%	10.5%	10.1%	0.4%
British Columbia	10.4%	10.8%	-0.4%	11.3%	10.9%	0.4%

* Gap = Male-Female

Table 3.7 indicates that over 33 percent of the Canadian population live in Ontario, more than 25 percent live in Quebec, and the remaining approximately 40 percent live in the other 8 provinces. In most provinces, the percentage gaps between males and females are very slim (less than 1 percent). However, for Quebec and Ontario the gaps are a little higher (almost 3 percent), and the gaps are quite different between the public sectors and the private sectors. The gaps in the public sector are 2.7 percent for Quebec and -2.8 percent for Ontario, and the gaps in the private sector are only -0.8 percent and -0.4 percent, respectively.

In many papers, occupation is viewed as a very important variable in

accounting for gender wage gap. We will now consider the occupation distributions of males and females in the public and private sectors in 1996.

Table 3.8 Occupational distribution by sex, 1996

	Public sector			Private sector		
	Male	Female	Gap	Male	Female	Gap
Senior managers	2.1%	0.9%	1.2%	1.6%	0.4%	1.2%
Middle and other managers	11.3%	5.1%	6.2%	13.0%	10.6%	2.4%
Professionals	34.3%	41.3%	-7.0%	9.7%	8.4%	1.3%
Semi-prof. technician	9.3%	8.8%	0.5%	5.9%	3.1%	2.8%
Super. clerical sales service	1.4%	1.3%	0.1%	1.8%	3.4%	-1.6%
Super. crafts trades	1.0%	0.1%	0.9%	5.3%	1.4%	3.9%
Admin. senior clerical	3.1%	13.2%	-10.1%	1.9%	15.2%	-13.3%
Skilled sales service	9.5%	1.4%	8.1%	4.5%	5.6%	-1.1%
Skilled craft trades	3.7%	0.1%	3.6%	15.7%	0.9%	14.8%
Clerical personnel	4.9%	14.4%	-9.5%	7.1%	26.5%	-19.4%
Intermediate sales service	8.7%	9.3%	-0.6%	6.9%	11.2%	-4.3%
Semi-skilled manual work	2.3%	0.2%	2.1%	18.9%	5.6%	13.3%
Other sales service	6.7%	3.9%	2.8%	3.9%	6.0%	-2.1%
Other manual workers	1.8%	0.1%	1.7%	3.8%	1.8%	2.0%

* Gap = Male-Female

There are some valuable findings in Table 3.8:

- The most popular occupation in the public sector for both genders is professional, while in the private sector it is semi-skilled manual work for males and clerical personnel for females.
- Usually, wages for senior managerial and middle and other managerial occupations are significantly higher than those for other occupations. The larger percentage of men works in these manager-related occupations, while

relatively fewer women are employed in these occupations.

- Only in low-paid service-related occupations, such as clerical personnel and administrative senior clerical occupations, are the percentages of women much higher than those for men (in the public sector, the gaps are 9.5 percent for clerical personnel and 10.1 percent for administrative senior clerical occupations, and in the private sector, the gaps are 19.4 percent and 13.3 percent respectively).

It is easy to see that segregation of occupation with respect to gender could partly contribute to the explained portion of the overall gender wage differential. We will study the occupational distribution in more detail in the next chapter.

In the above discussion, we only explain the nature and feasible effects on the wage differential based on only partial data. Please refer to Tables 3.9 to 3.12 in the Appendix for complete information.

This chapter has covered the estimations, decomposition techniques, data information, and variable definitions for calculation of gender wage differential. The next chapter will present the estimation of wage equations for male and female in four sectors separately and the decomposition of the gender wage gap in 1991 and 1996.

Chapter 4

Regression Results

This chapter presents the empirical results on earnings and earning gaps, obtained using the techniques and data sets described in the previous chapter. First the results are presented for the private and public sectors by gender. These are followed by the results derived from two specific industries within the public sector; namely, educational services and health and social services. The earnings results are presented in the next section, followed by decomposition of the earnings gap into explained and unexplained gaps. The third section examines the issue of change in the earning gap between two censuses (1991 and 1996).

4.1 Earnings Equation

The following general earnings equation, discussed in Chapter 3, has been estimated using the *Ordinary Least Squares* (OLS) method.

$$\ln W_{jt} = \mathbf{X}_{jt}\mathbf{B}_j + \varepsilon_{jt} \qquad (4.1)$$

The dependent variable is the natural log of the weekly earnings rate, measured in current Canadian dollars, $\mathbf{X}_{jt}$ is a vector of explanatory factors which includes the

following four quantitative variables: years of schooling (EDU), its square (EDU^2), age (AGE), and its square (AGE^2). All other explanatory factors, including rural/urban residence (RES), language abilities (LAN), province of residence (PRO), occupation (OCCU), and industry (INDU), are qualitative variables; the dummy variable technique has been used to measure change in the average effect of a category compared to the reference group. English-speaking individuals living in a city in Ontario and working as professionals in manufacturing industries are considered to be the base group for the private sector. As presented in Table 3.1, the only difference for the public sector is with regard to industry, where the base is health and social services. We chose these groups as the base groups since they have the most observations.

After splitting the observations into public and private sectors, we run separate regressions for male and female for each of the two census years under study, 1991 and 1996. The same exercise is then applied for the education and the health and social services industries within the public sectors. The 1996 results are presented in the text while the 1991 results are presented in the Appendix. In this section, the effects of the quantitative variables are presented first (Table 4.Xa) followed by the results for the qualitative variables presented as percentage of difference from the base group (Table 4.Xb).

Table 4.1a shows the parameters estimation of wage function (4.1) of the

quantitative explanatory variables for both male and female in the public and private sectors separately for the year 1996.

Table 4.1a Estimated parameters of wage equation for both genders in the public and private sectors (1996)

Quantitative Variable	Public		Private	
	Male	Female	Male	Female
Constant	4.56313*	4.348217*	4.691213*	4.997225*
EDU	0.07183*	0.091922*	0.048927*	0.056444*
EDUSQ/100	-0.126*	-0.162*	-0.076*	-0.085*
AGE	0.050522*	0.051054*	0.075409*	0.05025*
AGESQ/1000	-0. 44*	-0. 49*	-0. 77*	-0. 54*

* Parameters are statistically significant at a 5 percent level.

The parameters, given in Table 4.1a, provide results that explain the effects of education and experience on earnings in the public and private sectors, by sex, as follows:

- Education has a positive effect on wages. Higher education, as measured by years of schooling, produces higher wages for both genders in both sectors. Education squared has a negative effect on wages, indicated by a wage rise but at a diminishing rate.
- Wages increase but at a diminishing rate through the accumulation of experience (age as a proxy for experience). If we take derivative of age, we could find that in the public sector, males at age 57 and females at age 52 have the highest average wages while in the private sector, these figures are 49 and

47, respectively.

Table 4.1b shows adjusted wage differentials of qualitative variables for both genders in the public and private sectors separately for the year 1996. Here we use the formula $e^{\beta}-1$ to calculate the percentage changes in wage differentials when $\beta \geq 0.05$. When $\beta < 0.05$, the percentage changes in wage differentials equals β.[2]

Table 4.1b Adjusted wage differentials (%) in the public and private sectors (1996)

Qualitative Variable	Public		Private	
	Male	Female	Male	Female
RESIDENCE: (Base: City)				
Rural	-5.2*	-5.4*	-7.3*	-13.7*
LANGUAGE: (Base: English)				
French	-1.4	-1.6	-8.5*	-9.0*
Both English and French	4.0*	1.7	-0.3	0.8
PROVINCE: (Base: Ontario)				
Newfoundland	-10.1*	-12.8*	-12.0*	-12.8*
Prince Edward Island	-8.4*	-22.3*	-18.4*	-15.0*
Nova Scotia	-12.6*	-19.4*	-20.5*	-18.7*
New Brunswick	-10.3*	-14.5*	-15.0*	-14.9*
Quebec	-7.6*	-9.0*	-11.1*	-11.7*
Manitoba	-10.0*	-12.4*	-14.3*	-14.4*
Saskatchewan	-12.8*	-15.9*	-12.4*	-14.4*
Alberta	-8.5*	-12.7*	-5.2*	-9.6*
British Columbia	1.3	-0.4	4.4*	4.3*

[2] Benjamin *et al.* (2002), pp. 259-260.

