iii_case2

2024-10-31

```
library(ggplot2)
library(tidyr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
load("/Users/tusharyadav/Desktop/iii/case2/HW2.Rdata")
```

CAMW

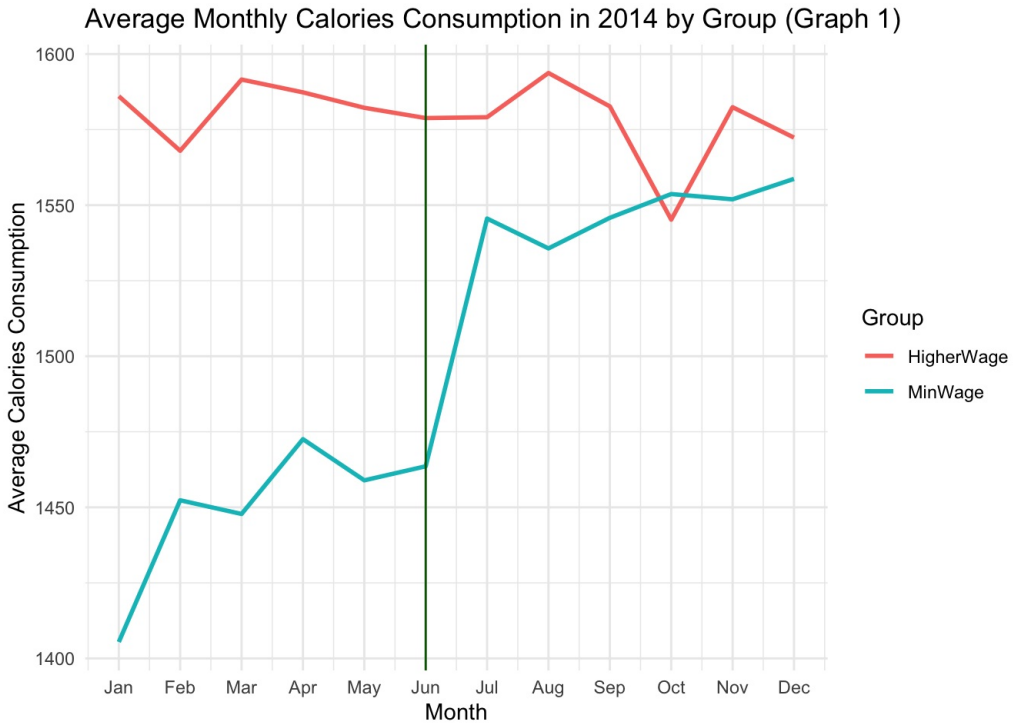
Average Plot Summaries - CAMW

```
monthly_averages <- CAMW %>%
group_by(Month, Group) %>%
summarise(Average_Calories = mean(Calories, na.rm = TRUE),
Average_BasketScore = mean(BasketScore, na.rm = TRUE))
```

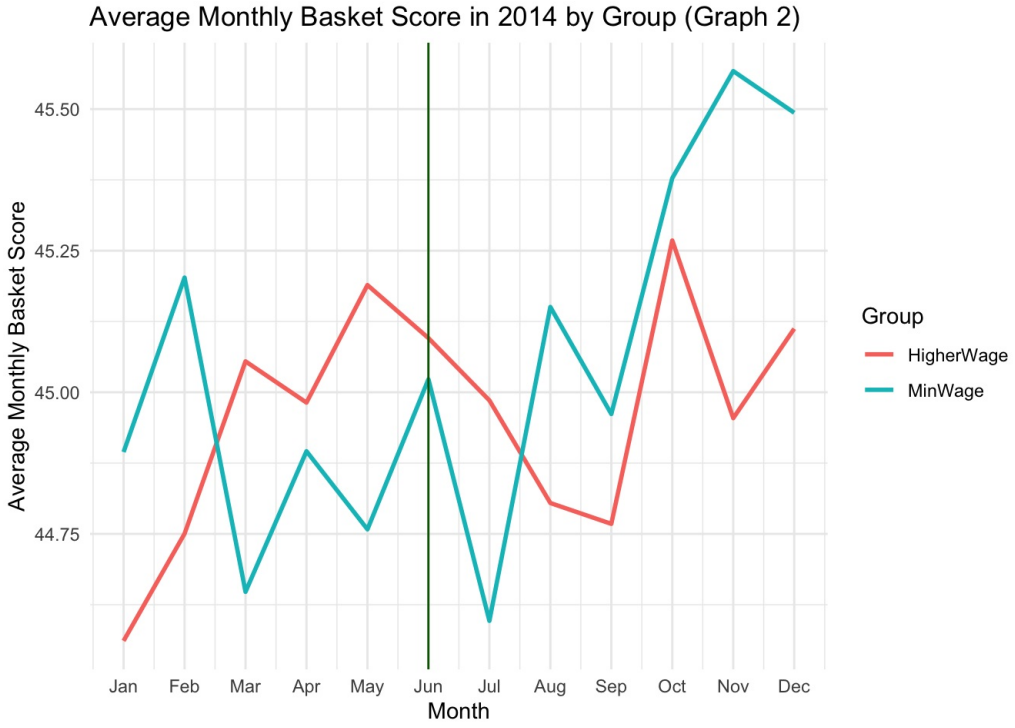
```
## `summarise()` has grouped output by 'Month'. You can override using the
## `.groups` argument.
```

```
## Average Calories vs Income Group
ggplot(monthly_averages, aes(x = Month, y = Average_Calories, color = Group)) +
  geom_line(size = 1) +
  geom_vline(xintercept = 6, color = "darkgreen") +
  labs(title = "Average Monthly Calories Consumption in 2014 by Group (Graph 1)", x = "Month", y = "Average Calor
ies Consumption", color = "Group") +
  scale_x_continuous(breaks = 1:12, labels = month.abb) +
theme_minimal()
```

```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## ℹ Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```




