

Study 5 (Gender 2x2 Business Panel)

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Variable Names

Variable	Description
treatment	Binary indicator of whether a participant was randomly assigned to treatment condition (1 = treat, 0 = control).
men_pool	Binary indicator of pool condition where women are underrepresented (1 = men pool/25% women, 0 = women pool/75% women).
female_pick	Binary indicator of whether the 7th (final) selection is a woman (PRIMARY DV).
base_gender	Count of women selected in the initial 6 choices (0-6).
tech_pick	Binary indicator of whether the 7th selection is a technologist.
choice-1 to choice-7	The selected CEOs/Founders (choices 1-6 are initial, choice-7 is final DV)
gender	Self-selected gender.
race	Self-selected race.
age	Self-entered age.

Demographics

Excluded Participants: 212

Total N: 1200

```
##           Percentage gender
## 1 Another gender not listed here:  0.17
## 2                               Man  39.25
## 3                               Non-binary  1.58
## 4                               Woman  59.00
```

```
##           Percentage Race
## 1 American Indian or Alaskan Native  1.08
## 2           Asian / Pacific Islander  8.42
## 3           Black or African American 11.17
## 4           Hispanic / Latinx        9.33
## 5           White / Caucasian        70.00
```

```
## # A tibble: 1 x 2
##   mean_age sd_age
##   <dbl> <dbl>
## 1    42.7   13.4
```

##

##

Cell Sizes by Condition:

```
## # A tibble: 4 x 3
##   pool cond      n
##   <chr> <chr> <int>
## 1 men   control  297
## 2 men   treat   301
## 3 women control  301
## 4 women treat   301
```

##

##

Mean number of women in initial 6 selections: 2.45

SD of women in initial 6 selections: 1.73

```
## # A tibble: 4 x 5
##   cond pool mean sd      n
##   <chr> <chr> <dbl> <dbl> <int>
## 1 control men    1.23  1.32  297
## 2 control women  3.59  1.18  301
## 3 treat  men    1.29  1.34  301
## 4 treat  women  3.69  1.17  301
```

##

##

Proportion who selected a woman for final choice: 0.585

```
## SD: 0.493
```

```
## # A tibble: 4 x 5
```

```
##   cond   pool  mean    sd    n
##   <chr>  <chr> <dbl> <dbl> <int>
## 1 control men   0.333 0.472  297
## 2 control women 0.767 0.423  301
## 3 treat  men   0.575 0.495  301
## 4 treat  women 0.661 0.474  301
```

Primary Analysis: 2x2 Interaction

```
## === 2x2 Interaction: Treatment × Women Underrepresented Pool ===

## Model: female_pick ~ treatment * men_pool

## (men_pool: 1 = women underrepresented, 0 = women overrepresented)

##
## Call:
## lm(formula = female_pick ~ treatment * men_pool, data = d0)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.7674 -0.3937  0.2326  0.3389  0.6667
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.76744    0.02443  31.412 < 2e-16 ***
## treatment      -0.10631    0.03669  -2.898  0.00383 **
## men_pool       -0.43411    0.03674 -11.814 < 2e-16 ***
## treatment:men_pool  0.34773    0.05401   6.438 1.74e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4669 on 1196 degrees of freedom
## Multiple R-squared:  0.1051, Adjusted R-squared:  0.1028
## F-statistic: 46.8 on 3 and 1196 DF, p-value: < 2.2e-16

##              2.5 %      97.5 %
## (Intercept)    0.7195085  0.81537527
## treatment      -0.1782968 -0.03432774
## men_pool       -0.5062001 -0.36201693
## treatment:men_pool  0.2417684  0.45369123

##
##
## Cell Means:

## # A tibble: 4 x 5
##   cond  pool    n mean_female_pick    se
##   <chr> <chr> <int>          <dbl> <dbl>
## 1 control men   297            33.3  2.74
## 2 control women 301            76.7  2.44
## 3 treat  men   301            57.5  2.85
## 4 treat  women 301            66.1  2.73
```

Simple Effects by Pool

Women Underrepresented Pool (25% Women)

```
## === WOMEN UNDERREPRESENTED POOL (MEN POOL, 25% WOMEN) ===

## Model: female_pick ~ treatment

##
## Call:
## lm(formula = female_pick ~ treatment, data = d0 %>% filter(men_pool ==
##    1))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.5747 -0.3333 -0.3333  0.4253  0.6667
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.33333    0.02745   12.145 < 2e-16 ***
## treatment    0.24142    0.03963    6.091 2.01e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4839 on 596 degrees of freedom
## Multiple R-squared:  0.05876,    Adjusted R-squared:  0.05718
## F-statistic: 37.21 on 1 and 596 DF,  p-value: 1.912e-09

##              2.5 %    97.5 %
## (Intercept) 0.2794306 0.3872361
## treatment   0.1635818 0.3192532

##
##
## Cell Means - Women Underrepresented Pool:

## # A tibble: 2 x 4
##   cond      n mean_female_pick    se
##   <chr> <int>          <dbl> <dbl>
## 1 control   297           33.3  2.74
## 2 treat    301           57.5  2.85
```

Women Overrepresented Pool (75% Women)

```
## === WOMEN OVERREPRESENTED POOL (WOMEN POOL, 75% WOMEN) ===

## --- MAIN EFFECT MODEL ---

## Model: female_pick ~ treatment

##
## Call:
## lm(formula = female_pick ~ treatment, data = d0 %>% filter(men_pool ==
##    0))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.7674 -0.6611  0.2326  0.3389  0.3389
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.76744    0.02443   31.412  <2e-16 ***
## treatment   -0.10631    0.03669   -2.898   0.0039 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4494 on 600 degrees of freedom
## Multiple R-squared:  0.01385,    Adjusted R-squared:  0.0122
## F-statistic: 8.424 on 1 and 600 DF,  p-value: 0.003839

##              2.5 %      97.5 %
## (Intercept)  0.7194602  0.81542355
## treatment   -0.1783693 -0.03425524

##
##
## Cell Means by Treatment:

## # A tibble: 2 x 4
##   cond      n mean_female_pick    se
##   <chr> <int>          <dbl> <dbl>
## 1 control  301            76.7  2.44
## 2 treat   301            66.1  2.73
```