OCCUPATION: (Base: Professionals)				
Senior managers	13.5*	7.7	49.4*	32.4*
Middle and other managers	14.4*	10.6*	8.8*	0.3
Semi-professionals and technicians	-10.5*	-13.2*	-13.9*	-15.4*
Super. clerical sales service	-10.3*	-11.1*	-10.4*	-16.4*
Super. crafts trades	-2.6	4.2	-7.4*	-25.2*
Admin. senior clerical	-11.8*	-21.2*	-12.9*	-22.5*
Skilled sales service	13.6*	-16.5*	-14.4*	-25.4*
Skilled craft trades	-15.0*	-30.8*	-13.4*	-28.1*
Clerical personnel	-26.5*	-26.0*	-29.6*	-28.1*
Intermediate sales service	-12.9*	-36.5*	-21.6*	-33.9*
Semi-skilled manual work	-28.6*	-37.6*	-28.5*	-36.8*
Other sales service	-29.3*	-27.9*	-39.4*	-40.2*
Other manual workers	-33.6*	-63.4*	-30.5*	-41.1*
INDUSTRY: (Public sector, Base: health & social services)				
Government	23.1*	20.5*	N/A	N/A
Semi-government	19.4*	17.3*	N/A	N/A
Educational services	11.3*	6.5*	N/A	N/A
INDUSTRY: (Private sector, Base: Manufacturing)				
Agriculture	N/A	N/A	-42*	-45.2*
Other primary industries	N/A	N/A	20.3*	14.8*
Construction	N/A	N/A	-15.9*	-13.9*
Transportation and storage	N/A	N/A	-2.7*	0.6
Communication and other utilities	N/A	N/A	2.2*	13.4*
Wholesale trade	N/A	N/A	-10.8*	-7.2*
Retail trade	N/A	N/A	-29.4*	-26.6*
Finance, insurance, and real estate	N/A	N/A	-8.5*	-6.8*
Business services	N/A	N/A	-14.2*	-10.6*
Accommodations, food and beverage	N/A	N/A	-46.1*	-42.9*
Other services	N/A	N/A	-30.1*	-27.3*
No. of observation:	16660	22397	57504	31046

* Parameters are statistically significant at a 5 percent level.

Results in Table 4.1b show:

- With regard to residence, the estimation shows that individuals who live in rural areas earn lower wages than do city residents. Females in the private sector who reside in rural areas appear to earn much less (13.7 percent) than do those living in a city.
- Language ability also impacts wages. Although English and French are both official languages in Canada, in the private sector, those who speak only French earn considerably less (8.5 percent for males and 9.0 percent for females) than those who speak only English. People in the public sector who are bilingual do not earn much more (4.0 percent for males and 1.7 percent for females) than those who speak only English.
- The estimation of province variable indicates that most of the provinces have lower average wages when compared to those of Ontario, the reference group. However, our results show that British Columbia has positive coefficients in this category except for the coefficient for females in the public sector. That means that except for the females in the public sector, people in British Columbia earn more money than do people in Ontario.
- As for the occupational variables, all coefficients for the senior managers and middle and other managers groups are positive, while the rest are almost all negative. This means that only the senior managers and middle and other managers groups usually have higher earnings than the reference group,

professionals. Even within the two managerial groups, males earn much higher wages than do females in both sectors. Furthermore, females have a larger wage gap than males have in almost all occupations when compared to the reference group.

- In the industries, the reference groups are health and social services in the public sector and manufacturing in the private sector. We find that all the coefficients for men and women in the public sector are positive when compared to the reference group. This indicates that average wages in these industries are higher than wages in health and social services, for both men and women. In the private sector, most groups have negative coefficients. For males, the greatest gap can be found in the accommodations, food and beverage group. More specifically, the effect of the accommodations, food and beverage group on the wage is smaller by 46.1 percent than that for manufacturing, the reference group. For females, the similar situation happens for the agriculture group. Only the groups "other primary industries" and "communication and other utilities" have positive coefficients for both males and females.
- About 42 (22397/(22397+31046)) percent of the female labour force is employed in the public sector and only 22 (16660/(16660+57504)) percent of the male labour force works in this sector.

Next, we move to consider two sub-groups in the public sector. Table 4.2a and Table 4.2b show the results from estimating wage functions for males and females separately in educational services and health and social services in 1996.

Table 4.2a Estimated parameters of wage equation for both genders in educational services and health and social services (1996)

Quantitative Variable	Educational Services		Health and Social Services	
	Male	Female	Male	Female
Constant	4.51541*	3.786924*	4.511271*	4.751793*
EDU	-0.00472	0.062249*	0.123963*	0.077443*
EDUSQ/100	0.1229*	-0.041	-0.255*	-0.111*
AGE	0.080202*	0.083841*	0.029847*	0.038318*
AGESQ/1000	-0.72*	-0.83*	-0.2	-0.36*

* Parameters are statistically significant at a 5 percent level.

The results in Table 4.2a are similar to those revealed in Table 4.1a.

- Almost all the coefficients for education and age are positive. Only the coefficient for education of males in educational services is negative, but it is not statistically significant at a 5 percent level.
- Except for the coefficient for education squared for males in educational services, all the coefficients for education squared and age squared are negative.

Table 4.2b shows the adjusted wage differentials of the dummy variables for both genders in educational services and health and social services separately for the year 1996.

Table 4.2b Adjusted wage differentials (%) in educational services and health and social services (1996)

Qualitative Variable	Educational Services		Health and Social Services	
	Male	Female	Male	Female
RESIDENCE: (Base: City)				
Rural	-3.2*	-4*	0.6	-3.6*
LANGUAGE: (Base: English)				
French	-1.6	1.8	-5.3	-3.8
Both English and French	3.5*	1.4	0.9	0.8
PROVINCE: (Base: Ontario)				
Newfoundland	-9.2*	-11.1*	-22.7*	-15.7*
Prince Edward Island	-13.5*	-23.2*	-5.2	-20.6*
Nova Scotia	-15.7*	-14.5*	-27.8*	-25.5*
New Brunswick	-13.6*	-13.8*	-22.3*	-17.7*
Quebec	-11*	-11.8*	-2.4	-7.2*
Manitoba	-9.5*	-7.1*	-16.1*	-16.6*
Saskatchewan	-14.9*	-17.6*	-19.6*	-13.1*
Alberta	-13.9*	-10.3*	-6.5	-13*
British Columbia	-1.2	-3.7*	-0.9	1.7
OCCUPATION: (Base: Professionals)				
Senior managers	33.4*	10.8	59.2*	32.3*
Middle and other Managers	21*	20.2*	21.2*	7.5
Semi-prof. technician	-22.7*	-20.1*	-5.9*	-12.4*
Super. clerical sales service	-17.5*	-25.8*	7.3	-8.1*
Super. crafts trades	-4.5	8.5	23.5	18.8
Admin. senior clerical	-4.2	-21*	-10.4*	-24.1*
Skilled sales service	-8.8	-11.7*	-15.4*	-35.1*
Skilled craft trades	-14.4*	-62.2*	-2.7	-50.4*
Clerical personnel	-23.3*	-22.8*	-23.3*	-26.4*
Intermediate sales service	-33.7*	-37.5*	-22.5*	-40*
Semi-skilled manual work	-43*	-42.7*	-43.4*	-68.7*
Other sales services	-28.5*	-19.7*	-27.2*	-29.2*
Other manual workers	-12.3	33.2	-75.8*	-93.8
No. of observations:	5105	6741	2662	10194

* Parameters are statistically significant at a 5 percent level.

