Average weekly wage ratio In Canada

Name: Jian-Min, Wu

Date: 2023/10/17

Reference: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410034002

● Introduction

Canada has a vast land area and a variety of resources and cultures, creating a variety of life styles and appearances. This made me wonder about the living standards of people under different conditions. After all, living standards will directly affect a person's quality of life and happiness, which is also a major meaning of life. Therefore, in this paper, I try to find documents and issues that can reflect people's living standards. I hope that this document can present the overall level of Canada as much as possible.

After thinking about the above, I decided to define this issue from the most intuitive perspective – wage level. wage level will differ due to many factors such as gender, age, geographical location and occupation, and the result of wage level is related to everyone's quality of life and happiness. There is a huge correlation. Although money mainly reflects material needs, I believe that it does have an obvious connection with spiritual needs.

In order to achieve my goal, I need to first set up various key analysis indicators. I decided to set the average wage rate as the key indicator, and selected several variables worthy of analysis and insights, including year, audience profile, province and occupation. This report will explore the impact of each various on the results through independent analysis and mutual analysis. For example, if we only observe wage levels by occupation and cross-compare the results with occupation and province, are there any different insight between these two methods?

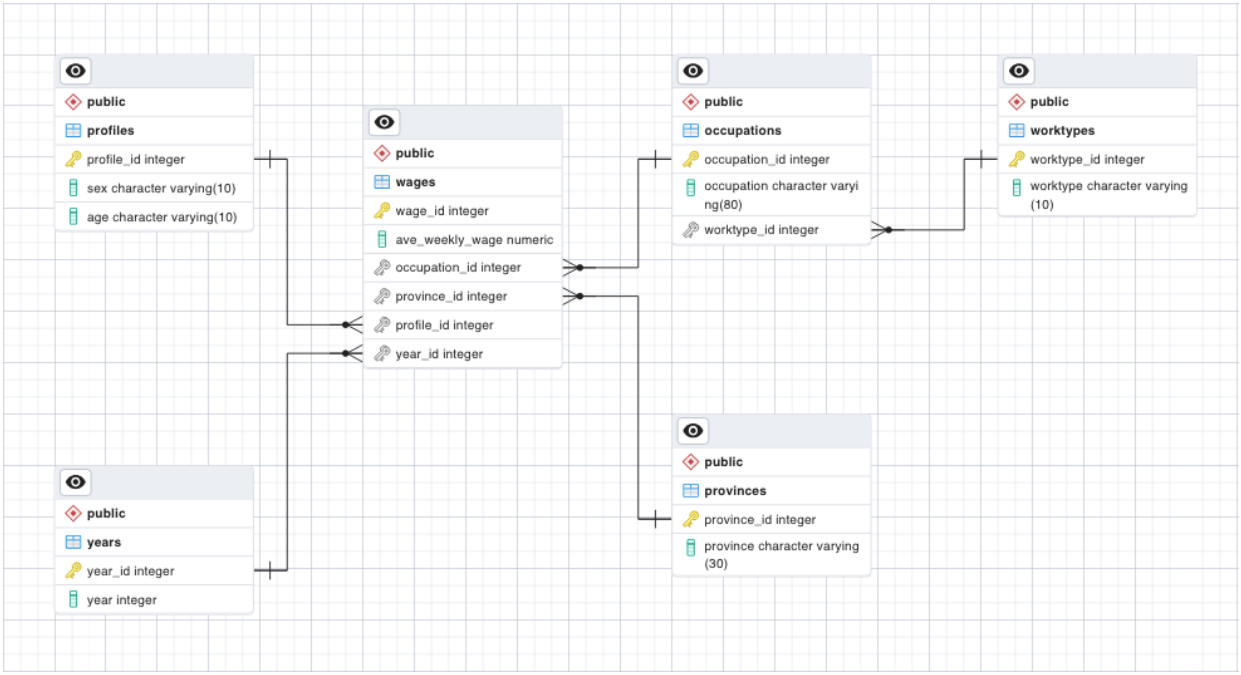
In the final deliverable, I hope to clearly and profoundly reflect meaningful results and insights, which means making trade-offs between complexity and intuition. Through this report, we can better understand Canada’s wage levels under different geographical and cultural conditions allow us to further gain a glimpse into the living standards of the people in this land.

