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Emerald Article: Slicing and dicing the gender/racial earnings differentials

Margaret Yap

Slicing and dicing the gender/racial earnings differentials

Margaret Yap
Ted Rogers School of Management, Ryerson University, Toronto, Canada

Abstract

Purpose – This paper aims to explore an extensive set of determinants of earnings and to offer recent empirical evidence of their effects on gender and racial earnings gaps.

Design/methodology/approach – Most previous studies looked at gender and racial comparisons independently of each other. This study extends previous studies by considering the interaction between gender and race. Using administrative data from a large Canadian firm, this paper explores the determinants of earnings based on a standard human capital model, comparing the earnings of white females, minority males and minority females with their white male counterparts. Both the dummy variable approach and a decomposition analysis are employed.

Findings – The results show that ranking in the organizational hierarchy accounts for most of the differences in gender and racial earnings, and ranking, together with human capital and job characteristics variables, explains over 90 percent of the earnings gap.

Research limitations/implications – The analyses in the paper are based on data from a Canadian organization with nation-wide operations. The findings may not apply to small or medium sized enterprises in Canada and in other non-Western economies.

Practical implications – To eliminate the earnings gap, equal pay programs need to be supplemented by effective employers' programs and policies targeted at equal advancement opportunity.

Originality/value – The paper uses firm-level data, which provides natural controls for variations across firms and allows for more in-depth analysis of the impact of various factors on earnings differentials.

Keywords Pay, Pay differentials, Gender, Canada

Paper type Research paper

Previous research on gender and racial differences in earnings in both the USA and Canada have generally relied on data from national household or labor force surveys. Although these surveys have large representative samples and are well designed, by their nature they focus on data collection of supply side variables (i.e. information on the employees) and rarely gather relevant information from the demand side (i.e. information on the employers). Researchers and policy makers, therefore, are limited to formulating recommendations based on information only about employees without consideration for the employers. Studies focusing on demand-side variables are needed to complement our extensive knowledge of the labor supply side. In Canada, the most

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comprehensive analysis of gender earnings differentials to date showed that workplace characteristics, together with careful industry measures, explained about 60 percent of the gender earnings gap (Drolet, 2002a). The goal of this paper is to explain the earnings gap by considering factors on both the supply and demand sides. A better understanding of the factors that contribute to earnings gaps can facilitate the development of policies and programs that can be put into place to help alleviate or eliminate such gaps.

This paper uses administrative data from a large Canadian firm. Firm-level data offer natural controls for factors that may have an impact on earnings, but which may be difficult to capture accurately in household surveys. Studying one particular organization also provides implicit controls for any wage differences resulting from different compensation strategies in different firms or industries. Focusing on one industry/sector also ensures that any sector effects and differences in the nature of the firm's product market, technology, size, etc., are removed. In short, the effects of any variables that are difficult to quantify or are unquantifiable are minimized.

Past empirical studies

Social scientists in Canada have studied the topic of gender earnings differentials for decades. Table I provides a brief summary of selected empirical studies that address gender/racial earnings differences in the Canadian context. The gross earnings ratio refers to the average female earnings as a percentage of male earnings without adjusting for productive attributes such as education and experience. The adjusted earnings ratio refers to the percentage after taking into consideration various factors that affect the level of earnings using multiple regression analyses. The "portion unexplained" refers to the percentage of the earnings gap that cannot be explained by productive attributes included in the regression model.

Ostry (1968) was one of the first studies that looked at gender differentials in earnings in Canada. Using the 1961 Census and looking at full-time, full-year workers, Ostry found that females made only 59 percent of males' annual earnings. After taking into consideration productivity-related factors, Ostry found that women earned about 20 percent less than comparable men. Using data on both full-time and part-time workers from the 1967 Survey of Consumer Finances, Holmes (1976) concluded that females' gross earnings were 49 percent of males' earnings. Schrank (1977) studied gender differentials among the faculty members at Memorial University of Newfoundland during 1973-1974 and found that female faculty members earned 95 percent of male faculty salaries, but only 75 percent of the gap was accounted for by differences in identifiable attributes.

Using data from the 1971 Census, Robb (1978) found that the differential was much larger between all males and all females than between all males and all single females aged 30 and over in Ontario. Gunderson (1979) compared male and female full-time, full-year workers with positive earnings in 1970 and found that female earnings were approximately 60 percent of male earnings, with about 60 percent of the gap unaccounted for by the observable characteristics included in the model. Cannings (1988) analyzed gender earnings differentials in a Canadian firm by using survey data. At the firm level, women's earnings were 87 percent of males' earnings, a figure relatively higher than that found using national survey data; however, a significant portion of the gap (70 percent) remained unexplained. Kidd and Shannon (1994) studied gender wage differentials using the 1989 Labor Market Activity Survey and found that women earned

Table I.
Previous empirical studies of the earnings gap using Canadian data

Author(s), year	Focus	Data source	Sample selection		Findings: Gross earnings ratios (percent)	Findings: Adjusted earnings ratios (percent)	Findings: Portion unexplained (percent)
Ostry (1968)	Gender	1961 Census	Full-time, full-year workers		59	81	
Holmes (1976)	Gender	1967 Survey of Consumer Finances	All persons full-time and part-time		49	56	
Schrank (1977)	Gender	598 faculty members at Memorial University of Newfoundland during 1973-1974			83	95	
Robb (1978)	Gender	1971 Census	All males and all females aged 18-65 in urban Ontario		59	73	59
			All males and single females 30 years of age and over in urban Ontario		79	97	15
Gunderson (1979)	Gender	1971	Full-time, full-year workers with positive earnings		60	73	63
Shapiro and Stelcner (1987)	Gender	1971 and 1981 Censuses	All Canada full-time workers (1970 results from Gunderson, 1979)	Year 1970	60	72	63
					66	76	66
Cannings (1988)	Gender	Survey data collected on 648 middle managers in a Canadian firm			87	90	77

(*continued*)

Table I.