This table shows:

- The effects of residence, language, province, and occupation on the wages for these two groups are similar to the effects of the same factors in the public sector.
- Both educational services and the health and social services are female-dominated industries, especially the health and social services industry, wherein almost 80 percent (10194/ (10194+2662)) of the employees are females.

Here we discuss only the regression results for 1996; the results for both genders in the public sector, private sector, educational services, and health and social services for 1991 are similar to those for 1996. These results are given in the Appendix, Table 4.5a to Table 4.6b.

All the regression results from this section will be used to calculate the percentages of the earnings differentials due to the explained and unexplained portions.

4.2 Explained/Unexplained Gaps

This section uses the Oaxaca decomposition technique to decompose the male and female earnings differentials into explained and unexplained portions. The method is described fully in Chapter 3. Following are the formulas that will be

used:

1. $(\bar{\mathbf{X}}_m - \bar{\mathbf{X}}_f)\mathbf{B}_m$ — The difference in the gender wage rate that reflects differences in the wage-determining factors $\mathbf{X}$ (the explained part of the gender wage gap). For example, in the private sector, to examine the rural place of residence category in order to explain the wage differential, we multiplied the gender difference (in percentage) living in a rural area (40.1%-35.2%=4.9%, from Table 3.5) by the male coefficient for rural residence (-7.3 percent in Table 4.1b). This gives us an explained gap of -0.4 percent due to gender difference in place of residence. This -0.4 percent explained gap implies that with identical residence patterns for both male and female workers, one would expect the wage gap to increase by four-tenths of one percent. Again, if the differential is greater than 0.05, we use the formula $e^{diff} - 1$ to recalculate the explained gender wage differential where Diff is $(\bar{\mathbf{X}}_m - \bar{\mathbf{X}}_f)\mathbf{B}_m$.

2. $\bar{\mathbf{X}}_f(\mathbf{B}_m - \mathbf{B}_f)$ = Total gap minus the explained gap derived using the above-mentioned technique indicates the extent of the unexplained part of the gender wage gap.

Table 4.3 shows the contribution of each of the explanatory variables to overall earnings differentials in the public and private sectors, separately, in 1996.

Table 4.3 Contribution of each variable to overall earnings differentials (public and private sectors, 1996)

	Public Sector	Private Sector
Productivity factor:		
Education	0.4%	0.3%
Age	1.0%	0.8%
Language	0.3%	0.1%
Geographic factor:		
Residence	0.0%	-0.4%
Province	-0.3%	0.0%
Occupation	3.3%	3.8%
Industry	5.8%	7.6%
Explained gap	10.4%	12.1%
Total gap	31.5%	51.0%
Unexplained gap	21.1%	38.8%

*Calculated from the regression coefficients ($\mathbf{B}$) and the mean values of explanatory variables ($\overline{\mathbf{X}}$) in Table 3.10.

Using the above data, we can estimate the contribution of each of the variables to the overall differential.

- In the public sector, with respect to the explained gap, the productivity factor age can explain 1.0 percentage point of the overall wage advantage of males. The wage advantage of males can also be explained by their higher earnings occupational (contribute 3.3 percentage points to the explained portion) and industrial (contribute 5.8 percentage points to the explained portion) distributions. A negative entry indicates an advantage for females, but all the negative numbers in the explained gap are very small. For females, there are no important factors that have a substantial impact on their wage advantage.

The effects of geographic factors, such as residence and province, have little effect on gender wage differentials. The unexplained portion is 21.1 percentage points. This means that for the same productivity characteristics, geographic factors, and industrial and occupational distribution, males receive considerably higher earnings than do females.

- In the private sector, age cannot be used to explain the wage advantage of males as well as it can in the public sector. But the occupational and industrial distributions can explain the male wage advantage to a certain extent (they contribute 3.8 percentage points and 7.6 percentage points to the explained portion, respectively). We have not found any important factors that influence females' earnings in the private sector.
- The unexplained portion in the public sector is 21.1 percentage points. This indicates that 67 (21.1%/31.5%) percent of the overall gender wage differential is due to unexplained factors. In the private sector, this figure is 38.8 percentage points, and 76 percent of the gender wage differential is due to unexplained factors, which means that women receive relatively better pay in the public sector.

Table 4.4 shows the contribution of each variable to overall earnings differentials in the educational services and health and social services sectors in 1996. The variables' effects in these two sub-groups are of little difference.

Table 4.4 Contribution of each variable to overall earnings differentials (educational services and health and social services, 1996)

	Educational Services	Health and Social Services
Productivity factor:		
Education	0.9%	0.3%
Age	2.5%	-0.6%
Language	0.1%	-0.2%
Geographic factor:		
Residence	-0.1%	0.0%
Province	-0.4%	0.3%
Occupation	-1.1%	0.6%
Explained gap	1.9%	0.4%
Total gap	18.2%	19.0%
Unexplained gap	16.2%	18.6%

*Calculated from the regression coefficients ($\mathbf{B}$) and the mean values of explanatory variables ($\overline{\mathbf{X}}$) in Table 3.12.

From Table 4.4 we find:

- In educational services, age contributes to a narrowing of the wage differentials. Specially, males' higher age relative to that of females induces the gender wage differential. That is, if women increase their ages (experience), the gender wage gap would decrease. In health and social services, there are no important variables that affect wage differentials.
- The contributions of education, residence, language, province, and occupation to overall wages differentials are quite small.
- In educational services, the unexplained portion accounts for 16.2 percentage points (89 percent) of the wage differential, but in health and social services,

this figure is quite high, reaching 18.6 percentage points (98 percent).

In this section we have discussed the gender wage gap in the public sector and private sector in 1996 separately, and we also have discussed the gender wage gap in the sub-groups educational services and health and social services in 1996 separately. In the next section, we will further disaggregate the results concluded from this section and will evaluate the effects of changes of wage dispersion and of the changes of relative ranking of females in the male wage distribution.

4.3 Changes over Time

In this section, we will combine the 1991 and 1996 results and use Juhn-Murphy-Pierce decomposition to study the reasons behind the development of the gender wage gap between these two census years. Based on the results from the regressions for men and women shown in Tables 4.1a and 4.1b, we have calculated the components of gender wage differentials, as shown in Table 4.9. Here we use the coefficients (β) instead of the percentage change in order to further study the changes of wage structure (change in β) over time.

Table 4.9 Components of the gender wage gap, 1991 and 1996 (public and private sectors)

Gender Wage Gap		Components of the gender wage gap, 1991 and 1996		
		1991	1996	Change 1991-1996
Total	Public	0.3088	0.2741	-0.0347
	Private	0.4671	0.4119	-0.0551
Explained	Public	0.0989	0.1017	0.0028
	Private	0.1150	0.1190	0.0040
Unexplained	Public	0.2098	0.1724	-0.0374
	Private	0.3521	0.2930	-0.0591

Table 4.9 indicates the overall progress of the gender wage gap in both public and private sectors. In the public sector, the gender wage gap decreased by about three percentage points and in the private sector, the gender wage gap decreased by above five percentage points. In both sectors, the decreases of gender wage gaps are due to the decrease in the unexplained gap. The changes in explained gaps of the two sectors are relatively small, less than one percentage point. Now we will use the technique described in Chapter 3 to disaggregate the results in Table 4.9. The formulas that will be used are equations 4.2, and 4.3.

$$\ln W_{jt} = \mathbf{X}_{jt}\mathbf{B}_t + \sigma_t\theta_{jt} \text{ , and} \tag{4.2}$$

$$D_1 - D_0 = (\Delta\mathbf{X}_1 - \Delta\mathbf{X}_0)\mathbf{B}_1 + \Delta\mathbf{X}_0(\mathbf{B}_1 - \mathbf{B}_0) + (\Delta\theta_1 - \Delta\theta_0)\sigma_1 + \Delta\theta_0(\sigma_1 - \sigma_0) \text{ ,} \tag{4.3}$$

where "1" represents year 1996 and "0" represents year 1991 (the meanings of the other variables are referred to in Section 3.1.4). As we discussed in the previous chapter, the first term of equation 4.3 can be seen as the "wage-determining factors effect," the second term measures the "observed prices effect," the third term

measures the "ranking effects," and the fourth term measures the "dispersion effect." By using the above formulas, we can decompose the changes in the gender wage gap between 1991 and 1996. These results are presented in Table 4.10.