```
## Average Monthly Basket Scores vs Income Group
ggplot(monthly_averages, aes(x = Month, y = Average_BasketScore, color = Group)) +
  geom_line(size = 1) +
  geom_vline(xintercept = 6, color = "darkgreen") +
  labs(title = "Average Monthly Basket Score in 2014 by Group (Graph 2)", x = "Month", y = "Average Monthly Baske
t Score", color = "Group") +
  scale_x_continuous(breaks = 1:12, labels = month.abb) +
theme_minimal()
```

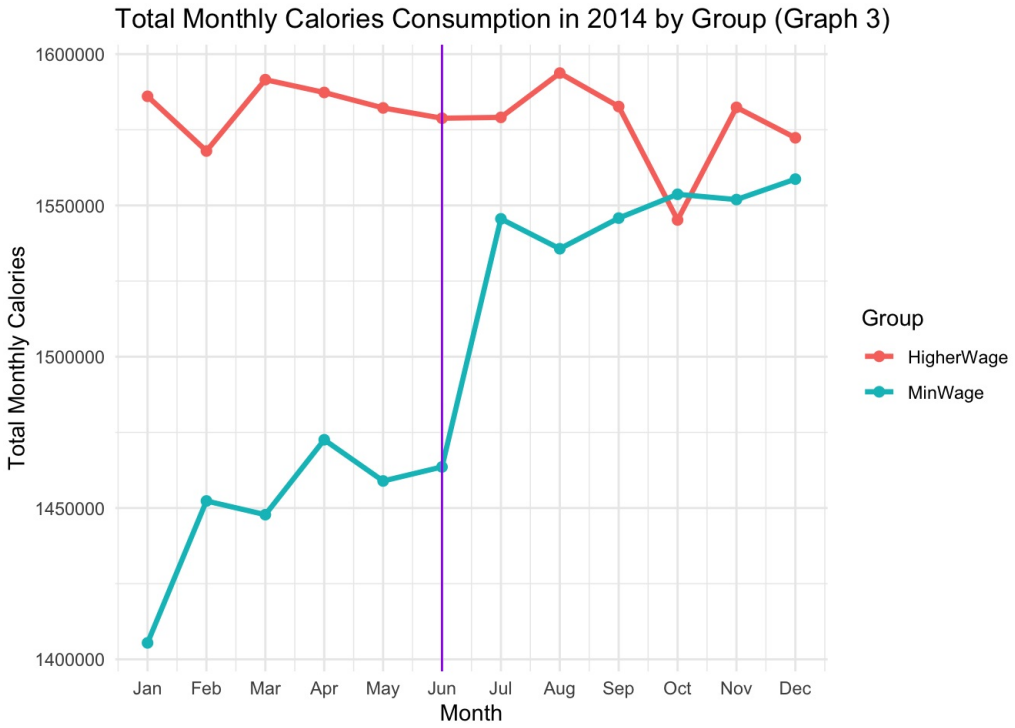


Total Plot Summaries - CAMW

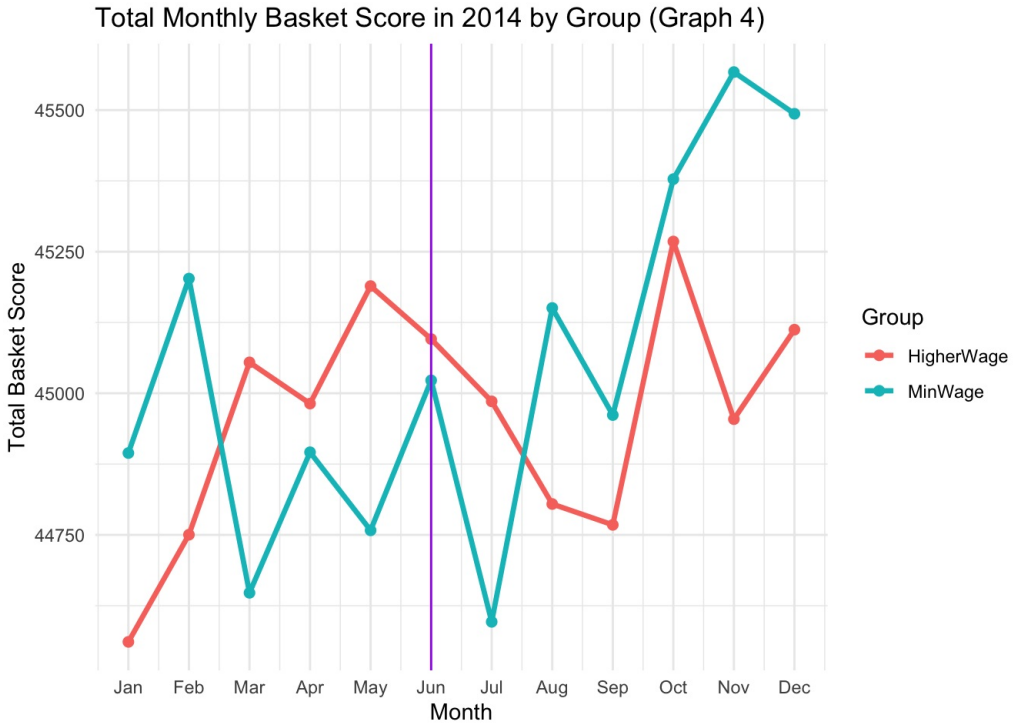
```
monthly_totals <- CAMW %>%
group_by(Month, Group) %>%
summarise(Total_Calories = sum(Calories, na.rm = TRUE),
Total_BasketScore = sum(BasketScore, na.rm = TRUE))
```

```
## `summarise()` has grouped output by 'Month'. You can override using the
## `.groups` argument.
```

```
## Total Calories vs Income Group
ggplot(monthly_totals, aes(x = Month, y = Total_Calories, color = Group, group = Group)) +
  geom_line(size = 1.2) +
  geom_point(size = 2) +
  geom_vline(xintercept = 6, color = "purple") +
  labs(title = "Total Monthly Calories Consumption in 2014 by Group (Graph 3)",x = "Month", y = "Total Monthly Ca
lories", color = "Group") +
  scale_x_continuous(breaks = 1:12, labels = month.abb) +
  theme_minimal()
```

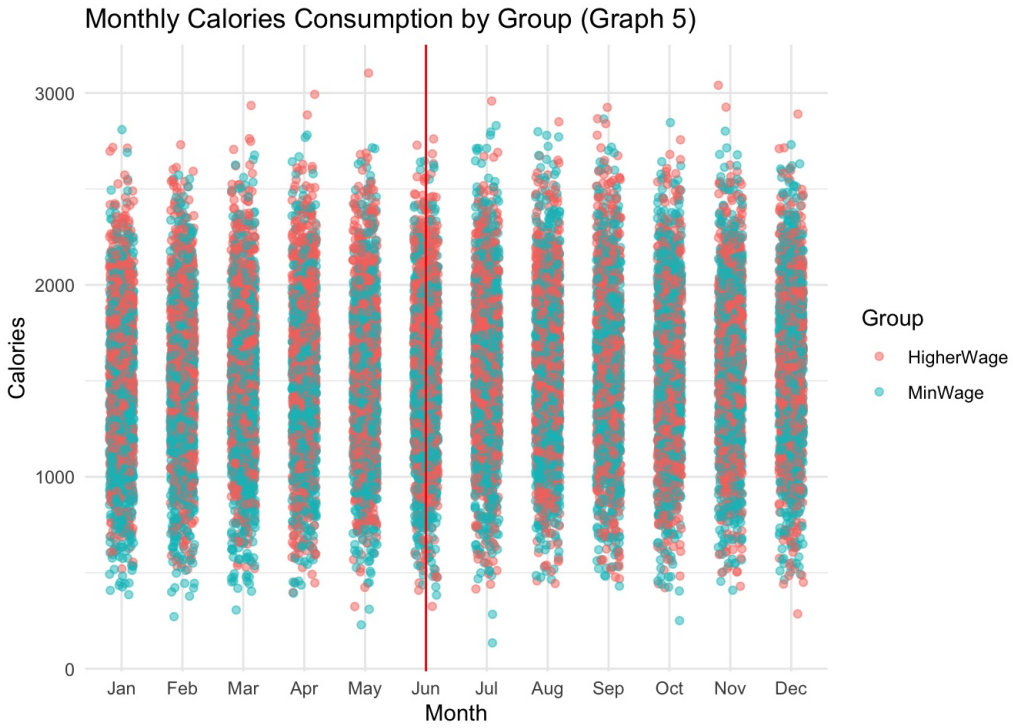