Wald Test: Comparing Treatment Effects Across Pools

=== WALD TEST: DIFFERENCE IN TREATMENT EFFECTS BETWEEN POOLS ===

Treatment Effect (Men Pool 25%): 0.2414 (SE = 0.0396)

Treatment Effect (Women Pool 75%): -0.1063 (SE = 0.0367)

Difference in Treatment Effects: 0.3477

Standard Error of Difference: 0.0540

Wald Statistic (z): 6.4385

P-value (two-tailed): 0.0000

95% CI for Difference: [0.2419, 0.4536]

Figure 4 Code

Mediation Analysis

Descriptives

```
## =====

## MECHANISM SCALE DESCRIPTIVES

## =====

## === OVERALL SCALE DESCRIPTIVES ===
##
## Fairness Scale (fair1, fair2, fair3):
##   Mean: 3.415
##   SD: 1.718
##   N (non-missing): 1200
##   Alpha: 0.898
##
## Internal Motivation Scale (I1, I2, I3, I4):
##   Mean: 3.477
##   SD: 1.72
##   N (non-missing): 1200
##   Alpha: 0.927
##
## External Motivation Scale (E1, E2, E3):
##   Mean: 2.82
##   SD: 1.518
##   N (non-missing): 1200
##   Alpha: 0.905
##
## === SCALE MEANS BY CONDITION ===
##
## # A tibble: 4 x 9
##   pool  cond      n fairness_m fairness_sd internal_m internal_sd external_m
##   <chr> <chr>  <int>      <dbl>      <dbl>      <dbl>      <dbl>      <dbl>
## 1 men   control  297        3.1        1.58        3.13        1.65        2.57
## 2 men   treat   301        4.01        1.97        4.12        1.87        3.27
## 3 women control  301        3.11        1.46        3.09        1.54        2.61
## 4 women treat   301        3.44        1.66        3.57        1.6         2.83
## # i 1 more variable: external_sd <dbl>
```

Mediation Analysis: Women Overrepresented Pool

```
# Set seed for reproducibility
set.seed(123)

# Filter to women overrepresented pool only
d_women_pool <- d0 |> filter(men_pool == 0, !is.na(fairness))

cat("=====\n")

## =====

cat("MEDIATION ANALYSIS: WOMEN OVERREPRESENTED POOL\n")

## MEDIATION ANALYSIS: WOMEN OVERREPRESENTED POOL

cat("=====\n\n")

## =====

cat("Sample size for mediation analysis:", nrow(d_women_pool), "\n\n")

## Sample size for mediation analysis: 602

# Define function for Sobel Test
sobel_test <- function(med.fit, out.fit, mediator) {
  med.se <- sqrt(diag(vcovHC(med.fit)))[mediator]
  out.se <- sqrt(diag(vcovHC(out.fit)))[mediator]
  sobel_test_statistic <- coef(out.fit)[mediator] / sqrt(vcovHC(out.fit)[mediator,
↪ mediator])
  sobel_p_value <- 2 * (1 - pnorm(abs(sobel_test_statistic)))
  list(statistic = sobel_test_statistic, p_value = sobel_p_value, se = out.se)
}

# -----
# Fairness Analysis
# -----

# Direct effect model
dir.fit.fairness <- lm(female_pick ~ treatment, data = d_women_pool)

# Mediator model (a path)
med.fit.fairness <- lm(fairness ~ treatment, data = d_women_pool)

# Outcome model including mediator (b path)
out.fit.fairness <- lm(female_pick ~ treatment + fairness, data = d_women_pool)

# Mediation analysis using Imai's mediation package
med.out.fairness <- mediate(med.fit.fairness, out.fit.fairness, boot = TRUE,
```

```

        treat = "treatment", boot.ci.type = "perc", mediator =
        ↪ "fairness", sims = 10000)

# Sensitivity analysis
sens.out.fairness <- medsens(med.out.fairness, rho.by = 0.01, eps = .01, effect.type =
  ↪ "indirect", sims = 10000)

# Sobel test for fairness
sobel.fairness <- sobel_test(med.fit.fairness, out.fit.fairness, "fairness")

# Print and visualize results for fairness
cat("\n--- FAIRNESS MEDIATION ---\n\n")

```

```

##
## --- FAIRNESS MEDIATION ---

```

```

cat("Sobel test for Fairness\n")

```

```

## Sobel test for Fairness

```

```

print(sobel.fairness)

```

```

## $statistic
##   fairness
## -3.133809
##
## $p_value
##   fairness
## 0.001725531
##
## $se
##   fairness
## 0.01167607

```

```

summary(med.out.fairness)

