**Gender wage gap by industry and by occupation in Canada**

***By Afghan Sher, Alia Nabulsi, Jean-Toussaint Olivieri Battestini, Cao Ying, Eshilama Otiamhe Apryl.***

**Abstract:** *Using the August 2018 Labor Force Survey, we exploit Canadian employee data to measure the gender wage gap by industry and by occupation and we investigate if there is a specific pattern between gender wage gap and high paying industries and occupations. Our results suggest although the gender wage gap should decrease when females are working in high paying industries and occupation because a higher level of education and experience are increasing the hourly wage, the gender wage gap is still high in some high paying industries such as finance for instance. Indeed, some social behaviours and customs in some industries and occupation may interfere with the pattern established.*

**Introduction**

Despite the improvement observed over the past years in women’s share of the labour force and the narrowing systematic gender wage gap, unequal payment between male and female workers, who acquires same level of working skills and shares same attributes, remains as a concerning issue in the global labour market, and the factors contributing to the gap remain unclear. The level of gender wage gap shows a great disparity among different industries and occupations. Again, with identical attributes, the variations in wage gap between female and male works suggests the type of industry or occupation, as well as gender-distribution of that industry or occupation are key determinants of the level of gender wage gap.

It is important to point out and recognize the problem of occupational segregation in the labour markets. Certain industries such as Motor skills and other occupations require strength and handy skill are often male-dominated. However, gender segregation in different industries and occupations failed to explain the gender wage gap (Arcila,Ferrer &Schirle, 2017). Instead gender wage gap in an occupation is partially explained by gender discrepancies in skills rather than unbalanced distribution and the net discrimination gaps vary across firms and are huge in male-dominated companies.

Similarly, Krueger and Summers (1988) also examines the discrepancies in wages for equally skilled employees. They proved that wages dispersion crosswise industries are substantial. They point out that the industries’ wage structures are extremely correlated for employees in large and small companies, in numerous states of the United States, and with different employment tenures. In other words, the amount of wage provided by the industry and occupation has direct impacts on gender wage gaps.

Education levels are also suspected to be a factor that contribute to the gender wage gap in different industries. Boudarbata and Connolly (2013) point out that female post-secondary graduates earn on average 6-14% less than male in post-secondary graduates during the period two to five years after graduation. As an important statement made in Boudarbata and Connolly’s study, women earn less at every point of the distribution compare to men. This suggests that gender discrimination exists in all industries and occupations, which manifested in the form of gender wage gap. By examining the interaction between the interindustry wage levels and the gender wage gap, we can see if the gender wage gap is greater in higher paying industries and occupations in Canada.

In addition, wage differences also existed between employees employed in different sectors and the hierarchy of industries in regards wages is the same for both female and male employees across nations (Gannon et al. 2007). There is an association between inter-industry wage discrepancies and gender wage gap, which suggests that the hierarchy of the industries or occupations would greatly influence gender wage gap within the industry.

Arcila, Ferrer and Schirle (2017) provide a sophisticated analysis of the characteristics of both male and female workers in different industries and occupations. Demographic characteristics such as age, marital status, number of children is all considered to be important factors that could influence workers’ wage. Distribution of men and women across educational categories, such as Grade 8 or lower, some post-secondary degree, Trades certificates, above B.A. are all used to measures the educational level and working skills of workers. Job characteristics, such as full time, permanent, public sector, union and etc. are all included in Aricilia, Ferrer and Schirle’s study to investigate the factors that could influence the gender wage gap in different industries or occupations. The workers’ characteristics listed in their study and the job categories analyzed in their study provides insights on our own study, especially in controlling variables in equation. By studying and analyzing the data collected from the Canada Labour Force Survey for August 2018, this research will investigate the gender wage gap found in multiple industries and occupations, and further determine the major cause that influence the different levels of gender wage gap found in different industries and occupations. Drawing from the literature review and the research result, factors such as gender segregation, physical attributes and gender socialization are closely related to gender wage gaps in different industries and occupations.