- **Data-set**
  - wages: Contains average weekly wage data.
  - years: Contains annual data for the past five years.
  - profiles: Contains information about gender and age.
  - provinces: Contains information for each province in Canada.
  - occupations: Contains occupational information based on Canadian NOC.
  - worktypes: Contains work type information of occupation.

- **Data source cleanup**

1. Remove unnecessary information: Including data date and some descriptions.
2. Remove unnecessary variables: This report will focus on the 'Average Weekly wage' analysis, so I have removed the hourly and median wage data.
3. Adjust variable name: Change the column title to the parameter name after.
4. Fill in data: Fill in the blank parts of the row data, mainly copy and paste the corresponding data.
5. Delete data: Some wage data does not display numerical values. Delete the row of invalid data.
6. Adjust data information: Simplify redundant data, for example: change '25 to 54 years' in the age column to '25 to 54'.
7. Split table: Split the entire table into different parts, with wages as the central table and connected to multiple tables including occupations and provinces etc.
8. Set foreign key value: After splitting the table, provide corresponding primary key/foreign key values for each table for subsequent query use.

● **ERD diagram**



● **SQL query**

```
-- 1. Observe key statistics on average wage

SELECT MAX(ave_weekly_wage) AS max_avewage,
        AVG(ave_weekly_wage) AS avg_avewage,
        MIN(ave_weekly_wage) AS min_avewage,
        PERCENTILE_CONT(0.25) WITHIN GROUP (ORDER BY ave_weekly_wage)
AS per25_avewage,
        PERCENTILE_CONT(0.5) WITHIN GROUP (ORDER BY ave_weekly_wage)
AS med_avewage,
        PERCENTILE_CONT(0.75) WITHIN GROUP (ORDER BY ave_weekly_wage)
AS per75_avewage
FROM wages;
```

max_avewage	avg_avewage	min_avewage	per25_avewage	med_avewage	per75_avewage
2454.99	895.2708927483240000	106.47	516.3075	852.51	1217.26

Insight: The gap between the maximum and minimum average weekly wages in Canada is more than 2,000, a multiple of approximately 24 times. However, the numerical difference between the average and the median is not large, reflecting that the overall data points are not heavily tilted towards one end. In addition, the 25th and 75th percentile values may be used as indicators for subsequent analysis.

-- 2. Comparison of average wage in the past five years

```
SELECT y.year, AVG(w.ave_weekly_wage) AS average
FROM wages w
INNER JOIN years y
        ON w.year_id = y.year_id
GROUP BY y.year
ORDER BY y.year;
```

year	average
2018	851.2343478260870000
2019	863.1481363636360000
2020	911.7411661341850000
2021	907.7807485029940000
2022	940.4369444444440000

Insight: Through the changes in average wage values in the past five years, we can find that most of the time, salaries have grown year by year (the growth rate is about 1-5%), except for 2021 (may be related to covid 19).

-- 3. Ranking of average weekly wage by province

```
SELECT p.province, AVG(w.ave_weekly_wage) AS ave_wage
FROM wages w
INNER JOIN provinces p
        ON w.province_id = p.province_id
GROUP BY p.province
ORDER BY ave_wage DESC;
```

province	ave_wage
Alberta	1035.3421856287400000
Newfoundland and Labrador	1025.2979591836700000
Saskatchewan	950.7300967741940000
British Columbia	925.2510416666670000
Prince Edward Island	922.0463265306120000
New Brunswick	918.2035950413220000
Nova Scotia	880.8961702127660000
Manitoba	844.2271511627910000
Ontario	807.2302083333330000
Quebec	801.5512660944210000

Insight: From the analysis results of each province, it is pointed out that Alberta occupies the first place in the provincial ranking, with a gap of about 200 yuan from Quebec, which ranks last. Interestingly, Alberta's population and GDP are not the highest in Canada. We can observe the province in the future. occupational distribution.

-- 4. Wage changes in the highest population province 'Ontario' by year

```
SELECT y.year, AVG(w.ave_weekly_wage) AS Ontario_wave_wage
FROM wages w
INNER JOIN years y
        ON w.year_id = y.year_id
WHERE w.province_id = (SELECT province_id FROM provinces WHERE province =
'Ontario')
GROUP BY y.year
ORDER BY y.year;
```

year	ontario_wave_wage
2018	773.7778571428570000
2019	784.2532352941180000
2020	805.9209615384620000
2021	825.0272727272730000
2022	840.5676315789470000

Insight: Ontario is the province with the highest population and highest GDP in Canada. It can be found that although the province's wage has shown positive growth every year, the wage every year has lagged behind Canada's overall value.