Table 4.10 Changes in components of the gender wage gap in the period 1991-1996 (public and private sectors)

	Public Sector	Private Sector
Total gap	-0.0347	-0.0551
Changes in explained gap		
Wage-determining factors effect $(\Delta\mathbf{X}_1 - \Delta\mathbf{X}_0)\mathbf{B}_1$	-0.0044	-0.0092
Observed prices effect $\Delta\mathbf{X}_0(\mathbf{B}_1 - \mathbf{B}_0)$	0.0072	0.0132
Changes in unexplained gap		
Ranking effect $(\Delta\theta_1 - \Delta\theta_0)\sigma_1$	-0.0413	-0.0971
Dispersion effect $\Delta\theta_0(\sigma_1 - \sigma_0)$	0.0039	0.0380

In this table, the overall gender wage gap (as calculated in Table 4.9) during 1991 to 1996 is split into four portions. First, the change in the explained part in Table 4.9 is split into the wage-determining factors effect and the observed prices effect. In the public sector, the wage-determining factors effect on the gender wage gap was a reduction of above 0.4 percentage points, which means that the difference in wage-determining factors $\mathbf{X}$ between males and females narrowed during years 1991 to 1996. But the observed prices effect on the gender wage gap worked more strongly in the opposite direction. The increases in males' returns to

wage-determining factors increased the gender wage gap by above 0.7 percentage points. Secondly, the change in the unexplained part in Table 4.9 is split into the ranking effect and the dispersion effect. The ranking effect, which measures the changes in female ranking in the male wage distribution, decreased the gender wage gap by about 4 percentage points in the public sector. Specifically, women increased their relative position between years 1991 and 1996. The dispersion effect measures the changes in the extent of male wage dispersion. It accounts for an increase in the gender wage gap of almost 0.4 percentage points in the public sector, which means that the extent of male wage dispersion increased over time.

Similarly, in the private sector, the reduction in the gender wage gap is due to the increase in the wage-determining factors effect; however, this gap too is cancelled by the observed prices effect. The ranking effect had decreased the gender wage gap by almost 10 percentage points and the dispersion effect accounted for a roughly increase of 4 percentage points.

Hence, ranking effect seems to play a very important role in explaining the development of the gender wage gap in both sectors.

Now we will take a look at the public sector sub-groups of educational services and health and social services. Table 4.11 shows the components of the gender wage gap between 1991 and 1996.

Table 4.11 Components of the gender wage gap, 1991 and 1996 (educational services and health and social services)

Gender Wage Gap		Components of the gender wage gap, 1991 and 1996		
		1991	1996	Change 1991-1996
Total	Educational services	0.2223	0.1668	-0.0555
	Health and social services	0.2172	0.1740	-0.0433
Explained	Educational services	0.0584	0.0188	-0.0396
	Health and social services	0.0063	0.0040	-0.0024
Unexplained	Educational services	0.1639	0.1480	-0.0159
	Health and social services	0.2109	0.1700	-0.0409

From Table 4.11 we deduce that the gender wage gap decreased by more than 5 percentage points in educational services, and by 4.33 percentage points in health and social services. However, the decreases in the two sectors were due to different reasons. In educational services, the decrease in the gender wage gap was mainly due to the change in the explained portion, corresponding to a reduction in the gender wage gap of nearly 4 percentage points. In health and social services, this figure is only 0.24 percentage points; the main reason for the decrease in the gender wage gap was the changes in the unexplained portion, which decreased the gender wage gap by more than 4 percentage points. Next we further decompose the results in Table 4.11 by using formulas 3.10 and 3.11.

Table 4.12 Changes in components of the gender wage gap in the period 1991-1996 (within the public sector)

	Educational services	Health and social services
Total gap	-0.0555	-0.0433
Changes in explained gap		
Wage-determining factors effect $(\Delta\mathbf{X}_1 - \Delta\mathbf{X}_0)\mathbf{B}_1$	-0.0335	0.0025
Observed prices effect $\Delta\mathbf{X}_0(\mathbf{B}_1 - \mathbf{B}_0)$	-0.0061	-0.0049
Changes in unexplained gap		
Ranking effect $(\Delta\theta_1 - \Delta\theta_0)\sigma_1$	-0.0210	-0.0566
Dispersion effect $\Delta\theta_0(\sigma_1 - \sigma_0)$	0.0051	0.0157

From the results in Table 4.12, we find that in the educational services sub-group, the wage-determining factors effect and the observed prices effect on the gender wage gap were reductions of about 3 percentage points and 0.6 percentage points, respectively. Specifically, between 1991 and 1996 the difference in $\mathbf{X}$ between males and females narrowed, and the returns to wage-determining factors for males had decreased slightly. Both effects worked together to reduce the gender wage gap from 1991 to 1996. In the health and social services sub-group, the gap in $\mathbf{X}$ between men and women increased, which in turn increased the gender wage gap by 0.2 percentage points, but the price effect worked more strongly in the opposite direction, decreasing the gender wage gap by 0.49 percentage points.

The ranking effect decreased the gender wage gap by more than 2 percentage points in educational services and by almost 6 percentage points in health and social services. Furthermore, in these two sectors, the relative wage position of females increased during this period. The dispersion effect, however, increased the gender wage gap by about 0.5 percentage points in educational services and by almost 2 percentage points in health and social services. This means that wage dispersion increased during this period.

This chapter presents the regression results, decomposes the gender wage into explained and unexplained portions, and then further studies the development of the gender wage gap between 1991 and 1996.

Chapter 5

Conclusions

This paper uses data from the Canada Census Individual Microdata Files for 1991 and 1996 to estimate separate earnings functions for males and females in the public and private sectors. Using the regression results, firstly, the gender wage differentials in different sectors were decomposed into an explained portion and an unexplained portion. Secondly, the results were further disaggregated by using Juhn-Murphy-Pierce decomposition. This decomposition allowed us to study the two above portions in more detail and to evaluate the differences in the gender gap between the two years 1991 and 1996.

We find the unexplained portion is smaller in the public sector than in the private sector. For example, in 1996, 67 percent of the wage gap is attributable to the unexplained part in the public sector, while in the private sector, this figure is 76 percent. Generally, males tend to have higher return to experience and more favorable occupation and industry distributions, which can account for the gender wage gap. More specifically, 50 percent of the gender wage gap can be explained by the industry variable. Therefore, after we decompose the gender wage

differential in educational services and health and social services, we find the "unexplained" portion is very high since we hold the industry variable constant. Nonetheless, no matter in which sector, even if females have the same productivity-related characteristics, geographic factors, and industrial and occupational distribution as males, they still earn less money on average.

Our findings also show that the overall gender wage gap decreases in both the public sector and the private sector between 1991 and 1996. This decrease is mainly attributed to the diminishing of the unexplained portion. In the public and the private sectors, the effect of changing male-female differences in wage-determining factors ($\mathbf{X}$) and the effect of changing women's relative wage positions to those of men contributed to a narrowing of the gender wage gap. However, this reduction is partly counteracted by the effects of observed price and wage dispersion; particularly in the private sector, the wage dispersion effect is substantial. In the educational services and health and social services sectors, the decline of gender wage differential is due to the decrease of explained gap as well as to the decrease of unexplained gap. In educational services, except for the dispersion effect, all three other effects decrease the gender wage gap and the dispersion effect on the gender wage gap is insignificant. In the health and social services sub-group, the picture is slightly different. Both the wage-determining factors and the dispersion effects have increased the gender wage gap, but these

effects are insignificant.