**Data Description**

Our study is based on the August 2018 Labour Force Survey (LFS) gathered by Statistics Canada. It contains information of individuals such as age, level of education, marital status, immigration status, union status, occupation, sex, hourly wage and information about the Canadian economy such as sector of activity, region - except the three Canadian territories - size of establishment, class of workers, current student status and size of Canadian cities. We chose the August 2018 LFS because it is the latest one released so far when we started to conduct our analysis[[1]](#footnote-1). We excluded all unemployed members of the labor force, individuals not in the labour force, retired people, all international students, part time workers, seasonal and self-employed workers, immigrants landed in Canada less than ten years ago because we assume their labour market structure is different from the rest of workers, that’s to say they are ready to accept a lower income than the rest of workers. Furthermore, we included a variable holding for the size of the establishment.

Finally, we excluded public sector workers from the sample because we know this sector is distinct from the other because of strict laws preventing a gender wage gap between a male and a female for the same position. After our data cleaning, we chose to use the ten-category occupation variable (NOC\_10) compared to the forty-category occupation variable (NOC\_40) to simplify our regressions, and so, our analysis because we don’t think observation dispersal fits our purpose [[2]](#footnote-2). In the same vein, we chose to group some industry categories from the twenty-one-category industry variable to have at the end seventeen industry categories. For instance, we grouped wholesale and retail trade as well as grouping educational services industry with information, culture and recreation as they both cover similar ground.

**Model:**

Firstly, estimating the model using OLS, we look at the impact that gender has on an individual’s hourly wage using the following model:

 (1)

where is a vector of covariates that controls for variables such as: years of experience, as well as dummy variables for marital status, residing province, union member status (whether individual is a member of a union or not), education (highest educational attainment), immigration status, size of establishment that individual *i* works in and whether individual *i* lives in one of the 9 largest census metropolitan areas (CMA) in Canada or not.

 In order to account for the effect that the industry in which an individual is working in has on wages, we include another vector, , which is compiled of a set of 17 dummy variables that represent different industries, including: agriculture, forestry and fishing, mining, utilities, construction, manufacturing, wholesale and retail trade, transportation and warehousing, finance and insurance, professional services, business services, educational services, healthcare, hospitality (accommodation and food services) and other services (except public administration). We also include an interactive term between the dummy variable and the vector to get, the coefficient of this variable,, measures the additional effect on wages when individual is female in a given industry. Thus, the model becomes:

 (2)

 Similarly, in order to estimate the gender wage gap in different occupations, we include vector , a set of 10 dummy variables made up of the different occupations given in the Labor Force Survey. The occupations we are controlling for are management occupations, business and finance occupations, natural and applied sciences occupations, health occupations, occupations in education and community, occupations in art, recreation and sport, sales occupations, trade occupations, natural resources occupations and occupations in manufacturing and utilities. Using the vector , we can create , an interactive term similar to the one in equation (3), that represents the additional wage impact of a female in a given occupation. Therefore, the equation becomes:

 (3)

Furthermore, in order to estimate the hourly wage for a male in industry *i,* holding all other variables constant, we can say:

 (4)

And to calculate the hourly wage for a female in industry *i,* holding all other variables constant, we get:

 (5)

So by finding the difference in hourly wage between female and male in industry *i,* we can estimate the gender wage gap, in industry *i:*

(6)

Where difference in percent between is female and male wages in industry *i*.

This shows us that our main parameters of interest are , which measures the effect of gender on hourly wages and , which measures the effect of gender and industry on hourly wages.

 Using the same method, we can estimate the hourly wage of a male in occupation *j*, holding all other independent variables constant:

 (7)

And estimated hourly wage for a female in occupation *j* , holding other independent variables constant, is:

 (8)

Therefore, by calculating the difference between the female wage rate and male wage rate in occupation *j*, we can estimate the hourly gender wage gap in occupation *j*:

 (9)

Where is the gender wage gap in occupation *j*, expressed in percent

**Results & Analysis**

In order to analyze this, we would need to know average wages in the industries and occupations that we are considering. Table (1) shows the average hourly wage in each of the industries and table (2) for occupations that we are analyzing for in our research, which we calculated by estimating yearly earnings per hour with all of the industries as our independent variables except professional and technical services since we will use that as our benchmark (Appendix A). Our data shows that the utilities industry has the highest per hour earnings with $40.84 per hour and the hospitality industry having the lowest mean hourly wages with $17.00 per hour.

