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Determinants of Annual Salary and Income Inequality in Canada Differentials in Earning Brackets

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Abstract: There are rarely advanced econometric studies showing the relationship between ranges of annual salary and several socioeconomic, institutional, and location variables in Canada. A sample of 12, 228 was extracted from 2016 census data. The annual salary data were grouped into seven non-overlapping homogeneous categories as outcome variables to reduce very high heterogeneity in the observations. The Ordered Probit regression underpinned the covariate analysis to understand the influence of various independent variables on annual salary for full-time employees in Canada. The prediction probability for an annual salary ranging from CDN$28,000 to 77,999 is 65.6 percent while for the CDN78,000 to 127,999 range is 32.5 percent; implying that 98.1 percent of full-time employees who completed at least high school and were aged 18 to retirement age received between minimum annual salary CDN$28,000 and maximum CDN$127,999. The remaining 2 percent received the highest salary ranging from CDN$128,000 to 400,000. The results indicate that all age groups, ethnicity except white, residential types, education levels, household size, marital status, and province (or location) factors significantly influenced annual earnings; however, the magnitude and the direction of influence depends on the annual salary earning brackets. The study, therefore, recommends that the government of Canada looks at different socio-economic variables to adjust the salaries to mitigate inequalities of earnings in diverse and multicultural Canada.

Keywords: Annual salary; Canada; Census; Covariate; Ordered Probit; Ranking

JEL Classification: D33

Introduction

Found in North America, Canada is a country consisting of ten provinces and three northern territories (which will be referred to as Northern Canada throughout this paper) (Wikimedia, 2023). Among its recorded census population in 2016, consisting of 35.15 million people (Burkinshaw, Terajima, and Wilkins, 2022), approximately 22% of the population are people of color and approximately 4.8% collectively identify as Aboriginal peoples (Statistics Canada, 2019). It is important to understand that Aboriginal peoples are a collective, legal term of North America's original or indigenous peoples. There are many different tribes among them and in some parts, colonial law has interfered with their identification as Aboriginal; however, this paper refers to them as Aboriginal peoples, as the name used to record in the 2016 Census.

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Canada is also part of several international and intergovernmental institutions such as the United Nations (UN), North American Treaty Organization (NATO), Group of Ten (G-10), Group of Twenty (G-20), Organization for Economic Co-operation and Development (OCED), World Trade Organization (WTO), Commonwealth of Nations and a few more (Wikimedia Foundation, 2023). According to United Nations Development Program's (UNDP) Development 2016 Report, Canada ranked 15th on the Human Development Index (HDI) which a score of 0.928 (Roser, 2014). HDI is an amalgamated statistic, ignoring inequality, of the three dimensions, life expectancy, education (years of schooling completed and expected years of schooling), and the gross national income (GNI) per capita. A country with a higher score of HDI infers a higher lifespan, higher education level, and higher GNI per capita (Wikimedia Foundation, 2023). However, factoring in the inequality within the three dimensions, Canada ranked 10th on the Inequality Human Development Index (IHDI) with a score of 0.852 (2023). Although its ranking increased, it is better to note there is an overall inequality of 8.2%, the majority stemming from inequality in income (Bukinshaw et al., 2022).

There is a dearth of descriptive studies and but rare econometrics reports linking annual salary to various socioeconomic, institutional, instrumental, and location variables. Therefore, this study focused to find out the significant drivers of annual salary for full-time workers in Canada.

2. Literature Review

With much over-concentrated research on Black compared to White income inequality, Leslie McCall (2001) examined the singular and overall effect of race, ethnicity, and gender on wage inequality within metropolitan labor markets. The sample population includes Black, Asian, and Latino individuals as well as splitting those groups into male and female parts. The results relayed, in terms of racial-gender effects, men of color generally have higher wages than women of color, however, collectively they have a negative effect on their wages when compared to White wages (McCall, 2001). The study concluded that wage premiums are larger for racial/ethnic groups than for gender groups. McCall (2001) also concludes that individuals of color that work in jobs dominated by them would compete with others like them, thus lowering their wages. Immigration plays an important aspect in this finding; as the increase in immigrants caused an increase in both the supply of low-skilled workers and an increase in the wage benefits of high-skill workers and owners, comprising mainly the White ethnic group.

Vejlin (2013) considers an individual's residence location to be closely interdependent as it determines the job they pursue and thus the wages they attain. Her sample population of employees consists of lower (elementary level) to higher (graduate/Ph.D.) education individuals and a working age below 55 years to disregard the probability of counting retired workers. Overall, Vejlin (2013) found that workers making job-to-job transitions have higher wages than those who maintain their current job. And workers who transition job-to-job only within a certain county earn less than those willing to move to a different county. However, residential mobility was considered in addition to the choice of job mobility. Everything else is constant, individuals who reside in a different municipality than they work in earn a 1.2% wage premium, whereas individuals who reside in a different county than they work in earn 2.4 percent. Thus, the farther the distance from the workplace of residence, the higher the annual wage (Vejlin, 2013). Focusing on the amount of job abundance within certain provinces more than others, job

mobility can certainly become an important factor. The study revealed that annual salary can also possibly be influenced by the degree of urbanization of a province.

Timothy and Wheaton (2001) used Public Use Microdata Sample (PUMS) data from the 1990 U.S. Census. Running their linear programming model, they discovered that there is an approximate 15% to 18% significant wage differential increase in metropolitan areas than suburban areas within the same city. Furthermore, the gender variable indicates a significant 1.5 to 2.5 times larger effect on women's wages due to commuting from further locations to work than on men's wages (Timothy and Wheaton, 2001). A possible explanation is given; women value their time lost to commuting as they have a greater share of responsibilities assigned via societal norms.

The Bank of Canada released a staff discussion paper regarding the income inequality found in Canada, later comparing it to the United States. They found that the increase in income inequality is mainly felt by low-income earners. Being the wage group hit hardest by past and recent recessions, their ability to recover is gradual whilst high-income earns can bounce back faster and earn profit as well (Burkinshaw et al., 2022). The Gini coefficient (a measure of the distribution of income among a population) for Canada in 2016, a score of 32.7, inferred a relatively low-income inequality (World Bank, 2023). However, the Bank of Canada (2018) found that some of the drivers of income inequality could be increased technological progress, globalization, education, immigration trends, changes in household size, and a few more (Burkinshaw et al., 2022). There would reduce the number of low-income earners in the Canadian population and thus even out the annual wage premium in the long run.

3. Methods and Materials

3.1. Data Sources and Type

Data for annual salary, socioeconomic, and location variables were extracted from the 2016 Census Canada, specifically from the Public Use Microdata File (PUMF): Individuals File. In this study, the target population is aged between 18 and 59 years (since this age group is the productive age group) and those who at least completed high school and reached retirement age with a full-time job during the census.

3.2. Sample Size and Data Grouping

Of the total population size, N=1.2 million full-time salaried population was reported in the census data. A sample of 204,489 was extracted after cleaning, editing, and deleting missing or incomplete annual salaries and some covariates data. It is worth noting that about 17% of the annual salary and some covariates data were incomplete or missing. Also, the 204,489 samples were further refined for this study based on two criteria to reduce high heterogeneity (salary ranging from CDN$1000 to over a million). The final 12,228 observations were extracted for full-time salaried workers conditioned on, (1) who are aged 18 to 59 years, who at least completed high school, and (2) who received a salary between a minimum average salary of CDN$28,000 and a maximum average salary of CDN400,000 (coincidently and approximately the prime minister's annual salary!) (Bank of Canada, 2019). This sample size was stratified into 7 non-overlapping homogeneous groups to fit the Ordered Probit (OP) model and drivers of annual salary in Canada.

