Analysis of Ontario wages in relation to economic factors based on Ontario Data Catalogue (1997-2019)

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1 Loading the Data

We will use the following data sets:

```
wages = read.csv("wages.csv") %>% mutate_if(is.character, str_trim)

wages$Education.level =
  factor(wages$Education.level,
         levels = c("Above bachelor's degree",
                    "Bachelor's degree",
                    "University certificate below bachelors degree",
                    "University degree",
                    "Community college, CEGEP",
                    "Trade certificate or diploma",
                    "Post-secondary certificate or diploma",
                    "Some post-secondary",
                    "High school graduate",
                    "Some high school",
                    "PSE  (5,6,7,8,9))",
                    "No PSE  (0,1,2,3,4)",
                    "0 - 8  years",
                    "Total, all education levels"),
         ordered = TRUE)

wages$Age.group =
  factor(wages$Age.group,
         levels = c("25-64 years",
                    "25-54 years",
                    "25-34 years",
                    "20-34 years",
                    "15-24 years",
                    "55 years and over",
                    "25 years and over",
                    "15 years and over"),
         ordered = TRUE)
```

2 Description of the Data set

The `wages` data set includes the average weekly wages rates by education level and immigration status for Canada and Ontario in the years from 1997 to 2019. It includes the following columns:

```r
names(wages)
```

```
## [1] "YEAR"            "Geography"       "Type.of.work"    "Wages"
## [5] "Education.level" "Age.group"       "Both.Sexes"      "Male"
## [9] "Female"
```

1. `YEAR`: Indicates the year in which the data was collected.
2. `Geography`: Indicates the region from which the data was collected. Its possible values include Canada as well as the Canadian provinces and territories.
3. `Type.of.work`: Indicates whether the data in the row is for full-time employees or part-time employees or both.
4. `Wages`:
    1. `Total employees`: The number of employees in the given age range, education level, and job status.
    2. `Averag hourly wage rate`: The average hourly wage of the employees in the given age range, education level, and job status.
    3. And so on for `Average weekly wage rate`, `Median hourly wage rate`, and `Median weekly wage rate`.
5. `Education.level`: Indicates the level of education. It can include the following:

Education.level
Above bachelor's degree
Bachelor's degree
University certificate below bachelors degree
University degree
Community college, CEGEP
Trade certificate or diploma
Post-secondary certificate or diploma
Some post-secondary
High school graduate
Some high school
PSE (5,6,7,8,9))
No PSE (0,1,2,3,4)
0 - 8 years
Total, all education levels

6. `Age.group`: Indicates the age range of the individuals under consideration. It can include the following:

Age.group
25-64 years
25-54 years
25-34 years
20-34 years
15-24 years
55 years and over
25 years and over
15 years and over

7. `Both.sexes`: The data not seperated by gender.
8. `Male`: The data for males.
9. `Female`: The data for females.

3 The Background of the Data

4 Research Questions

4.1 Trend Analysis

- How has the average hourly wage rate changed over the years across different regions?
- Are there any noticeable trends in the median weekly wage rate for full-time employees over the past decade?
- What is the overall trend in the number of full-time employees versus part-time employees across different age groups?

4.2 Regional Disparities

- How do average hourly wage rates vary between different Canadian provinces and territories?
- Are there significant differences in the employment rates between urban and rural areas within a specific province?
- Is there a noticeable gender wage gap within specific regions or provinces?

4.3 Educational Attainment

- How does the average hourly wage rate differ across various education levels?
- Are there any trends in the employment rates based on different levels of education attainment?
- Is there a correlation between educational attainment and the likelihood of being employed full-time versus part-time?

4.4 Age Groups Analysis

- How do wage rates vary across different age groups, and is there a trend in wage growth as individuals age?
- Are there noticeable differences in employment rates between younger and older age groups?
- What is the distribution of educational attainment among different age groups, and how does it correlate with employment status and wage rates?

4.5 Gender Analysis

- Is there a significant gender wage gap, and how has it evolved over time?
- Are there differences in the distribution of employment types (full-time vs. part-time) between males and females?
- How does educational attainment affect the gender wage gap within specific age groups or regions?

4.6 Overall Employment Trends

- How has the total number of employees changed over the years?
- Are there seasonal variations in employment rates or wage rates within certain regions or industries?
- What industries or sectors have shown the highest growth in employment rates, and how does this correlate with wage rates?

5 Tables Summary

5.1 How does the average hourly wage rate differ across various education levels for different genders?

```
avg_wage_by_education <- wages %>%
  filter(Wages == "Average hourly wage rate") %>%
  select(Education.level, Male, Female) %>%
  group_by(Education.level) %>%
  summarise(male_avg = mean(Male),
            female_avg = mean(Female))

kable(avg_wage_by_education)
```

Education.level	male_avg	female_avg
Above bachelor's degree	21.52786	21.358605
Bachelor's degree	21.23880	21.537037
University certificate below bachelors degree	14.44475	15.227574
University degree	23.11843	22.597640
Community college, CEGEP	17.77588	17.622327
Trade certificate or diploma	17.49131	14.579638
Post-secondary certificate or diploma	19.05727	17.322469
Some post-secondary	15.39858	14.009190
High school graduate	16.15161	14.040695
Some high school	14.01283	11.510512
PSE (5,6,7,8,9))	21.39878	19.553837
No PSE (0,1,2,3,4)	16.18388	13.799071
0 - 8 years	10.30092	7.049868
Total, all education levels	19.25272	17.379601

```
ggplot(avg_wage_by_education, aes(x = Education.level)) +
  geom_bar(aes(y = male_avg),
           stat = "identity",
           fill = "blue",
           alpha = 0.5,
           width = 0.55,
           position = "dodge") +
  geom_bar(aes(y = female_avg),
           stat = "identity",
           fill = "red",
           alpha = 0.5,
           width = 0.5,
           position = "dodge") +
  labs(title = "Average Hourly Wage Rate by Education Level and Gender",
       x = "Education Level",
       y = "Average Hourly Wage Rate",
       fill = "Gender") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  coord_flip()
```