Overall, the decrease in Canada's gender wage gaps between 1991 and 1996 can be attributed to the decreasing unexplained gaps; to be more exact, to women's increased ranking position relative to that of males in the male wage distribution. While the explained gap is the result of gender difference in observed wage-determining factors, the remaining gap consists of effects of unobserved factors and/or discrimination. However, some differences in observed wage-determining factors, such as occupational distribution by gender, may be affected by discrimination as well.

This paper contains some shortcomings. First, due to a lack of suitably detailed data on work experience, we use age as a proxy of the experience variable. It is recognized that while this might be a good experience proxy for males, it perhaps may overstate the work experience for females, some of whom are likely to have spent time out of the labour force. In such a case, the percentage of the gender wage differential attributed to unexplained portion is likely to be overstated. Secondly, in order to get a better understanding of the gender wage differentials, it is very important to include all possible explanatory variables that could affect wage. This paper provides only a broad indication of the bases of pay differences. Finally, this research assumes that all individuals in both the public and private sectors are randomly selected from the labour market population. However, unlike

sex, an individual's workplace is a choice variable. Therefore, the wage equation is not independent of the selection (sectoral choice) process. Ignoring this process of choice and proceeding with Ordinary Least Squares (OLS) will result in biased estimates of the wage equation coefficients. However, the labour force participation rates of Canada men and women were relatively stable for the whole estimation period[3], so we do not take this problem into account in the present study.

In considering the implications of our results for policy development, the results generated by this study may be very encouraging since although the gender wage differential still exists in Canada, the wage gap between male and female workers in both sectors decreased from 1991 to 1996. We also notice that the experience variable plays a very important role in determining wage rate, so if the federal government can help women to increase their work experience and to strengthen their attachment to the labour force market, the gender wage gap will be reduced further.

[3] The labour force participation rate for men are 75.1 in 1991 and 72.1 in 1996, while these figures are 58.4 in 1991 and 57.4 in 1996 for women respectively. (Source: Statistics Canada, CANSIM Table 2820002)

References

Baker, M. and N. Fortin (2000) 'The Gender Composition and Wages: Why is Canada Different from the United States ', *Statistics Canada Catalogue* No. 11F0019MPE No.140.

Becker, G. S. (1975) Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, 2nd edition (New York: Columbia University).

Benjamin, D. M. Gunderson and W. C. Riddell (2002) Labour Market Economics (Toronto: McGraw-Hill Ryerson Limited).

Blinder, A. S. (1973) 'Wage Discrimination: Reduced Form and Structural Estimates', *Journal of Human Resources*, 8, 4, (Autumn), 436-55.

Blau, F. D. and L. M. Kahn (1992) 'The Gender Earnings Gap: Learning from International Comparisons', *American Economic Review*, (Papers and Proceedings), 82, 2, (May), 533-38.

Blau, F. D. and L. M Kahn (1992) 'Rising Wage Inequality and the U.S. Gender Wage Gap', *American Economic Review*, 84, 2, (May), 23-8.

Choudhury, S. (1994) 'New Evidence on Public Sector Wage Differentials', *Applied Economics*, 26, 3, (March), 259-66.

Falaris, E. M. (2004) 'Private and Public Sector Wages in Bulgaria', *Journal of Comparative Economics*, 32, 1, (March), 56-72.

Fortin, N. and M. Huberman (2002) 'Occupational Gender Segregation and Women's Wages in Canada: An Historical Perspective' *Canadian Public Policy*, 28, supplement 1, (May), 11-39.

Fuller, S. (2001) The Case for Pay Equity (British Columbia Office: Canadian Centre for Policy Alternatives).

Gunderson, M. (1979) 'Decomposition of the Male/Female Earnings Differential: Canada 1970', *Canadian Journal of Economics*, 12, 3, (August), 479-85.

Gunderson, M. (1998) Women and the Canadian Labour Market: Transitions Towards the Future (Toronto: Statistics Canada and ITP Nelson).

Gunderson, M., D. Hyatt, and W. C. Riddell (2000) 'Pay Differences between the Government and Private Sectors: Labour Force Survey and Census Estimates,' CPRN Discussion Paper, Number W 10.

Gupta, N. D., R. Oaxaca and N. Smith (1998) 'Wage Dispersion, Public Sector Wages and the Stagnating Danish Gender Wage Gap', CLS Working paper 98-18, University of Aarhus and Aarhus School of Business.

Gupta, N. D., R. Oaxaca, and N. Smith (2000) 'The Danish Gender Wage Gap and Wage Determination in the Private and Public Sectors', in Siv S. Gustafsson (ed.), *Gender and the Labour Market* (New York: St. Martin's Press), 53-74.

Heckman, J. (1979) 'Sample Selection Bias as a Specification Error', *Econometrica*, 47, 1, (January), 153-61.

Juhn, C., K. M. Murphy and B. Pierce (1991) 'Accounting for the Slowdown in Black-White Wage Convergence', in M. H. Kosters (ed.), *Workers and Their Wages* (Washington, DC: AEI Press), 107-43.

Long, J. (1976) 'Employment Discrimination in the Federal Sector', *Journal of Human Resources*, 11, 1, (Winter), 86-97.

Mincer, J. (1974) Schooling, Experience and Earnings (New York: National Bureau of Economic Research).

Oaxaca, R. (1973) 'Male-Female Wage Differentials in Urban Labour Markers', *International Economic Review*, 14, 3, (October), 693-709.

Robb, R. (1978) 'Earnings Differentials between Males and Females in Ontario, 1971', *Canadian Journal of Economics*, 11, 2, (May), 350-9.

Smith, A. (1776) The Wealth of Nations. (London: Methuen and Company).

Appendix

Table 3.9 Sample means in 1991 (public and private sectors)

	Public sector				Private sector			
	Male		Female		Male		Female	
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
WAGESP	42420.3	17403.8	31442.9	12940.3	39230.2	21307.4	24910.7	13306.5
Wage	816.8	335.0	605.6	248.9	757.0	410.5	480.8	256.4
LnWage	6.606	0.518	6.298	0.545	6.480	0.628	6.013	0.662
Edu	15.058	3.476	15.006	3.118	13.280	3.340	12.986	2.915
Edu^2	238.8	98.6	234.9	89.3	187.5	90.6	177.1	79.8
Age	41.505	9.290	40.231	9.142	39.684	9.820	39.022	9.573
Age^2	1808.9	805.0	1702.1	777.1	1671.2	842.4	1614.4	809.1
City	0.599	0.490	0.613	0.487	0.603	0.489	0.656	0.475
Rural	0.401	0.490	0.387	0.487	0.397	0.489	0.344	0.475
English	0.605	0.489	0.617	0.486	0.665	0.472	0.658	0.474
French	0.113	0.316	0.146	0.354	0.125	0.331	0.136	0.343
Both English and French	0.282	0.450	0.236	0.425	0.210	0.407	0.206	0.404
Newfoundland	0.028	0.166	0.024	0.152	0.015	0.121	0.014	0.117
Prince Edward Island	0.006	0.075	0.007	0.081	0.003	0.058	0.004	0.063
Nova Scotia	0.051	0.219	0.042	0.202	0.033	0.178	0.031	0.173
New Brunswick	0.031	0.173	0.030	0.169	0.026	0.160	0.022	0.147
Quebec	0.276	0.447	0.267	0.442	0.273	0.446	0.279	0.449
Ontario	0.337	0.473	0.357	0.479	0.370	0.483	0.380	0.485
Manitoba	0.047	0.212	0.047	0.211	0.039	0.194	0.037	0.190
Saskatchewan	0.037	0.189	0.039	0.194	0.031	0.175	0.032	0.176
Alberta	0.092	0.289	0.093	0.290	0.100	0.301	0.097	0.297
British Columbia	0.096	0.294	0.096	0.294	0.108	0.311	0.104	0.305
Senior managers	0.021	0.145	0.007	0.084	0.018	0.132	0.004	0.066
Middle and other managers	0.121	0.326	0.050	0.219	0.152	0.359	0.106	0.307
Professionals	0.318	0.466	0.384	0.486	0.090	0.286	0.073	0.259
Semi-prof. technician	0.091	0.288	0.105	0.306	0.057	0.231	0.028	0.166
Super. clerical sales service	0.013	0.112	0.015	0.122	0.018	0.131	0.034	0.182
Super. crafts trades	0.013	0.112	0.001	0.029	0.055	0.228	0.011	0.105
Admin. senior clerical	0.029	0.168	0.143	0.350	0.018	0.132	0.180	0.385
Skilled sales service	0.098	0.297	0.013	0.111	0.044	0.204	0.053	0.224