The dependent variable, seven ranked salary groups are 1=CDN$28,000 to $77,999, 2=CDN$78,000 to $127,999, 3=CDN$128,000 to $177,999, 4=CDN$178,000 to $227,999, 5=CDN$228,000 to $277,999, 6=CDN$278,000 to $327,999, and 7=CDN$278,000 to $400,000.

As evidenced in the literature review section, the following variables are selected and operationalized. The list of covariates, description for each covariate, a unit of measurement, and expected outcome for each regressor are shown in Table 1.

Table 1. Descriptions of the Explanatory Variables and Expected Signs

No	Variable (x)	Unit of Measurement	Expected sign
1	Education	Dummy: 1=College, 2=Bachelor, 3=Professional, 4=Masters	+
2	Age	Dummy: 1= 18-29, 2=30-39, 3=40-49, 4=50-60 years	+
3	Sex	Dummy: female = 1, male=0	±
4	Residence province	Dummy: 1=NFL, 2=PRI, 3=NS, 4=NB, 5=QC, 6=ON, 7=MN, 8=SKWN, 9=AB, 10=BC, 11=Northern Canada	±
5	Residential type	Dummy: 1=Single-detached, 2=Apartment, 3=Others	+
6	Household size	Number	+
7	Marital status	Dummy: 1=single, 2=legally married, 3=common law, 4= separated, 5=divorced, 6=widowed	±
8	Ethnicity	Dummy: 1= White, 2= South Asian, 3=Chinese, 4= Black, 5=Aboriginal (or first nations)	±

Analytical Techniques

This study used both descriptive and econometric analytic methods. Detailed analysis techniques are presented as follows.

Descriptive analysis

Descriptive statistics is important in providing insight into the distribution of the data, as well as, explaining some important statistical measures prior to the econometric analysis. Averages or means, variances, standard deviations, percentages, minimums, maximums, and some statistical tests were done and presented in the tables.

3.3. Econometrics analysis

In addition to descriptive analysis, the study also used the Ordered Probit (OP) model, which is an indexed model whereby multiple grouped dependent variables are indexed as latent variables.

Since the OP model uses a dependent variable with ordered categories, the 7 annual salary groups were used to analyze the effects of the explanatory variables: education, age, gender, residence province, residential type, household size, marital status, and ethnicity on annual salary for full-time workers aged 18 to 59 years in Canada.

Noting the difference between rankings is not constant from one ranking to the other, the Linear Regression Model that assumes the distance between the orders is the same is not applicable; therefore,

the use of OP regression with a latent variable Y* is introduced representing annual salary. Following Maddala and Lahiri (2009), a variable y* might refer to a utility which is an unobserved measure of annual salary, y. For individual *i,*

$$y_i^* = x_i'\beta + u_i \quad -\infty < Y_i < \infty \tag{1}$$

Where

β: Vector of parameters to be estimated

x_i: *Observed vector of explanatory variables showing the characteristic of* i^{th} *person*

u_i: *normally distributed residuals*

In equation (1), regressors (***x's)*** do not include a constant, and if y_i is considered as a discrete and observable variable which shows different levels of people's annual salary or wages, the relation between latent variable y_i^* and observable variable y_i is obtained from the Ordered probit model as follows:

$$y_i = 1 \ if -\infty \le y_i^* < \alpha_1 \quad i = 1, \dots, n$$
$$y_i = 2 \ if \ \alpha_1 \le y_i^* < \alpha_2 \quad i = 1, \dots, n$$
$$y_i = 3 \ if \ \alpha_2 \le y_i^* < \alpha_3 \quad i = 1, \dots, n$$
$$y_i = m \ if \ \alpha_{m-1} \le y_i^* < +\infty \quad i = 1, \dots, n \tag{2}$$

Where, m=7, n=12,228, and α's are the thresholds that define discrete answers to be estimated. α_i is only dependent on the probability of predicting the category and is not dependent on explanatory variables.

Assuming that errors are normally distributed across observations, and normalizing the mean and the variance of the error to 0 and 1, respectively, then for an *m*-ordered model, $y^* = m$ if $\alpha_{m-1} < y^* \le \alpha_j$, where $\alpha_0 = -\infty$ and $\alpha_m = +\infty$. We have the following probabilities:

$$P_{i1} = \text{Prob}(y_i = 1) = \Phi(\alpha_1 - x'\beta) - \Phi(-x'\beta) = \frac{1}{1+\exp[-\alpha_1+(x'\beta)]}$$

$$P_{i2} = \text{Prob}(y_i = 2) = \Phi(\alpha_2 - x'\beta) - \Phi(\alpha_1 - x'\beta) = \frac{1}{1+\exp[-\alpha_2+(x'\beta)]} - \frac{1}{1+\exp[-\alpha_1+(x'\beta)]}$$

$$P_{i7} = \text{Prob}(y_i = 7) = 1 - \Phi(\alpha_6 - x'\beta) = 1 - \frac{1}{1+\exp[-\alpha_7+(x'\beta)]} \tag{3}$$

We have *m-1=6* cut-off points as threshold variables (not *m=6 categories*) to avoid *collinearity*.

For all probabilities to be positive, the threshold values (or cut-offs) must be $0 < \alpha_1 < \alpha_2 < \dots < \alpha_{m-1}$.

The regression parameters, *β*s, and the *m* – 1=6 threshold parameters, α_1 to α_6 is obtained by using the maximum log-likelihood method.

$$\log\left[\frac{\Phi_m(x_i)}{1-\Phi_m(x_i)}\right] = \alpha_m - (\beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \dots + \beta_k x_{ki}) \tag{4}$$

Where m=1, …, 7 (groups); i=1, …, n (=12,228); k=1, …..,8 (explanatory variables); Φ is cumulative probability density function, β's are parameters to be estimated; x's are explanatory variables

*(*education, age, gender, residence province, residential type, household size, marital status and ethnicity) used in the Ordered probit model.

To evaluate the hypothesis of equality of the parameters for all the groups, a parallel regression test is used. This test compares the estimated model with a series of coefficients for all the groups with a model with a separate series of coefficients for each group. In this case, if the current model, which is the null hypothesis, is accepted, it proves that the status parameters are the same for all the answer groups.

Specifically, following Maddala and Lahiri (2009), since the ordered probit model is used, the use of the *log likelihood* value associated with the likelihood model is in order. A likelihood ratio test involves a ratio comparison of maximized likelihood values; the general likelihood test statistic being performed is: $-2\ln(\hat{L}_1/\hat{L}_2)$, where $\hat{L}_1$ is the maximized likelihood value for the less complex model (model with only a constant term) and $\hat{L}_2$ is the maximized likelihood value for the more complex model (model with all variables including the constant term). Specifically, we can claim that for large n, the maximum likelihood ratio generally is –

$$-2\ln\left[\frac{L(y;\hat{\beta}_0,\hat{\sigma}_0^2)}{L(y;\hat{\beta}_0,\hat{\beta}_1,...,\hat{\beta}_k\hat{\sigma}_k^2)}=n\ln\left(\frac{\hat{\sigma}_0^2}{\hat{\sigma}_k^2}\right)\right] \text{ has an approximate } \chi^2_{k-1} \text{ distribution} \quad (5)$$

under the null hypothesis H_0: $\beta_1=\beta_2=,\ldots=\beta_k=0$. Therefore, for high log-likelihood values, the chi-square and associated ρ-value would suggest the rejection of the null hypothesis; and therefore, conclude that the model has fitted the data adequately.