Author(s), year	Focus	Data source	Sample selection		Findings: Gross earnings ratios (percent)	Findings: Adjusted earnings ratios (percent)	Findings: Portion unexplained (percent)
Beach and Worswick (1993)	Race	1973 Job Mobility Survey	Foreign-born and native-born females, aged 25-64 with positive earnings in 1972	Immigrants with 20 years of education received on average 9-17 percent lower earnings than their native-born peers			
Christofides and Swidinsky (1994)	Gender and race	1989 Labour Market Activity Survey	All workers who held only one job in year, excluding students	White females	76	8,282	7474
				Minority males	83	88	69
				Minority females	74	83	63
Kidd and Shannon (1994)	Gender	1989 Labour Market Activity Survey	Individuals 16-64 with at least one paid full-time job in 1989		74	89	39
Coish and Hale (1995)	Gender	1994 Survey of Labour and Income Dynamics	Individuals 15-69, employed in January 1993		78	80	88
Baker *et al.* (1995)	Gender	1971, 1981 and 1986 Censuses and the 1986 and 1991 Survey of Consumer Finances (SCF)	Full-time, full-year workers between the ages of 16 and 64, excluding the self-employed or those employed in agriculture	1970 Census	60	69	74
				1980 Census	64	73	73
				1985 Census	66	73	75
				1985 SCF	64	71	79
				1990 SCF	67	71	84
Kidd and Shannon (1997)	Gender	1981 Canadian Survey of Work History (CSWH)	Full-time paid workers, aged 17 to 64	1981 CSWH	77	88	48
		1989 Labour Market Activity Survey (LMAS)		1989 LMAS	78	89	46

(*continued*)

Table I.

Author(s), year	Focus	Data source	Sample selection		Findings Gross earnings ratios (percent)	Findings Adjusted earnings ratios (percent)	Findings Portion unexplained (percent)
Baker and Benjamin (1997)	Race	1991 Census	Full-time, full-year males aged 16-64, including all immigrants and members of ethnic groups, and a 15 percent sample of native-born whites	Black	78	81	83
				South Asian	85	87	81
				SE Asian	76	87	51
				Chinese	84	96	27
Gunderson (1998)	Gender	1971, 1981 and 1991 Censuses	Full-time full-year persons 15 years and over who worked for pay or profit	Year 1970	63	74	65
				Year 1980	67	76	67
				Year 1990	72	79	71
Hum and Simpson (1999)	Race	1994 Survey of labour and Income Dynamics	Individuals aged 15-69 who reported earnings in 1993	Regression with single visible minority dummy showed a wage disadvantage of about 15 percent			
Drolet (2001)	Gender	1997 Survey of Labour and Income Dynamics	Full-time, full-year employees aged 18-64		80	89	51
Swidinsky and Swidinsky (2002)	Race and gender	1996 Census	Non-native paid workers between 15 and 64 years of age	Ethnic earnings disadvantages are substantially moderation from one generation to another			
Drolet (2002)	Gender	1999 Workplace and Employee Survey	Paid workers between 18 and 64 years of age		80	92	39

74 cents for every dollar men earned. Their model, which included the imputation of female actual work experience and included a separate home-time variable, still left 39 percent of the gap unexplained. Findings from Coish and Hale (1995), based on data from the 1994 Survey of Labor and Income Dynamics, are similar to those of Kidd and Shannon: they found that women earned 78 cents for every dollar earned by men. However, the unexplained portion in the Coish and Hale study was 88 percent.

There are also a number of researchers who have attempted to take a longitudinal approach to assessing the earnings differentials. For example, Baker *et al.* (1995) examined trends in gender differentials using Census data as well as data from the Surveys of Consumer Finances. The authors determined that while both the gross and adjusted earnings ratios narrowed slightly between 1970 and 1990, the portion of the gap that was unexplained increased from 74 percent to 84 percent. Kidd and Shannon (1997) and Gunderson (1998) also analyzed the trends in gender earnings differentials and found similar results.

More recent studies include Statistics Canada reports using data from the 1997 Survey of Labor and Income Dynamics and the 1999 Workplace and Employee Survey (Drolet, 2001, 2002a). Full-time and full-year female employees earned about 80 percent of what their male counterparts earned. Drolet (2001) found that about half of the adjusted gap could be accounted for by the explanatory variables included in the model. Using matched employee-employer data from the 1999 Workplace and Employee Survey (WES), Drolet (2002b) found that women were paid on average 80 cents for every dollar earned by men. The inclusion of a very extensive list of explanatory variables that are available from WES increased the explained component of the gender wage gap to 61 percent and also concluded that workplace characteristics ("where you work") account for more of the gap than "who you are", "what you do", and "when you work".

While many scholars have undertaken research on gender earnings differentials, relatively few have looked at the racial earnings gap. Beach and Worswick (1993) investigated racial earnings differentials among females using the 1973 Job Mobility Survey. Their objective was to determine whether or not immigrant women suffered a "double negative" effect on earnings. Their sample included foreign-born and native-born females, aged 25-64, who had positive earnings in 1972. Overall, they found that the double negative effect did not appear to hold across the board for immigrant women, but that female immigrants with 20 years of education received, on average, earnings that were 9 percent to 17 percent lower than their native-born counterparts.

Christofides and Swidinsky (1994) analyzed the earnings differentials among a number of race/gender groups. Using the 1989 Labour Market Activity Survey, they determined that when compared to white males, gross earnings figures were 76 percent for white females, 83 percent for minority males, and 74 percent for minority females. After adjusting for various observable characteristics, significant gaps still existed. Studies by Baker and Benjamin (1997) and Hum and Simpson (1999) focused specifically on racial earnings differentials. Based on a sample from the 1991 Census, they found that Blacks, South Asians, Southeast Asians, and Chinese respondents earned 81 percent to 96 percent of white males' earnings. Over 80 percent of the adjusted gaps between white males and Blacks and South Asians remained unexplained, whereas only 27 percent remained unexplained for Chinese respondents. Hum and Simpson (1999), on the other hand, estimated a regression model with a single visible minority dummy variable and found that visible minorities suffered a wage disadvantage of about 15 percent compared with whites. Swidinsky and

Swidinsky (2002) provided a more recent look at the ethnic earnings differentials. Using data from the 1996 Census, the researchers found that earnings disadvantages for ethnic minorities fluctuate substantially from one generation to another.

Data

This paper utilizes a proprietary dataset obtained from the human resource information system of a large Canadian firm. This dataset contains specific compensation and demographic information on regular, full-time, non-unionized employees as of year-end 1999. The final sample of 12,983 employees excludes those who chose not to self-identify their ethnicities.

A firm-level dataset offers the possibility of observing variables that are either missing from, or otherwise under-specified, in national household surveys. Variables such as performance ratings and job level are usually not available from household surveys because they are impossible to measure consistently due to the heterogeneity of the target worker population. Other variables such as occupation are under-specified as the standard occupation codes used in household surveys are so broad that they often have many different jobs grouped together as a single category. A number of studies have found occupational segregation to be a significant determinant of the wage gap (Gunderson, 1979; Drolet, 2001). However, since the use of broad standard occupational categories combines the effects of horizontal segregation (how employees are allocated in different job functions) and vertical segregation (how employees are allocated in the organizational hierarchy), it precludes the investigation and separation of their respective effects on the gender or racial differences in employment outcomes. The more precise and narrowly defined job categories that firm-level data provide not only allow us to investigate the impact of human capital variables on employment outcomes, but also allow the disaggregation of the effects of horizontal and vertical segregation.

