EDA hackathon wages

April 20, 2021

1 Do women in Canada earn less than men? Can you predict the average wage given historical data?

[2]:
```
# Initial import
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

[42]:
```
Wages = pd.read_excel("./Dataset - Average Wages (1).xlsx")
```

1.1 EDA

1.1.1 Check data size, categories, cleanliness, etc.

[12]:
```
Wages.head()
```

[12]:
```
   Year Geography              Type of work              Education level  \
0  1997    Canada  Both full- and part-time  Total, all education levels
1  1998    Canada  Both full- and part-time  Total, all education levels
2  1999    Canada  Both full- and part-time  Total, all education levels
3  2000    Canada  Both full- and part-time  Total, all education levels
4  2001    Canada  Both full- and part-time  Total, all education levels

      Sex           Age group            Wages   Value
0    Male  15 years and over   Total employees  5954.5
1    Male  15 years and over   Total employees  6060.1
2    Male  15 years and over   Total employees  6203.8
3    Male  15 years and over   Total employees  6427.6
4    Male  15 years and over   Total employees  6520.2
```

[9]:
```
Wages.tail()
```

[9]:
```
        Year         Geography   Type of work                Education level  \
633595  2012  British Columbia     Part-time         Above bachelor's degree
633596  2013  British Columbia     Part-time         Above bachelor's degree
633597  2014  British Columbia     Part-time         Above bachelor's degree
633598  2015  British Columbia     Part-time         Above bachelor's degree
```

```
633599  2016  British Columbia     Part-time         Above bachelor's degree

             Sex          Age group                     Wages   Value
633595    Female  55 years and over  Median weekly wage rate  522.50
633596    Female  55 years and over  Median weekly wage rate  461.55
633597    Female  55 years and over  Median weekly wage rate  497.52
633598    Female  55 years and over  Median weekly wage rate  480.80
633599    Female  55 years and over  Median weekly wage rate  692.37
```

[38]:
```
Wages.shape
```

[38]:
```
(633600, 8)
```

[19]:
```
Wages.isna().sum()
```

[19]:
```
Year               0
Geography          0
Type of work       0
Education level    0
Sex                0
Age group          0
Wages              0
Value              0
dtype: int64
```

[13]:
```
print("Year:", Wages["Year"].unique())
print()
print("Geography:", Wages["Geography"].unique())
print()
print("Type of work:", Wages["Type of work"].unique())
print()
print("Education level:", Wages["Education level"].unique())
print()
print("Age group:", Wages["Age group"].unique())
print()
print("Wages:", Wages["Wages"].unique())
```

```
Year: [1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
 2011 2012 2013 2014 2015 2016]

Geography: ['Canada' 'Newfoundland and Labrador' 'Prince Edward Island' 'Nova
Scotia'
 'New Brunswick' 'Quebec' 'Ontario' 'Manitoba' 'Saskatchewan' 'Alberta'
 'British Columbia']

Type of work: ['Both full- and part-time' '   Full-time ' '   Part-time ']

Education level: ['Total, all education levels' '   0 - 8  years' '   Some high
```

```
school'
 '   High school graduate' '   Some post-secondary'
 '   Post-secondary certificate or diploma'
 '    Trade certificate or diploma' '    Community college, CEGEP'
 '    University certificate below bachelors degree'
 '   University degree' "      Bachelor's degree"
 "      Above bachelor's degree"]

Age group: ['15 years and over ' '15-24 years' '20-34 years' '25 years and over'
 '25-34 years' '25-54 years' '25-64 years' '55 years and over']