Likewise, our estimates indicate that management is, on average, the highest paying occupation with an hourly wage of $42.43 and sales being the lowest paying occupation bracket with earnings of $19.06 per hour. As mentioned before, we hypothesize that as industries and occupations pay a higher wage, the gender wage gap will decrease since factors such as education and experience will play a bigger role in the job and that higher paying jobs have a smaller labor market to choose from, making it less important about the gender and focuses more on the individual’s productivity and capability.

**Wage Gap: Across Industries**

By looking at the hospitality industry, which we have found to have the lowest hourly wage, we can see from table (1) that there is a low gender wage gap in this industry, with females earning 6.79% less compared to their male colleagues. This is not surprising as Table (1) also displays the percentage of males and females in the hospitality (accommodation and food services) industry, showing that 59.4% of workers in that industry are female. Reasons why industries with similar wages could have different gender wage gaps vary significantly, for agriculture, there seems to be a lot more males taking part in the industry compared to females, with males making up 71.88% of the industry in our sample, low amount of female employment could create a culture within the industry where females are not given top positions, leading to a gender wage gap that is above the average we initially estimated using equation (1).

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| **Table 1:** Main Results for industries |   |   |   |
|  |  |  |  |  |
|   | Average Hourly Wage ($/hour) | Gender Composition (%)  | Wage Gap  |
| Industry |   | male  | female |   |
|  | (1) | (2) | (3) | (4) |
| Hospitality  | 17 | 40.6 | 59.4 | -0.0607914 |
| Forestry and logging | 19.37 | 81.4 | 18.6 | -0.3394196 |
| Agriculture | 21.14 | 71.88 | 28.18 | -0.2287719 |
| Trade (wholesale and retail) | 22.48 | 56.8 | 43.2 | -0.2286337 |
| Nondurable Manufacturing  | 25.18 | 82.12 | 17.88 | -0.1606315 |
| Other Services | 25.18 | 55.94 | 44.06 | -0.1703388 |
| Real estate, renting and leasing | 28.85 | 59.1 | 40.9 | -0.1351804 |
| Transportation | 27.37 | 78.17 | 21.83 | -0.1720145 |
| Healthcare and social assistance  | 28.43 | 17.28 | 82.72 | -0.06731 |
| Construction  | 29.51 | 86.88 | 13.12 | -0.2281026 |
| Forestry and logging | 30.23 | 81.4 | 18.6 | -0.0188138 |
| Finance and insurance  | 31.23 | 33.49 | 66.51 | -0.2286337 |
| Educational services  | 32.31 | 47.21 | 52.79 | -0.2072026 |
| Professional services | 35.21 | 53.86 | 46.14 | -0.2271076 |
| Mining | 39.44 | 86 | 14 | -0.3394196 |
| Utilities  | 40.84 | 76 | 24 | -0.3394196 |
| Column (1) displays the average hourly wage which we estimated using the equation in Appendix A, column (2) and (3) display the percentage of males and females respectively. Column (4) displays the estimated gender wage gap in the industry which we estimated using equation (6)  |

 Despite having similar hourly wages, the gender wage gaps estimated differ drastically depending on the industry. For example, despite the healthcare industry and construction industry having similar wages, $28.43 and $29.51 respectively, there is a significant difference between the two gender wage gaps predicted by the model (with females only earning 6.68% less compared to males in the healthcare industry and females earning 22.81% less compared to males in the construction industry). The reasons for this may be obvious as females make up a large number of nurses as well as a number of practitioners and doctors. Similarly, we can see from table (1) that the construction industry is highly male dominated, with 86.66% of the industry made up of males in our sample. Similar to the wholesale trade industry, culture and society do not push females to enter this kind of industry.

Finally, we take a look at the highest paying industries according to our sample, the mining industry has high hourly wages since it is the extraction of valuable minerals, however, our sample of individuals working in the mining sector are only 14% female, the lack of females in such a high paying industry show that women are perhaps not working in this high paying industry, perhaps due to the requirements of the jobs in this sector, employees will have to leave their home and go to mining sights, which would be more likely done by a male than a female. Having said that, the gender wage gap we estimated for the mining industry is much higher than the average gender wage gap, with females earning 33.9% less than males in the mining industry.

The finance and insurance industry, which has an estimated overall hourly income of $31.12, has a large gender wage gap with females earning 22.86% less than males in the same industry. The finance sector has traditionally been known to be extremely male dominated, but in our sample females make up 66.51% of the industry, we usually correlate a high percent of females in an industry to have a lower gender wage gap, but in the finance and insurance sector there seems to be a large gender wage gap in our sample, this could be from a tradition of male dominance in high paying sectors in this industry.