Administrative data can also offer a higher level of accuracy and integrity for variables such as annual salaries, tenure, and age, as compared to retrospective survey data. The dataset used in this paper contains a number of variables not usually available in conventional datasets: job level, incidence of promotion, break(s) in service, and incidence of separation, all of which are defined in more detail later in the paper.

Methodology

To explore the determinants of earnings, a cross-sectional earnings model based on a standard human capital model is employed. While most previous studies looked at gender and racial comparisons independently of each other, this study extends considers the interaction between gender and race. Thus, instead of including dummy variables for race and gender, four variables to represent race and gender differences are created:

(1) white males;
(2) white females;
(3) minority males; and
(4) minority females.

Both the dummy variable approach and a decomposition analysis will be conducted.

A semi-log earnings equation with the productivity-related variables on the right-hand side plus dummy variables for each of the minority race/gender groups (with white males being the omitted or reference category) was estimated as follows:

$$\ln Y = \beta_0 + \beta_1 WF + \beta_2 MM + \beta_3 MF + \beta_4 X + \varepsilon,$$

where WF, MM and MF indicate the minority gender/race combinations, i.e. white females, minority males, or minority females. The first term ($\ln Y$) is the logarithm of annual pre-tax earnings. X is a vector of explanatory variables, and ε is the error term.

The dummy variable approach implicitly assumes that the coefficients of the explanatory variables included in the model are equal for each race/gender group and that the earnings differentials can be captured by the additive dummy variables. This restriction of equal coefficients can be tested empirically; if it is not satisfied, separate earnings equations for each group can be estimated, allowing the coefficients to vary between groups.

Estimating separate equations for each group provides a further understanding of the earnings differentials. Following Oaxaca (1973) and Blinder (1973), any differentials can be partitioned into an explained portion and an unexplained portion. The explained portion is the portion that can be explained by differences in characteristics (average value of explanatory variables) between the two groups, while the unexplained portion is due to differential returns (regression coefficients) on the same characteristics – often labelled "discrimination". The difference between the average log earnings for white males and white females (as an example), can be written as follows:

$$\ln \bar{Y}_{wm} - \ln \bar{Y}_{wf} = (\beta_{wm}\bar{X} - \beta_{wf}\bar{X}_{wf}).$$

Using the wage structure enjoyed by white males as the competitive wage structure[1] in the absence of differential wage treatment due to differences in gender or race, the difference between the average log earnings for white males and white females (as an example) can be written as follows:

$$\ln \bar{Y}_{wm} - \ln \bar{Y}_{wf} = \underbrace{(\beta_{wm} - \beta_{wf})\bar{X}_{wf}}_{\text{Part I}} + \underbrace{\beta_{wm}(\bar{X}_{wm} - \bar{X}_{wf})}_{\text{Part II}}$$

Part I, the "coefficients" component, represents the differential returns to characteristics based on the mean characteristics of the disadvantaged group, while Part II, the "attributes" component, represents the effect of differences in characteristics (valued at the returns to the advantaged group) on wages.

A number of researchers have suggested various ways of estimating a competitive wage structure using the white male's wage structure (Oaxaca, 1973; Reimers, 1983; Cotton, 1988; Neumark, 1988). In general form, if β^* is the competitive wage structure in the absence of differential wage treatment due to differences in gender or race, the above can be rewritten as:

$$\ln \bar{Y}_{wm} - \ln \bar{Y}_{wf} = \underbrace{(\beta_{wm} - \beta^*)\bar{X}_{wm}}_{\text{Part I}} + \underbrace{(\beta^* - \beta_{wf})\bar{X}_{wf}}_{\text{Part II}} + \underbrace{\beta^*(\bar{X}_{wm} - \bar{X}_{wf})}_{\text{Part III}}$$

Part I, the first component of the right-hand side, captures the preferential treatment enjoyed by white males, over and above the competitive wage structure, whereas Part II captures the disadvantage suffered by white females, relative to the competitive wage

structure. The sum of these two components represents the total unexplained portion of the gap. The last component, Part III, provides an estimate of the returns to average characteristic or endowment differences between the two groups and represents the explained portion of the gap.

The dependent and independent variables

The dependent variable in our study is the natural logarithm of employees' annual base salaries in 1999[2]. Because compensation information in most other surveys is recorded in broad ranges, researchers are forced to use estimates in their analyses. Salary information from a firm's administrative system – as is used in this study – provides the exact salaries of the employees.

Most of the independent variables considered in our model are commonly used in wage studies, including educational attainment, age, tenure[3], and region of work. In addition to these standard human capital model variables, our study also allows us to investigate factors not previously explored in past studies, thus increasing our ability to explain the gender and racial differences in compensation. These include performance ratings (a proxy for productivity), job family (a measure of horizontal segregation), job level (a proxy for vertical segregation), incidence of promotions (a proxy for career advancement), and incidence of termination and breaks in service (measures or proxies for labor force attachment).

Most of the variables included in this analysis are self-explanatory; however, below is a brief discussion of some of the variables that are specific in this firm-level dataset.

Job level

Job level is included in the analyses as a measure for vertical segregation. Jobs within organizations are systematically ordered in a hierarchy, to facilitate their human resource management and business processes. In the firm used in this study, the ordering is based on the complexity of the job, thus providing a consistent ranking for the level of responsibilities and compensation. The methodology used to determine an employee's respective job level is consistently applied to all employees. This job level information allows the investigation of the impact of vertical segregation between genders and between whites and non-whites. As depicted in Figure 1, while white males are concentrated at higher job levels in the organizational hierarchy, the representation levels of white females, minority males, and minority females are more likely to occupy roles at lower job levels.

Incidence of promotion

The explicit ranking of jobs and the longitudinal nature of the data enable a clear definition of promotion. Since employees are assigned a certain job level, any reclassification to a higher level can be classified as a promotion. Studies have shown that promotions have positive effects on earnings levels (Baker *et al.*, 1994a, b; McCue, 1996; Bognanno, 2001); however, the effects may differ for men and women. In their study, Hersch and Viscusi (1996) found that promotions lead to higher wage levels for men but have no significant impact on the wage levels for women. Data for the years 1991-1995 from the British Household Panel Survey showed that although men and women were being promoted at similar rates, promoted men were found to receive wages 20 percent higher than unpromoted men, whereas wages of promoted women were only 9.8 percent higher than those of unpromoted women (Booth *et al.*, 2003).