```

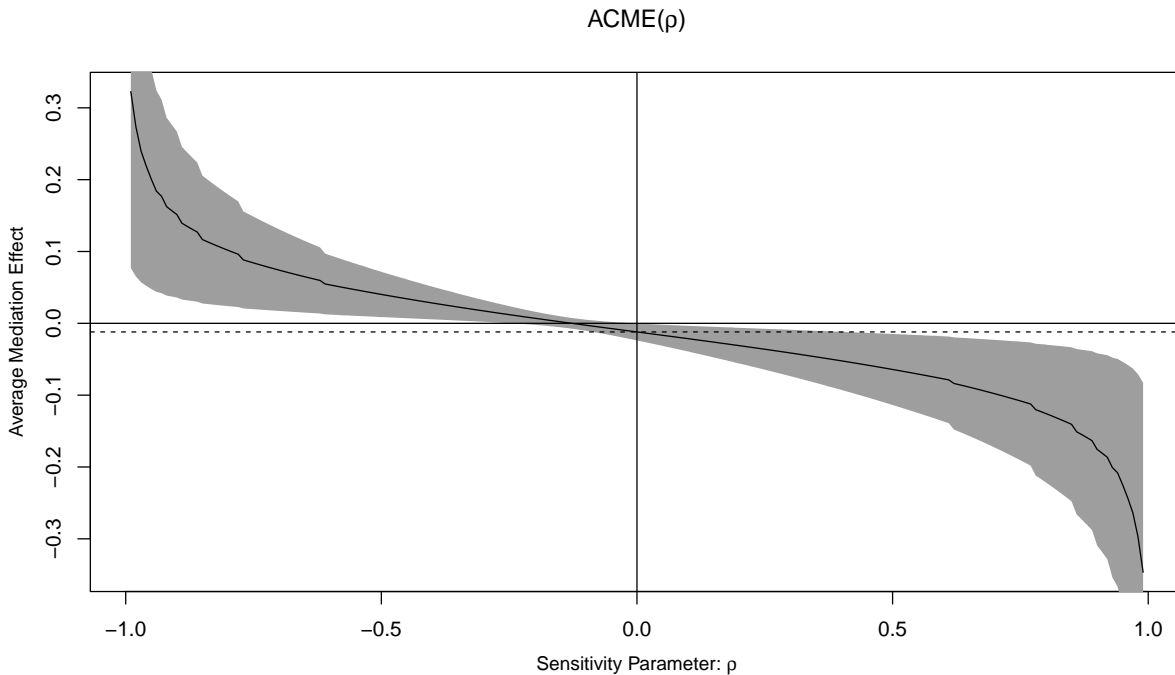
```

##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##           Estimate 95% CI Lower 95% CI Upper p-value
## ACME           -0.0119942  -0.0261952  -0.0017671  0.0134 *
## ADE             -0.0943180  -0.1647812  -0.0251431  0.0082 **
## Total Effect   -0.1063123  -0.1781680  -0.0357640  0.0040 **
## Prop. Mediated  0.1128209   0.0164698   0.3515553  0.0166 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 602

```

```
##
##
## Simulations: 10000
```

```
plot(sens.out.fairness)
```



```
# -----
# Internal Motivation Analysis
# -----

# Mediator model (a path)
med.fit.internal <- lm(internal_motivation ~ treatment, data = d_women_pool)

# Outcome model including mediator (b path)
out.fit.internal <- lm(female_pick ~ treatment + internal_motivation, data =
  ↪ d_women_pool)

# Mediation analysis
med.out.internal <- mediate(med.fit.internal, out.fit.internal, boot = TRUE,
  treat = "treatment", boot.ci.type = "perc", mediator =
  ↪ "internal_motivation", sims = 10000)

# Sensitivity analysis
sens.out.internal <- medsens(med.out.internal, rho.by = 0.01, eps = .01, effect.type =
  ↪ "indirect", sims = 10000)

# Sobel test for internal motivation
sobel.internal <- sobel_test(med.fit.internal, out.fit.internal, "internal_motivation")
```

```
# Print and visualize results for internal motivation
cat("\n--- INTERNAL MOTIVATION MEDIATION ---\n\n")
```

```
##
## --- INTERNAL MOTIVATION MEDIATION ---
```

```
cat("Sobel test for Internal Motivation\n")
```

```
## Sobel test for Internal Motivation
```

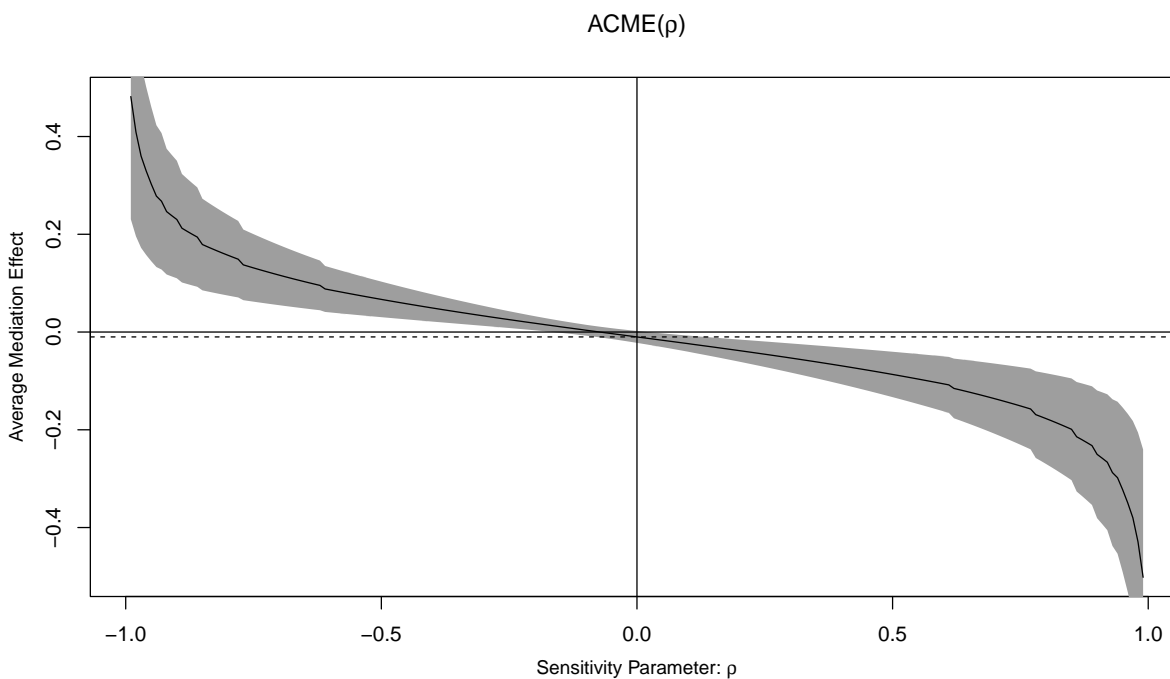
```
print(sobel.internal)
```

```
## $statistic
## internal_motivation
##          -1.807569
##
## $p_value
## internal_motivation
##          0.07067363
##
## $se
## internal_motivation
##          0.01150776
```

```
summary(med.out.internal)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##          Estimate 95% CI Lower 95% CI Upper p-value
## ACME          -0.01000317 -0.02407438  0.00070076  0.0720 .
## ADE           -0.09630912 -0.16699996 -0.02356042  0.0074 **
## Total Effect  -0.10631229 -0.17805740 -0.03275986  0.0034 **
## Prop. Mediated 0.09409234 -0.00891778  0.34062595  0.0746 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 602
##
##
## Simulations: 10000
```

```
plot(sens.out.internal)
```



```
# -----
# External Motivation Analysis
# -----

# Mediator model (a path)
med.fit.external <- lm(external_motivation ~ treatment, data = d_women_pool)

# Outcome model including mediator (b path)
out.fit.external <- lm(female_pick ~ treatment + external_motivation, data =
  ↪ d_women_pool)

# Mediation analysis
med.out.external <- mediate(med.fit.external, out.fit.external, boot = TRUE,
  treat = "treatment", boot.ci.type = "perc", mediator =
  ↪ "external_motivation", sims = 10000)

# Sensitivity analysis
sens.out.external <- medsens(med.out.external, rho.by = 0.01, eps = .01, effect.type =
  ↪ "indirect", sims = 10000)

# Sobel test for external motivation
sobel.external <- sobel_test(med.fit.external, out.fit.external, "external_motivation")

# Print and visualize results for external motivation
cat("\n--- EXTERNAL MOTIVATION MEDIATION ---\n\n")
```

```
##
## --- EXTERNAL MOTIVATION MEDIATION ---
```

```
cat("Sobel test for External Motivation\n")
```

```
## Sobel test for External Motivation
```