Parameters are estimated by maximum likelihood estimation method, which maximizes the probability of categorization. The likelihood function for a sample of *n* independent observations is the product of the *n* densities, thus $L=\prod_{i=1}^{n}\prod_{j=1}^{m}p_{ij}^{y_{ij}}$. For the Ordered probit model, the log-likelihood function is given specifically as,

$$L(y|\beta;\alpha_1,\alpha_2,\alpha_3,\ldots,\alpha_{m-1})=\prod_{i=1}^{n}\prod_{j=1}^{m}[\Phi(\alpha_m-x'\beta)-\Phi(\alpha_{m-1}-x'\beta)]^{Z_{ij}} \quad (6)$$

Where 'Z_{ij}' is a binary variable. It equals 1 when the observed group for person 'i' is in group 'j', and if they are not equal, it equals zero.

Regarding the interpretation of the coefficients, the parameter estimates of the ordered probit model are not directly interpretable. For example, a positive coefficient need not mean that an increase in the independent variable leads to an increase in the probability of an outcome being selected.

In case the predicting variable increases, changes in probability are dependent on two factors: one of them is the predicting value and the other is dependent on other variables; because changes in probability are not constant, coefficients are not directly interpreted.

Instead, we computed and explained the Marginal Effect (ME) of each independent variable. For each independent variable, there will be *m* MEs corresponding to the *m* probabilities, and these *m* MEs sum to zero because probabilities sum to one. Note also that only *m-1* of the probabilities can be freely specified because probabilities sum to one as is the case also for other non-linear models the MEs vary with the evaluation point x (here we use the default mean evaluation of point).

Following Maddala and Lahiri (2009), the calculation of the marginal effect of one unit changes in x_k predictor or explanatory variable on the probability of 'm' category is as follows:

$$\frac{\partial P(y_i = m|x_i}{\partial x_k} = \left[\frac{\partial \Phi(\alpha_m - x'\beta)}{\partial x_k} - \frac{\partial \Phi(\alpha_{m-1} - x'\beta)}{\partial x_k}\right]$$

$$= [\lambda(\alpha_{m-1} - x'\beta) - \lambda(\alpha_m - x'\beta)]\beta_k \quad (7)$$

Where $\lambda_m(x_i) = \frac{\partial \Phi_m(x_i)}{\partial (x_k)}$, $\alpha_m = +\infty, and\ \alpha_0 = -\infty$

Note also that making decisions about using the value of the variables in estimation is crucial since the marginal effect estimate depends on the values of all explanatory variables. Since total Probability always equals 1, the total marginal effect for each variable is zero. But it should be noted that the marginal effect is not directly on binary variables, and it is obtained by calculating the difference between the two possible probabilities.

4. Results and Discussion

This section contains descriptive and summary statistics for all the variables, as well as estimates from the Ordered probit model. Parameter estimates, marginal effect estimates, and associated results are interpreted and discussed accordingly.

4.1. Descriptive Analysis

The following tables present descriptive statistics. Table 2 displays the distribution of productive age groups.

Table 2. Proportion Estimations for Age Groups

Age group	Proportion	Std. Err.	[95% Conf. Interval]
Age 18-29	.1729637	.0034204	[.1663615 .1797714]
Age 30-39	.2980864	.0041367	[.2900417 .3062578]
Age 40-49	.2858194	.0040859	[.2778781 .2938953]
Age 50-59	.2431305	.0038795	[.2356071 .2508153]

Source: Authors' computations, 2023

Almost 60 percent of the respondents are between 30 to 49 years. The proportion of full-time workers started declining after 49 years because of early retirements and perhaps health issues; however, there is no significant difference between the last three age groups. It is expected that the age of the respondent increases the likelihood of the annual salary and econometrics analysis provides evidence for such a relationship.

As shown in Table 3, it is obvious that most of the workers, 57.3 percent, who are full-time workers aged 18-60 years and at least completed high school are white, whereas the proportion of the other races altogether are by far less than the white since over 74 percent of the population in Canada is white (Stats Canada, 2019).

Table 3. Distributions of Ethnicity

Ethnicity	Proportion	Std. Err.	[95% Conf. Interval]
White	.5727838	.0044736	[.5639928 .581529]
South Asia	.1218515	.0029583	[.1161706 .12777]
Chinese	.1234871	.0029753	[.1177723 .1294384]
Black	.0812071	.0024703	[.0764947 .0861827]
Aborigines/Natives	.0006706	.0027211	[.0954608 .1061313]
Others	.0452120	.0012231	[.0400102 .0476511]

Source: Authors' computations, 2023

Among the full-time workers aged 18-60, Chinese are 12.3 percent followed by South Asians (12.2%). The Blacks and Aboriginals are the lowest, 8.1 and 0.06 percent respectively, among full-time workers aged 18-59 with at least a high school diploma.

Table 4 reveals that among residential houses, detached houses are 48 percent; apartments are 29.4 percent and others such as cottages, townhouses, etc., are 22.7 percent. Noting that Canada Revenue Authority (2022) reported that mortgaged houses and rented apartments including condos take the lion's share of residential type with associated real income.

Table 4. Distribution of houses by residential type

Residential type	Proportion	Std. Err.	[95% Conf. Interval]
Detached House	.4791462	.0045179	[.470298 .4880076]
Apartment	.2938338	.0041195	[.2858242 .301973]
Others	.22702	.0037884	[.21968 .2345315]

Source: Authors' computations, 2023

Table 5 reports distribution by education level for full-time workers aged 18 to 59 years, who have at least completed college. The majority (41.7%) had a bachelor's degree, 32.6 percent had completed college, followed by master's degree holders (22.3%), and lastly, professional workers, such as medical doctors, judges, lawyer,s and pharmacists at 3.38 percent of the full-time workforce.

Table 5. Distribution by education level

Education	Proportion	Std. Err.	[95% Conf. Interval]
College	.3262185	.0042399	[.3179629 .3345833]
Bachelor	.4174027	.0044597	[.4086879 .4261694]
Professional	.0338567	.0016356	[.0307931 .0372135]
Masters	.2225221	.0037616	[.215236 .2299825]

Source: Authors' computations, 2023

With full time workers aged 18 to 59 years, as shown in Table 6, the majority (26.7%) of the households were with 2 persons, 21.7 percent had 3 persons, and 17.7 percent had 4 persons and 15.2 percent of the households 1 person.