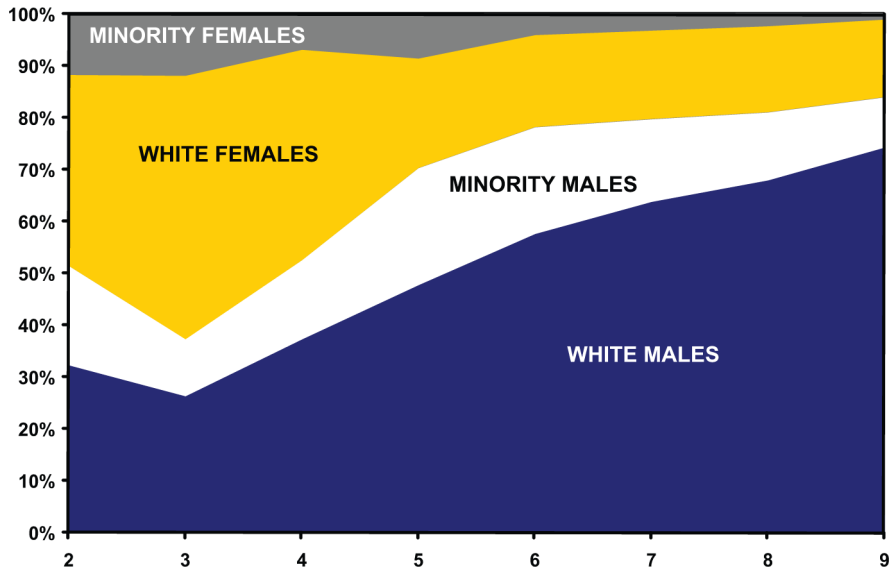

Figure 1.
Distribution of race/gender groups by job level

Lazear and Rosen (1990), on the other hand, showed that promoted women gained higher average wages than promoted men because the average promoted woman was of higher ability. Cobb-Clark (2001) also found that young women experienced wage gains at promotion that were 2.4 percent to 5.6 percent higher than those for promoted men and that promotions increased the rate of wage growth for promoted women much more than for promoted men. Including this variable in our model will allow us to control for this positive effect.

Break(s) in service

Because consecutive years of the year-end files can be compared, the data provide information as to whether or not each employee's service with the company is continuous. Employees who left the firm but were subsequently rehired are assigned the same identification number. This allows the derivation of the "break(s) in service" variable. Other reasons for "break in service" include educational, maternity/paternity, or other personal leaves that crossed calendar years between 1995 and 2000. Though limiting to some extent, this information can offer insight into how interrupted tenure affects employment outcomes.

Incidence of and reason for separation

In addition to information on the incidence of separation of employment from the firm, information on the reason for termination is also available. The ability to identify the reason for termination provides opportunities to understand the nuances behind the decision-making, from both the employer's perspective and the employee's perspective. Other studies have either looked at the incidence of termination or differentiated only between voluntary and involuntary termination. The availability of specific separation reasons enables more in-depth analysis of whether incidence of and reason for separation are associated with any gender or racial earnings differential.

Job family

Job family is included as a measure of horizontal segregation. A number of studies have found occupational segregation to be a significant determinant of the wage gap (Gunderson, 1979; Drolet, 2001). However, since the use of broad standard occupational categories combines the effects of horizontal segregation (how employees are allocated in different job functions) and vertical segregation (how employees are allocated in the organizational hierarchy), such use precludes the investigation and separation of their respective effects on the gender or racial differences in employment outcomes. The more precise and narrowly defined job categories that firm-level data provide not only allow us to investigate the impact of human capital variables on employment outcomes, but also allow the separation of the effects of horizontal and vertical segregation. As is illustrated in Figure 2, there are nine job families in this organization. Human Resources and Corporate Services are two job families that are female-dominated, whereas Customer Service and Research and Development are two job families that are to be male-dominated[4].

Table II shows the descriptive statistics of the variables used in the analyses and their definitions.

Determinants of earnings

To investigate the potential determinants of earnings, a series of hierarchical models that build on the standard wage equation with traditional human capital variables was estimated. Each model builds on the previous one with an additional set of variables, including performance, firm attachment, and job family or horizontal segregation. The final model incorporates the job level variable, which accounts for vertical segregation. Table III presents the estimates for the various specifications of the semi-logarithm earnings equations.

