

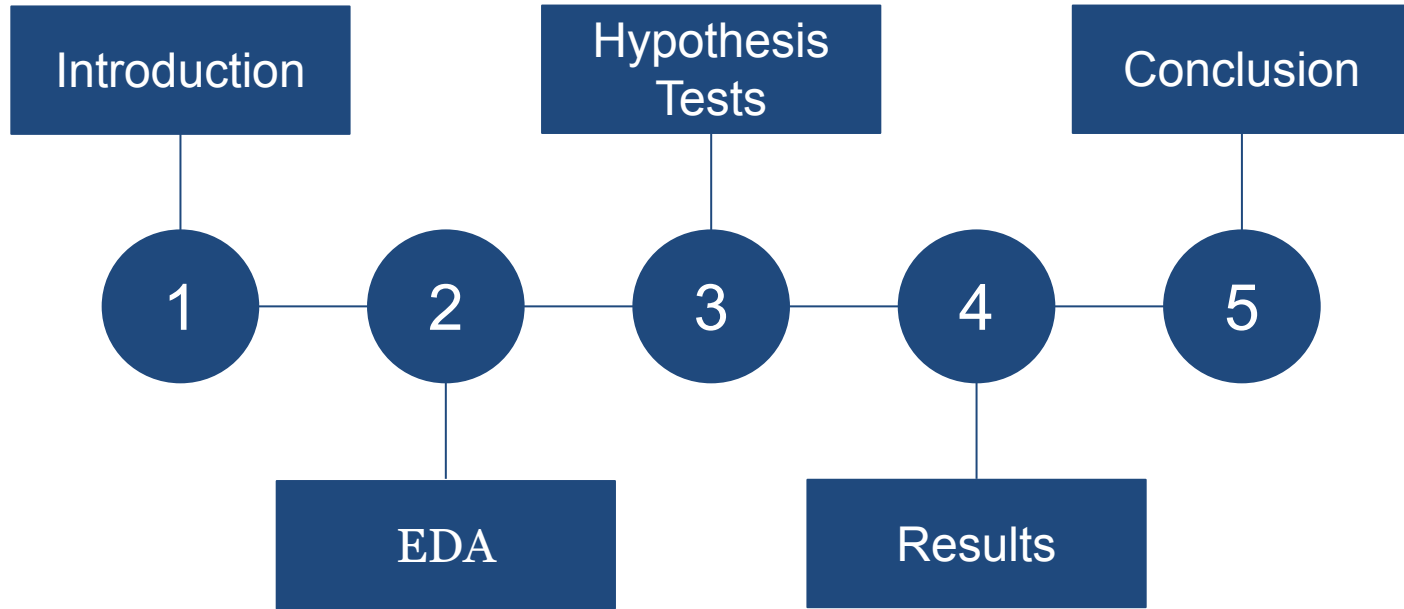


Benefits of Union Membership

Group 5

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Agenda



Introduction: Labor Unions

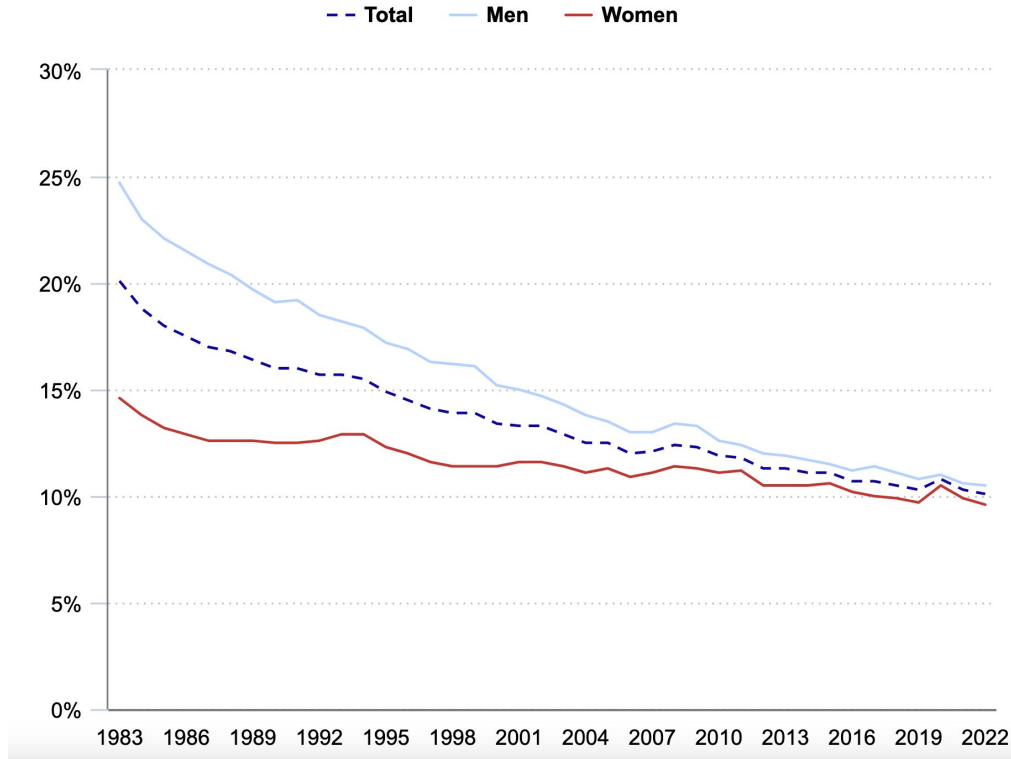
- **Organized group of workers who unite to make decisions about conditions affecting their work**
- **Decisions related to:**
 - **Wages**
 - **Working Conditions**



Labor Unions Over The Years

Source: BLS

Union membership rates by sex, 1983–2022



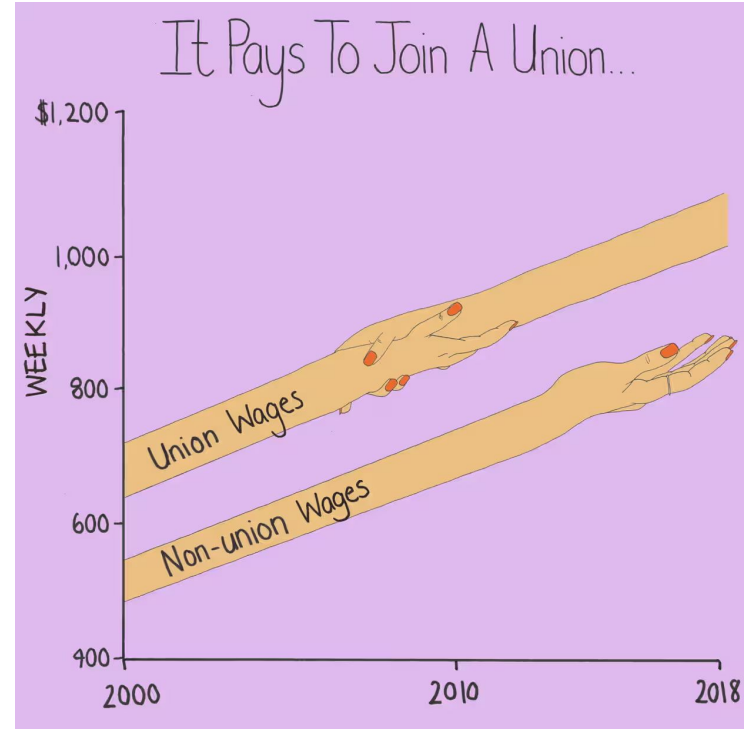
Research Questions

- **What effect, if any, does being a part of a labor union have on workers' wages?**
- **Do the benefits of union membership vary significantly across different racial groups?**
- **Is there a statistically significant difference in median weekly earnings between women and men workers?**

Data Cleaning & EDA

Data Source

- Downloaded from [Data World](#) who collected the data from a [Guardian article](#) that used the [Bureau of Labor Statistics](#)
- BLS allows for greater specification but our dataset focuses on only the bottom half of options
 - Therefore, we were unable to consider age in our analysis
- Graph from [the Guardian](#)



Basic Data Checks

- Data is 532 rows by 9 columns (28 rows for each of 19 years)
- No duplicate or null rows
- Key metric is annual median usual weekly earnings
 - “Usual” here is self-defined as data is collected by [survey](#)



Union

1. All
2. Members of Union refers to members of a labor union or an employee association similar to a union.
3. Represented by Unions refers to both union members and workers who report no union affiliation but whose jobs are covered by a union or an employee association contract.
4. Non-Union refers to workers who are neither members of a union nor represented by a union on their job.