Wages: ['Total employees' 'Average hourly wage rate' 'Average weekly wage rate'
 'Median hourly wage rate' 'Median weekly wage rate']
```

[6]:
```
Wages["Geography"].value_counts()
```

[6]:
```
Nova Scotia                  57600
New Brunswick                57600
Ontario                      57600
Manitoba                     57600
Saskatchewan                 57600
Newfoundland and Labrador    57600
British Columbia             57600
Prince Edward Island         57600
Alberta                      57600
Canada                       57600
Quebec                       57600
Name: Geography, dtype: int64
```

[7]:
```
Wages["Sex"].value_counts()
```

[7]:
```
  Male      316800
  Female    316800
Name: Sex, dtype: int64
```

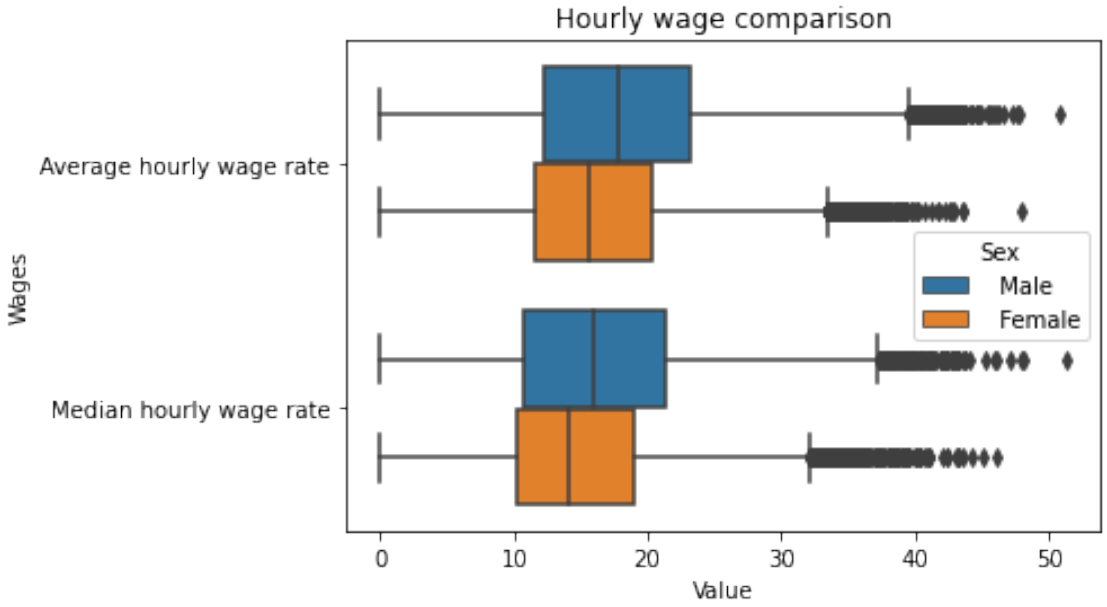
[7]:
```
# Define a new datafram for Wages across the country (grouped by Sex and Age␣
↪Group)