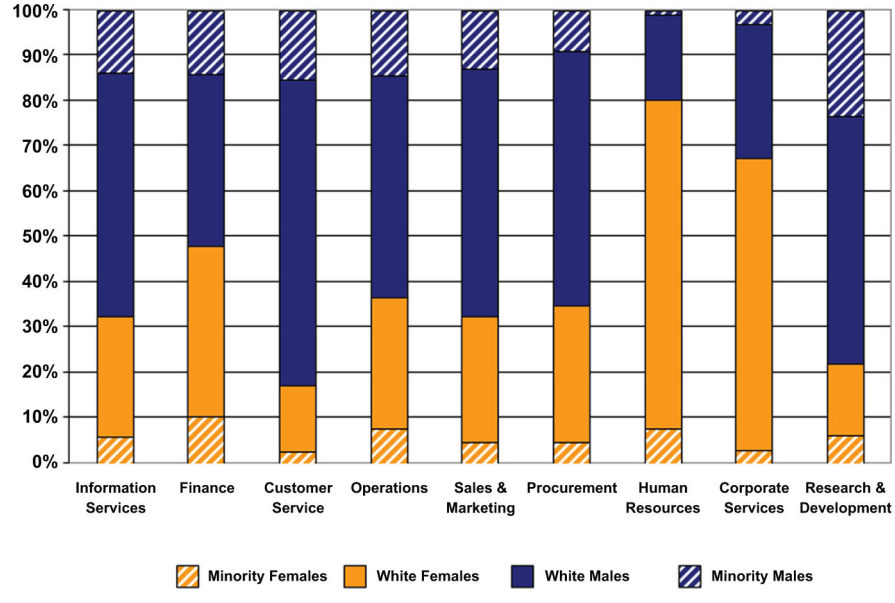

Figure 2.
Race/gender composition of job families

Table II.
Variable definitions and descriptive statistics

Variable names	Description	Overall	White males	White females	Minority males	Minority females
Annual salary	Indicates employee's annual salary level at year end (1999) (in $000s)	69.9	75.7	58.9	71.2	59.2
Race/gender	White males (percent)	52.8				
	White females (percent)	23.3				
	Minority males (percent)	18.0				
	Minority females (percent)	5.9				
Educational attainment	Less than high school (percent)	3.3	2.3	7.5	0.9	3.0
	High school (percent)	12.8	10.5	22.4	6.9	13.3
	Pos high school or college (percent)	21.4	25.6	20.0	13.8	12.5
	With undergraduate degrees (percent)	39.4	41.0	31.7	44.0	41.4
	With graduate degrees (percent)	17.2	15.0	9.8	30.9	25.0
	Undisclosed (percent)	5.9	5.6	8.7	3.5	4.8
Age	Age of the employee, in years	38.4	38.7	38.9	37.7	36.1
Tenure	Indicates the numbers of years with this employer	10.0	11.0	10.0	8.1	6.8
Breaks in service	Indicates whether the employee's service with the company is not continuous (percent)	1.8	1.2	3.0	1.4	4.8
	Percentage of employees with short breaks (percent)	1.3	0.6	2.5	0.8	4.6
	Percentage of employees with long breaks (percent)	0.5	0.5	0.5	0.6	0.3
Employment separation	Percentage of employees who left the firm after 1999 (percent)	23.3	22.4	24.5	23.9	25.5
	1. Left for better prospects (percent)	5.0	5.2	1.9	8.5	4.9
	2. Left for personal reasons (percent)	1.6	1.1	1.3	2.6	4.7
	3. Retirement (percent)	0.8	1.2	0.5	0.6	0.1
	Left due to divestitures (percent)	11.2	10.9	13.1	9.0	11.8
	5. Layoffs (percent)	4.4	3.7	7.3	2.9	3.4
	6. Dismissals (percent)	0.3	0.2	0.4	0.3	0.5
Performance rating	The employee's annual performance rating for the previous year:					
	Percentage rated as exceeding objectives (percent)	22.6	23.8	24.9	17.9	16.9
	Percentage rated as achieving objectives(percent)	64.1	64.0	63.3	65.5	64.5
Promotion	Percentage of employees who received promotion to and within management levels (percent)	5.6	6.6	4.5	4.8	4.6
	Percentage of employees who received promotion at non-management levels (percent)	11.2	10.4	12.2	12.0	12.9
Job level	Indicates employee's level in the organisation hierarchy (from 1 to 9)	5.5	5.9	5.0	5.5	4.8
Number of observations						
n		12,983	6,853	3,028	2,355	768
Percent		100.0	52.8	23.3	18.0	5.9

Table III.
Various specifications of the earnings equation, 1999

	Model I			Model II			Model III			Model IV			Model V			Model VI		
	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE
Race/gender																		
White male																		
White female	−0.215	−0.242 **	(0.007)	−0.166	−0.181 **	(0.005)	−0.164	−0.179 **	(0.005)	−0.164	−0.179 **	(0.005)	−0.160	−0.175 **	(0.005)	−0.049	−0.051 **	(0.002)
Minority male	−0.059	−0.061 **	(0.007)	−0.077	−0.081 **	(0.006)	−0.073	−0.076 **	(0.005)	−0.073	−0.076	(0.005)	−0.065	−0.068 **	(0.005)	0.000	0.000	(0.003)
Minority female	−0.213	−0.239 **	(0.012)	−0.186	−0.205 **	(0.009)	−0.170	−0.186 **	(0.008)	−0.168	−0.184 **	(0.008)	−0.161	−0.175 **	(0.008)	−0.031	−0.031 **	(0.004)
Human capital																		
Less than high school																		
High school				0.101	0.096 **	(0.013)	0.065	0.063 **	(0.012)	0.059	0.057 **	(0.012)	0.060	0.059 **	(0.012)	−0.022	−0.022 **	(0.006)
Post-high school and above				0.162	0.150 **	(0.013)	0.107	0.102 **	(0.012)	0.098	0.093 **	(0.012)	0.095	0.091 **	(0.011)	−0.025	−0.025 **	(0.005)
Undergraduate degrees				0.498	0.404 **	(0.013)	0.350	0.300 **	(0.012)	0.331	0.286 **	(0.012)	0.322	0.279 **	(0.011)	0.022	0.022 *	(0.006)
Graduate degrees				0.618	0.481 **	(0.013)	0.439	0.364 **	(0.013)	0.418	0.349 **	(0.012)	0.401	0.337 **	(0.012)	0.043	0.042 **	(0.006)
Undisclosed				0.229	0.206 **	(0.015)	0.132	0.124 **	(0.014)	0.123	0.116 **	(0.014)	0.122	0.115 **	(0.013)	−0.012	−0.012	(0.006)
Age (in years)				0.046	0.045 **	(0.002)	0.046	0l042 **	(0.002)	0.046	0.043	(0.002)	0.046	0.040 **	(0.002)	0.046	0.006 **	(0.001)
Tenure squared				−0.001	−0.001 **	(0.000)	−0.001	0.000 **	(0.000)	−0.001	−0.000 *	(0.000)	−0.001	0.000 *	(0.000)	−0.001	0.000 **	(0.000)
				0.023	0.023 **	(0.001)	0.023	0.026 **	(0.001)	0.023	0.026 **	(0.001)	0.023	0.024 **	(0.001)	0.023	0.008 **	(0.000)
				0.000	0.000 **	(0.000)	0.000	0.000 **	(0.000)	0.000	0.000 **	(0.000)	0.000	0.000 **	(0.000)	0.000	0.000 **	(0.000)
Horizontal segregation																		
Research and development																		
Information technology							−0.054	−0.056 **	(0.007)	−0.025	−0.026 **	(0.007)	−0.033	−0.033 **	(0.007)	−0.092	−0.096 **	(0.003)
Finance							−0.043	−0.044 **	(0.012)	−0.041	−0.042 **	(0.011)	−0.057	−0.059 **	(0.011)	−0.137	−0.147 **	(0.005)
Customer service							−0.076	−0.079 **	(0.009)	−0.076	−0.080 **	(0.009)	−0.080	−0.84 **	(0.009)	−0.099	−0.104 **	(0.004)
Operations							−0.275	−0.322 **	(0.007)	−0.260	−0.301 **	(0.007)	−0.261	−0.302	(0.007)	−0.131	−0.140 **	(0.003)
Sales and marketing							0.031	0.031 **	(0.007)	0.030	0.029 **	(0.007)	0.011	0.011 **	(0.007)	−0.119	−0.126 **	(0.003)
Procurement							−0.169	−0.186 **	(0.011)	−0.154	−0.167 **	(0.011)	−0.162	−0.177 **	(0.011)	−0.136	−0.146 **	(0.005)
Human resources							0.018	0.018	(0.014)	0.035	0.034 *	(0.014)	0.001	0.001	(0.014)	−0.152	0.164 **	(0.007)
Corporate services							−0.087	0.091 **	(0.014)	−0.074	−0.077 **	(0.014)	−0.089	−0.093 **	(0.014)	−0.110	−0.117 **	(0.007)
Attachment																		
No break in service																		
Short break										0.016	0.016 **	(0.017)	0.021	0.021 **	(0.016)	0.011	0.011 **	(0.008)
Long break										0.178	0.164 **	(0.027)	0.169	0.156 **	(0.026)	0.111	0.105 **	(0.013)
Stayers																		
Better prospects										0.023	0.023 **	(0.009)	0.024	0.023 *	(0.009)	0.032	0.031 **	(0.004)

(*continued*)

Table III.