Source: [BLS](#)

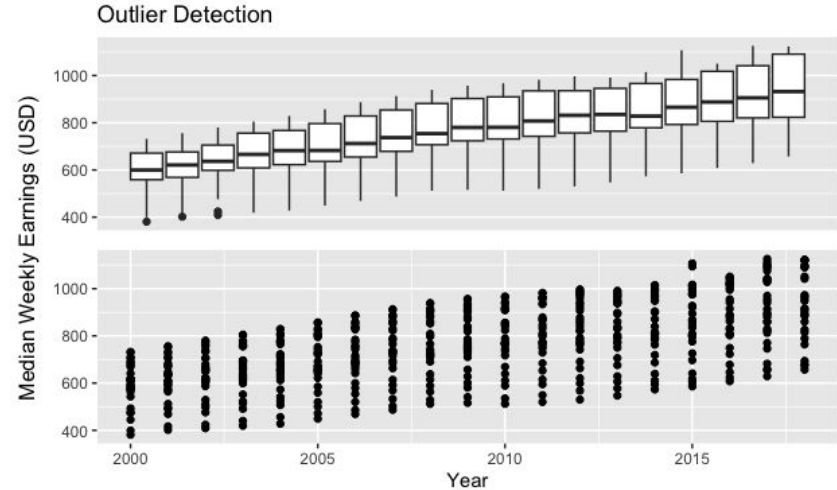
Demographics

- Sex
 - Both Sexes
 - Men
 - Women
- Race
 - All Races
 - Asian
 - Black or African American
 - White
- Ethnic Origin
 - All Origins
 - Hispanic or Latino



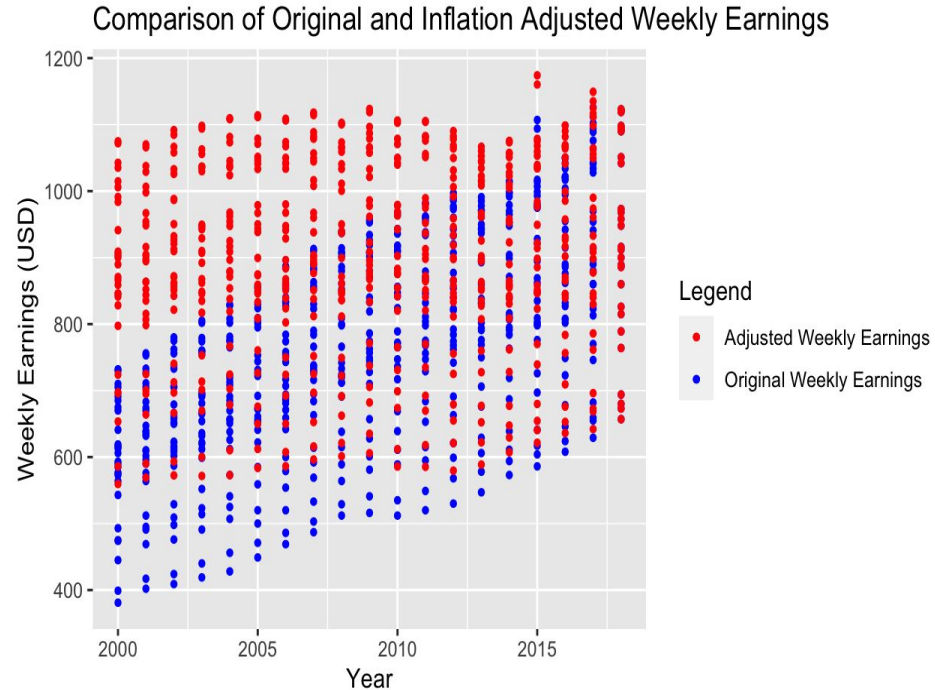
Outliers

- Nothing sticks out as an obvious outlier
- Perhaps some of the lowest data points in the early 2000s
- Clear upward trend across the data, likely due to inflation