Table 6. Distribution of household size

HHsize	Proportion	Std. Err.	[95% Conf. Interval]
1	.151701	.0032442	[.1454507 .1581702]
2	.2669284	.0040005	[.2591604 .2748428]
3	.2168793	.003727	[.2096627 .2242738]
4	.1769709	.0034514	[.1703067 .183838]
5	.1027151	.0027455	[.0974569 .1082229]
6	.0543016	.0020494	[.0504217 .0584616]
7	.0305038	.0015552	[.0275985 .0337043]

Source: Authors' computations, 2023

Table 7 reports the distribution of marital status. Forty percent are legally married, 24.7 percent are single, followed by common law 17.3 percent.

Table 7. Distribution of Marital status

Marital status	Proportion	Std. Err.	[95% Conf. Interval]
Single	.2478737	.0039048	[.2402991 .2556068]
Legally married	.4020281	.0044341	[.3933682 .4107497]
Common law	.1728001	.0034191	[.1662005 .1796053]
Separated	.0655054	.0022375	[.0612537 .0700302]
Divorced	.0940465	.0026398	[.0889981 .0993499]
Widowed	.0177462	.001194	[.0155512 .0202446]

Source: Authors' computations, 2023

There is a significant difference between single and legally married persons ($\rho=0.0000<0.5$; $Z=-14.11$), and between legally married and common law at $\rho=0.0000<0.5$ (or $Z=-14.11>1.96$); implying that marital status in Canada is very diverse and no single marital status is dominant among the full-time workers aged 18 to 59 years.

Table 8 reports the distribution of full-time workers by the 10 provinces and 3 territories (*alias* northern Canada) of Canada. The lion's share (28.9% of workers) goes to the province of Ontario, which is the most populous province in Canada, followed by British Columbia with 15.9 percent, the 14 percent for the provinces, Alberta, and Quebec.

Table 8. Distribution of full-time workers by Province

Provinces	Proportion	Std. Err.	[95% Conf. Interval]
Newfound land (NFL)	.0362283	.0016899	[.0330578 .0396905]
Prince Edward Island (PEI)	.0151292	.0011039	[.013111 .0174526]
Nova Scotia (NS)	.0554465	.0020696	[.0515267 .0596458]
New Brunswick (NB)	.040808	.0017892	[.0374416 .0444631]
Quebec (QC)	.1404154	.0031419	[.1343691 .1466878]
Ontario (ON)	.2891724	.0041002	[.2812021 .2972751]
Manitoba (NB)	.0590448	.0021316	[.0550024 .0633644]
Saskatchewan (SKWN)	.0505397	.001981	[.0467948 .0545672]
Alberta (AB)	.1417239	.0031541	[.1356532 .1480197]
British Colombia (BC)	.1589794	.0033068	[.1526041 .165569]
Northern Canada	.0125123	.0010052	[.0106875 .0146439]

Source: Authors' computations, 2023

It is worth noting that this distribution is for the population aged 18-59 years obtaining a salary between CDN$28,000 to $400,000 annually. These provinces apart from having a high population size are also characterised by most economic and service sectors, hence the hub of commerce and business in Canada. Note that the three territories (or Northern Canada) have only 1.3 percent of the full-time workforce since most of the residents belong to the people of First Nations (or Aboriginals), which are less developed and discriminated since the colonial era.

As reported in Table 9, it is also worth noting that 53.1 percent of females, and 46.9 percent males are full-time employees aged 18 to 59 with at least high school completion.

Table 9. Distribution by sex

Sex	Proportion	Std. Err.	[95% Conf. Interval]
Female	.5314033	.0045129	[.5225485 .5402385]
Male	.4685967	.0045129	[.4597615 .4774515]

Source: Authors' computations, 2023

Table 10 presents the distribution of annual salary by salary grouping, median and mean annual salaries. The median annual salary for full-time workers ages 18-59 years was a Canadian dollar $69,000, while the mean salary was $75,279.41 during the 2016 census. The average annual salary in Canada was $72,000 per year as of September 2022 (Canada Talent, 2023).

Table 10. Distribution by Salary Group

Salary Category	Proportion	Std. Err.	[95% Conf. Interval]
1=CDN$28,000 – $77,999	.6050049	.0044209	[.596307 .6136368]
2=CDN$78,000 – $127,999	.324174	.004233	[.3159326 .332526]
3=CDN$128,000 – $177,999	.0531567	.0020289	[.0493173 .057277]
4=CDN$178,000 – $227,999	.0117763	.0009756	[.0100096 .0138503]
5=CDN$228,000 – $277,999	.0036801	.0005476	[.0027487 .0049256]
6=CDN$278,000 – $327,999	.0009814	.0002832	[.0005574 .0017273]
7=CDN$328,000 – $400,000	.0012267	.0003165	[.0007396 .0020339]
Median Annual Salary	***Mean Annual Salary***	***Std. Err.***	***[95% Conf. Interval]***
CDN$69,000	CDN$75,279.41	317.4495	[74657.16 75901.66]

Source: Authors' computations, 2023

Among full-time employees aged 18 to 59 years, most (60.5%) were in CDN$28,000 to $77,999 annual salary bracket, followed by 32.4 percent in the CDN$78,000 – $127,999 range. This implies that about 93 percent of the full-time workers received annual salaries close to the average and median annual salary; leaving less than 7 percent who got higher salaries between CDN$128,000 to $378,000 annually. This was analyzed further in the econometrics analysis to find out which factors influence annual salary in Canada, keeping in mind that some literature such as the US Bureau of Labor Statistics Office (2022) citing credentials, experience, skills, industry type and geographical location as main reasons affecting annual wages.

4.2. Econometrics Analysis

There are rare studies connecting the influence of various socio-economic, institutional, and location variables on annual salary using advanced econometrics techniques. Table 11 highlights the determining factors of annual salary in Canada using the Ordered Probit regression.

As discussed in the methodology, the econometrics analysis used the Ordered Probit regression to examine the factors influencing annual salary in Canada. The 7 groups used as the dependent variable are: 1=CDN$28,000 to $77,999, 2= CDN$78,000 to $127,999, 3= CDN$128, 000 to $177,999, 4= CDN$178,000 to $227,999, 5= CDN$228,000 to $277,999, 6= CDN$278,000 to $327,999, and 7= CDN$328,000 to $400,000, and explanatory variables that are expected to influence these salary groups are: education, age, gender, residence province, residential type, household size, marital status, and ethnicity. Using equations (1), (4), and (5), the following ANOVA table (Table 11) presents log-likelihood, coefficients, cut-offs, and associated estimates from the Ordered Probit analysis. The log-likelihood value is -9141.38 with a high chi-square value (chi2(28) = 4065.03>41.3) and p-value=0.000 < 0.5 suggesting the overall significance of all the explanatory variables. Effectively, these results suggest the rejection of the null hypothesis, H_0: $\beta_1=\beta_2=,\ldots, =\beta_k=0$, confirming the Ordered Probit model has adequately fitted the data.