```
## Total Monthly Basket Score vs Income Group
ggplot(monthly_totals, aes(x = Month, y = Total_BasketScore, color = Group, group = Group)) +
  geom_line(size = 1.2) +
  geom_point(size = 2) +
  geom_vline(xintercept = 6, color = "purple") +
  labs(title = "Total Monthly Basket Score in 2014 by Group (Graph 4)",x = "Month", y = "Total Basket Score", col
or = "Group") +
  scale_x_continuous(breaks = 1:12, labels = month.abb) +
  theme_minimal()
```

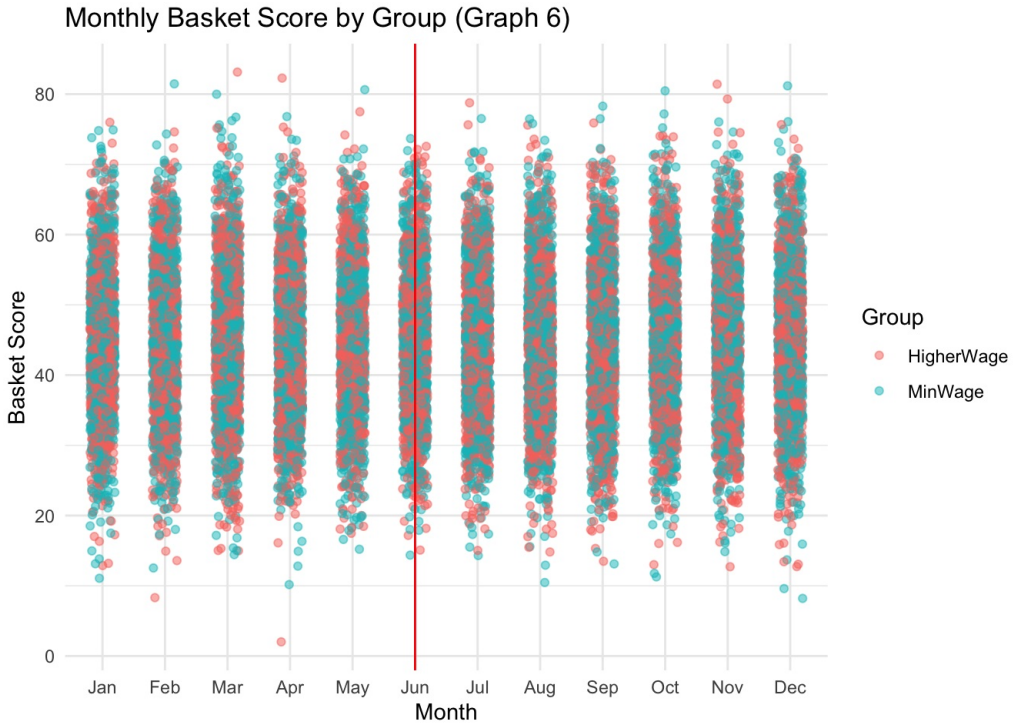


Jitter Box Plot Monthly Summaries - CAMW

```
## Calories Distribution by Group
ggplot(CAMW, aes(x = factor(Month, labels = month.abb), y = Calories, color = Group)) +
  geom_jitter(width = 0.2, alpha = 0.5) +
  geom_vline(xintercept = 6, color = "red") +
  labs(title = "Monthly Calories Consumption by Group (Graph 5)",x = "Month",y = "Calories",color = "Group") +
  theme_minimal()
```

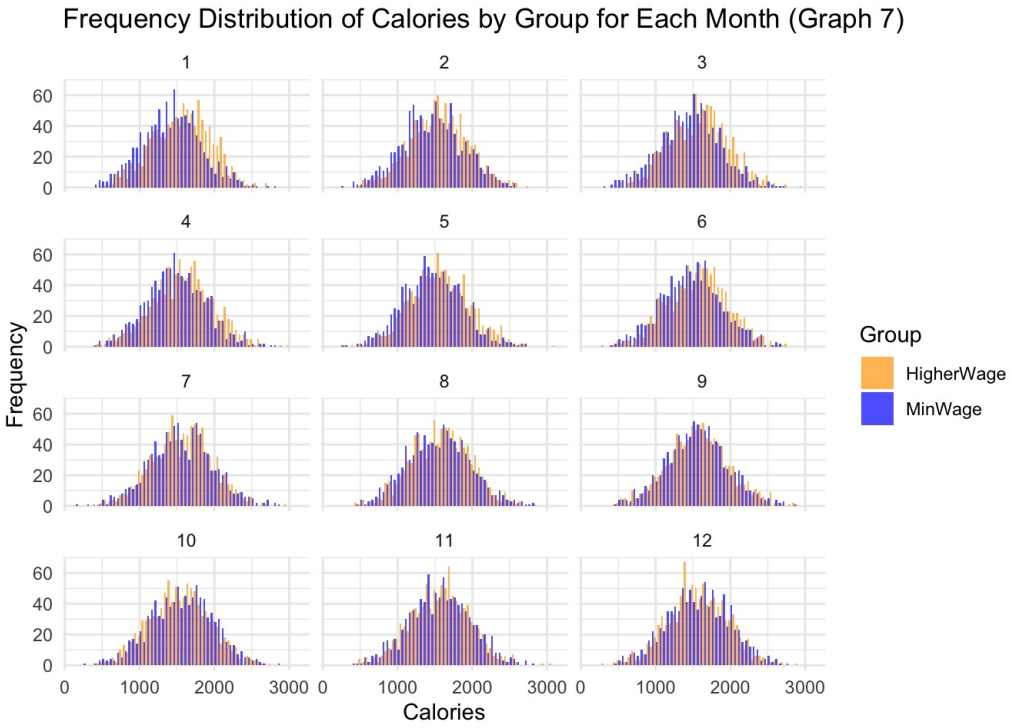



```
## Basket Score Distribution By Group
ggplot(CAMW, aes(x = factor(Month, labels = month.abb), y = BasketScore, color = Group)) +
  geom_jitter(width = 0.2, alpha = 0.5) +
  geom_vline(xintercept = 6, color = "red") +
  labs(title = "Monthly Basket Score by Group (Graph 6)",x = "Month",y = "Basket Score",color = "Group") +
  theme_minimal()
```

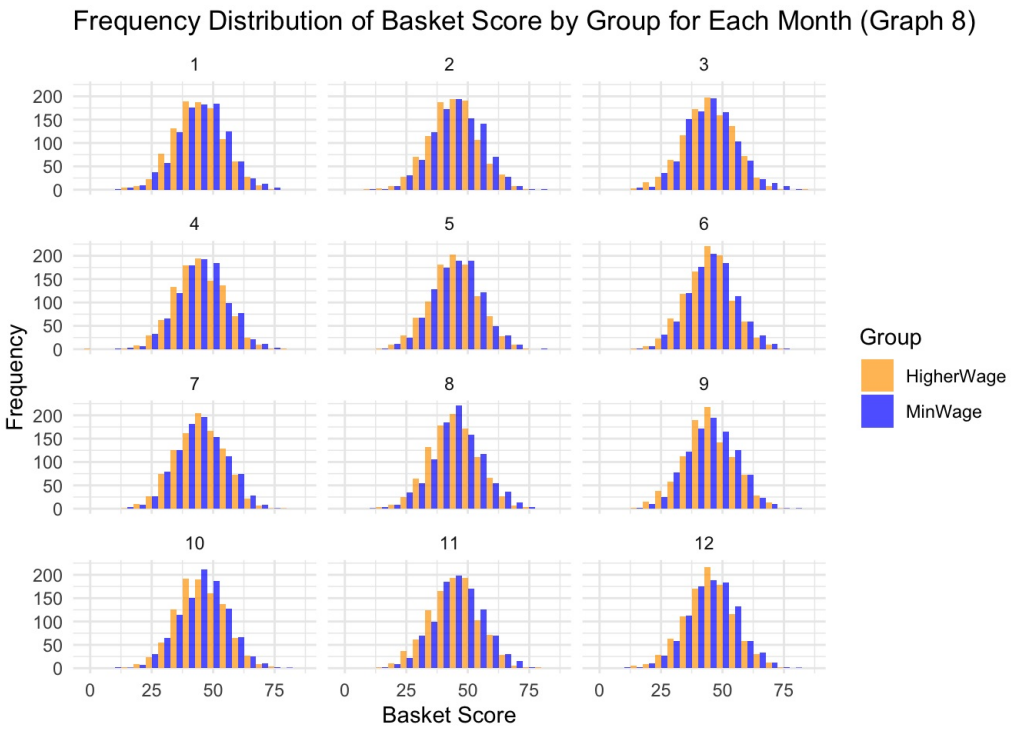


Monthly Frequency Distribution - CAMW