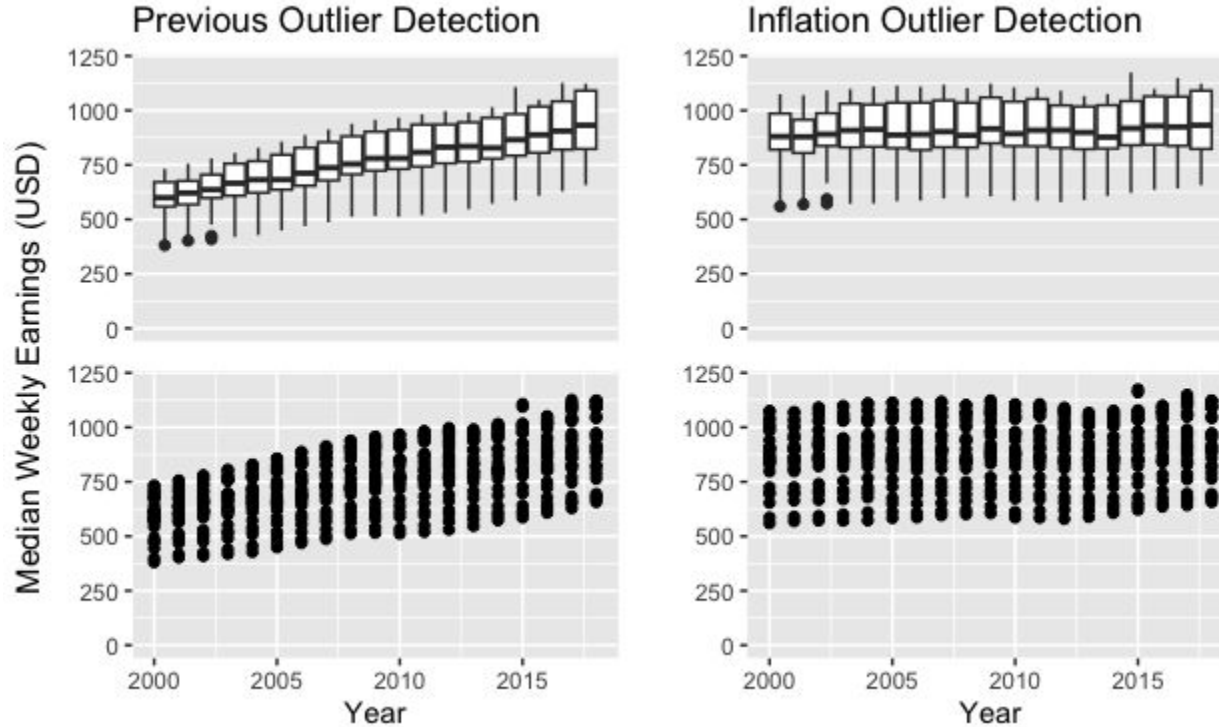


Normalization / Chaining Earnings

- Used R's Quantmod package to collect [FRED CPI Data](#)
- Filtered data for January CPI
- Found inflation factor related to 2018 CPI
- Chained all other years to 2018 to find Adjusted Weekly Earnings in 2018 dollars