	Model I			Model II			Model III			Model IV			Model V			Model VI		
	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE	Percentage change[a]	Coefficient	SE
Personal reasons										−0.011	−0.011	(0.016)	−0.008	−0.008	(0.015)	0.019	0.019**	(0.007)
Retirement										0.081	0.078**	(0.024)	0.072	0.070**	(0.023)	0.011	0.011	(0.011)
Divestiture										−0.096	−0.101**	(0.007)	−0.088	−0.092	(0.007)	−0.011	−0.011**	(0.003)
Layoff										−0.068	−0.071**	(0.010)	−0.058	−0.060	(0.010)	−0.022	−0.022**	(0.005)
Dismissals										−0.061	−0.063	(0.036)	−0.050	−0.051	(0.035)	−0.050	−0.052	(0.017)
Performance																		
Performance ratings																		
Exceeded objectives													0.086	0.082**	(0.007)	0.031	0.030**	(0.003)
Achieved objectives													0.001	0.001	(0.006)	−0.004	−0.004	(0.003)
No promotion																		
Promotion – management ranks													0.166	0.154	(0.008)	0.120	0.113**	(0.004)
Promotion – non-management ranks													−0.057	−0.059**	(0.006)	0.110	0.105**	(0.003)
Vertical segregation																		
Job level																0.191	0.191**	(0.001)
Constant		11.232**	(0.004)		9.830**	(0.045)		9.967**	(0.041)		9.962**	(0.041)		10.009*	(0.040)		9.910**	(0.020)
Adjusted R^2		0.234			0.526			0.604			0.613			0.638			0.915	

Notes: $n = 12,984$. Reference categories are given in italics. Standard errors are given in parentheses. All models control for regional differences. [a]The relative effect (g) of a dummy variable (X) on the dependent variable in a semi-logarithmic equation, in percentage terms, is equal to $100g = 100[\exp(c) - 1]$, where c is the coefficient of the dummy variable from the regression equation (Halvorsen and Palmquist, 1980)

Model I in Table III shows that after controlling for region of employment, white females and minority females earn 22 percent less than white males, while minority males earn 6 percent less than white males. The traditional human capital variables of level of educational attainment, age, and tenure are then added to the model. Model II in Table III shows that these additional variables, together with the region of employment, explained approximately half of the variation in earnings. In this model, white females earned about 17 percent less than white males, minority males earned about 8 percent less than white males, and minority females earned about 19 percent less than white males. The addition of the human capital variables narrow the earnings gaps for white women and minority women; however, the earnings gap for minority males actually increased by two percentage points. This may be due to the fact that about 75 percent of the minority males in this sample possessed university degrees, as compared to only 56 percent of the white males.

Because the type of work one does will also affect the level of compensation, Model III also includes a set of dummy variables to control for job family. As a result, the power of the model to explain the variation in earnings increased to about 60 percent. Under this specification, the coefficients for the race/gender dummy variables decreased slightly. White females still earned about 16 percent less than white males. Minority males earned about 7 percent less than white males, while minority females earned about 17 percent less than white males. These results are quite different from results of national studies in which occupational segregation explains a significant portion of the racial/gender differentials. This may be due to the fact that in this particular firm, occupational segregation is not as pronounced as it is in the broader Canadian labor market; it may also be attributed to the fact that data from national studies usually define occupational categories broadly, whereas job families in one firm are more narrowly defined.

Models IV and V, which include the performance and attachment variables, further increased the model's ability to explain the variations in earnings. Performance was measured by:

- an employee's ability to exceed annual performance goals; and
- whether the employee received any promotion during the year.

Attachment was also measured by two variables:

(1) breaks in service; and

(2) incidence of separation.

These performance and attachment variables improved the model's ability to explain variations in earnings by a slight 3.4 percent. However, these two groups of variables do not have any significant impact on the coefficients of the race/gender variables in the earnings equation[5].

Model VI in Table III builds on Model V and incorporates a variable for vertical segregation, i.e. job level. With the addition of this variable, the model explains almost 92 percent of the variations in earnings. With the inclusion of this variable, the coefficients of the race/gender variables decreased substantially. Earnings of minority males are no longer significantly different from those of white males. White females earned 5 percent less than white males and minority females earned only 3 percent less than white males.

In this final model, the traditional human capital variables (education, age, and tenure), job family, performance, break in service, termination behavior, actual incidence of promotion, and job level are all significant determinants of earnings. In general, employees possessing university degrees enjoy a higher level of earnings; in particular, a graduate education significantly increases earnings by about 4 percent. Both age and tenure exhibit concave relationships to earnings. Employees who exceed their objectives enjoy a premium. Employees with long breaks in service seem to have a higher level of earnings than those who do not, receiving a significant premium of 11 percent. This may reflect the observation that employees who experienced long work interruptions were those who left but were then rehired by the firm after gaining broader experience from employment with other firms. Job level has the most significantly positive influence on earnings levels – employees' earnings levels increase as they move up in the organizational hierarchy[6].

Employees in all other job families earned less than those in Research and Development. Employees who were promoted during the year earned about 11 percent more than those who were not. With respect to the termination variables, employees who left on their own terms (e.g. for better prospects or for personal reasons) had higher earnings than those who stayed, whereas employer-initiated separations (e.g. divestitures, layoffs, and dismissals) are usually associated with lower earnings.

Decomposition analyses

The model used above does not take into consideration possible differences in the returns for productivity-related attributes between white males and the other race/gender groups. A series of Chow tests (i.e. overall *F*-tests) for equality of coefficients was conducted to test the null hypothesis that the coefficients were the same for the different race/gender groups. The results confirmed that the null hypothesis can be rejected and that the coefficients were different for each of the pairs. Accordingly, separate earnings equations for each of the race/gender groups are proposed in order to carry out the decomposition analyses.

Applying the decomposition technique suggested by Oaxaca (1973), the earnings gap can be decomposed into two parts:

(1) an explained portion due to differences in productivity-related factors (or attributable to differences in endowments); and

(2) an unexplained portion that most literature attributes to discrimination.

Tables IV-VI provide a summary of the decomposition of earnings differentials grouped into the explained and unexplained portions for the three different comparisons:

(1) white males/white females;

(2) white males/minority males; and

(3) white males/minority females.

These tables provide estimates of the contribution of each of the variables included in our model to the overall earnings differentials. In general, a positive number indicates an advantage to the advantaged group, increasing the earnings gap, while a negative number denotes an advantage to the disadvantaged group, thereby decreasing the earnings gap.

Table IV.
Summary of decomposition results, year 1999

	Competitive wage structures			
	(1) White male		(2) Pooled structure	
	Explained	Unexplained	Explained	Unexplained
Education	0.0082		0.0079	
Age	− 0.0001		− 0.0001	
Tenure	0.0028		0.0031	
Performance	− 0.0003		− 0.0003	
Break in service	− 0.0007		0.0000	
Job level	0.1711		0.1728	
Job family	0.0314		0.0288	
Advancement	0.0005		0.0005	
Attachment	0.0025		0.0027	
Region	0.0015		0.0012	
Total	0.2168	0.0412	0.2165	0.0415
Standard error	(0.0075)	(0.0029)	(0.0073)	(0.0021)
	84 percent	16 percent	84 percent	16 percent

Table V.
Summary of decomposition results, year 1999

	Competitive wage structures			
	(1) White male		(2) Pooled structure	
	Explained	Unexplained	Explained	Unexplained
Education	− 0.0016		− 0.0109	
Age	0.0012		0.0011	
Tenure	0.0105		0.0107	
Performance	0.0017		0.0018	
Break in service	− 0.0002		− 0.0002	
Job level	0.0729		0.0734	
Job family	− 0.0172		− 0.0169	
Advancement	0.0003		0.0003	
Attachment	− 0.0020		− 0.0016	
Region	− 0.0027		− 0.0027	
Total	0.0530	0.0034	0.0550	0.0014
Standard error	(0.0073)	(0.0025)	(0.0073)	(0.0022)
	94 percent	6 percent	98 percent	2 percent

Table IV shows the decomposition of the earnings gap between white males and white females. The logarithm of average earnings for white males is 11.1825 and the logarithm of average earnings for white females is 10.9244. Therefore, white males have an overall earnings advantage of 0.26 log points. This gap can be broken down into two parts:

(1) 0.217 log points (or 84 percent of the gap) can be attributed to endowment differences; and

(2) 0.0412 log points, representing 16 percent of the gap, remain unexplained.

Note that this unexplained portion is very similar to the estimate of 5.1 percent obtained from the dummy variable technique (see Model VI in Table III). A substantial portion of the explained portion of the gap can be attributed to the job level variable, which accounts for 0.1711 of the total explained difference of 0.2168 log points. Using the pooled structure as the competitive wage structure in the absence of differential

	Competitive wage structures			
	(1) White male		(2) Pooled structure	
	Explained	Unexplained	Explained	Unexplained
Education	− 0.0063		− 0.0059	
Age	0.0035		0.0030	
Tenure	0.0156		0.0160	
Performance	0.0020		0.0020	
Break in service	− 0.0013		0.0004	
Job level	0.1991		0.2018	
Job family	0.0042		0.0043	
Advancement	− 0.0004		− 0.0004	
Attachment	− 0.0009		− 0.0006	
Region	− 0.0014		− 0.0014	
Total	0.2141	0.0317	0.2192	0.0266
Standard error	(0.0120)	(0.0042)	(0.0120)	(0.0036)
	87 percent	13 percent	89 percent	11 percent

Table VI.
Summary of decomposition results, year 1999

treatment, white males enjoyed an advantage of just over one percentage point, while white females suffered a disadvantage of about three percentage points.

Table V shows the decomposition of the earnings gap between white males and minority males. The logarithm of average earnings for white males is 11.1825 and the logarithm of average earnings for minority males is 11.1261. Therefore, white males have an overall earnings advantage of 0.0564 log points. This gap can be broken down into two parts:

(1) 0.053 log points (94 percent of the gap) can be attributed to endowment differences; and

(2) 0.0034 log points (6 percent of the gap) remain unexplained.

Again, a substantial portion of the explained component of the gap is due to the job level variable. The variables that give minority males a small advantage are education and job family. The extent of discrimination against minority males (0.0034 log points) is again similar to the result obtained from the dummy variable technique (see Model VI in Table III). As the unexplained portion is relatively small, the advantage enjoyed by white males and the disadvantage suffered by minority males are minuscule when using the pooled structure as the competitive wage structure in the absence of differential treatment.

Table VI shows the decomposition of the earnings gap between white males and minority females. The logarithm of average earnings for white males is 11.1825, and the logarithm of average earnings for minority females is 10.9367. Therefore, white males have an overall earnings advantage of 0.2458 log points. This gap can be broken down into two parts:

(1) 0.2141 log points (87 percent of the gap) can be attributed to endowment differences; and

(2) 0.0316 log points (13 percent of the gap) remain unexplained.

Again, a substantial portion of the explained portion of the gap can be attributed to the job level variable. None of the wage-determining factors gives the minority females any

endowment advantage that has a substantial impact on their earnings. As in the above two analyses, the estimated amount of discrimination (0.031 log points) is similar to the estimate obtained from the dummy variable technique (see Model VI in Table IV). Using the pooled structure as the competitive wage structure in the absence of differential treatment, white males enjoyed an advantage of a little over one percentage point and white females suffered about three percentage points disadvantage. Using the pooled structure as the competitive wage structure in the absence of differential treatment between white males and minority females, white males enjoyed an advantage of less than half a percentage point while minority females suffered an approximate two-and-a-half percentage point disadvantage.

From this decomposition exercise, 84 percent to 88 percent of the earnings gap between white males/white females and white males/minority females can be explained by variables included in our model. In the comparison between white males and minority males, 95 percent of the gap can be accounted for. While this does not necessarily imply an absence of unequal treatment, it does provide clues to the measures one might take to minimize or reduce the gap.

Limitations

Although the analyses in this paper shed light on the effects of vertical segregation, horizontal segregation, attachment and performance variables on earnings, there are a number of limitations that come with the use of the administrative data used. First, because information on employees' past work experience was not captured on the firm's administrative data, previous work experience may have had an impact on the starting salaries of employees when they first joined the firm.

Second, the measure of the visible minority variable does not indicate "ethnicity" which poses a limitation as numerous researchers have found that the experience among racial minority groups is not homogeneous. For example, Howland and Sakellariou (1993) found that the earnings differentials ranged from 2 percent for South Asian males to 21 percent for Black males, and from 4 percent for South Asian women to 5 percent for Black women.

Finally, findings from a large Canadian organization with nationwide operations may not be generalizable to the overall Canadian labor market and may not apply to small or medium-sized enterprises or to organizations in non-Western economies. For example, the relatively small impact of horizontal segregation may be a result of the limited breadth in jobs found within a single firm rather than in the overall labor market, where women and minorities are mostly concentrated in lower paid segments of the labor market. The firm's compensation practices may also deviate from that of the overall Canadian labor market. As a large employer with national presence, the firm may be more concerned about internal and external equity in order to retain their best talent.

Conclusion

Drawing on data from a large Canadian firm in the late 1990s, this paper revisited the determinants of earnings and their effects on gender and racial earnings gaps. The findings suggest that there is indeed a significant difference in earnings levels between white males and white females and minority males and minority females. The most important factor in explaining the differences in earnings between groups is job level, or one's position in the organizational hierarchy. This finding may signify that if white

females, minority males, and minority females are given equal access to career advancement opportunities, the aggregate race/gender earnings gap will narrow.