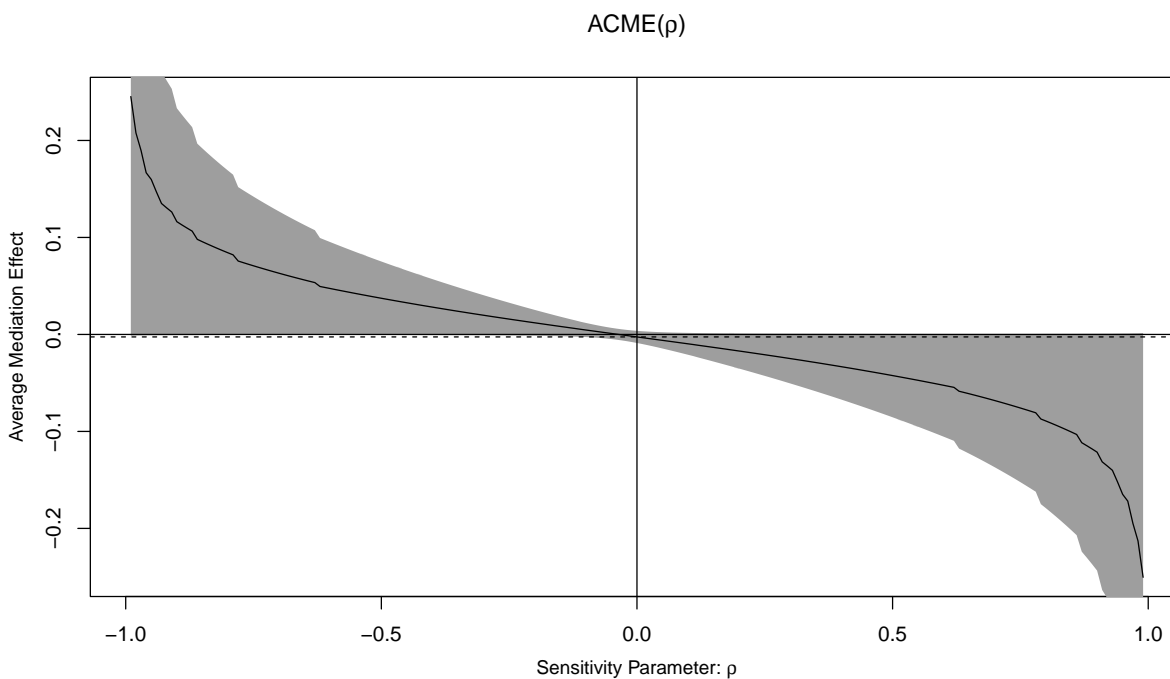
```
print(sobel.external)
```

```
## $statistic
## external_motivation
##      -0.8749026
##
## $p_value
## external_motivation
##      0.3816269
##
## $se
## external_motivation
##      0.0129537
```

```
summary(med.out.external)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##      Estimate 95% CI Lower 95% CI Upper p-value
## ACME      -0.0025603  -0.0106881   0.0033033  0.4094
## ADE      -0.1037520  -0.1742735  -0.0316267  0.0060 **
## Total Effect -0.1063123 -0.1767591 -0.0345689  0.0050 **
## Prop. Mediated 0.0240831 -0.0389347   0.1382644  0.4124
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 602
##
##
## Simulations: 10000
```

```
plot(sens.out.external)
```

```
# -----
# Combined Multiple Mediation Model
# -----

# Compute the correlation coefficient and p-value between mediators
cat("\n--- MEDIATOR CORRELATIONS ---\n\n")
```

```
##
## --- MEDIATOR CORRELATIONS ---
```

```
cor_fair_int <- cor.test(d_women_pool$fairness, d_women_pool$internal_motivation)
cor_fair_ext <- cor.test(d_women_pool$fairness, d_women_pool$external_motivation)
cor_int_ext <- cor.test(d_women_pool$internal_motivation,
  ↪ d_women_pool$external_motivation)

cat("Correlation (Fairness, Internal):", round(cor_fair_int$estimate, 3), "p =",
  ↪ round(cor_fair_int$p.value, 4), "\n")
```

```
## Correlation (Fairness, Internal): 0.789 p = 0
```

```
cat("Correlation (Fairness, External):", round(cor_fair_ext$estimate, 3), "p =",
  ↪ round(cor_fair_ext$p.value, 4), "\n")
```

```
## Correlation (Fairness, External): 0.647 p = 0
```

```
cat("Correlation (Internal, External):", round(cor_int_ext$estimate, 3), "p =",
    ↪ round(cor_int_ext$p.value, 4), "\n\n")
```

```
## Correlation (Internal, External): 0.752 p = 0
```

```
# Building combined outcome model with all mediators
out.fit.combined <- lm(female_pick ~ treatment + fairness + internal_motivation +
    ↪ external_motivation, data = d_women_pool)

# Run combined mediation analyses
med.out.combined.fairness <- mediate(med.fit.fairness, out.fit.combined, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator
    ↪ = "fairness", sims = 10000)
med.out.combined.internal <- mediate(med.fit.internal, out.fit.combined, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator
    ↪ = "internal_motivation", sims = 10000)
med.out.combined.external <- mediate(med.fit.external, out.fit.combined, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator
    ↪ = "external_motivation", sims = 10000)

# Summarize and print the results for combined analysis
cat("\n--- COMBINED MULTIPLE MEDIATION MODEL RESULTS ---\n\n")
```

```
##
## --- COMBINED MULTIPLE MEDIATION MODEL RESULTS ---
```

```
cat("Fairness (controlling for other mediators):\n")
```

```
## Fairness (controlling for other mediators):
```

```
summary(med.out.combined.fairness)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##           Estimate 95% CI Lower 95% CI Upper p-value
## ACME          -0.0181997   -0.0417490   -0.0022375  0.0148 *
## ADE            -0.0968789   -0.1677729   -0.0258105  0.0078 **
## Total Effect   -0.1150786   -0.1883002   -0.0400464  0.0032 **
## Prop. Mediated  0.1581501    0.0198721    0.4558110  0.0180 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 602
##
##
## Simulations: 10000
```

```
cat("\nInternal Motivation (controlling for other mediators):\n")
```

```
##  
## Internal Motivation (controlling for other mediators):
```

```
summary(med.out.combined.internal)
```

```
##  
## Causal Mediation Analysis  
##  
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method  
##  
##           Estimate 95% CI Lower 95% CI Upper p-value  
## ACME           0.0040061   -0.0179039    0.0268675  0.6944  
## ADE            -0.0968789   -0.1685563   -0.0262503  0.0090 **  
## Total Effect  -0.0928729   -0.1661897   -0.0207390  0.0128 *  
## Prop. Mediated -0.0431348   -0.5901270    0.2113310  0.7032  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Sample Size Used: 602  
##  
##  
## Simulations: 10000
```

```
cat("\nExternal Motivation (controlling for other mediators):\n")
```

```
##  
## External Motivation (controlling for other mediators):
```

```
summary(med.out.combined.external)
```

```
##  
## Causal Mediation Analysis  
##  
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method  
##  
##           Estimate 95% CI Lower 95% CI Upper p-value  
## ACME           0.0047603   -0.0038565    0.0176710  0.3074  
## ADE            -0.0968789   -0.1666242   -0.0241396  0.0086 **  
## Total Effect  -0.0921187   -0.1621690   -0.0193986  0.0130 *  
## Prop. Mediated -0.0516753   -0.3797989    0.0550423  0.3180  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Sample Size Used: 602  
##  
##  
## Simulations: 10000
```

Mediation Analysis: Women Underrepresented Pool

```
# Set seed for reproducibility
set.seed(456)

# Filter to women underrepresented pool only (men pool, 25% women)
d_men_pool <- d0 |> filter(men_pool == 1, !is.na(fairness))

cat("=====\n")

## =====

cat("MEDIATION ANALYSIS: WOMEN UNDERREPRESENTED POOL\n")

## MEDIATION ANALYSIS: WOMEN UNDERREPRESENTED POOL

cat("=====\n\n")

## =====

cat("Sample size for mediation analysis:", nrow(d_men_pool), "\n\n")

## Sample size for mediation analysis: 598

# -----
# Fairness Analysis
# -----

# Direct effect model
dir.fit.fairness.underrep <- lm(female_pick ~ treatment, data = d_men_pool)

# Mediator model (a path)
med.fit.fairness.underrep <- lm(fairness ~ treatment, data = d_men_pool)

# Outcome model including mediator (b path)
out.fit.fairness.underrep <- lm(female_pick ~ treatment + fairness, data = d_men_pool)

# Mediation analysis using Imai's mediation package
med.out.fairness.underrep <- mediate(med.fit.fairness.underrep,
  ↪ out.fit.fairness.underrep, boot = TRUE,
  ↪ treat = "treatment", boot.ci.type = "perc", mediator =
  ↪ "fairness", sims = 10000)

# Sensitivity analysis
sens.out.fairness.underrep <- medsens(med.out.fairness.underrep, rho.by = 0.01, eps =
  ↪ .01, effect.type = "indirect", sims = 10000)

# Sobel test for fairness
sobel.fairness.underrep <- sobel_test(med.fit.fairness.underrep,
  ↪ out.fit.fairness.underrep, "fairness")
```

```
# Print and visualize results for fairness
cat("\n--- FAIRNESS MEDIATION ---\n\n")
```

```
##
## --- FAIRNESS MEDIATION ---
```

```
cat("Sobel test for Fairness\n")
```

```
## Sobel test for Fairness
```

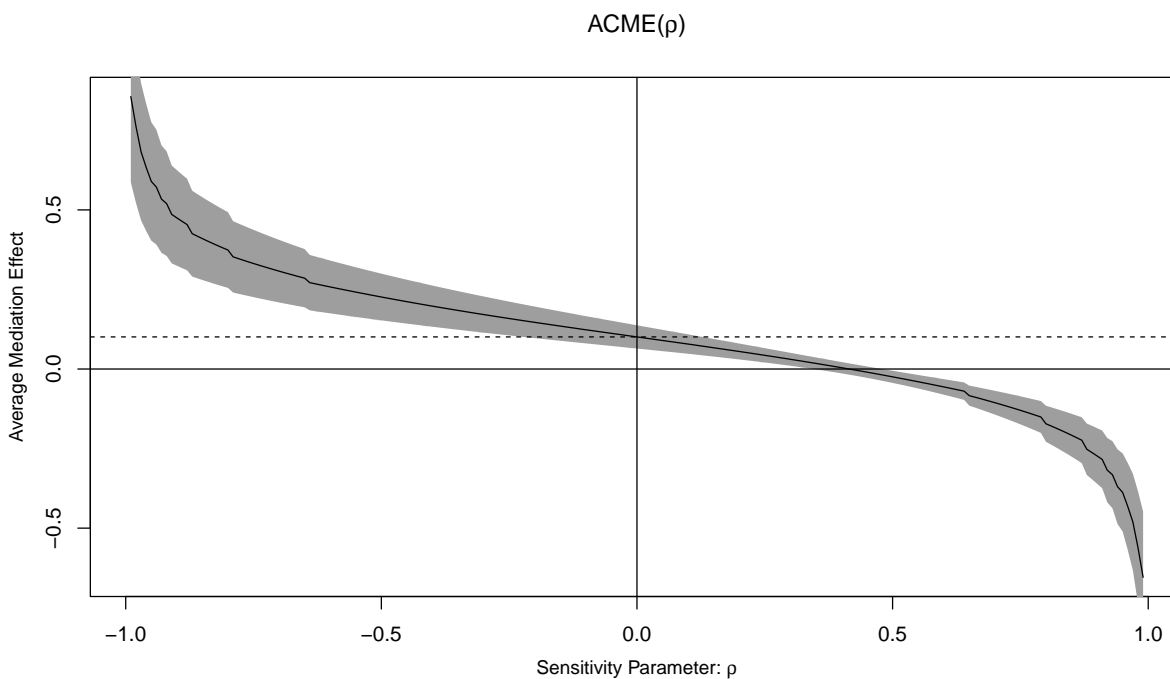
```
print(sobel.fairness.underrep)
```

```
## $statistic
## fairness
## 11.7266
##
## $p_value
## fairness
## 0
##
## $se
## fairness
## 0.009453088
```

```
summary(med.out.fairness.underrep)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##      Estimate 95% CI Lower 95% CI Upper p-value
## ACME      0.100888    0.067239    0.137071 <2e-16 ***
## ADE      0.140530    0.065716    0.213965 2e-04 ***
## Total Effect 0.241417    0.163329    0.318045 <2e-16 ***
## Prop. Mediated 0.417898    0.278724    0.630291 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 598
##
##
## Simulations: 10000
```

```
plot(sens.out.fairness.underrep)
```



```
# -----
# Internal Motivation Analysis
# -----

# Mediator model (a path)
med.fit.internal.underrep <- lm(internal_motivation ~ treatment, data = d_men_pool)

# Outcome model including mediator (b path)
out.fit.internal.underrep <- lm(female_pick ~ treatment + internal_motivation, data =
  ↳ d_men_pool)

# Mediation analysis
med.out.internal.underrep <- mediate(med.fit.internal.underrep,
  ↳ out.fit.internal.underrep, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator =
    ↳ "internal_motivation", sims = 10000)

# Sensitivity analysis
sens.out.internal.underrep <- medsens(med.out.internal.underrep, rho.by = 0.01, eps =
  ↳ .01, effect.type = "indirect", sims = 10000)

# Sobel test for internal motivation
sobel.internal.underrep <- sobel_test(med.fit.internal.underrep,
  ↳ out.fit.internal.underrep, "internal_motivation")

# Print and visualize results for internal motivation
cat("\n--- INTERNAL MOTIVATION MEDIATION ---\n\n")
```

```
##
```

```
## --- INTERNAL MOTIVATION MEDIATION ---
```

```
cat("Sobel test for Internal Motivation\n")
```

```
## Sobel test for Internal Motivation
```

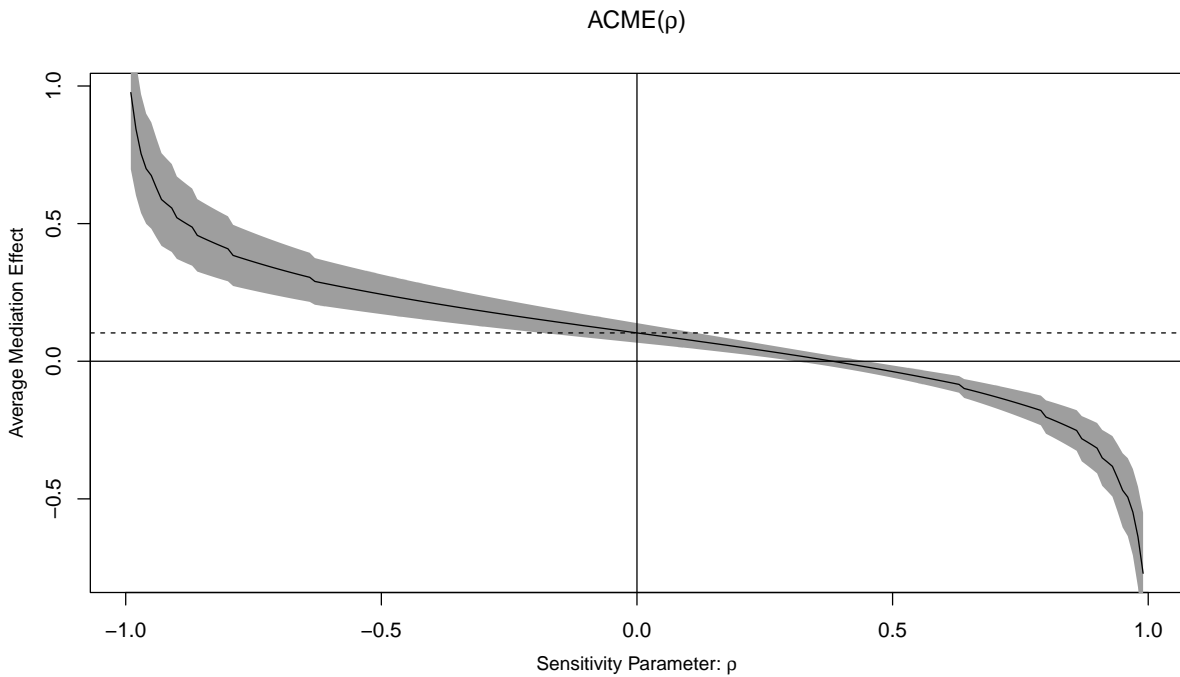
```
print(sobel.internal.underrep)
```

```
## $statistic
## internal_motivation
##          10.23571
##
## $p_value
## internal_motivation
##              0
##
## $se
## internal_motivation
##          0.01014876
```

```
summary(med.out.internal.underrep)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##          Estimate 95% CI Lower 95% CI Upper p-value
## ACME          0.102924    0.069796    0.138808 <2e-16 ***
## ADE           0.138493    0.063919    0.216489 6e-04 ***
## Total Effect  0.241417    0.164832    0.319598 <2e-16 ***
## Prop. Mediated 0.426333    0.282022    0.644070 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 598
##
##
## Simulations: 10000
```

```
plot(sens.out.internal.underrep)
```



```
# -----
# External Motivation Analysis
# -----

# Mediator model (a path)
med.fit.external.underrep <- lm(external_motivation ~ treatment, data = d_men_pool)

# Outcome model including mediator (b path)
out.fit.external.underrep <- lm(female_pick ~ treatment + external_motivation, data =
  ↪ d_men_pool)

# Mediation analysis
med.out.external.underrep <- mediate(med.fit.external.underrep,
  ↪ out.fit.external.underrep, boot = TRUE,
  treat = "treatment", boot.ci.type = "perc", mediator =
  ↪ "external_motivation", sims = 10000)

# Sensitivity analysis
sens.out.external.underrep <- medsens(med.out.external.underrep, rho.by = 0.01, eps =
  ↪ .01, effect.type = "indirect", sims = 10000)

# Sobel test for external motivation
sobel.external.underrep <- sobel_test(med.fit.external.underrep,
  ↪ out.fit.external.underrep, "external_motivation")

# Print and visualize results for external motivation
cat("\n--- EXTERNAL MOTIVATION MEDIATION ---\n\n")
```

```
##
```



```
## --- EXTERNAL MOTIVATION MEDIATION ---
```

```
cat("Sobel test for External Motivation\n")
```

```
## Sobel test for External Motivation
```

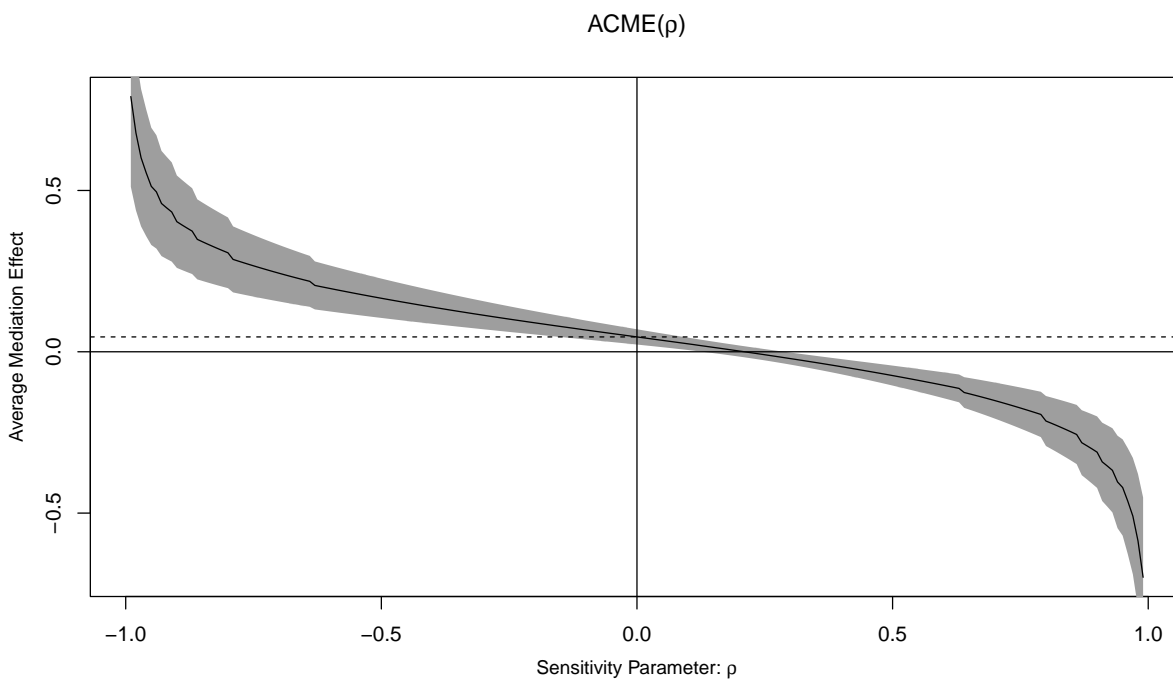
```
print(sobel.external.underrep)
```

```
## $statistic
## external_motivation
##          5.288926
##
## $p_value
## external_motivation
##          1.230366e-07
##
## $se
## external_motivation
##          0.01230329
```

```
summary(med.out.external.underrep)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##          Estimate 95% CI Lower 95% CI Upper    p-value
## ACME          0.046062    0.024885    0.071768 < 2.2e-16 ***
## ADE          0.195355    0.118357    0.275134 < 2.2e-16 ***
## Total Effect  0.241417    0.166161    0.320806 < 2.2e-16 ***
## Prop. Mediated 0.190799    0.100439    0.329114 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 598
##
##
## Simulations: 10000
```

```
plot(sens.out.external.underrep)
```



```
# -----
# Combined Multiple Mediation Model
# -----

# Compute the correlation coefficient and p-value between mediators
cat("\n--- MEDIATOR CORRELATIONS ---\n\n")

##
## --- MEDIATOR CORRELATIONS ---

cor_fair_int.underrep <- cor.test(d_men_pool$fairness, d_men_pool$internal_motivation)
cor_fair_ext.underrep <- cor.test(d_men_pool$fairness, d_men_pool$external_motivation)
cor_int_ext.underrep <- cor.test(d_men_pool$internal_motivation,
  ↪ d_men_pool$external_motivation)

cat("Correlation (Fairness, Internal):", round(cor_fair_int.underrep$estimate, 3), "p =",
  ↪ round(cor_fair_int.underrep$p.value, 4), "\n")

## Correlation (Fairness, Internal): 0.857 p = 0

cat("Correlation (Fairness, External):", round(cor_fair_ext.underrep$estimate, 3), "p =",
  ↪ round(cor_fair_ext.underrep$p.value, 4), "\n")

## Correlation (Fairness, External): 0.684 p = 0
```

```
cat("Correlation (Internal, External):", round(cor_int_ext.underrep$estimate, 3), "p =",
    ↪ round(cor_int_ext.underrep$p.value, 4), "\n\n")
```

```
## Correlation (Internal, External): 0.736 p = 0
```

```
# Building combined outcome model with all mediators
out.fit.combined.underrep <- lm(female_pick ~ treatment + fairness + internal_motivation
    ↪ + external_motivation, data = d_men_pool)

# Run combined mediation analyses
med.out.combined.fairness.underrep <- mediate(med.fit.fairness.underrep,
    ↪ out.fit.combined.underrep, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator
    ↪ = "fairness", sims = 10000)
med.out.combined.internal.underrep <- mediate(med.fit.internal.underrep,
    ↪ out.fit.combined.underrep, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator
    ↪ = "internal_motivation", sims = 10000)
med.out.combined.external.underrep <- mediate(med.fit.external.underrep,
    ↪ out.fit.combined.underrep, boot = TRUE,
    treat = "treatment", boot.ci.type = "perc", mediator
    ↪ = "external_motivation", sims = 10000)

# Summarize and print the results for combined analysis
cat("\n--- COMBINED MULTIPLE MEDIATION MODEL RESULTS ---\n\n")
```

```
##
## --- COMBINED MULTIPLE MEDIATION MODEL RESULTS ---
```

```
cat("Fairness (controlling for other mediators):\n")
```

```
## Fairness (controlling for other mediators):
```

```
summary(med.out.combined.fairness.underrep)
```

```
##
## Causal Mediation Analysis
##
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method
##
##           Estimate 95% CI Lower 95% CI Upper p-value
## ACME           0.085767    0.046679    0.132153 <2e-16 ***
## ADE            0.136964    0.061841    0.213727 6e-04 ***
## Total Effect   0.222731    0.137101    0.311288 <2e-16 ***
## Prop. Mediated 0.385070    0.226843    0.605834 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Sample Size Used: 598
##
##
## Simulations: 10000
```

```
cat("\nInternal Motivation (controlling for other mediators):\n")
```

```
##  
## Internal Motivation (controlling for other mediators):
```

```
summary(med.out.combined.internal.underrep)
```

```
##  
## Causal Mediation Analysis  
##  
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method  
##  
##           Estimate 95% CI Lower 95% CI Upper p-value  
## ACME           0.056096    0.011477    0.107932  0.0140 *  
## ADE            0.136964    0.061623    0.212519  0.0006 ***  
## Total Effect   0.193060    0.111199    0.279585  <2e-16 ***  
## Prop. Mediated 0.290564    0.069440    0.555670  0.0140 *  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Sample Size Used: 598  
##  
##  
## Simulations: 10000
```

```
cat("\nExternal Motivation (controlling for other mediators):\n")
```

```
##  
## External Motivation (controlling for other mediators):
```

```
summary(med.out.combined.external.underrep)
```

```
##  
## Causal Mediation Analysis  
##  
## Nonparametric Bootstrap Confidence Intervals with the Percentile Method  
##  
##           Estimate 95% CI Lower 95% CI Upper p-value  
## ACME          -0.037410   -0.065981   -0.014000  0.0016 **  
## ADE            0.136964    0.062246    0.214794  0.0008 ***  
## Total Effect   0.099554    0.019247    0.180103  0.0150 *  
## Prop. Mediated -0.375773   -1.998599   -0.091728  0.0166 *  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Sample Size Used: 598  
##  
##  
## Simulations: 10000
```