If we look at the gender wage gaps estimated by our model for the professional, scientific and technical services industry and for the educational services industry, we see a case where two services industries with similar estimated wages have a similar estimated gender wage gap. The professional, scientific and technical services industry has an estimated hourly wage of $35.21 and a gender wage gap where females earn 22.71% less than males while the educational services industry has an estimated hourly wage of $32.31 and females wages differ by 20.72% compared to males in the same industry. Neither of the two industries are significantly male or female dominated.

There is no specific pattern in the way the estimated gender wage gap moves in relation to average hourly wages when we are dealing with industries with wages between $17 per hour and $30 per hour. We typically see that the gender wage gaps can be large for some of the lower paying industries and small for some of the higher paying industries. Instead, the reasons behind gender wage gaps in different industries is due to the characteristics of the specific industry, like how healthcare industry has a large amount of females working in it and how construction has a higher gender wage gap due to requirements that come with the jobs in the sector. However, when we look at the high paying industries, we can see that the wage gap never goes below 20%, this may be because of the industries that are the highest paying, such as the utilities and mining industries, are male dominated. But, when we look at educational services industry and professional, scientific and technical services industry we see that there is a large gender wage gap despite not being extremely dominated by one gender. In the professional, scientific and technical services industry, there is little explanation to give and our best guess would be that there are mainly males in the higher paying roles and females make up the lower paying, administrative jobs. For the education services industry, remember that we do not include public industries in our model, so the estimates we are getting are for privately owned schools and universities, which influence the gender wage gap. Instead of gender wage gaps having a correlation with the overall average hourly wages, gender wage gaps can be explained by social behaviors and gender composition of industries.

**Wage Gap: Across Occupations**

Using the same method, we used to analyze different industries, we can see how different occupations have different gender wage gaps. Looking at occupations will give us additional information we can use to analyze how gender wage gaps change from different occupations.

Table (2) shows the estimated hourly wages and the estimated gender wage gap for each of the 10 occupations in the Labor Force Survey, as well as the gender composition and the gender wage gap in each of the occupations. Looking at occupations in manufacturing and utilities and occupations in art, culture, recreation and sport, we see these two occupations estimated to have similar wages, however, the characteristics of the two differ greatly and can be seen in the estimated gender wage gap of the two. Table (2) shows that occupations in manufacturing and utilities have gender wage gaps where females earn 20.37% less than males in the same occupation, however, occupations in art, culture, recreation and sport have a gender wage gap of females earning 9.58% less than males, this is due to the characteristics of the two occupations as well as occupations in manufacturing and utilities only being 17.88% female in this sample. Also, art is traditionally a special industry with its own characteristics and social behaviors, like how the financial industry is estimated gender wage gap of the two. Table (2) shows that occupations in manufacturing and utilities have gender wage gaps where females earn 20.37% less than males in the same occupation, however, occupations in art, culture, recreation and sport have a gender wage gap of females earning 9.58% less than males, this is due to the characteristics of the two occupations as well as occupations in manufacturing and utilities only being 17.88% female in this sample. Also, art is traditionally a special industry with its own characteristics and social behaviors, like how the financial industry is.

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| **Table 2**: Main results for Occupation |   |   |   |   |
|  |  |  |  |  |
|   | Hourly Wages ($/hour) |  Gender Composition (%) | Wage Gap |
| Occupation  |   | male | female |   |
|  | (1) | (2) | (3) | (4) |
| Sales | 19.06 | 46.84 | 53.16 | -0.133501 |
| Occupations in manufacturing and utilities | 24.74 | 82.12 | 17.88 | -0.2036783 |
| Occupations in art, culture, recreation and sport | 25.76 | 45.3 | 54.7 | -0.0958424 |
| Business occupations  | 27.21 | 27.79 | 72.21 | -0.1350952 |
| Trade occupations | 27.7 | 94.93 | 5.07 | -0.2452588 |
| Natural Resources | 28.67 | 85.9 | 14.1 | -0.334922 |
| Health occupations  | 30.71 | 16.13 | 83.87 | -0.0689168 |
| Occupations in education, law and social, community  | 34.11 | 36.89 | 63.11 | -0.1653681 |
| Natural and applied sciences and related occupations  | 37.11 | 77.75 | 22.25 | -0.1105693 |
| Management occupations  | 42.43 | 59.22 | 40.78 | -0.1417665 |
| Column (1) displays the average hourly wage which we estimated using the equation in Appendix A, column (2) and (3) display the percentage of males and females respectively. Column (4) displays the estimated gender wage gap in the occupation which we estimated using equation (9) |