Canada_Total_Wages = Wages[Wages["Geography"] == "Canada"]
```

[18]:
```
Canada_Total_Wages.shape
```

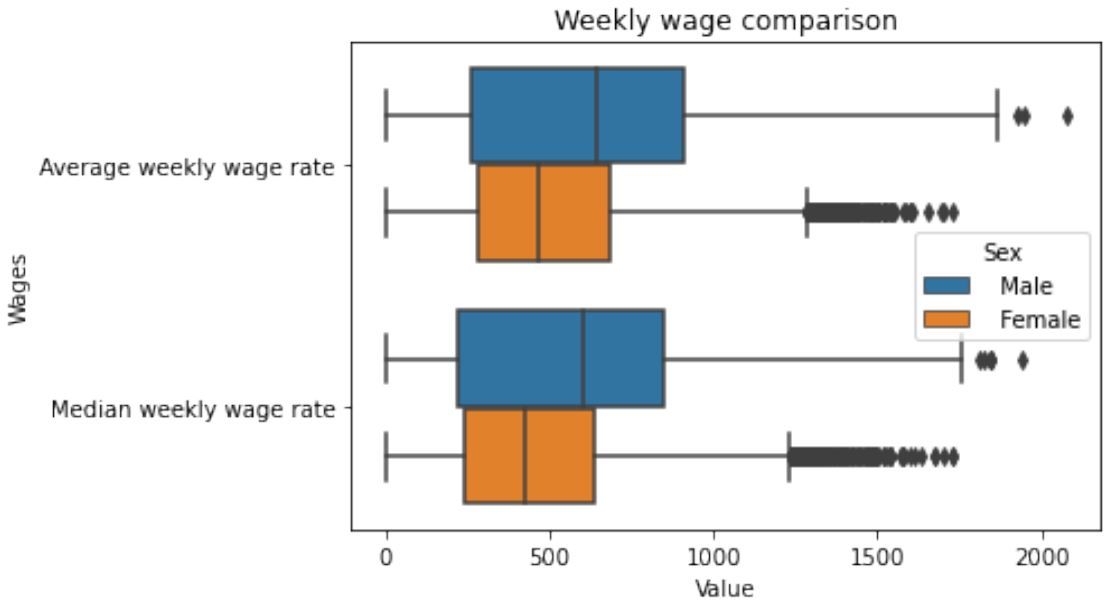
[18]:
```
(57600, 8)
```

1.1.2 Observe overall trends w/ plots

[48]:
```
Wages_Hourly = Wages.loc[(Wages["Wages"] == "Average hourly wage rate") |␣
 ↪(Wages["Wages"] == "Median hourly wage rate")]
sns.boxplot(x="Value", y="Wages", hue="Sex", data=Wages_Hourly).
 ↪set_title("Hourly wage comparison")
plt.show()
```

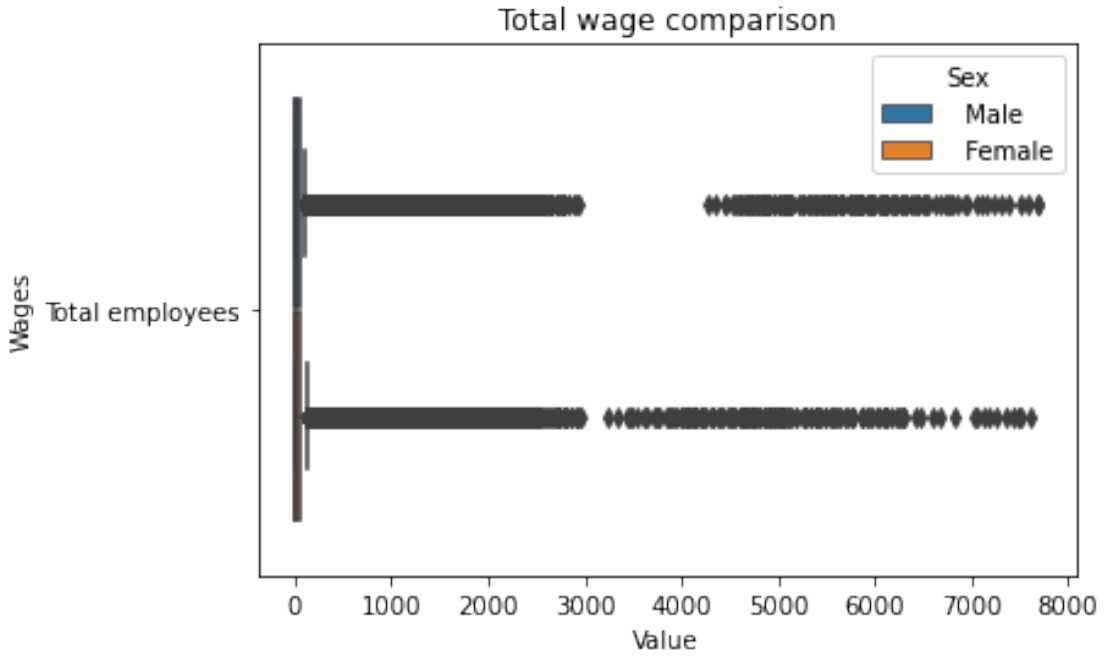


[49]:
```
Wages_Weekly = Wages.loc[(Wages["Wages"] == "Average weekly wage rate") |␣
 ↪(Wages["Wages"] == "Median weekly wage rate")]
sns.boxplot(x="Value", y="Wages", hue="Sex", data=Wages_Weekly).
 ↪set_title("Weekly wage comparison")
plt.show()
```

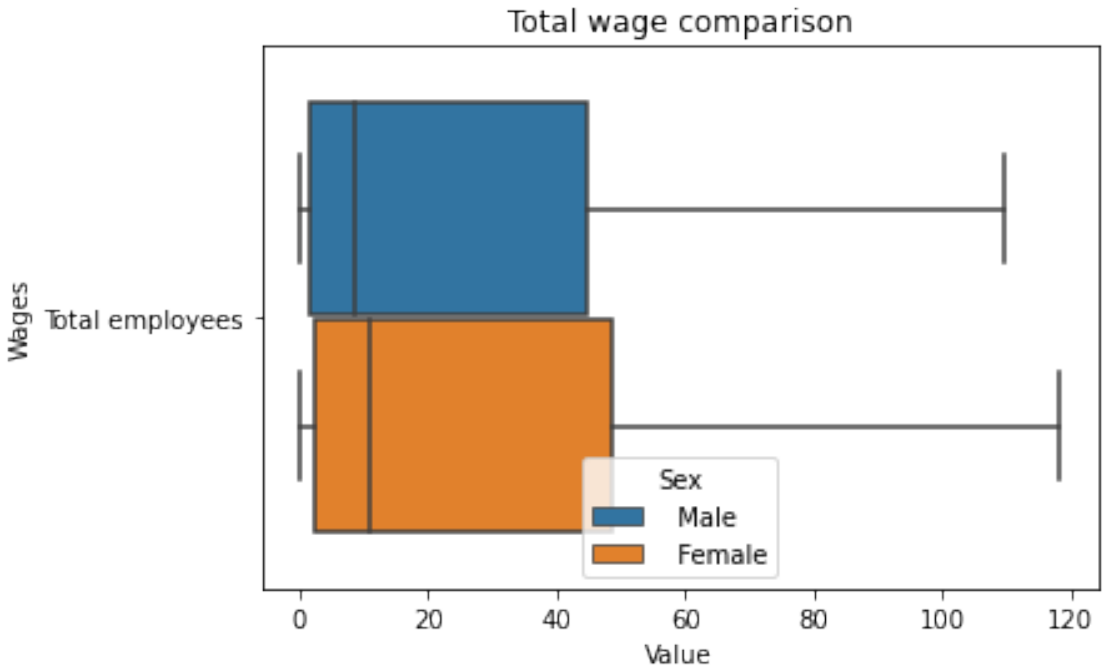