-- 5. Wage levels by gender and age group

```
SELECT p.sex, p.age, AVG(w.ave_weekly_wage) AS ave_wage
FROM wages w
INNER JOIN profiles p
        ON w.profile_id = p.profile_id
GROUP BY p.sex, p.age
ORDER BY ave_wage DESC;
```

sex	age	ave_wage
Males	54 over	1125.8251417769400000
Males	25 to 54	1072.8315129683000000
Females	54 over	925.0761814744800000
Females	25 to 54	920.8458069164270000
Males	15 to 24	581.5870574162680000
Females	15 to 24	542.1933492822970000

Insight: Observing the wage levels of various age groups and genders, I found that men aged 25-54 and over 54 years old accounted for relatively high salaries, which made me further want to confirm the wage ratio of men and women in Canada. (See next analysis for details)

```
-- 6. Comparison of gender wage levels by age group

WITH wage_gender AS(
SELECT p.sex, p.age, AVG(w.ave_weekly_wage) AS ave_wage
FROM wages w
INNER JOIN profiles p
	ON w.profile_id = p.profile_id
GROUP BY p.sex, p.age
)
SELECT AVG(ww.ave_wage / wm.ave_wage) AS gender_wage_ratio
FROM (
	SELECT *
	FROM wage_gender
	WHERE sex = 'Females'
	) AS ww
INNER JOIN wage_gender wm
	ON wm.age = ww.age
WHERE wm.sex = 'Males';
```

gender_wage_ratio
0.87076153253430000000

Insight: Continuing the above analysis, if the age factor is not taken into account, it can be found that the average wage of Canadian women is 87% of that of men. This result is something that Canada, which values gender equality, can work on.

```
-- 7. Ranking of full-time occupations by average weekly wage

SELECT ot.occupation, AVG(w.ave_weekly_wage) AS fulltime_ave_wage
FROM (
	SELECT o.occupation_id, o.occupation, w.worktype
	FROM occupations o
	INNER JOIN worktypes w
		ON o.worktype_id = w.worktype_id
	WHERE w.worktype = 'Full-time'
	) AS ot
INNER JOIN wages w
	ON ot.occupation_id = w.occupation_id
GROUP BY ot.occupation
ORDER BY fulltime_ave_wage DESC;
```

occupation	fulltime_ave_wage
Management occupations	1748.5278846153800000
Natural and applied sciences and related occupations	1370.8922268907600000
Occupations in education, law and social, community and government services	1254.0339694656500000
Health occupations	1214.1645909090900000
Occupations in art, culture, recreation and sport	1043.6472602739700000
Natural resources, agriculture and related production occupations	1026.7790853658500000
Trades, transport and equipment operators and related occupations	1025.5827522935800000
Business, finance and administration occupations	1022.3161224489800000
Occupations in manufacturing and utilities	921.9230373831780000
Sales and service occupations	725.8768333333330000

Insight: Regarding occupations, we first focus on the results of full-time employment. We can find that the wage level of management occupations is very high, even more than twice that of sales and service occupations. Health occupations rank fourth, which may reflect the importance attached to health in advanced countries.

```
-- 8. Comparison of work type wage levels by occupation

WITH wage_worktype AS(
SELECT ot.worktype, ot.occupation, AVG(w.ave_weekly_wage) AS ave_wage
FROM (
	SELECT o.occupation_id, o.occupation, w.worktype
	FROM occupations o
	INNER JOIN worktypes w
		ON o.worktype_id = w.worktype_id
	) AS ot
INNER JOIN wages w
	ON ot.occupation_id = w.occupation_id
GROUP BY ot.worktype, ot.occupation
)
SELECT wp.occupation, (wp.ave_wage / wf.ave_wage) AS worktype_wage_ratio
FROM (
	SELECT *
	FROM wage_worktype
	WHERE worktype = 'Part-time'
	) AS wp
INNER JOIN wage_worktype wf
	ON wf.occupation = wp.occupation
WHERE wf.worktype = 'Full-time'
ORDER BY worktype_wage_ratio DESC;
```

occupation	worktype_wage_ratio
Health occupations	0.46036869817996100000
Natural and applied sciences and related occupations	0.44457983619104300000
Management occupations	0.41813277592804200000
Trades, transport and equipment operators and related occupations	0.38891522180705200000
Occupations in education, law and social, community and government services	0.37806314964504700000
Sales and service occupations	0.37298804142169000000
Business, finance and administration occupations	0.36466041198466000000
Occupations in manufacturing and utilities	0.34630331063883000000
Occupations in art, culture, recreation and sport	0.25488326597282600000
Natural resources, agriculture and related production occupations	0.25133503324486200000