 Furthermore, we see that for business occupations the gender wage gap is 13.50%, which is consistent with what we see with other related industries. Natural resources and related production occupations has an extremely high estimated gender wage gap of females earning 33.49% less compared to males in the same occupation. As we can see in table (2), this occupation is only 14.10% female in our sample and the gap in the wages could be due to the severity of how male dominated this occupation is.

 Now, we look at the four highest paying occupations on table (2) according to our estimates. Like what we saw in the healthcare industry, health occupations are extremely female dominated, with females occupying 83.87% of healthcare occupations in our sample. As you would guess, the gender wage gap in this occupation is small and very close to the gender wage gap estimated in the healthcare industry, with females earning only 6.89% less than males in the same occupation. Furthermore, natural and applied sciences occupations show that despite being made up of 22.25% female in our sample, the gender wage gap is below average with the estimated wage gap to be females earning 11.06% less that males. This could be because there is little physical boundaries and males and females working in the same occupations have similar productivity. Lastly, we look at management occupations. Which has an estimated hourly wage of $42.43 and an estimated gender wage gap where females earn 14.17% less than males. Since the jobs in these industries can easily be done by both males and females, the gender wage gap will be closer to the average.

 Our results when analyzing gender wage gaps for different occupations show similar results to what we found when analyzing gender wage gaps for different industries. That is, the reasons for a higher or lower gender wage gap relies more on the characteristics of the occupation and not really on the wage of the occupation. We found that management occupations, the occupation with the highest hourly income, had a lower gender wage gap than some of the lower paying occupations. This tells us that there is no specific pattern in which the gender wage gap moves, we see that occupations with a large percent of females have both a high and low gender wage gap. Thus, our hypothesis is not consistent with our findings.

**Conclusion**

Using the Canada Labour Force Survey for August 2018, we exploit variations between the inter-industry wage differentials as it is vital to bring to light the existence of systematic wage disparities amid the industrial segment which has existed for several years.

 According to our analysis, the gender wage gap ranges from 6.08% to 33.9% between industries and ranges from 6.9% to 33.5% between occupations. Part of the overall gender wage gap can be explained by differences in the distribution of male and female workers across sectors.

 The proportion of the overall gender wage gap explained by differences in the employment distributions of male and female workers varies depending on the level of industry disaggregation and the sample used. It can be acknowledged that this econometric study should be completed by a sociological study on social behaviors by industry and by occupation in order to have more literacy in explaining the gender wage gap in Canada, and so, in western economies.

 It was observed that there was no specific pattern by which the gender wage gap moved with respect to overall wages. From observations, even after adjusting for productivity-related characteristics of workers in the different occupations or industries, there remains a substantial wage gap at the industry level between the genders. The results of this paper highlight some social behaviors and customs in some industries and occupation that are compiled of various gender socialization factors are playing a huge role the wage gaps across different industries and occupations.

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**Appendix A**

In order to estimate the average hourly wage in each industry and occupation, we use the data from the Canada Labour Force Survey August 2018 and create the following models:

We estimate the average hourly wage of an industry and occupation by estimating yearly hourly income with industries and occupations are the independent variables

(10)

 (11)

Results for this model can be seen in column (1) of table (1) for industries and column (1) in table (2) for occupations.

1. 1) There is the 2016 Census of Population survey available on Odesi.ca, but some data limitations prevented us from using it such as the union status and the size of firm and establishment. In addition, the LFS includes two new variables, which were crucial to conduct our analysis: the immigration status variable and a ten-occupation category variable, to simplify the current forty-occupation category variable. That said, we chose the LFS to have more accurate information about individuals. [↑](#footnote-ref-1)
2. Indeed, after our data cleaning, we only have 29.522 obervsations left; so the risk was to disperse too much our observations in some occupation categories, and so, to not be able to conduct satisfactory regressions. [↑](#footnote-ref-2)