Note: Small differences in hourly wage compound into large differences in weekly wages

[31]:
```
Wages_Total = Wages[(Wages["Wages"] == "Total employees")]
sns.boxplot(x="Value", y="Wages", hue="Sex", data=Wages_Total).set_title("Total␣
 ↪wage comparison")
plt.show()
```

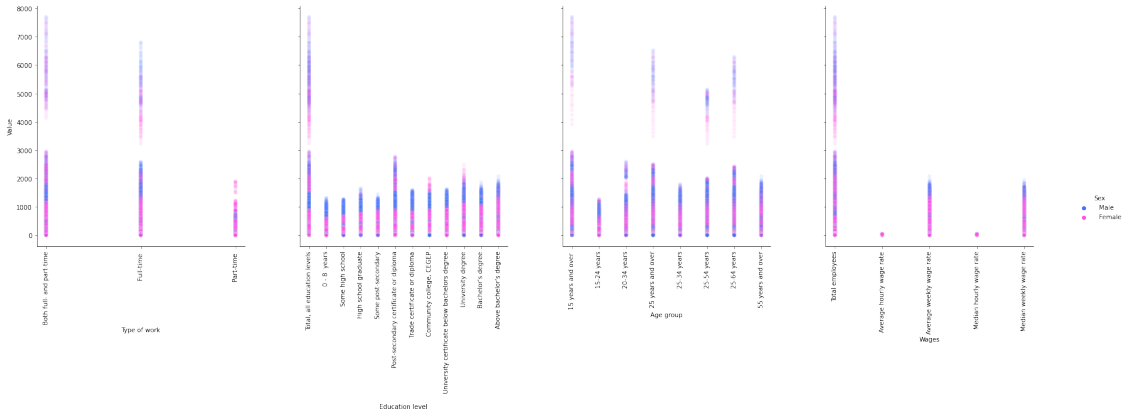


[35]:
```
# Outliers had to be disabled because there were LOTS and it made the boxplot␣
 ↪unreadable.
Wages_Total = Wages[(Wages["Wages"] == "Total employees")]
sns.boxplot(x="Value", y="Wages", hue="Sex", data=Wages_Total,␣
 ↪showfliers=False).set_title("Total wage comparison")
plt.show()
```



[52]:
```
grid = sns.pairplot(
    data=Wages,
    hue="Sex",
    palette=sns.color_palette(["#4271ff", "#ff4fea"]),
    x_vars=["Type of work", "Education level", "Age group", "Wages"],
    y_vars=["Value"],
    diag_kind = None,
    height=6,
    plot_kws={'alpha':0.1},
)