Table 11. Ordered Probit Regression Estimates

Ordered probit regression					**Number of obs = 12,228**	
LR chi2(28) = 4065.03						
Prob > chi2 = 0.0000						
Log likelihood = -9133.3825				**Pseudo R2 = 0.1820**		
Annual Salary	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
age30	.9444874	.0449622	21.01	0.000	[.8563631	1.032612]
age40	1.3104	.0455446	28.77	0.000	[1.221134	1.399665]
age50	1.371362	.0465176	29.48	0.000	[1.280189	1.462535]
age18	0 (omitted=base)					
white	.0412199	.0407679	1.01	0.312	[-.0386837	.1211234]
south_a	-.412024	.0522729	-7.88	0.000	[-.514477	-.3095711]
chinese	-.2937992	.051236	-5.73	0.000	[-.3942199	-.1933784]
black	-.4817792	.0587534	-8.20	0.000	[-.5969336	-.3666247]
aboriginal	0 (omitted=base)					
DTYPE	-.1460518	.0152018	-9.61	0.000	[-.1758466	-.1162569]
BA	.8175482	.0301729	27.10	0.000	[.7584104	.8766861]
PRF	1.446809	.062449	23.17	0.000	[1.324411	1.569207]
MA	1.207156	.034138	35.36	0.000	[1.140247	1.274066]
COL	0 (omitted=base)					
HHSIZE	-.0338508	.0084794	-3.99	0.000	[-.0504701	-.0172314]
legally_m	.3247165	.034492	9.41	0.000	[.2571134	.3923197]
common_law	.243595	.03968	6.14	0.000	[.1658237	.3213664]
separated	.2996754	.0517514	5.79	0.000	[.1982446	.4011063]
divorced	.2734506	.045627	5.99	0.000	[.1840234	.3628778]
widowed	.2123628	.0895884	2.37	0.018	[.0367728	.3879528]

single	0 (omitted=base)					
NFL	-.839163	.1084177	-7.74	0.000	[-1.051658	-.6266683]
PEI	-1.601443	.1440298	-11.12	0.000	[-1.883736	-1.319149]
NS	-1.273175	.1055434	-12.06	0.000	[-1.480036	-1.066314]
NB	-1.309181	.1110497	-11.79	0.000	[-1.526835	-1.091528]
QC	-1.129695	.0968897	-11.66	0.000	[-1.319595	-.9397948]
ON	-.7473311	.0944245	-7.91	0.000	[-.9323997	-.5622625]
MB	-1.121558	.1036434	-10.82	0.000	[-1.324696	-.918421]
SKWN	-.7222045	.1035771	-6.97	0.000	[-.9252119	-.519197]
AB	-.4000595	.0954856	-4.19	0.000	[-.5872077	-.2129113]
BC	-.9156354	.096166	-9.52	0.000	[-1.104117	-.7271535]
Northern_Can	0 (omitted=base)					
Female	-.5385982	.0238577	-22.58	0.000	[-.5853584	-.4918381]
Male	0 (omitted=base)					
Cut off points	***the α_i's as discussed in equation (2)***					
/cut1	.6371405	.1099873	-	-	[4215694	.8527117]
/cut2	2.161195	.111169	-	-	[1.943308	2.379082]
/cut3	2.907016	.113739	-	-	[2.684092	3.129941]
/cut4	3.365392	.1187285	-	-	[3.132689	3.598096]
/cut5	3.721774	.1282412	-	-	[3.470426	3.973123]
/cut6	3.913721	.137811	-	-	[3.643617	4.183826]

Source: Authors' computations, 2023

Furthermore, following equations (2) and (3), there are 6 cutoff variables (not 7) as threshold variables for the given 7 categories of annual salary (dependent variable). Since the estimated thresholds or cutoff points, $0<\alpha_1=0.63<\alpha_2=2.16<\alpha_3=2.90<\alpha_4=3.36<\alpha_5=3.72<\alpha_6=3.91$, are less than each other for groups 1 to 6, these estimates suggest that all the probabilities associated with each predicted outcome are positive (Tables 12-14), and the probabilities of each outcome warrant the use of marginal effects (Tables 12 and 13) with respect to changes in the explanatory variables.

Note also the use of dummy dependent variables and many dummy independent variables (refer to Table 1) in the Ordered probit model, and hence the possibility of dummy variable traps (or perfect collinearities). The Dummy variable trap is a scenario where there are attributes that are highly correlated (multicollinear) and one variable predicts the value of others. When we use one-hot encoding (or base) for handling the categorical data, then one dummy variable (attribute) can be predicted with the help of other dummy variables, thus avoiding dummy variable traps. Thus, each dummy variable is compared with the reference group (base group or variable). In this analysis, a positive marginal effect estimate means that the annual salary is higher for the independent variable than for the reference (or base) group; a negative marginal effect estimate means that the annual salary is lower.

Using equations (2), (3), and (7), probabilities for each dependent variable group (Tables 12-14), and marginal effects for the explanatory variables are estimated as shown in Tables 12 and 13 for outcomes 1 and 2 only since 97.1 percent of the annual salary data falls in groups 1 and 2. Table 12 reports marginal effect results based on outcome 1 for the annual salary category ((1=CDN$28,000 – 77,999). The predicted probability for this annual salary bracket is 65.57 percent; implying that most full-time employees (64.57%) were receiving annual salaries ranging from CDN$28,000 to 77,999. These results also suggest that most full-time workers aged 18 to retirement age received annual salaries between the

minimum average annual salary between CDN$27,040 (in Saskatchewan) and CDN$74, 000 (in Yellow Knife, Northern Canada) (Wikipedia, 2022).

Given the base variable for each explanatory variable, Table 12 also reports that all age groups, ethnicity groups except white, residential type, education levels, household size, marital status, and all the provinces (or location) variables significantly (p-value < 0.05) influence belonging in the annual salary bracket, CDN$28,000 to 77,999.

Table 12. Marginal effect estimates for outcome 1 (=CDN$28,000 to 77,999)

y = Pr (AnnualSalary==1) (predict) = .64570027						
Variable	**dy/dx**	**Std. Err.**	**Z**	**P>z**	**[95% Conf. Interval]**	**X**
age30*	-.3576451	.01705	-20.98	0.000	[-.391056 -.324234]	.298086
age40*	-.4858373	.01572	-0.91	0.000	[-.516643 -.455031]	.285819
age50*	-.506986	.01566	-32.38	0.000	[-.537671 -.476301]	.243131
white*	-.0153169	.0155	-0.99	0.323	[-.045691 .015057]	.572784
south_a*	.1421457	.0174	8.17	0.000	[.108047 .176245]	.121851
chinese*	.1039497	.01782	5.83	0.000	[.069016 .138883]	.123487
black*	.1618205	.0185	8.75	0.000	[.125568 .198073]	.081207
DTYPE	.0543358	.00574	9.47	0.000	[.043087 .065585]	1.74787
BA*	-.3035361	.01077	-28.17	0.000	[-.324651 -.282421]	.417403
PRF*	-.5108539	.01522	-33.56	0.000	[-.540686 -.481022]	.033857
MA*	-.4535742	.01147	-39.55	0.000	[-.476052 -.431096]	.222522
HHSIZE	.0125935	.00323	3.90	0.000	[.006271 .018916]	3.09699
legally_m*	-.1217152	.01295	-9.40	0.000	[-.147096 -.096334]	.402028
common_w*	-.0928592	.0154	-6.03	0.000	[-.123042 -.062676]	.1728
separated*	-.1156528	.02045	-5.65	0.000	[-.155738 -.075568]	.065505
divorced*	-.1050853	.01793	-5.86	0.000	[-.14023 -.069941]	.094046
widowed*	-.0815168	.03522	-2.31	0.021	[-.15054 -.012493]	.017746
NFL*	.2471689	.02169	11.39	0.000	[.204652 .289686]	.036228
PEI*	.3378222	.01002	33.72	0.000	[.318188 .357456]	.015129
NS*	.3234137	.01363	23.72	0.000	[.29669 .350137]	.055447
NB*	.3227614	.01309	24.65	0.000	[.297103 .34842]	.040808
QC*	.3254964	.01807	18.01	0.000	[.290083 .36091]	.140415
ON*	.2546312	.02717	9.37	0.000	[.201376 .307887]	.289172
MB*	.302734	.01598	18.94	0.000	[.271409 .334059]	.059045
SKWN*	.2232696	.02333	9.57	0.000	[.177551 .268988]	.05054
AB*	.1389503	.02907	4.78	0.000	[.081969 .195931]	.141724
BC*	.2834048	.0218	13.00	0.000	[.240672 .326138]	.158979
female*	.1995101	.00868	22.99	0.000	[.182504 .216516]	.531403