Skilled craft trades	0.041	0.199	0.001	0.030	0.161	0.367	0.010	0.098
Clerical personnel	0.050	0.218	0.151	0.358	0.065	0.247	0.249	0.432
Intermediate sales service	0.081	0.273	0.085	0.278	0.067	0.249	0.117	0.322
Semi-skilled manual work	0.036	0.186	0.004	0.060	0.181	0.385	0.056	0.230
Other sales service	0.064	0.245	0.040	0.197	0.037	0.189	0.061	0.239
Other manual workers	0.025	0.155	0.002	0.045	0.039	0.193	0.018	0.133
Agriculture					0.015	0.120	0.021	0.143
Other primary industries					0.047	0.212	0.015	0.123
Manufacturing					0.286	0.452	0.172	0.377
Construction					0.072	0.259	0.026	0.158
Transportation and storage					0.095	0.293	0.034	0.181
Communication and other utilities					0.085	0.279	0.071	0.258
Wholesale trade					0.088	0.284	0.060	0.237
Retail trade					0.119	0.324	0.170	0.376
Finance, insurance, and real estate					0.068	0.252	0.186	0.389
Business services					0.061	0.239	0.095	0.293
Accommodations, food and beverage					0.022	0.146	0.072	0.258
Other services					0.042	0.201	0.079	0.270
Government services: federal	0.244	0.429	0.112	0.316				
Government services: Other	0.325	0.468	0.160	0.367				
Educational Services	0.293	0.455	0.302	0.459				
Health and social services	0.138	0.345	0.425	0.494				
No. of observation:	19431		23087		63514		33123	

Table 3.10 Sample means in 1996 (public and private sectors)

	Public sector				Private sector			
	Male		Female		Male		Female	
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
WAGESP	46669.6	18893.9	36101.0	14923.9	43761.9	24650.1	28995.8	15630.9
Wage	898.7	363.8	695.4	287.1	844.8	475.1	559.7	301.1
lnWage	6.701	0.532	6.427	0.587	6.566	0.698	6.154	0.701
Edu	15.560	3.286	15.378	3.038	13.687	3.297	13.517	2.992
Edu^2	252.9	94.4	245.7	88.0	198.2	90.5	191.7	83.2
Age	42.570	8.823	41.837	8.824	40.405	9.221	39.705	9.072
Age^2	1890.0	764.9	1828.2	756.0	1717.6	790.6	1658.8	765.9
City	0.604	0.489	0.611	0.487	0.599	0.490	0.648	0.478
Rural	0.396	0.489	0.389	0.487	0.401	0.490	0.352	0.478
English	0.593	0.491	0.627	0.484	0.670	0.470	0.659	0.474
French	0.110	0.312	0.134	0.340	0.119	0.323	0.128	0.334
Both English and French	0.298	0.457	0.239	0.427	0.211	0.408	0.214	0.410
Newfoundland	0.028	0.164	0.024	0.153	0.014	0.117	0.014	0.116
Prince Edward Island	0.006	0.076	0.007	0.082	0.004	0.059	0.004	0.064
Nova Scotia	0.050	0.217	0.039	0.195	0.030	0.169	0.031	0.173
New Brunswick	0.033	0.180	0.030	0.172	0.025	0.157	0.023	0.151
Quebec	0.284	0.451	0.257	0.437	0.264	0.441	0.272	0.445
Ontario	0.330	0.470	0.358	0.479	0.374	0.484	0.378	0.485
Manitoba	0.044	0.206	0.044	0.204	0.040	0.195	0.038	0.191
Saskatchewan	0.037	0.189	0.043	0.204	0.033	0.178	0.031	0.173
Alberta	0.084	0.277	0.090	0.286	0.105	0.306	0.101	0.301
British Columbia	0.104	0.306	0.108	0.311	0.113	0.316	0.109	0.312
Senior managers	0.021	0.144	0.009	0.093	0.016	0.125	0.004	0.063
Middle and other managers	0.113	0.316	0.051	0.220	0.130	0.337	0.106	0.307
Professionals	0.343	0.475	0.413	0.492	0.097	0.296	0.084	0.277
Semi-prof. technician	0.093	0.290	0.088	0.283	0.059	0.236	0.031	0.174
Super. clerical sales service	0.014	0.116	0.013	0.112	0.018	0.132	0.034	0.182
Super. crafts trades	0.010	0.097	0.001	0.030	0.053	0.225	0.014	0.116
Admin. senior clerical	0.031	0.173	0.132	0.339	0.019	0.136	0.152	0.359
Skilled sales service	0.095	0.294	0.014	0.117	0.045	0.206	0.056	0.230
Skilled craft trades	0.037	0.189	0.001	0.032	0.157	0.363	0.009	0.095

Clerical personnel	0.049	0.216	0.144	0.351	0.071	0.257	0.265	0.441
Intermediate sales service	0.087	0.281	0.093	0.291	0.069	0.253	0.112	0.315
Semi-skilled manual work	0.023	0.151	0.002	0.044	0.189	0.391	0.056	0.230
Other sales service	0.067	0.250	0.039	0.193	0.039	0.195	0.060	0.238
Other manual workers	0.018	0.133	0.001	0.031	0.038	0.192	0.018	0.132
Agriculture	-	-	-	-	0.015	0.122	0.020	0.141
Other primary industries	-	-	-	-	0.042	0.200	0.013	0.113
Manufacturing	-	-	-	-	0.297	0.457	0.166	0.372
Construction	-	--	-	-	0.055	0.229	0.021	0.143
Transportation and storage	-	-	-	-	0.096	0.294	0.036	0.187
Communication and other utilities	-	-	-	-	0.080	0.271	0.070	0.256
Wholesale trade	-	-	-	-	0.104	0.305	0.071	0.256
Retail trade	-	-	-	-	0.111	0.314	0.159	0.366
Finance, insurance, and real estate	-	-	-	-	0.064	0.245	0.182	0.386
Business services	-	-	-	-	0.066	0.249	0.103	0.304
Accommodations, food and beverage	-	-	-	-	0.024	0.154	0.071	0.257
Other services	-	-	-	-	0.047	0.211	0.087	0.282
Government services: federal	0.230	0.421	0.100	0.300	-	-	-	-
Government services: other	0.303	0.460	0.144	0.351	-	-	-	-
Educational services	0.306	0.461	0.301	0.459	-	-	-	-
Health and social services	0.160	0.366	0.455	0.498	-	-	-	-
No. of observation:	16660		22397		57504		31046	

Table 3.11 Sample means in educational and health service, 1991

	Educational services				Health and social services			
	Male		Female		Male		Female	
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
WAGESP	44720.2	17074.6	35922.9	13445.1	36143.7	20792.8	28156.4	12060.3
Wage	860.9	328.4	6914.4	258.6	696.6	401.8	542.7	232.0
LnWage	6.667	0.489	6.445	0.498	6.393	0.644	6.176	0.589
Edu	16.622	3.106	16.333	2.661	14.628	3.706	14.566	3.243
Edu^2	285.9	89.6	273.9	78.9	227.7	102.2	222.7	90.1
Age	43.245	8.840	41.187	8.707	39.814	9.631	40.268	9.451
Age^2	1948.3	776.6	1772.2	739.8	1677.9	830.2	1710.9	807.1
City	0.566	0.496	0.604	0.489	0.594	0.491	0.576	0.494
Rural	0.434	0.496	0.396	0.489	0.406	0.491	0.424	0.494
English	0.613	0.487	0.593	0.491	0.532	0.499	0.649	0.477
French	0.113	0.317	0.152	0.359	0.217	0.412	0.166	0.372
Both English and French	0.274	0.446	0.255	0.436	0.250	0.433	0.184	0.388
Newfoundland	0.029	0.168	0.022	0.147	0.025	0.155	0.025	0.157
Prince Edward Island	0.005	0.074	0.004	0.067	0.004	0.064	0.007	0.081
Nova Scotia	0.039	0.193	0.034	0.182	0.036	0.187	0.046	0.210
New Brunswick	0.029	0.168	0.027	0.162	0.028	0.166	0.031	0.173
Quebec	0.268	0.443	0.269	0.443	0.394	0.489	0.274	0.446
Ontario	0.354	0.478	0.384	0.486	0.269	0.444	0.329	0.470
Manitoba	0.046	0.209	0.046	0.209	0.039	0.195	0.049	0.216
Saskatchewan	0.040	0.196	0.038	0.192	0.039	0.194	0.042	0.201
Alberta	0.099	0.299	0.092	0.289	0.079	0.270	0.094	0.292
British Columbia	0.091	0.288	0.084	0.277	0.086	0.281	0.103	0.304
Senior managers	0.005	0.071	0.002	0.040	0.018	0.132	0.003	0.055
Middle and other managers	0.113	0.316	0.037	0.189	0.109	0.311	0.050	0.219
Professionals	0.638	0.481	0.666	0.472	0.243	0.429	0.317	0.465
Semi-prof. technician	0.040	0.195	0.046	0.209	0.202	0.401	0.168	0.374
Super. clerical sales service	0.011	0.103	0.006	0.080	0.016	0.127	0.013	0.112
Super. crafts trades	0.005	0.071	0.001	0.032	0.005	0.072	0.000	0.017
Admin. senior clerical	0.008	0.090	0.109	0.312	0.016	0.127	0.106	0.308
Skilled sales service	0.004	0.059	0.003	0.053	0.028	0.164	0.016	0.127
Skilled craft trades	0.028	0.166	0.000	0.017	0.057	0.231	0.001	0.033
Clerical personnel	0.020	0.139	0.074	0.262	0.043	0.203	0.101	0.302
Intermediate sales service	0.007	0.085	0.027	0.162	0.089	0.285	0.154	0.361

Semi-skilled manual work	0.020	0.139	0.004	0.060	0.017	0.131	0.003	0.057
Other sales services	0.099	0.299	0.025	0.157	0.148	0.356	0.066	0.249
Other manual workers	0.003	0.053	0.000	0.021	0.009	0.092	0.001	0.035
No. of observation:	5693		6973		2688		9823	

Table 3.12 Sample means in educational and health and social services, 1996

	Educational services				Health and social services			
	Male		Female		Male		Female	
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
WAGESP	48696.7	18100.3	41412.1	15201.4	39884.0	23717.6	32491.0	14474.8
Wage	937.7	348.4	797.1	292.4	768.8	457.8	626.4	278.7
Ln Wage	6.751	0.505	6.584	0.530	6.475	0.697	6.301	0.644
Edu	16.856	2.930	16.691	2.519	15.080	3.531	14.872	3.152
Edu^2	292.7	85.5	284.9	75.9	239.9	98.0	231.1	88.6
Age	44.559	8.785	42.928	8.583	41.183	8.918	41.706	9.126
Age^2	2062.6	775.1	1916.4	733.4	1775.6	767.7	1822.7	785.0
City	0.571	0.495	0.604	0.489	0.601	0.490	0.575	0.494
Rural	0.429	0.495	0.396	0.489	0.399	0.490	0.425	0.494
English	0.606	0.489	0.595	0.491	0.545	0.498	0.675	0.468
French	0.105	0.306	0.136	0.343	0.206	0.404	0.149	0.356
Both English and French	0.289	0.453	0.269	0.443	0.249	0.432	0.176	0.381
Newfoundland	0.030	0.169	0.022	0.147	0.029	0.168	0.027	0.162
Prince Edward Island	0.006	0.078	0.005	0.068	0.007	0.084	0.007	0.085
Nova Scotia	0.040	0.195	0.033	0.178	0.035	0.185	0.044	0.204
New Brunswick	0.028	0.164	0.031	0.175	0.031	0.173	0.030	0.171
Quebec	0.276	0.447	0.259	0.438	0.385	0.487	0.250	0.433
Ontario	0.343	0.475	0.386	0.487	0.275	0.447	0.347	0.476
Manitoba	0.046	0.209	0.039	0.193	0.045	0.208	0.047	0.211
Saskatchewan	0.043	0.202	0.042	0.200	0.037	0.188	0.048	0.215
Alberta	0.088	0.284	0.088	0.284	0.076	0.265	0.091	0.288
British Columbia	0.102	0.302	0.095	0.293	0.080	0.271	0.109	0.312
Senior managers	0.005	0.068	0.002	0.044	0.015	0.120	0.005	0.072
Middle other managers	0.099	0.298	0.051	0.219	0.088	0.284	0.043	0.203
Professionals	0.652	0.476	0.705	0.456	0.277	0.448	0.337	0.473
Semi-prof. technician	0.041	0.198	0.028	0.166	0.205	0.404	0.143	0.350
Super. clerical sales service	0.011	0.104	0.004	0.064	0.015	0.120	0.012	0.107
Super. crafts trades	0.003	0.058	0.001	0.032	0.003	0.058	0.000	0.014
Admin. senior clerical	0.009	0.092	0.090	0.286	0.017	0.130	0.107	0.309
Skilled sales service	0.003	0.050	0.004	0.063	0.026	0.159	0.015	0.122
Skilled craft trades	0.029	0.168	0.001	0.024	0.044	0.204	0.001	0.026
Clerical personnel	0.020	0.139	0.072	0.258	0.039	0.193	0.100	0.300

Intermediate sales service	0.007	0.083	0.018	0.133	0.105	0.307	0.171	0.376
Semi-skilled manual work	0.010	0.099	0.002	0.049	0.014	0.116	0.001	0.026
Other sales services	0.108	0.311	0.022	0.146	0.145	0.352	0.065	0.246
Other manual workers	0.004	0.064	0.000	0.012	0.008	0.091	0.000	0.020
No. of observation:	5105		6741		2662		10194	

Table 4.5a Estimated parameters of wage equation for both genders in the public and private sectors (1991)

Quantitative Variable	Public		Private	
	Male	Female	Male	Female
	Coefficient (t-stat)	**Coefficient** (t-stat)	**Coefficient** (t-stat)	**Coefficient** (t-stat)
Constant	**4.459046** (51.73759)	**4.674324** (49.85811)	**4.604039** (82.16898)	**4.852057** (54.08938)
EDU	**0.064527** (7.175732)	**0.061686** (5.810051)	**0.069093** (11.65569)	**0.104147** (10.19606)
EDUSQ/100	**-0.112** (-3.53859)	**-0.071** (-1.91844)	**-0.156** (-7.18818)	**-0.252** (-6.81775)
AGE	**0.058879** (20.0185)	**0.044595** (15.94861)	**0.068194** (35.51568)	**0.034764** (12.67945)
AGESQ/1000	**-0.55** (-16.2296)	**-0.46** (-13.8829)	**-0.7** (-31.1975)	**-0.38** (-11.7273)

Table 4.5b Adjusted wage differentials (%) in the public and private sectors (1991)

Dummies Variable	Public		Private	
	Male	Female	Male	Female
	Coefficient	Coefficient	Coefficient	Coefficient
RESIDENCE; (Base: City)				
Rural	-4.4*	-7.6*	-8.7*	-15.6*
LANGUAGE: (Base: English)				
French	-1.2	2.1*	-5.2*	-8.5*
Both English and French	2.5*	2.2*	0.9	2.2*
PROVINCE: (Base: Ontario)				
Newfoundland	-5*	-0.1	-6.3*	-5.7*
Prince Edward Island	-11.8*	-2.6	-17.1*	-5.5
Nova Scotia	-7*	-10.8*	-15.5*	-17.6*
New Brunswick	-12.1*	-12.4*	-9.8*	-12.2*
Quebec	-6.5*	-6.9*	-8.8*	-7.9*
Manitoba	-11.9*	-8.4*	-11.9*	-14*
Saskatchewan	-12.9*	-11.2*	-13.2*	-20.6*
Alberta	-6.9*	-5.9*	-4*	-7.9*
British Columbia	-3.9*	-3.9*	2.3*	-0.5
OCCUPATION: (Base: Professionals)				
Senior managers	18.2*	2.5	46.8*	36.6*
Middle and other managers	11.7*	5.8*	8.1*	-0.3
Semi-prof. technician	-12.5*	-16.7*	-12.2*	-18*
Super. clerical sales service	-14.9*	-10.8*	-9.8*	-10.5*
Super. crafts trades	-12.5*	-33*	-6.1*	-30.2*
Admin. senior clerical	-11.1*	-22.7*	-12.9*	-21.1*
Skilled sales service	12.7*	-17.3*	-13.8*	-20.8*
Skilled craft trades	-13.7*	-16*	-11.2*	-33*
Clerical personnel	-26.3*	-25.2*	-27.4*	-26.1*
Intermediate sales service	-12.9*	-34*	-15*	-33.1*
Semi-skilled manual work	-23.9*	-41*	-23*	-33.3*
Other sales service	-28.6*	-29.8*	-37.2*	-35.6*
Other manual workers	-29.3*	-53.4*	-26.2*	-33.2*
INDUSTRY: (Base: health and social services)				
Government	22.8*	28.7*	N/A	N/A
Semi-government	14.9*	12.6*	N/A	N/A
Educational services	9.6*	8*	N/A	N/A

INDUSTRY :(Base: Manufacturing))				
Agriculture	N/A	N/A	-37*	-45.5*
Other primary industries	N/A	N/A	22*	19.1*
Construction	N/A	N/A	-10.3*	-11.8*
Transportation and storage	N/A	N/A	0.3	0.9
Communication and other utilities	N/A	N/A	5.5*	15.4*
Wholesale trade	N/A	N/A	-9.3*	-6.9*
Retail trade	N/A	N/A	-21.2*	-20.4*
Finance, insurance and real estate	N/A	N/A	-5.1*	-4.9*
Business services	N/A	N/A	-6.8*	-6.6*
Accommodation, food and beverage	N/A	N/A	-41.2*	-35.9*
Other services	N/A	N/A	-27.2*	-25.8*
No. of observation:	19431	23087	63514	33123

* Parameters are statistically significant at a 5 percent level.

Table 4.6a Estimated parameters of wage equation for both genders in educational services and health and social services (1991)

Quantitative Variable	Educational Services		Health and Social Services	
	Male	Female	Male	Female
	Coefficient (t-stat)	**Coefficient** (t-stat)	**Coefficient** (t-stat)	**Coefficient** (t-stat)
Constant	**3.88439**	**4.171186**	**4.680271**	**5.138754**
	(23.51861)	(22.86327)	(18.55012)	(35.51561)
EDU	**0.056153**	**0.050958**	**0.061611**	**0.039677**
	(3.306778)	(2.40641)	(2.514907)	(2.458187)
EDUSQ/100	**-0.07**	**-0.0090**	**-0.064**	**0.0064**
	(-1.21481)	(-0.12723)	(-0.72436)	(0.110738)
AGE	**0.087526**	**0.071179**	**0.046243**	**0.028643**
	(16.57961)	(15.04428)	(4.895386)	(6.203644)
AGESQ/1000	**-0.83**	**-0.73**	**-0.42**	**-0.28**
	(-13.727)	(-13.1927)	(-3.80335)	(-5.16323)

Table 4.6b Adjusted wage differentials (%) in educational services and health and social services (1991)

Dummies Variable:	Educational Services		Health and Social Services	
	Male	Female	Male	Female
	Coefficient	Coefficient	Coefficient	Coefficient
RESIDENCE: (Base: City)				
Rural	-4.0*	-6.7*	-1.3*	-6.3*
LANGUAGE: (Base: English)				
French	-2.9	3.8*	-2.6	0.9
Both English and French	-0.9	1.9	0.6	0.2
PROVINCE: (Base: Ontario)				
Newfoundland	-6.9*	-3.5	-12.5*	3.6
Prince Edward Island	-13.2	-8.6	-46.0*	1.3
Nova Scotia	-7.3*	-10.9*	-17.4*	-9.9*
New Brunswick	-15*	-12.3*	-22.1*	-14.4*
Quebec	-8.4*	-10.6*	-2.6	-2.4
Manitoba	-15.0*	-12*	-13.4*	-4.8*
Saskatchewan	-14.4*	-17.1*	-16*	-4.1
Alberta	-11.8*	-8.9*	-1.0	-1.4
British Columbia	-4.8*	-9.9*	-8.1*	1.0
OCCUPATION: (Base: Professionals)				
Senior managers	32.8*	-12.0	36.1*	23.0*
Middle and other managers	18.2*	16.6*	10.0*	3.8
Semi-prof. technician	-17.9*	-20.5*	-8.9*	-15.1*
Super. clerical sales service	-10.1*	-10.0*	-4.5	-5.8
Super. crafts trades	-18.1	-11.8	-7.1	-21.8
Admin. senior clerical	-11.2*	-22.0*	-4.8	-25.2*
Skilled sales service	-32.0*	-23.2*	-15.0*	-29.8*
Skilled craft trades	-13.2*	-4.5	2.0	-28.3*
Clerical personnel	-24.3*	-21.5*	-24.8*	-25.5*
Intermediate sales service	-34.8*	-44.1*	-32.4*	-35.7*
Semi-skilled manual work	-25.2*	-45.5*	-43.0*	-41.6*
Other sales services	-24.0*	-29.1*	-27.2*	-28.3*
Other manual workers	-25.0*	-38.1*	-69.6*	-83.9*
No. of observation:	5693	6973	2688	9823

* Parameters are statistically significant at a 5 percent level.

***Table 4.7** Contribution of each variable to overall earnings differentials (public and private sectors, 1991)*

	Public Sector	Private Sector
Productivity factor:		
Education	-0.1%	0.4%
Age	1.6%	0.5%
Language	0.2%	0.1%
Geographer factor:		
Residence	-0.1%	-0.5%
Province	-0.1%	0.0%
Occupation	3.6%	5.0%
Industry	5.0%	6.3%
Explained gap	10.1%	11.8%
Total gap	36.2%	59.5%
Unexplained gap	26.1%	47.7%

***Table 4.8** Contribution of each variable to overall earnings differentials (educational services and health and social service, 1991)*

	Educational Services	Health and Social Services
Productivity factor:		
Education	0.8%	0.1%
Age	3.6%	-0.7%
Language	0.1%	-0.1%
Geographer factor:		
Residence	-0.2%	0.0%
Province	-0.3%	0.4%
Occupation	1.9%	0.9%
Explained gap	5.9%	0.6%
Total gap	24.9%	24.2%
Unexplained gap	19.0%	23.6%