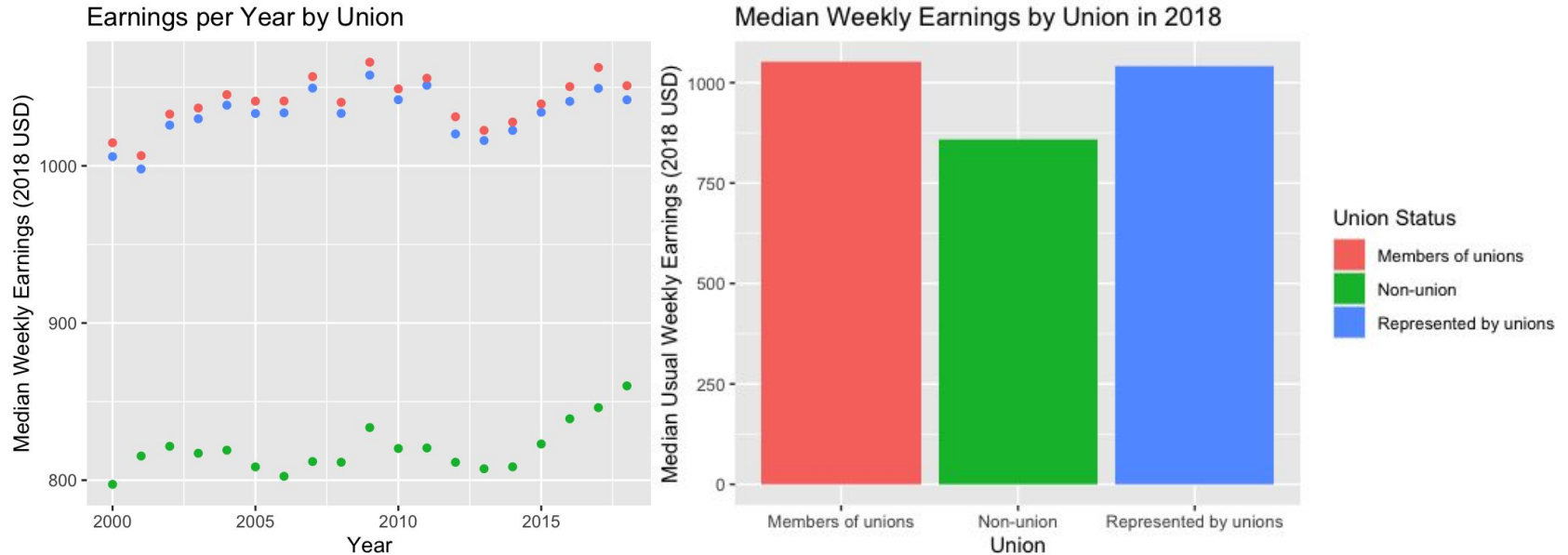


Outlier Detection

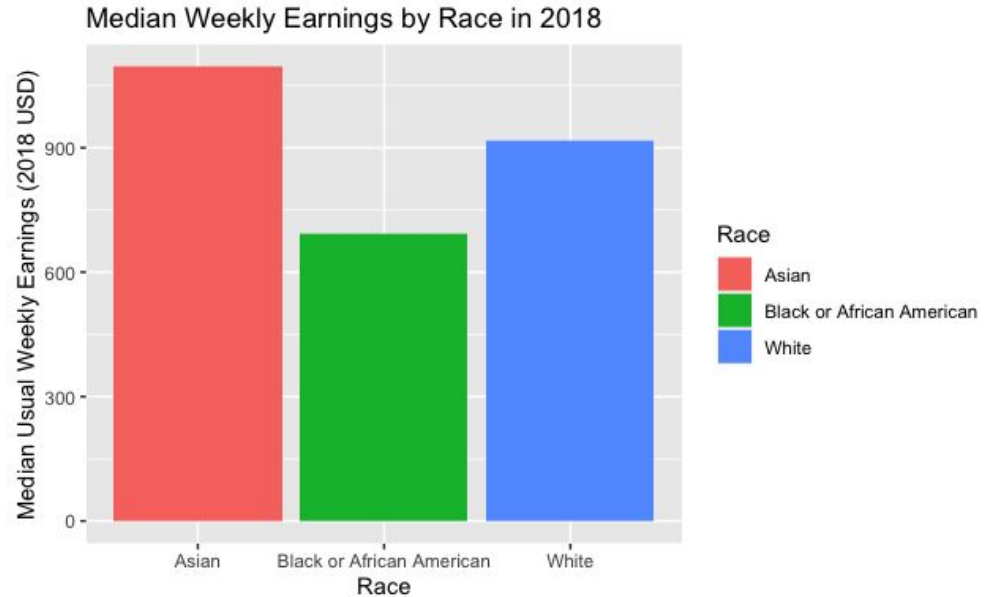
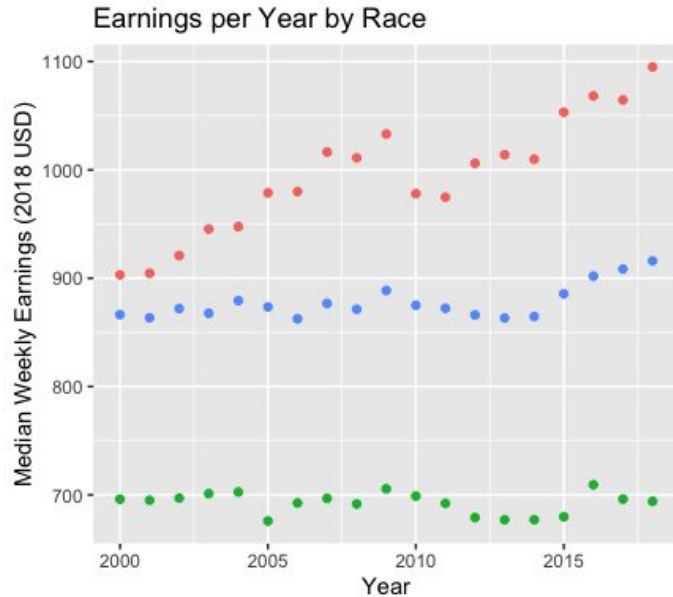