(*) dy/dx is for discrete change of dummy variable from 0 to 1
Source: Authors' computations, 2023

4.3. Interpretations with the First Outcome

Age: Since outcome 1 is 'CDN$28,000 to 77,999', being in the age group between 30-39 years significantly (p-value =0.000<0.05) decreases the probability of receiving an annual salary between CDN$28,000 and 77,999 by 35.8 percent. Also, referring to the base age group of 18-29 years, being in the age group 40-49 years and 50-60 significantly decreases the probability of getting an annual salary between CDN$28,000 and 77,999 by 48.6 and 50.7 percent, respectively. Though contrary to the

expected results, these results suggest that as employees' age increases, the probability of a reduction in the annual salary increases. However, for a higher annual salary range (Table 13), the age estimate suggests that as the age of the respondent increases, the likelihood of being in the annual salary range of CDN$77,999 to 127,999 increases. This is consistent with the expectations, considering that age may reflect experiences and hence annual salary increments. This result agrees with the findings by Canada Indeed (2023), which shows the increase in average Canadian salary by age group.

Ethnicity: Since outcome 1 is 'CDN$28,000 to 77,999', being white does not significantly (p-value =0.323>0.05) decrease the probability of receiving an annual salary between CDN$28,000 and 77,999. However, referring to the reference aborigines/natives group, being South Asian, Chinese, and Black significantly (p-value=0.000<0.05) increase the probability of getting an annual salary between CDN$28,000 and 77,999 by 14.2, 10.4 and 16.2 percent, respectively; implying that these ethnic groups mostly obtain the lowest salary in Canada as reported in Stats Canada (2019), and the white ethnic group gets higher salary due to various social injustices in Canada.

Dwelling type (DTYPE): In reference to the residential type 'apartment', residing in a detached house significantly (p-value=0.000<0.05) influences obtaining an annual salary (between CDN$28,000 and 77,999) by 5.43 percent. Also, note that residents in detached house are 1.7 times more than residents who live in apartments; suggesting there are more houses (mostly mortgaged and owned) than apartment buildings in Canada.

Education: In comparison to the base group 'high school completion,' all education levels (Bachelor, Professional and Master' holders) significantly reduces getting annual salary between CDN$28,000 and 77,999 (Table 12). Perhaps this is an indication of a mismatch between higher education levels and this annual salary bracket in Canada. It also suggests that being in the lowest salary bracket does not necessarily require higher education attainment. On the other hand, as reported in Table 13, with higher levels of education, the likelihood of full-time workers getting higher annual salary (CDN$78,000-127,999) significantly increases; confirming the a higher the education level of the respondents, the higher annual salary they received. Note also that 41.7 percent completed a bachelor's degree, 22.2 percent masters and 3.4 percent professional qualifications; hence, as discussed above the mismatch of education level with this lowest salary bracket.

Household size (HHSIZE): Household size significantly (p-value=0.000<0.05) influences getting annual salary between CDN$28,000 and 77,999 by 1.26 percent; suggesting perhaps more cumulative salary from the number of persons in the households. The average household size is 3 persons.

Sex: In reference to male, being female positively and significantly increases the likelihood of receiving the lowest annual salary between CDN$28,000 and 77,999 by about 20 percent. Noting that 53 percent of the females fall within the lowest salary bracket in contrast with the males. This result is different for higher annual salary range as presented in Table 13. Being male influences the likelihood of increasing a higher salary and hence belonging within higher salary bracket (CDN$78,000-127,999). Perhaps indicating gender payment disparity.

Marital Status: With respect to single marital status, the likelihood of people with any marital status (legally married, common law, separated, divorced, and widowed), to be placed in lower annual salary range of CDN$28,000 and 77,999 is significant (p=0.000<0.05). Since outcome 1 is the annual salary bracket 'CDN$28,000 to 77,999, being legally married, common law, separated, divorced and widowed

significantly decrease the probability of getting an annual salary between CDN$28,000 and 77,999 by 12.2, 9.3, 11.6, 10.5 and 8.2 percent, respectively. The highest is for the single person while the lowest is for the widowed.

Provinces: Canada has ten provinces and three territories (*alias* Northern Canada) and is important to analyze the effect of each province on the given annual salary brackets since each province has different economic and service activities, for example, Alberta with oil, British Columbia with lumber industry and Ontario with manufacturing. Table 12 reports marginal effect estimates for the provinces and Northern Canada indicating the likelihood effect of the location of residence and mobility on the annual salary.

As reported in Table 12, the Ordered Probit marginal effect estimates imply that living in any one of the provinces significantly (p-value 0.000 < 0.05) increases the probability of getting an annual salary between CDN$28,000 and 77,999. However, the magnitude of influence differs from province to province. Considering Northern Canada as a base (with the highest average salary in Canada), residing in Newfound land (NFL) increases the probability to be in this lower annual salary bracket by 24.7 percent, Prince Edward Island (PEI) by 33.8 percent, Nova Scotia (NS) by 32.3 percent, New Brunswick (NB) 32.3 percent, Quebec (QC) by 32.5 percent, Ontario (ON) by 25.5 percent, Manitoba (MB) by 30.3 percent, Saskatchewan (SKWN) by 22.3 percent, Alberta (AB) by 13.9 percent and British Colombia (BC) by 28.34 percent.

Also, note that of those who received an annual salary between CDN78,000 and 127,999, 14 percent live in Quebec, 28.9 percent in Ontario, 14.2 percent in Alberta and 15.9 percent in British Colombia. These are the provinces with high a population with more economic, business and development activities, and thus more full-time employees though their influence on an annual salary is less compared to the other provinces that are less developed and with few economic activities. These remote and less developed provinces have more influence on salary to attract full time employees as is the case in northern Canada.

As reported in Table 12 and discussed previously, the predicted probability for annual salary outcome 1 (=CDN$28,000 and 77,999) is 65.57 percent; implying that most full-time employees (64.57%) were receiving annual salary ranging from CDN$28,000 to 77,999. Similarly, Table 13 presents outcome 2 (ranging from CDN$78,000 to 127,999) suggesting 32.5 percent of full-time employees belong in the annual salary bracket of CDN$78,000 to 127,999. It is worth noting that these results further suggest that 97.1 percent (=64.6 + 32.5 percent) of the full-time employees received annual salary ranging from CDN$28,000 to 127,999 during the 2016 census and leaving only 2.9 percent getting the highest annual salary between CDN128,000 to 378,000 (closer to a maximum average annual salary of CDN$400,000, Statista (2022)). Not surprisingly, this is a rare high annual salary bracket associated with professionals such as medical doctors, lawyers, CEOs, and specialized professionals in Canada.

Also, Table 13 reports the marginal effect estimates of each explanatory variable associated with outcome 2 (=CDN$78,000 – 127,999). Using a reference group for each explanatory variable, the table displays that age, ethnicity except white race, residential type, education level, household size, marital status, provinces, and gender significantly (p-value < 0.05) influence getting an annual salary between CDN$78,000 and 127,999 during the 2016 census (latest census available). Note that magnitude and

direction of influence for each explanatory variable differ and some discussions and interpretations are as follows.

First, the results indicate that 32.5 percent of the respondents get an annual salary between CDN$78,000 and 127,999.

4.4. Interpretations with the second outcome

Age: Contrary to outcome 1 (=CDN$28,000 to 77,999), being in age groups, 30-39, 40-49, and 50-60 years significantly (p-value =0.000<0.05) increase the probability of receiving an annual salary between CDN$78,000 and 127, 999 by 29.4, 32.9 and 32.5 percent, respectively. These probability results suggest that as full-time employees' age increase and have more experience, they move to a higher annual salary bracket (CDN$78,000 and 127, 999), given 18-29 years as a base age group.

Table 13. Marginal effect estimates for outcome 2 (=CDN$78,000 to 127,999)

Marginal effects after oprobit **y = Pr (AnnualSalary==2) (predict, outcome(2))** **= .32543799**						
Variable	dy/dx	Std. Err.	z	P>|z|	[95% Conf. Interval]	X
age30*	.2638543	.01091	24.18	0.000	[.242465 .285244]	.298086
age40*	.3293282	.00876	37.59	0.000	[.312159 .346498]	.285819
age50*	.3248837	.00782	41.52	0.000	[.309548 .340219]	.243131
white*	.0126158	.01247	1.01	0.312	[-.011833 .037065]	.572784
south_a*	-.1217373	.01457	-8.35	0.000	[-.150297 -.093178]	.121851
chinese*	-.0881825	.0149	-5.92	0.000	[-.117385 -.05898]	.123487
black*	-.1399137	.01557	-8.98	0.000	[-.170437 -.10939]	.081207
DTYPE	-.0447122	.00469	-9.53	0.000	[-.053908 -.035516]	1.74787
BA*	.2385257	.00856	27.85	0.000	[.221741 .255311]	.417403
PRF*	.2280856	.00869	26.23	0.000	[.211045 .245126]	.033857
MA*	.2999988	.00718	41.77	0.000	[.285921 .314076]	.222522
HHSIZE	-.0103631	.0026	-3.99	0.000	[-.015455 -.005271]	3.09699
legally_m*	.0987521	.01042	9.48	0.000	[.078335 .11917]	.402028
common_w*	.0741405	.01193	6.21	0.000	[.050752 .097529]	.1728
separated*	.0903864	.0151	5.99	0.000	[.060801 .119972]	.065505
divorced*	.0828278	.0135	6.14	0.000	[.056371 .109284]	.094046
widowed*	.0645404	.0267	2.42	0.016	[.012201 .11688]	.017746
NFL*	-.2196447	.02102	-10.45	0.000	[-.260846 -.178443]	.036228
PEI*	-.3075823	.00979	-31.42	0.000	[-.326772 -.288393]	.015129
NS*	-.2905452	.01341	-21.67	0.000	[-.316825 -.264266]	.055447
NB*	-.291003	.01285	-22.65	0.000	[-.316188 -.265818]	.040808
QC*	-.2865534	.01735	-16.52	0.000	[-.320554 -.252552]	.140415
ON*	-.2158861	.02463	-8.76	0.000	[-.264169 -.167603]	.289172
MB*	-.2707991	.01573	-17.22	0.000	[-.301629 -.23997]	.059045
SKWN*	-.1968084	.02272	-8.66	0.000	[-.241341 -.152276]	.05054
AB*	-.1186545	.02681	-4.42	0.000	[-.171211 -.066098]	.141724
BC*	-.247354	.02069	-11.95	0.000	[-.287915 -.206793]	.158979
female*	-.1617539	.00721	-22.43	0.000	[-.175888 -.14762]	.531403

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Source: Authors' computations, 2023

Ethnicity: Unlike marginal effect estimates related to outcome 1 (=CDN$28,000 to 77,999), being white does not significantly (p-value =0.312>0.05) influence but increases the probability of receiving a higher annual salary between CDN$78,000 and 127,999. However, being South Asian, Chinese, and Black significantly (p-value=0.000<0.05) decrease the probability of getting annual salary between CDN$78,000 and 127,999 by 12.6, 8.8 and 14 percent, respectively. These results further suggest that there are fewer non-white ethnics in this higher annual salary bracket (=CDN$78,000 and 127,999) while full-time employees who are non-white increase the likelihood of being in the lower annual salary bracket (=CDN$28,000 to 77,999) (Table 12); implying racial issues in Canada. This is even worse for the black employees and followed by South Asians who were 20 percent of the total full-time employees, who do not belong in this salary bracket.

Education: In comparison to the base group 'high school completion,' all education levels (Bachelor, Professional and Master holders) significantly increase getting higher annual salary between CDN$78,000 and 127,999 (Table 13). Comparing results for outcome 1(Table 12) and outcome 2 (Table 13), education levels increase the probability of been in a higher annual salary bracket. In reference to a high school completion, holding a bachelor's degree significantly increases annual salary by 23.9 percent, master's degree been in this salary bracket also increases salary by 30 percent, and been in a professional group increases salary within this range by 22.8 percent.

Sex: In reference to males, been female positively and significantly increases the likelihood of receiving an annual salary between CDN28,000 and 77,999 by about 20 percent. In contrast, been female significantly decreases getting a higher annual salary of CDN$78,000-127,999 by 16.2 percent (Table 13); suggesting being male full-time worker increases the likelihood of getting a higher annual salary.

Provinces: Canada has ten provinces and three territories (*alias* Norther Canada) and is important to analyze the effect of each province and mobility among the provinces on the given annual salary brackets. Note that each province has different economic and service sectors, as well as activities, for example, Alberta with oil, British Columbia with lumber industry and Ontario with manufacturing. Table 13 also reports marginal effect estimates indicating the likelihood of changes in residential province or location on the annual salary.

Generally, in reference to Northern Canada, provincial marginal effect estimates imply that a full-time worker living in any one of the ten provinces significantly (p-value 0.000 < 0.05) decreases the probability of getting an annual salary between CDN$78,000 and 127,999.

As reported in Table 13, a negative marginal estimate for each province suggests that as full-time employees moving from Northern Canada, where the highest average annual salary was CDN$115,330 in Canada 2016 (Statista (2022), to the rest of Canada, the annual salary for full time employees dropped significantly. In reference to Northern Canada, residing in Newfound land (NFL) decreases the likelihood of getting a higher salary by 22 percent, Prince Edward Island (PEI) by 30.8 percent, Nova Scotia (NS) by 29.1 percent, New Brunswick (NB) 29.1 percent, Quebec (QC) by 28.7 percent, Ontario (ON) by 21.6 percent, Manitoba (MB) by 27.1 percent, Saskatchewan (SKWN) by 19.7 percent, Alberta (AB) by 11.9 percent and British Colombia (BC) by 24.7 percent. Also, these results suggest that working in remote areas like Northern Canada pays more salaries (perhaps with more fringe benefits) to attract more full-time employees.