```
## Calories by Group
ggplot(CAMW, aes(x = Calories, fill = Group)) +
  geom_histogram(binwidth = 50, position = "dodge", alpha = 0.7) +
  labs(title = "Frequency Distribution of Calories by Group for Each Month (Graph 7)", x = "Calories", y = "Frequ
ency") +
  theme_minimal() +
  facet_wrap(~ Month, ncol = 3) +
  scale_fill_manual(values = c("orange", "blue"))
```




```
## Basket Score by Group
ggplot(CAMW, aes(x = BasketScore, fill = Group)) +
  geom_histogram(binwidth = 5, position = "dodge", alpha = 0.7) +
  labs(title = "Frequency Distribution of Basket Score by Group for Each Month (Graph 8)", x = "Basket Score", y
= "Frequency") +
  theme_minimal() +
  facet_wrap(~ Month, ncol = 3) +
  scale_fill_manual(values = c("orange", "blue"))
```



Parallel Trend test - Calories - CAMW

```
pre_treatment_data <- CAMW %>%
  filter(Month %in% c(1, 2, 3, 4, 5, 6))
calories_ptt <- lm(Calories ~ Month * Group, data = pre_treatment_data)
print(summary(calories_ptt))
```

```
##
## Call:
## lm(formula = Calories ~ Month * Group, data = pre_treatment_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1258.42  -274.06     3.64   268.71  1521.58
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)        1582.09987   11.82312 133.814   <2e-16 ***
## Month                 0.06451    3.03590   0.021   0.9830
## GroupMinWage       -165.52160   16.72041  -9.899   <2e-16 ***
## Month:GroupMinWage    9.51503    4.29341   2.216   0.0267 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 401.6 on 11996 degrees of freedom
## Multiple R-squared:  0.02718,    Adjusted R-squared:  0.02693
## F-statistic: 111.7 on 3 and 11996 DF,  p-value: < 2.2e-16
```

Parallel Trend test - Basket Score - CAMW

```
pre_treatment_data <- CAMW %>%
  filter(Month %in% c(1, 2, 3, 4, 5, 6))
basket_ptt <- lm(BasketScore ~ Month * Group, data = pre_treatment_data)
print(summary(basket_ptt))
```

```
##
## Call:
## lm(formula = BasketScore ~ Month * Group, data = pre_treatment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -42.995  -6.707  -0.071   6.681  38.217
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        44.54708    0.29389 151.578   <2e-16 ***
## Month               0.11192    0.07546   1.483    0.138
## GroupMinWage        0.40087    0.41562   0.965    0.335
## Month:GroupMinWage -0.12460    0.10672  -1.168    0.243
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.983 on 11996 degrees of freedom
## Multiple R-squared:  0.0001888,  Adjusted R-squared:  -6.124e-05
## F-statistic: 0.7551 on 3 and 11996 DF,  p-value: 0.5192
```

DiD - Calories Analysis - CAMW

```
CAMW <- CAMW %>%
  mutate(Post = ifelse(Month >= 7, 1, 0))
calories_did <- lm(Calories ~ Group * Post, data = CAMW)
print(summary(calories_did))
```

```
##
## Call:
## lm(formula = Calories ~ Group * Post, data = CAMW)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1413.56  -277.56     3.44   273.67  1521.67
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)       1582.326      5.233 302.374   <2e-16 ***
## GroupMinWage      -132.219      7.401 -17.866   <2e-16 ***
## Post                -6.416      7.401  -0.867    0.386
## GroupMinWage:Post  104.867     10.466  10.020   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 405.3 on 23996 degrees of freedom
## Multiple R-squared:  0.01681,    Adjusted R-squared:  0.01668
## F-statistic: 136.7 on 3 and 23996 DF,  p-value: < 2.2e-16
```

DiD - Basket Score Analysis - CAMW

```
CAMW <- CAMW %>%
  mutate(Post = ifelse(Month >= 7, 1, 0))
basket_did <- lm(BasketScore ~ Group * Post, data = CAMW)
print(summary(basket_did))
```

```
##
## Call:
## lm(formula = BasketScore ~ Group * Post, data = CAMW)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -42.939  -6.704  -0.091   6.709  38.161
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)       44.93880    0.12921 347.801   <2e-16 ***
## GroupMinWage      -0.03523    0.18273  -0.193    0.847
## Post               0.04328    0.18273   0.237    0.813
## GroupMinWage:Post  0.24438    0.25842   0.946    0.344
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 10.01 on 23996 degrees of freedom
## Multiple R-squared:  0.0001245,  Adjusted R-squared:  -5.236e-07
## F-statistic: 0.9958 on 3 and 23996 DF,  p-value: 0.3936
```

Calories Control & Treatment Summary Table - CAMW

```
calories_coef <- coef(calories_did)
calories_intercept <- calories_coef["(Intercept)"]
calories_group_min_wage <- calories_coef["GroupMinWage"]
calories_post <- calories_coef["Post"]
calories_interaction <- calories_coef["GroupMinWage:Post"]
calories_table <- matrix(c(
  calories_intercept, calories_intercept + calories_post, calories_intercept + calories_group_min_wage, calories_
intercept + calories_group_min_wage + calories_interaction), nrow = 2, byrow = TRUE, dimnames = list(Group = c("H
igh Wage", "Low Wage"), Period = c("Before Treatment", "After Treatment")
))
print("Calories Control & Treatment Summary (Table 1)")
```

```
## [1] "Calories Control & Treatment Summary (Table 1)"
```

```
print(calories_table)
```

```
##            Period
## Group       Before Treatment After Treatment
##   High Wage         1582.326        1575.909
##   Low Wage          1450.107        1554.973
```

Basket Score Control & Treatment Summary Table - CAMW

```
basket_coef <- coef(basket_did)
basket_intercept <- basket_coef["(Intercept)"]
basket_group_min_wage <- basket_coef["GroupMinWage"]
basket_post <- basket_coef["Post"]
basket_interaction <- basket_coef["GroupMinWage:Post"]
basket_table <- matrix(c(
basket_intercept,
basket_intercept + basket_post,
basket_intercept + basket_group_min_wage,
basket_intercept + basket_group_min_wage + basket_interaction),nrow = 2, byrow = TRUE, dimnames = list(Group = c(
"High Wage", "Low Wage"),Period = c("Before Treatment", "After Treatment")
))
print("Basket Score Control & Treatment Summary (Table 2)")
```

```
## [1] "Basket Score Control & Treatment Summary (Table 2)"
```

```
print(basket_table)
```

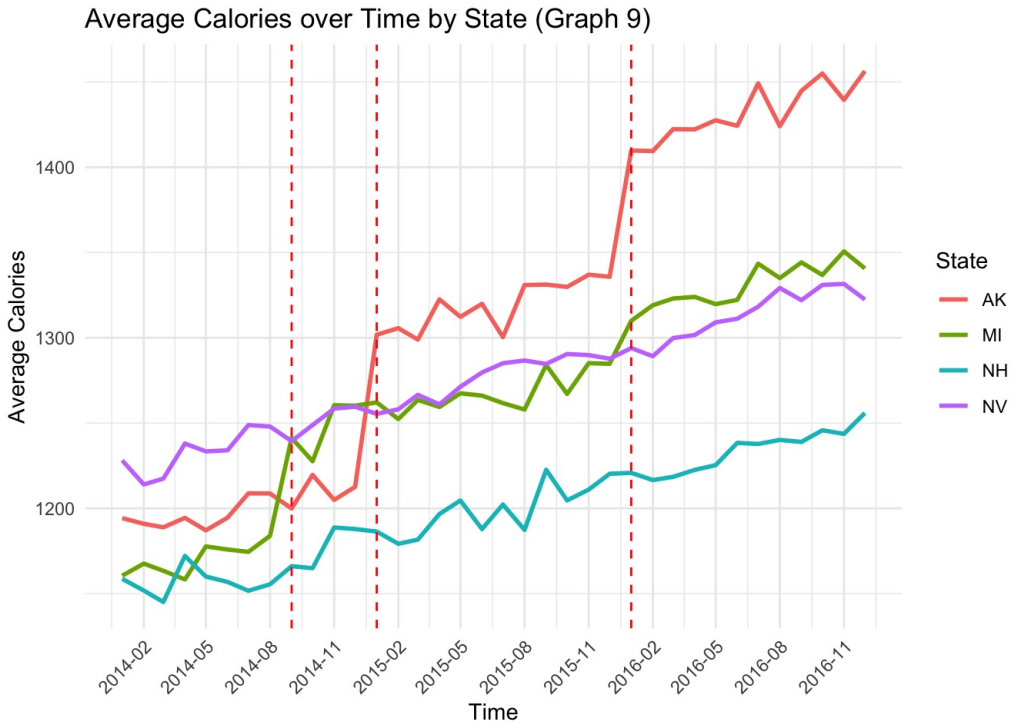
```
##            Period
## Group       Before Treatment After Treatment
##   High Wage         44.93880        44.98208
##   Low Wage          44.90357        45.14795
```

USMW

```
change_dates <- as.Date(c("2014-09-01", "2015-01-01", "2016-01-01"))
average_data <- USMW %>%
group_by(State, Month, Year) %>%
summarize(
Avg_Calories = mean(Calories, na.rm = TRUE),
Avg_BasketScore = mean(BasketScore, na.rm = TRUE),
.groups = "drop" # This will prevent the grouping message
) %>%
mutate(Time = as.Date(paste(Year, Month, "1", sep = "-"), format = "%Y-%m-%d"))
```

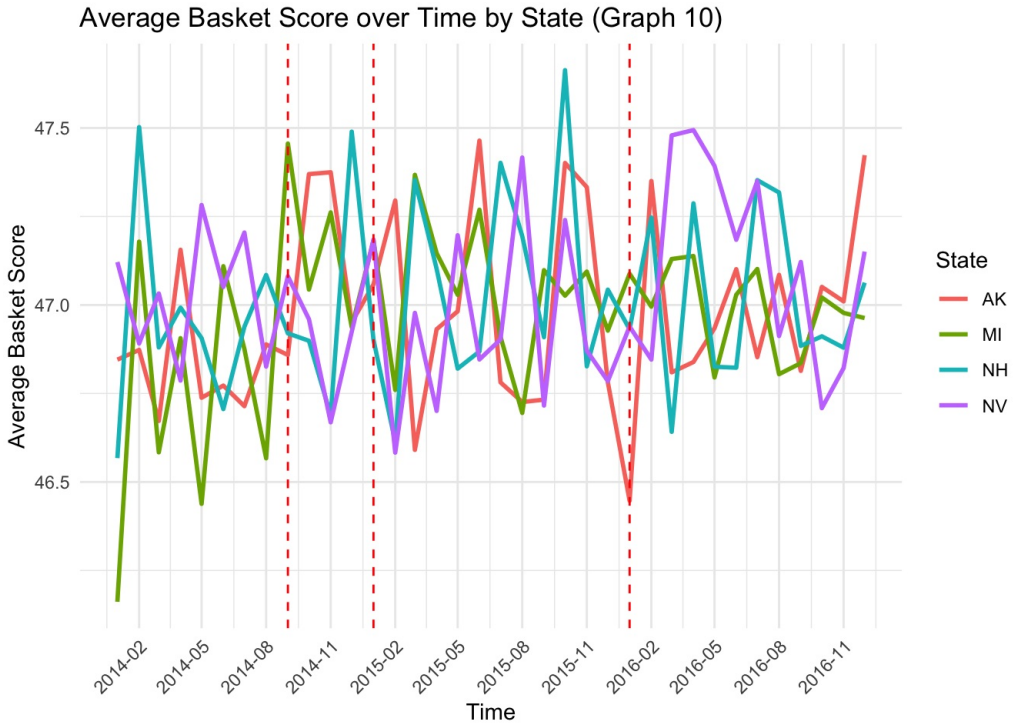
Average Calories over Time by State - USMW

```
calories_plot <- ggplot(average_data, aes(x = Time, y = Avg_Calories, color = State)) + geom_line(size = 1) + lab
s(title = "Average Calories over Time by State (Graph 9)", x = "Time", y = "Average Calories") + theme_minimal()
+ scale_x_date(date_labels = "%Y-%m", date_breaks = "3 months") + theme(axis.text.x = element_text(angle = 45, hj
ust = 1)) + geom_vline(xintercept = as.numeric(change_dates), linetype = "dashed", color = "red") + annotate("tex
t", x = as.Date("2014-09-01"), y = Inf, label = "MI: Sept 1, 2014", vjust =-1, color = "darkgreen") + annotate("t
ext", x = as.Date("2015-01-01"), y = Inf, label = "AK: Jan 1, 2015", vjust = -1, color = "blue") + annotate("text
", x = as.Date("2016-01-01"), y = Inf, label = "Both: Jan 1, 2016", vjust =-1, color = "orange")

print(calories_plot)
```



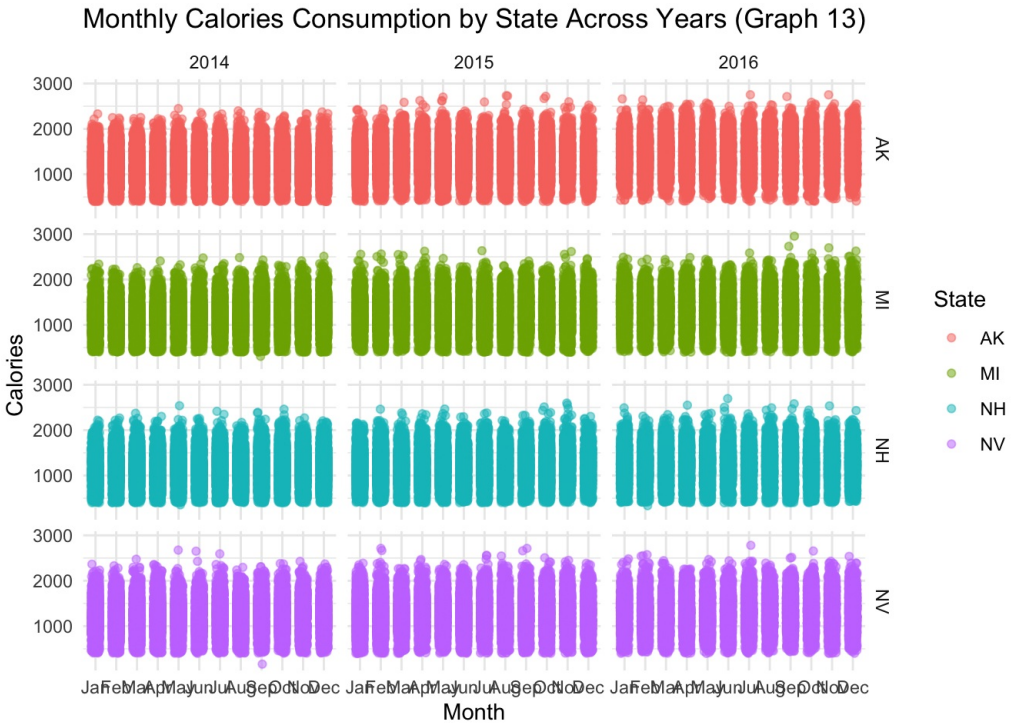
Average Basket Score over Time by State - USMW

```
basket_plot <- ggplot(average_data, aes(x = Time, y = Avg_BasketScore, color = State)) + geom_line(size = 1) +
labs(title = "Average Basket Score over Time by State (Graph 10)", x =  "Time", y = "Average Basket Score") + the
me_minimal() + scale_x_date(date_labels = "%Y-%m", date_breaks = "3 months") + theme(axis.text.x = element_text(a
ngle = 45, hjust = 1)) + geom_vline(xintercept = as.numeric(change_dates), linetype = "dashed", color = "red") +
annotate("text", x = as.Date("2014-09-01"), y = Inf, label = "MI: Sept 1, 2014", vjust =-1, color = "darkgreen")
+ annotate("text", x = as.Date("2015-01-01"), y = Inf, label = "AK: Jan 1, 2015", vjust =-1, color = "blue") + an
notate("text", x = as.Date("2016-01-01"), y = Inf, label = "Both: Jan 1, 2016", vjust =-1, color = "orange")

print(basket_plot)
```

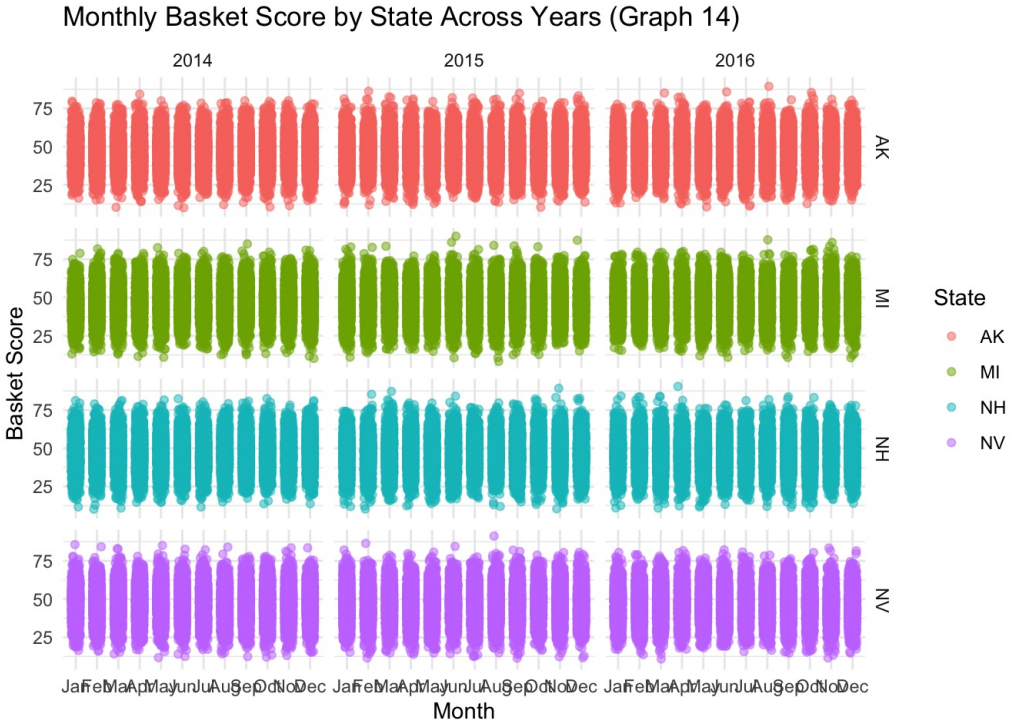


Jitter Box Plot Yearly Summaries - USMW

```
USMW <- USMW %>%
mutate(Time = as.Date(paste(Year, Month, "1", sep = "-"), format = "%Y-%m-%d"))

ggplot(USMW, aes(x = factor(Month, labels = month.abb), y = Calories, color = State)) + geom_jitter(width = 0.2,
alpha = 0.5) + labs(title = "Monthly Calories Consumption by State Across Years (Graph 13)", x = "Month", y = "Ca
lories", color = "State") + theme_minimal() + facet_grid(State~ Year) + scale_x_discrete(labels = month.abb)
```

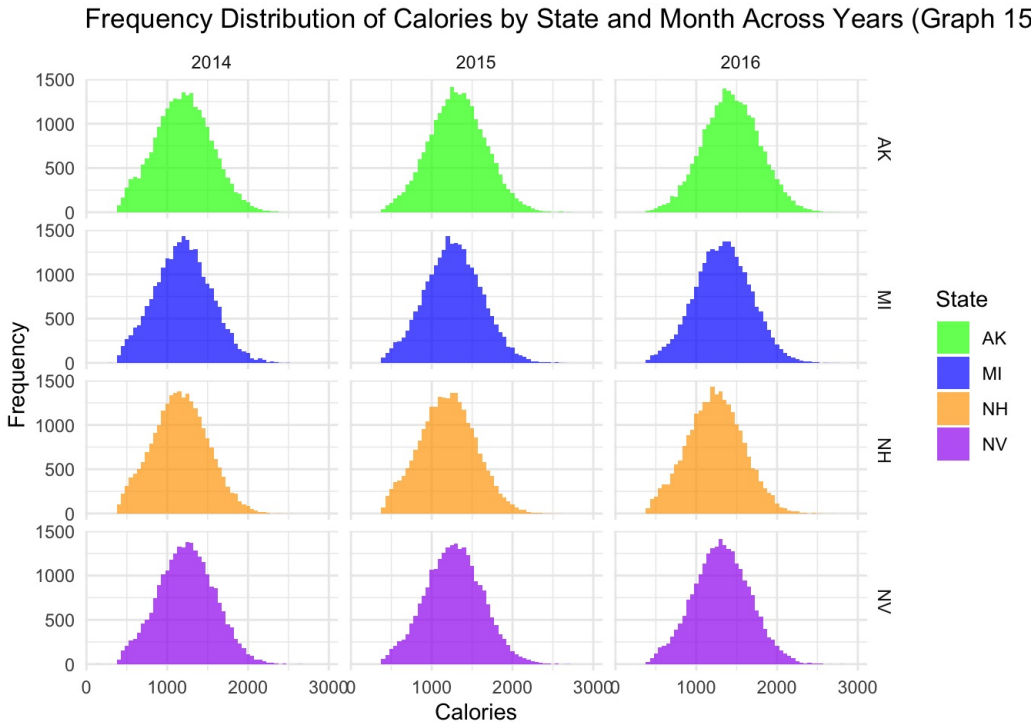



```
ggplot(USMW, aes(x = factor(Month, labels = month.abb), y = BasketScore, color = State)) + geom_jitter(width = 0.
2, alpha = 0.5) + labs(title = "Monthly Basket Score by State Across Years (Graph 14)", x = "Month", y = "Basket
Score", color = "State") + theme_minimal() + facet_grid(State~ Year) + scale_x_discrete(labels = month.abb)
```

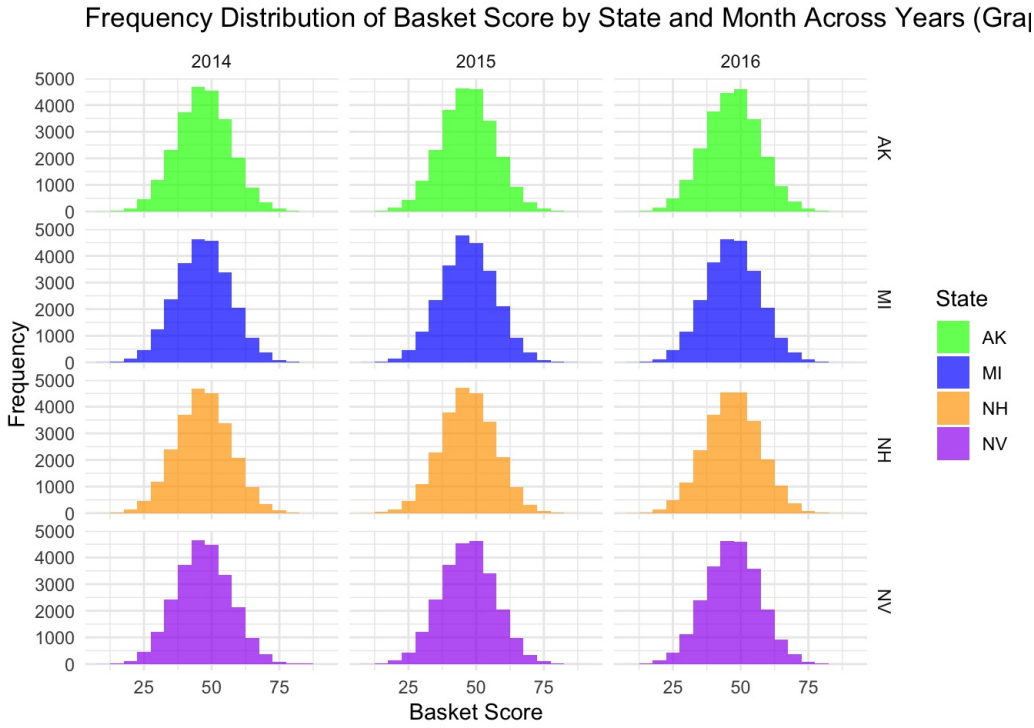


Yearly Frequency Distribution - USMW

```
ggplot(USMW, aes(x = Calories, fill = State)) + geom_histogram(binwidth = 50, position = "dodge", alpha = 0.7) +
labs(title = "Frequency Distribution of Calories by State and Month Across Years (Graph 15)", x = "Calories", y =
"Frequency") + theme_minimal() + facet_grid(State~ Year) + scale_fill_manual(values = c("green", "blue", "orange"
, "purple"))
```




```
ggplot(USMW, aes(x = BasketScore, fill = State)) + geom_histogram(binwidth = 5, position = "dodge", alpha = 0.7)
+ labs(title = "Frequency Distribution of Basket Score by State and Month Across Years (Graph 16)", x = "Basket S
core", y = "Frequency") + theme_minimal() + facet_grid(State~ Year) + scale_fill_manual(values = c("green", "blue
", "orange", "purple"))
```



Parallel Trend test - Calories - USMW

```
USMW <- USMW %>%
  mutate(
    treated = ifelse(State %in% c("Michigan", "Alaska"), 1, 0),
    post = ifelse(Year >= 2015 | (Year== 2014 & Month >= 9), 1, 0),
    time = Year * 12 + Month # Create a continuous time variable
  )
pre_treatment_data <- USMW %>%
  filter(post== 0)

parallel_trends_calories <- lm(Calories~ treated * time + State, data = pre_treatment_data)
print(summary(parallel_trends_calories))
```

```
##
## Call:
## lm(formula = Calories ~ treated * time + State, data = pre_treatment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -838.20 -238.36   -2.01  233.72 1441.06
##
## Coefficients: (2 not defined because of singularities)
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -5.730e+04  1.428e+04  -4.013  6.0e-05 ***
## treated              NA         NA      NA       NA
## time          2.420e+00  5.907e-01   4.097  4.2e-05 ***
## StateMI      -2.573e+01  3.828e+00  -6.723  1.8e-11 ***
## StateNH      -3.948e+01  3.828e+00 -10.314  < 2e-16 ***
## StateNV       3.677e+01  3.828e+00   9.606  < 2e-16 ***
## treated:time         NA         NA      NA       NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 342.4 on 63995 degrees of freedom
## Multiple R-squared:  0.007396,   Adjusted R-squared:  0.007334
## F-statistic: 119.2 on 4 and 63995 DF,  p-value: < 2.2e-16
```

Parallel Trend test - Basket Score - USMW

```
parallel_trends_basket <- lm(BasketScore~ treated * time + State, data = pre_treatment_data)
print(summary(parallel_trends_basket))
```

```
##
## Call:
## lm(formula = BasketScore ~ treated * time + State, data = pre_treatment_data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -36.742  -6.734  -0.040   6.754  38.597
##
## Coefficients: (2 not defined because of singularities)
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.016e+02  4.169e+02  -0.244    0.807
## treated              NA         NA      NA       NA
## time          6.141e-03  1.725e-02   0.356    0.722
## StateMI      -1.049e-01  1.118e-01  -0.938    0.348
## StateNH       1.148e-01  1.118e-01   1.027    0.305
## StateNV       1.919e-01  1.118e-01   1.717    0.086 .
## treated:time         NA         NA      NA       NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 9.998 on 63995 degrees of freedom
## Multiple R-squared:  0.0001291,  Adjusted R-squared:  6.656e-05
## F-statistic: 2.065 on 4 and 63995 DF,  p-value: 0.08251
```

DiD - Calories Analysis - USMW