To explore the determinants of earnings, an extensive range of explanatory variables previously not available in the Canadian context is employed. In addition to the standard conventional human capital variables, the analysis includes performance and attachment variables, job family, and job level. After controlling for these variables, the adjusted earnings gaps significantly decreased for all groups when compared to white males. White and minority females suffered disadvantages of just over 5 percent and 3 percent respectively, whereas there were no significant differences in earnings between white males and minority males. Our final model explained over 90 percent of the variation in earnings between white males and the three race/gender minority groups (see Figure 3). All the variables in our model are significant in predicting the level of earnings, with job level appearing to be the most influential variable affecting earnings.

Although the magnitudes are small, both white and minority women suffer statistically significant earnings disadvantages, as compared to white males. Using the Oaxaca-Blinder decomposition technique, gender and racial earnings differentials are partitioned into an explained component attributable to differences in observed characteristics and an unexplained component. Relative to previous research where almost half of the earnings gaps remained unexplained, 80 percent to 90 percent of the earnings gap can be accounted for by the variables included in the final model.

It is not possible to establish conclusively that the unexplained differences are due to discrimination, as some of the variables included in the final model may themselves reflect differential treatment by gender and race. However, the relatively small "adjusted" gaps experienced by white and minority females do not necessarily imply that there is an absence of unequal treatment. Analyses of the determinants of employment outcomes using firm-level data significantly reduce the unexplained portion of the differences. It is important to note that the variables that accounted

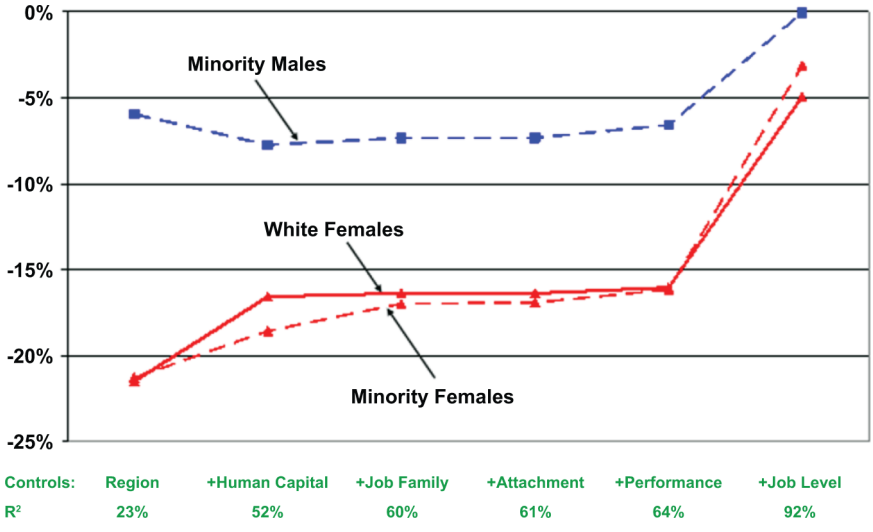

Figure 3.
Determinants of earnings differentials

for the explained portion of the differences may also signal barriers that impede individual development and access to opportunities. Even though the unexplained gender/racial earnings differentials appear small in magnitude, the explanatory variables may themselves be sources of differential treatments. As the analyses have shown, job level is a key variable in determining wage levels. Thus, different promotion structures for different race/gender groups may have a substantial impact on the earnings gaps.

Companies and firms need to evaluate their career advancement practices, policies, and programs and provide a positive, supportive, and inclusive environment for all workers, irrespective of gender or race, and minimize or eradicate any marginalization, disadvantage, and discrimination experienced by women and racial minorities. The outcome is a win-win situation, in which individuals can fully develop and utilize their skills and potential and employers can reap the benefits of the contributions of their employees.

Notes

1. A number of researchers have suggested various ways of calculating the competitive wage structure β^*. Oaxaca (1973) suggested the use of the wage structures of either the advantaged group (Oaxaca I) or the disadvantaged group (Oaxaca II) as the competitive wage structure in the absence of discrimination. Reimers (1983) suggested that the non-discriminatory wage structure would be the average of the advantaged group and the disadvantaged group, i.e. $\Omega = 0.5I$ or $\beta^* = 0.5\beta_{wm} + 0.5\beta_{wf}$. Cotton (1988) chose a weighting scheme that scaled the βs by the proportion of workers belonging to each of the groups in the total population, i.e. $\Omega = p_{wm}I$ or $\beta^* = p_{wm}\beta_{wm} + (1 - p_{wm})\beta_{wf}$. Both Cotton and Reimers' methods constrained the estimates of the non-discriminatory wage structure to be between the bounds estimated from Oaxaca I and Oaxaca II when either the advantaged or disadvantaged group wage structure is used as the non-discriminatory wage structure. Finally, Neumark (1988) assumed that the competitive wage structure would be obtained from a pooled regression function over the entire population. This method does not impose the constraint under Cotton and Reimers' methods, and allows estimation of a non-discriminatory wage structure based on characteristics that are blind to either gender or race. Oaxaca and Ransom (1994) offer a summary of these various algorithms.
2. For the purposes of this paper, annual base salaries will be considered an appropriate measure of earnings as only full time employees were included in the analyses.
3. As the actual date of birth and date of hire are captured in the data, information on age and tenure are more precise, reliance on respondents to recall their years of service with the firm or to accurately report their age is removed. Squared terms of both age and tenure are included in the regression models to capture the non-linear effects.
4. 4. According to the 1990 Ontario Pay Equity Act, a male job class is one in which 70 percent or more of the members are male, whereas a female job class is one in which 60 percent or more of the members are female.
5. Results from *F*-tests showed that these variables are jointly and significantly different from 0 at $p < 0.01$. The *F*-statistics for the attachment and performance variables are 25.77 and 601.14, respectively.
6. The marginal effect of an increase in job level is 19.1 percent for the full sample. The corresponding values are: (1) all males: 19.4 percent, white males: 19.2 percent, minority males: 19.7 percent; and (2) all females: 18.6 percent, white females: 18.5 percent, minority females: 19.5 percent.

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About the author

Margaret Yap's research interests include diversity and equity in organizations. Prior to joining Ryerson University, she was the Director of Research at Catalyst Canada, where she directed the research study "The bottom line: connecting corporate performance and gender diversity". Her doctoral dissertation "Gender and racial differentials in compensation, promotions and separations" was the winner of the International Alliance for Human Resources Researchers (IAHRR) Award for best HR-related doctoral dissertation, sponsored by Human Resources and Skills Development Canada (HRSDC). Margaret Yap can be contacted at: myap@ryerson.ca