Comparing these estimates to statistics reported by Jobillico (2019), which presented that a person working in Northwest Territories typically earns an average of CDN$73,620 annually, and Canadian annual average salaries by Province and Territory are reported as follows (Table 14).

Table 14. Canadian Annual Average Salaries by Province

Newfoundland and Labrador – $54,451	Ontario – $53,598
New Brunswick – $48,122	Manitoba – $49,498
Nova Scotia – $46,396	Saskatchewan – $53,251
Prince Edward Island – $44,455	Alberta – $59,920
Québec – $49,312	British Columbia – $50,716

Source: Jobillico Report (2019)

Jobillico's report is in line with the Ordered Probit model estimates that if full-time employees move from Northern Canada to any province, there is high probability of a reduction in the annual salary as discussed above.

Finally, probabilities for annual salaries (outcomes 3, 4, 5, and 6), and associated marginal effects were calculated. Table 15 reports the probabilities only for annual salary categories 3, 4, 5 and 6 since the marginal effects generally reflect similar significant effect but with lower magnitude on the remaining annual salary group. Note also that since only 2.88 percent of the data set reflects full time employees, its contribution to the data analysis is minimal. However, detailed marginal effect estimates on the remaining outcomes are reported in Table 15. The predicted probabilities for salary groups, 3=CDN$128,000 – 177,999, 4=CDN$178,000 – 227,999, 5=CDN$228,000 – 277,999, 6=CDN$278,000 – 327,999 and 7=CDN$328,000 – 400,000 are as follow.

Table 15. Probabilities for Outcomes 3, 4, 5, 6 and 7

Marginal effects after *oprobit* y = Pr(AnnualSalary==3) (predict, outcome(3))= CDN$128,000 – 177,999 = .02476042 = 2.47%
Marginal effects after oprobit y = Pr(AnnualSalary==4) (predict, outcome(4))= CDN$178,000 – 227,999 = .00314019 = 0.31%
Marginal effects after oprobit y = Pr(AnnualSalary==5) (predict, outcome(5))= CDN$228,000 – 277,999 = .0006894=0.069%
Marginal effects after oprobit y = Pr(AnnualSalary==6) (predict, outcome(6))= CDN$278,000 – 327,999 = .00014077=0.014%
Marginal effects after oprobit y = Pr(AnnualSalary==7)(predict, outcome(7))= CDN$328,000 – 400,000 = .00013096=0.013%

Of the data analyzed only 2.47 percent of the full-time employees received an annual salary between CDN$128,000 and 177,999, 0.31 percent between CDN$178,000 and 227,999, 0.069 percent between CDN$228,000 – 277,999, 0.014 percent between CDN$278,000 and 327,999, as well as, 0.013 percent received between CDN$328,000 and 400,000. This implies that rarely full-time employees who completed at least a high school education and aged 18 to 59 belong in these salary brackets in Canada.

5. Conclusion and Recommendations

This part of the study provides conclusion and recommendations for the study as follows. The main thrust of the study is to identify the factors affecting annual earnings in Canada. A sample of 12,228 was extracted from 2016 census data. To reduce very high heterogeneity in the observations, the annual salary data were grouped into seven non-overlapping homogeneous categories as outcome variables. The Ordered Probit regression underpinned the covariate analysis to understand the influence of various independent variables on annual salary for full-time employees in Canada.

6. Conclusion

The prediction probability for an annual salary ranging from CDN$28,000 to 77,999 is 65.6 percent while for CDN78000 to 127,999 range is 32.5 percent; implying that 98.1 percent of full-time employees who completed at least high school, and are 18 years to retirement age of 60 years received annual salary between CDN$28,000 and 127,999. The remaining 2 percent received the highest salary ranging from CDN$128,000 to 400,000 during the period of analysis.

For full-time employees who at least completed high school and are aged 18 to 59 years, the median annual salary was CDN$69,000, while the mean salary was CDN$75,279.41 for Canada. The study found that about 60 percent of full-time employees are within the productive age of 30 to 49 years. In terms of ethnicity, about 58 percent are of the white race, 25 percent of Asian, 8.1 percent are black, and about 0.05 percent are natives. About 48 percent of respondents live in detached houses, and about 30 percent in apartments. About 42 percent completed bachelor's degree, followed by 32.6 percent college diploma. The average household size is 3 persons. Note that 40.2% of the respondents were legally married, followed by singles (24.8%) and common law (17.3%) marital status.

Geographical variables indicate that most full-time annual salaried employees (28.9%) live in Ontario, 15.9 percent in British Colombia, 14.2 percent in Alberta, and 14 percent in Quebec, while the least (1.2%) live in the three territories (*alias* Northern Canada) of Canada.

The results indicate that all age groups, ethnicity except white, residential type, education levels, household size, marital status, and all the provinces (or location) variables are statistically significant (p-value < 0.05); however, the magnitude and the direction (positively or negatively) of influence depends on the respondent's annual salary ranges. Nonetheless, education has a negative and significant influence on the lowest salary range, but positive and significant effect on the higher salary brackets.

Furthermore, relocation from Northern Canada to the rest of Canada reduces the annual salary by an average of 20 percent for full-time employees who were in the higher salary bracket; however, the results are vice versa for the lower annual salary bracket. The highest average annual salary was about CDN$80,000 for Northern Canada, while it was about CDN$60,000 on average for the rest of Canada; hence, the negative marginal effect estimates for the provinces verify the difference in annual salary between Northern Canada and the rest of Canada, as well as differences among provinces.

Finally, ranking from the most to the least influential covariate on annual salary is – education (college 40.8%), age (age 40-50, 21.7%), residential province (Alberta, 30.8%), ethnicity (white, 21.7%), gender (female, 19.2%), residential type (detached house, 9.4%), household size (3 persons, 7.2%) and marital status (single or married equally, 5.9%).

7. Recommendations

The study, therefore, recommends that the government of Canada looks at different socio-economic variables, for example,

Males influence the likelihood of increasing a higher salary and hence belonging within a higher salary bracket (CDN$78,000-127,999); implying gender payment disparity.

Also, results further suggest that there are fewer non-white ethnics in a higher annual salary bracket (=CDN$78,000 and 127,999) while full-time employees who are non-white increase the likelihood of being in the lower annual salary bracket (=CDN$28,000 to 77,999); implying racial issues related to employment in Canada.

Even worse for the black employees and followed by South Asians who were 20 percent of the total full-time employees, who do not belong in this salary bracket. Discrimination based on ethnic identity should be eliminated and solely salaries should be paid based on education levels, skills, and experiences.

Therefore, the Government of Canada has a bigger role to play through legislation, awareness, and inclusiveness to adjust the salaries to mitigate inequalities of earnings in diverse and multicultural Canada.

Author credit statement

Abdi Khalil Edriss: Conceptualization, Formal analysis, writing an original draft, Reviewing, and Editing.

Nesub Abdi: Data curation, Investigations, Software, Methodology, Visualization, Validation, Descriptive Analysis & Editing.

Declaration of competing interest

No competing interest.

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