```
USMW <- USMW %>%
  mutate(
    treated = ifelse(State %in% c("Michigan", "Alaska"), 1, 0),
    post_michigan_2014 = ifelse(State == "Michigan" & (Year > 2014 | (Year == 2014 & Month >= 9)), 1, 0),
    post_michigan_2016 = ifelse(State == "Michigan" & (Year > 2016 | (Year == 2016 & Month >= 1)), 1, 0),
    post_alaska_2015 = ifelse(State == "Alaska" & (Year > 2015 | (Year == 2015 & Month >= 1)), 1, 0),
    post_alaska_2016 = ifelse(State == "Alaska" & (Year > 2016 | (Year == 2016 & Month >= 1)), 1, 0)
)

USMW <- USMW %>%
  mutate(
    # Interaction terms for Michigan's wage changes
    treat_michigan_2014 = treated * post_michigan_2014, # Sept 2014 increase
    treat_michigan_2016 = treated * post_michigan_2016, # Jan 2016 increase
    # Interaction terms for Alaska's wage changes
    treat_alaska_2015 = treated * post_alaska_2015, # Jan 2015 increase
    treat_alaska_2016 = treated * post_alaska_2016 # Jan 2016 increase
)

## DiD model for Calories with staggered double treatment effects
did_calories <- lm(Calories~ treated + post_michigan_2014 + post_michigan_2016 + post_alaska_2015 + post_alaska_2
016 + treat_michigan_2014 + treat_michigan_2016 + treat_alaska_2015 + treat_alaska_2016 + factor(State) + factor(
Month) + factor(Year), data = USMW)
print(summary(did_calories))
```

```
##
## Call:
## lm(formula = Calories ~ treated + post_michigan_2014 + post_michigan_2016 +
##     post_alaska_2015 + post_alaska_2016 + treat_michigan_2014 +
##     treat_michigan_2016 + treat_alaska_2015 + treat_alaska_2016 +
##     factor(State) + factor(Month) + factor(Year), data = USMW)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1061.15  -239.50    -1.74   235.65  1614.52
##
## Coefficients: (9 not defined because of singularities)
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)         1236.9113     2.6677 463.669  < 2e-16 ***
## treated                   NA         NA      NA       NA
## post_michigan_2014        NA         NA      NA       NA
## post_michigan_2016        NA         NA      NA       NA
## post_alaska_2015          NA         NA      NA       NA
## post_alaska_2016          NA         NA      NA       NA
## treat_michigan_2014       NA         NA      NA       NA
## treat_michigan_2016       NA         NA      NA       NA
## treat_alaska_2015         NA         NA      NA       NA
## treat_alaska_2016         NA         NA      NA       NA
## factor(State)MI      -52.3111     1.8300 -28.585  < 2e-16 ***
## factor(State)NH     -118.5210     1.8300 -64.766  < 2e-16 ***
## factor(State)NV      -40.8667     1.8300 -22.332  < 2e-16 ***
## factor(Month)2        -2.3110     3.1697  -0.729 0.465948
## factor(Month)3         0.6165     3.1697   0.194 0.845794
## factor(Month)4         7.5840     3.1697   2.393 0.016726 *
## factor(Month)5         9.4732     3.1697   2.989 0.002802 **
## factor(Month)6        10.7606     3.1697   3.395 0.000687 ***
## factor(Month)7        16.6662     3.1697   5.258 1.46e-07 ***
## factor(Month)8        17.1316     3.1697   5.405 6.49e-08 ***
## factor(Month)9        28.1096     3.1697   8.868  < 2e-16 ***
## factor(Month)10       28.3160     3.1697   8.933  < 2e-16 ***
## factor(Month)11       34.9379     3.1697  11.023  < 2e-16 ***
## factor(Month)12       36.8652     3.1697  11.631  < 2e-16 ***
## factor(Year)2015      65.7315     1.5848  41.475  < 2e-16 ***
## factor(Year)2016     127.7705     1.5848  80.621  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 347.2 on 287983 degrees of freedom
## Multiple R-squared:  0.03757,    Adjusted R-squared:  0.03752
## F-statistic: 702.6 on 16 and 287983 DF,  p-value: < 2.2e-16
```

DiD - Basket Score Analysis - USMW

```
## DiD model for BasketScore with staggered double treatment effects
did_basket <- lm(BasketScore~ treated + post_michigan_2014 + post_michigan_2016 + post_alaska_2015 + post_alaska_
2016 + treat_michigan_2014 + treat_michigan_2016 + treat_alaska_2015 + treat_alaska_2016 + factor(State) + factor
(Month) + factor(Year), data = USMW)
print(summary(did_basket))
```

```
##
## Call:
## lm(formula = BasketScore ~ treated + post_michigan_2014 + post_michigan_2016 +
##     post_alaska_2015 + post_alaska_2016 + treat_michigan_2014 +
##     treat_michigan_2016 + treat_alaska_2015 + treat_alaska_2016 +
##     factor(State) + factor(Month) + factor(Year), data = USMW)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -38.758  -6.771   0.023   6.739  44.194
##
## Coefficients: (9 not defined because of singularities)
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)         46.795768   0.076872 608.751   <2e-16 ***
## treated                   NA         NA      NA       NA
## post_michigan_2014        NA         NA      NA       NA
## post_michigan_2016        NA         NA      NA       NA
## post_alaska_2015          NA         NA      NA       NA
## post_alaska_2016          NA         NA      NA       NA
## treat_michigan_2014       NA         NA      NA       NA
## treat_michigan_2016       NA         NA      NA       NA
## treat_alaska_2015         NA         NA      NA       NA
## treat_alaska_2016         NA         NA      NA       NA
## factor(State)MI     -0.002904   0.052734  -0.055   0.9561
## factor(State)NH      0.039622   0.052734   0.751   0.4524
## factor(State)NV      0.045579   0.052734   0.864   0.3874
## factor(Month)2       0.142242   0.091337   1.557   0.1194
## factor(Month)3       0.090858   0.091337   0.995   0.3199
## factor(Month)4       0.170975   0.091337   1.872   0.0612 .
## factor(Month)5       0.076079   0.091337   0.833   0.4049
## factor(Month)6       0.149629   0.091337   1.638   0.1014
## factor(Month)7       0.163137   0.091337   1.786   0.0741 .
## factor(Month)8       0.090812   0.091337   0.994   0.3201
## factor(Month)9       0.083258   0.091337   0.912   0.3620
## factor(Month)10      0.238921   0.091337   2.616   0.0089 **
## factor(Month)11      0.114946   0.091337   1.258   0.2082
## factor(Month)12      0.167617   0.091337   1.835   0.0665 .
## factor(Year)2015     0.074199   0.045669   1.625   0.1042
## factor(Year)2016     0.083823   0.045669   1.835   0.0664 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 10.01 on 287983 degrees of freedom
## Multiple R-squared:  5.342e-05,  Adjusted R-squared:  -2.138e-06
## F-statistic: 0.9615 on 16 and 287983 DF,  p-value: 0.4967
```