Insight: Comparing the wage levels of full-time and part-time workers, part-time workers only account for about 20% to 40% of full-time workers. Even including the factor of working hours, this gap is still very high, which shows that full-time work obviously has better wages.

-- 9. Average wage levels by gender in various occupations

```
SELECT o.occupation, p.sex,
SUM(CASE WHEN w.ave_weekly_wage > 1217 THEN 1 ELSE 0 END) AS high_wage,
SUM(CASE WHEN w.ave_weekly_wage BETWEEN 516 AND 1217 THEN 1 ELSE 0
END) AS medium_wage,
SUM(CASE WHEN w.ave_weekly_wage < 516 THEN 1 ELSE 0 END) AS low_wage
FROM wages w
INNER JOIN profiles p
        ON w.profile_id = p.profile_id
INNER JOIN occupations o
        ON w.occupation_id = o.occupation_id
GROUP BY o.occupation, p.sex
ORDER BY 1, 2 DESC;
```

occupation	sex	high_wage	medium_wage	low_wage
Business, finance and administration occupations	Males	55	107	72
Business, finance and administration occupations	Females	5	146	83
Health occupations	Males	70	68	15
Health occupations	Females	38	104	11
Management occupations	Males	100	13	2
Management occupations	Females	96	19	0
Natural and applied sciences and related occupations	Males	89	47	7
Natural and applied sciences and related occupations	Females	77	59	7
Natural resources, agriculture and related production occupations	Males	28	54	9
Natural resources, agriculture and related production occupations	Females	7	75	9
Occupations in art, culture, recreation and sport	Males	23	51	44
Occupations in art, culture, recreation and sport	Females	12	64	42
Occupations in education, law and social, community and government services	Males	99	80	45
Occupations in education, law and social, community and government services	Females	54	111	59
Occupations in manufacturing and utilities	Males	24	83	10
Occupations in manufacturing and utilities	Females	0	107	10
Sales and service occupations	Males	0	144	154
Sales and service occupations	Females	0	134	164
Trades, transport and equipment operators and related occupations	Males	41	68	39
Trades, transport and equipment operators and related occupations	Females	4	106	38

Insight: Observe the wage levels of each occupation by gender. Divide the wage range into three intervals, based on the 25th and 75th percentile data points from the first analysis. It can be found that gender has little impact on the Management occupations, Sales and service occupations industry, while there is a relatively large gap in other occupations.

```
-- 10. Observe the wage distribution by occupation in some provinces

WITH pvso AS(
SELECT o.occupation, p.province,
SUM(CASE WHEN w.ave_weekly_wage > 1217 THEN 1 ELSE 0 END) AS high_wage,
SUM(CASE WHEN w.ave_weekly_wage BETWEEN 516 AND 1217 THEN 1 ELSE 0
END) AS medium_wage,
SUM(CASE WHEN w.ave_weekly_wage < 516 THEN 1 ELSE 0 END) AS low_wage
FROM wages w
INNER JOIN provinces p
        ON w.province_id = p.province_id
INNER JOIN occupations o
        ON w.occupation_id = o.occupation_id
WHERE province IN ('Alberta', 'Ontario')
GROUP BY o.occupation, p.province
)
SELECT occupation, province,
round(high_wage / (high_wage + medium_wage + low_wage)::numeric, 2) AS
high_wage_per,
round(medium_wage / (high_wage + medium_wage + low_wage)::numeric, 2) AS
medium_wage_per,
round(low_wage / (high_wage + medium_wage + low_wage)::numeric, 2) AS
low_wage_per
FROM pvso
ORDER BY occupation, province;
```

occupation	province	high_wage_per	medium_wage_per	low_wage_per
Business, finance and administration occupations	Alberta	0.26	0.41	0.33
Business, finance and administration occupations	Ontario	0.18	0.33	0.48
Health occupations	Alberta	0.69	0.31	0.00
Health occupations	Ontario	0.30	0.50	0.20
Management occupations	Alberta	1.00	0.00	0.00
Management occupations	Ontario	0.48	0.50	0.02

Natural and applied sciences and related occupations	Alberta	0.59	0.41	0.00
Natural and applied sciences and related occupations	Ontario	0.40	0.48	0.12
Natural resources, agriculture and related production occupations	Alberta	0.50	0.50	0.00
Natural resources, agriculture and related production occupations	Ontario	0.10	0.57	0.33
Occupations in art, culture, recreation and sport	Alberta	0.22	0.33	0.44
Occupations in art, culture, recreation and sport	Ontario	0.18	0.36	0.46
Occupations in education, law and social, community and government services	Alberta	0.43	0.35	0.22
Occupations in education, law and social, community and government services	Ontario	0.33	0.33	0.33
Occupations in manufacturing and utilities	Alberta	0.50	0.50	0.00
Occupations in manufacturing and utilities	Ontario	0.00	0.63	0.38
Sales and service occupations	Alberta	0.00	0.50	0.50
Sales and service occupations	Ontario	0.00	0.50	0.50
Trades, transport and equipment operators and related occupations	Alberta	0.32	0.37	0.32
Trades, transport and equipment operators and related occupations	Ontario	0.11	0.43	0.46

Insight: Comparing the two most representative provinces based on occupation, Alberta has the highest wage and Ontario has the highest population and GDP. In Alberta, Health occupations, Management occupations, Natural resources, agriculture and related production occupations and Occupations in manufacturing and utilities have relatively high salaries. Ontario is only close to Alberta with Occupations in art, culture, recreation and sport and Sales and service occupations.

```
-- View 1. For marketing department

CREATE VIEW marketing_target AS
SELECT pf.sex, pf.age, pv.province, AVG(w.ave_weekly_wage)
FROM wages w
LEFT JOIN profiles pf
        ON w.profile_id = pf.profile_id
LEFT JOIN provinces pv
        ON w.province_id = pv.province_id
GROUP BY pf.sex, pf.age, pv.province
ORDER BY pf.sex, pf.age, pv.province;
```

Insight: When a company's marketing department sets the target audience for digital advertising (like Facebook platform), they can generally improve the effectiveness of ad delivery by filtering gender, age, and location. Therefore, if the marketing department can know which audiences are more likely to be able to afford the corresponding products, and only deliver ads to this group of audiences, it can improve marketing performance.

```
-- View 2. For Human Resource department

CREATE VIEW HR_recruitment AS
SELECT y.year, o.occupation, AVG(w.ave_weekly_wage)
FROM wages w
LEFT JOIN years y
        ON w.year_id = y.year_id
LEFT JOIN occupations o
        ON w.occupation_id = o.occupation_id
GROUP BY y.year, o.occupation
ORDER BY y.year, o.occupation;
```

Insight: When the company's human resources department is recruiting talents, it can know in advance the occupation of the interviewer's last job, and then use the query to find out the approximate range of the average wage of the occupation in the past few years, so as to adjust the suitable employment wage. This will help companies bring in talent at a more accurate cost.

● Conclusion

In Canada, the average weekly wage of people is about $900. Through the median value, we can find that the overall wage demographic structure does not tend to be seriously skewed.

In terms of year-on-year performance, most periods show positive growth and fall within a growth rate of 1%-5%.

In terms of geography, Alberta ranks first, and surprisingly, Ontario, the province with the largest population and highest GDP, ranks second to last, we also found that the province lags behind the average in wage performance every year. After comparing the two provinces in various occupations, it was found that salaries in the health, management, and natural resource industries in Alberta are much higher than those in Ontario.

In terms of gender and age, we found that women's average wage accounts for about 87% of men. This is an issue that can be considered in terms of gender equality. We also took a closer look at occupations and found that the gap between different genders is most obvious in the management and sales service industries.

In terms of occupations, in addition to management occupations, health, education and natural sciences also have high wage levels. These occupations have a positive impact on the development of the country. In addition, the average wage of part-time workers lags significantly behind that of full-time workers. For many people who must work part-time (such as housewives), this may be a problem that needs to be improved.

After comprehensive data analysis, we can observe the average wage level from multiple dimensions, including profile (sex and age), year, province and occupation, which will help us better understand the wage level of the Canadian people.