Earnings Breakdowns

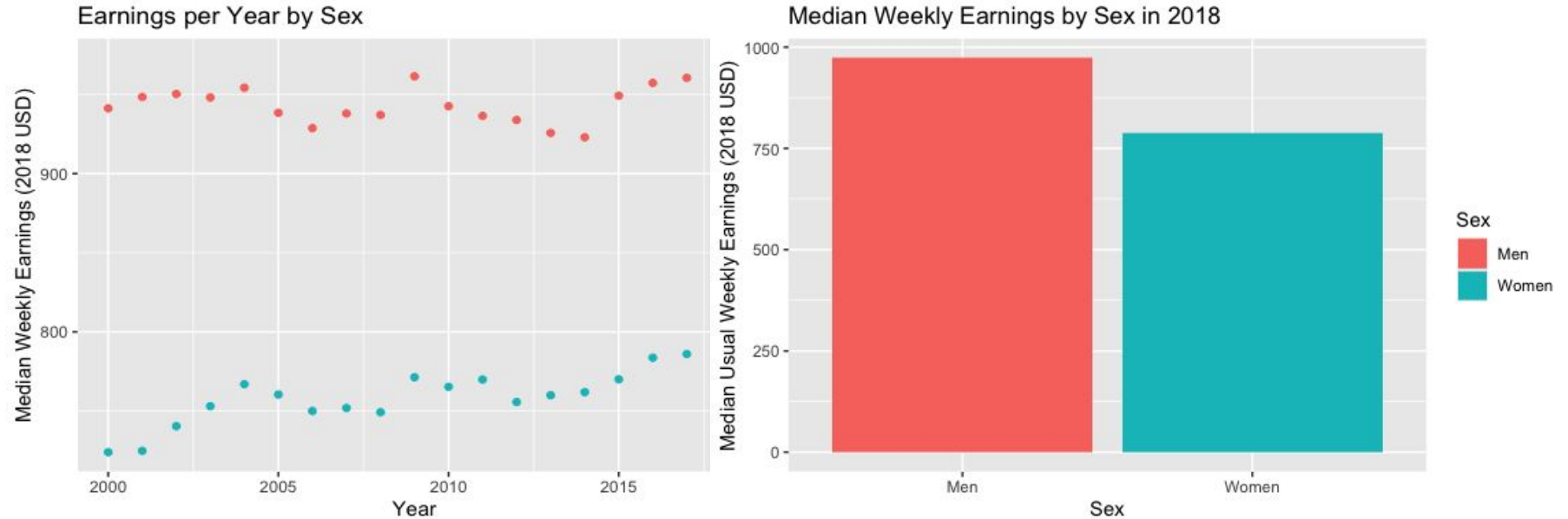
Earnings by Union Status



Earnings by Race

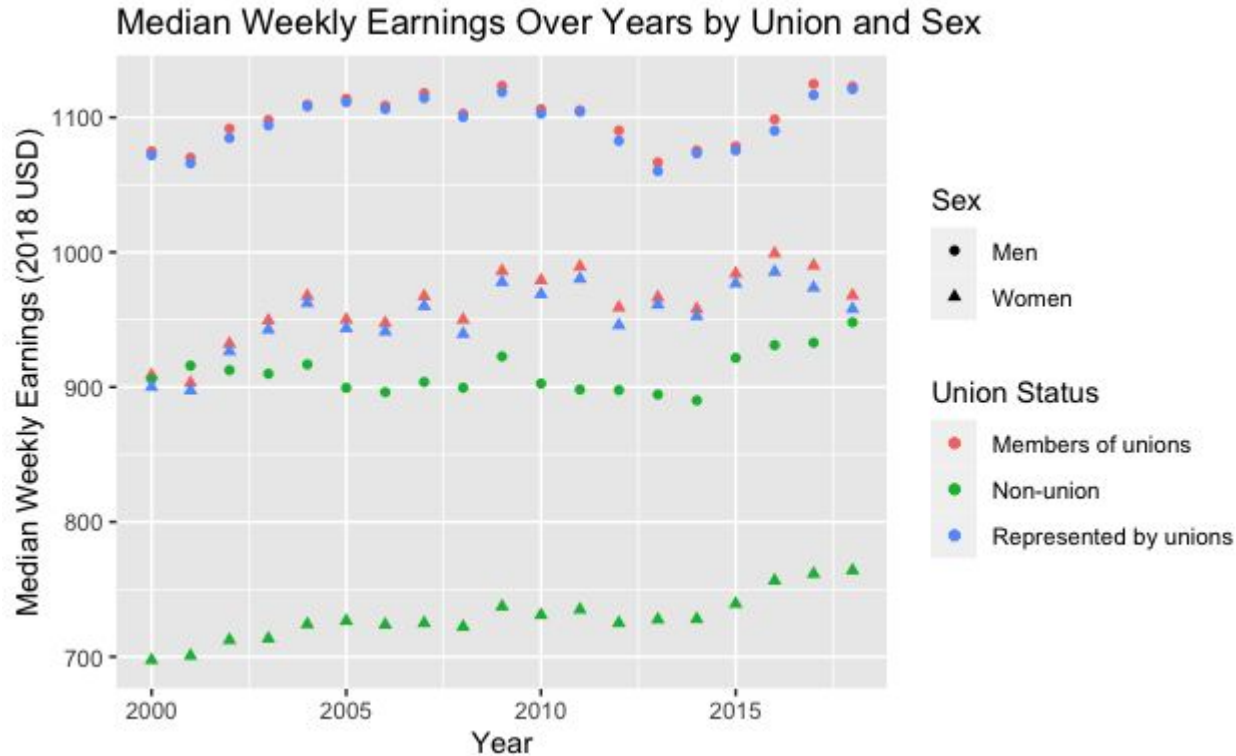


Earnings by Sex

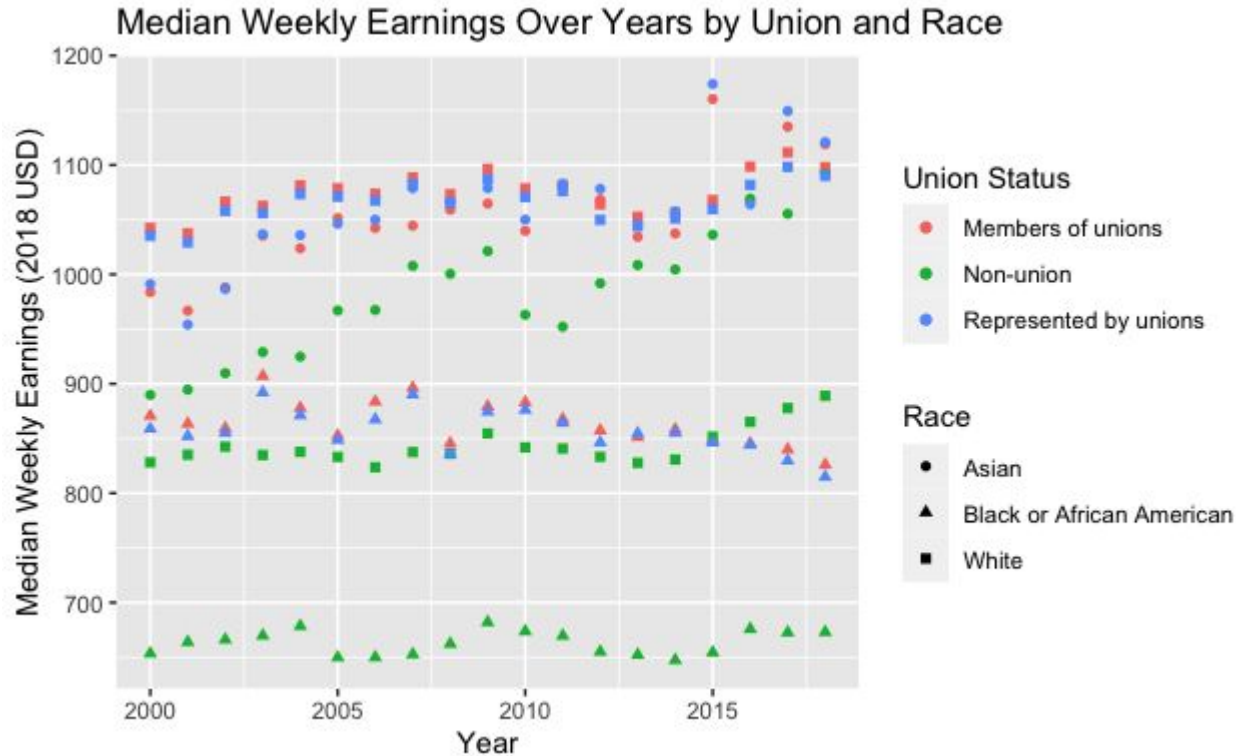


Combined Plots

Earnings by Union and Sex



Earnings by Union and Race



Hypothesis Tests

2 Sample T-test (1/2)

- Median weekly earnings: union vs. non-union
 - Null Hypothesis: The median weekly earnings for union vs non union members are the same
 - Alternate Hypothesis: There is a significant difference between the median weekly earnings for unions vs non union members

```
t_test_result <- t.test(Adjusted.Weekly.Earnings ~ union_combined, data = df)
print(t_test_result)
```



Welch Two Sample t-test

```
data: Adjusted.Weekly.Earnings by union_combined
t = -10.965, df = 231.05, p-value < 2.2e-16
alternative hypothesis: true difference in means between group non-union and group union is
not equal to 0
95 percent confidence interval:
 -169.9045 -118.1451
sample estimates:
mean in group non-union    mean in group union
          792.1493              936.1741
```

2 Sample T-test (2/2)

To check if median weekly earnings between men and women is significantly different.

Null Hypothesis: There is no difference between the salaries of men vs women

Alternate Hypothesis: There is a significant difference between the salaries of men vs women

The p-value less than 0.05 indicates that the difference in means between the two groups (men and women) is statistically significant.

Welch Two Sample t-test

data: Median_usual_weekly_earnings by Sex

t = 6.4093, df = 149.5, p-value = 1.803e-09

alternative hypothesis: true difference in means between group Men and group Women is not equal to 0

95 percent confidence interval:

93.91733 177.63530

sample estimates:

mean in group Men mean in group Women

858.0132

722.2368

ANOVA test

To check if there is a significant pay disparity between the races in the data: Asian, White, and “Black or African American”.

Null Hypothesis (H_0): There is no significant difference in the mean weekly earnings among the three racial groups.

Alternative Hypothesis (H_1): There is no significant difference in the mean weekly earnings among the three racial groups.

Anova Test Results

The very low p-value in the ANOVA test indicates that there is a statistically significant difference in the mean earnings among these three racial groups

```
      Df Sum Sq Mean Sq F value Pr(>F)
Race      2  883492    441746   392.4 <2e-16 ***
Residuals 54   60795     1126
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Conclusion

- Being in a union has a significant impact on median weekly earnings, with union workers earning more than non-union workers
- There are discrepancies in weekly earnings among the racial groups.
- There is a significant difference between weekly earnings of men and women, and men on average are paid more than women per week.

Questions?

Sources

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Thank you!