# Rotate x-axis on each plot so they are readable
for ax in grid.axes.flat[:]:
    ax.tick_params(axis='x', labelrotation=90)
```



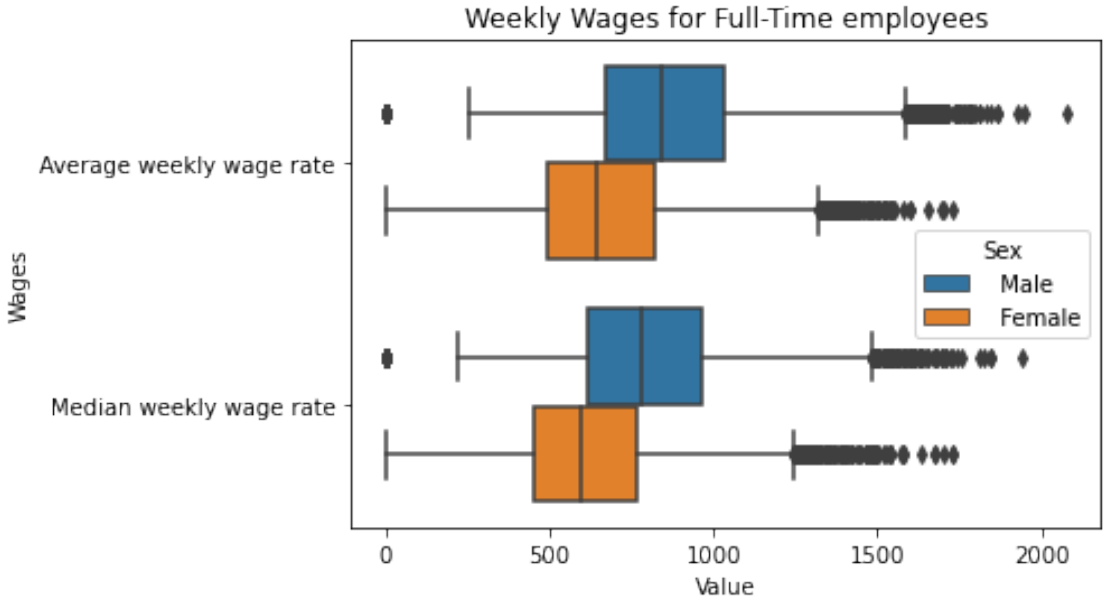
Note: Canada (Total Employees) was included in these plots, and likely is the reason many high-value points are seen

1.1.3 Compare type of employment (Full- vs. Part-time)

[51]:
```
# Type of Work has some interesting patterns -
# Part-time is dominated by females, Full-time has males leading in wage values␣
 ↪over females
Wages_Fulltime_Hourly = Wages_Hourly.loc[Wages_Hourly["Type of work"] == '  ␣
 ↪Full-time ']
Wages_Fulltime_Weekly = Wages_Weekly.loc[Wages_Weekly["Type of work"] == '  ␣
 ↪Full-time ']
```

[52]:
```
sns.boxplot(x="Value", y="Wages", hue="Sex", data=Wages_Fulltime_Hourly).
 ↪set_title("Hourly Wages for Full-Time employees")
plt.show()
```

[53]:
```
sns.boxplot(x="Value", y="Wages", hue="Sex", data=Wages_Fulltime_Weekly).
 ↪set_title("Weekly Wages for Full-Time employees")
plt.show()
```



[ ]: