Study 5 (Gender 2x2 Business Panel)

December 31, 2025

Items

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
```

```
##   mean_age   sd_age
## 1 42.70583 13.42427
```

```
##
##
## 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 Overrepresented Pool ===

## (women_overrep: 1 = women overrepresented/75%, 0 = women underrepresented/25%)

## --- MODEL 5: OLS WITHOUT CONTROLS ---

## Model: female_pick ~ treatment * women_overrep

##
## Call:
## lm(formula = female_pick ~ treatment * women_overrep, 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)               0.33333    0.02745  12.145  < 2e-16 ***
## treatment                 0.24142    0.03963   6.091 1.51e-09 ***
## women_overrep             0.43411    0.03674  11.814  < 2e-16 ***
## treatment:women_overrep -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)               0.2794855  0.3871811
## treatment                 0.1636611  0.3191739
## women_overrep             0.3620169  0.5062001
## treatment:women_overrep -0.4536912 -0.2417684

##
##
## --- MODEL 6: OLS WITH DEMOGRAPHIC CONTROLS ---

## Model: female_pick ~ treatment * women_overrep + female_participant + white_participant + age

##
## Call:
## lm(formula = female_pick ~ treatment * women_overrep + female_participant +
##     white_participant + age, data = d0)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.8177 -0.4155  0.2055  0.3841  0.7259
##
```

```
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)               0.2765260  0.0522369   5.294 1.43e-07 ***
## treatment                 0.2384420  0.0397133   6.004 2.55e-09 ***
## women_overrep             0.4351700  0.0367979  11.826  < 2e-16 ***
## female_participant        0.0787471  0.0277636   2.836  0.00464 **
## white_participant        -0.0125537  0.0301815  -0.416  0.67753
## age                       0.0004617  0.0010584   0.436  0.66275
## treatment:women_overrep -0.3462270  0.0539302  -6.420 1.96e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4658 on 1193 degrees of freedom
## Multiple R-squared:  0.1116, Adjusted R-squared:  0.1071
## F-statistic: 24.98 on 6 and 1193 DF,  p-value: < 2.2e-16

##                                2.5 %       97.5 %
## (Intercept)               0.174039589  0.379012313
## treatment                 0.160526257  0.316357656
## women_overrep             0.362974270  0.507365711
## female_participant        0.024276177  0.133217943
## white_participant        -0.071768450  0.046660966
## age                      -0.001614857  0.002538268
## treatment:women_overrep -0.452035560 -0.240418381

##
##
## --- LOGISTIC REGRESSION ROBUSTNESS CHECK ---

## Model: female_pick ~ treatment * women_overrep (logit)

##
## Call:
## glm(formula = female_pick ~ treatment * women_overrep, family = binomial,
##     data = d0)
##
## Coefficients:
##                          Estimate Std. Error z value Pr(>|z|)
## (Intercept)               -0.6931     0.1231  -5.631 1.79e-08 ***
## treatment                  0.9944     0.1695   5.865 4.48e-09 ***
## women_overrep              1.8871     0.1838  10.269  < 2e-16 ***
## treatment:women_overrep  -1.5200     0.2494  -6.095 1.09e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 1628.7  on 1199  degrees of freedom
## Residual deviance: 1500.6  on 1196  degrees of freedom
## AIC: 1508.6
##
## Number of Fisher Scoring iterations: 4
```

```
##
## Logit with controls:

##
## Call:
## glm(formula = female_pick ~ treatment * women_overrep + female_participant +
##     white_participant + age, family = binomial, data = d0)
##
## Coefficients:
##                           Estimate Std. Error z value Pr(>|z|)
## (Intercept)             -0.958439   0.242178  -3.958 7.57e-05 ***
## treatment                0.988891   0.170449   5.802 6.57e-09 ***
## women_overrep            1.906689   0.184836  10.316  < 2e-16 ***
## female_participant       0.362680   0.127145   2.852  0.00434 **
## white_participant       -0.057617   0.139317  -0.414  0.67919
## age                      0.002072   0.004785   0.433  0.66496
## treatment:women_overrep -1.524857   0.250505  -6.087 1.15e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 1628.7  on 1199  degrees of freedom
## Residual deviance: 1491.8  on 1193  degrees of freedom
## AIC: 1505.8
##
## Number of Fisher Scoring iterations: 4

##
##
## 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 1: OLS WITHOUT CONTROLS ---

## Model: female_pick ~ treatment

##
## Call:
## lm(formula = female_pick ~ treatment, data = d0_underrep)
##
## 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

##
##
## --- MODEL 2: OLS WITH DEMOGRAPHIC CONTROLS ---

## Model: female_pick ~ treatment + female_participant + white_participant + age

##
## Call:
## lm(formula = female_pick ~ treatment + female_participant + white_participant +
##     age, data = d0_underrep)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6752 -0.3912 -0.2702  0.4403  0.7494
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)         0.210978   0.070110   3.009  0.00273 **
## treatment           0.235299   0.039902   5.897 6.22e-09 ***
```

```
## female_participant  0.071430   0.041168   1.735  0.08325 .
## white_participant  -0.004758   0.043905  -0.108  0.91373
## age                 0.002018   0.001550   1.303  0.19321
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4829 on 593 degrees of freedom
## Multiple R-squared:  0.06758,    Adjusted R-squared:  0.06129
## F-statistic: 10.75 on 4 and 593 DF,  p-value: 2.054e-08
```

```
##                           2.5 %      97.5 %
## (Intercept)         0.073283916 0.348673069
## treatment           0.156933059 0.313665750
## female_participant -0.009423009 0.152282047
## white_participant  -0.090986379 0.081469806
## age                -0.001024783 0.005061775
```

```
##
##
## --- LOGISTIC REGRESSION ROBUSTNESS CHECK ---
```

```
## Model: female_pick ~ treatment (logit)
```

```
##
## Call:
## glm(formula = female_pick ~ treatment, family = binomial, data = d0_underrep)
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -0.6931     0.1231  -5.631 1.79e-08 ***
## treatment     0.9944     0.1695   5.865 4.48e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 824.12  on 597  degrees of freedom
## Residual deviance: 788.61  on 596  degrees of freedom
## AIC: 792.61
##
## Number of Fisher Scoring iterations: 4
```

```
##
## Logit with controls:
```

```
##
## Call:
## glm(formula = female_pick ~ treatment + female_participant +
##     white_participant + age, family = binomial, data = d0_underrep)
##
## Coefficients:
##                     Estimate Std. Error z value Pr(>|z|)
```

```
## (Intercept)        -1.227806   0.313477  -3.917 8.98e-05 ***
## treatment           0.977856   0.170591   5.732 9.92e-09 ***
## female_participant  0.308875   0.176017   1.755   0.0793 .
## white_participant  -0.018942   0.188797  -0.100   0.9201
## age                 0.008671   0.006581   1.318   0.1877
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 824.12  on 597  degrees of freedom
## Residual deviance: 782.99  on 593  degrees of freedom
## AIC: 792.99
##
## Number of Fisher Scoring iterations: 4

##
##
## 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) ===

## --- MODEL 3: OLS WITHOUT CONTROLS ---

## Model: female_pick ~ treatment

##
## Call:
## lm(formula = female_pick ~ treatment, data = d0_overrep)
##
## 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

##
##
## --- MODEL 4: OLS WITH DEMOGRAPHIC CONTROLS ---

## Model: female_pick ~ treatment + female_participant + white_participant + age

##
## Call:
## lm(formula = female_pick ~ treatment + female_participant + white_participant +
##     age, data = d0_overrep)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.8357 -0.6145  0.2251  0.3029  0.4272
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)         0.776643   0.066968  11.597  < 2e-16 ***
## treatment          -0.105492   0.036690  -2.875  0.00418 **
## female_participant  0.083382   0.037631   2.216  0.02708 *
## white_participant  -0.020125   0.041379  -0.486  0.62690
```

```
## age                -0.001016   0.001456  -0.698  0.48576
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4484 on 597 degrees of freedom
## Multiple R-squared:  0.02309,    Adjusted R-squared:  0.01654
## F-statistic: 3.528 on 4 and 597 DF,  p-value: 0.007393

##                          2.5 %       97.5 %
## (Intercept)         0.645120558  0.908165501
## treatment          -0.177549443 -0.033433608
## female_participant  0.009478079  0.157286735
## white_participant  -0.101390785  0.061141284
## age                -0.003875217  0.001844017

##
##
## --- LOGISTIC REGRESSION ROBUSTNESS CHECK ---

## Model: female_pick ~ treatment (logit)

##
## Call:
## glm(formula = female_pick ~ treatment, family = binomial, data = d0_overrep)
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)   1.1939     0.1364   8.751  < 2e-16 ***
## treatment    -0.5256     0.1829  -2.874  0.00405 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 720.32  on 601  degrees of freedom
## Residual deviance: 711.94  on 600  degrees of freedom
## AIC: 715.94
##
## Number of Fisher Scoring iterations: 4

##
## Logit with controls:

##
## Call:
## glm(formula = female_pick ~ treatment + female_participant +
##     white_participant + age, family = binomial, data = d0_overrep)
##
## Coefficients:
##                     Estimate Std. Error z value Pr(>|z|)
## (Intercept)         1.258973   0.334112   3.768 0.000164 ***
## treatment          -0.527103   0.184223  -2.861 0.004220 **
```

```
## female_participant  0.414105   0.184399   2.246 0.024723 *
## white_participant  -0.103490   0.208975  -0.495 0.620440
## age                -0.005137   0.006931  -0.741 0.458541
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 720.32  on 601  degrees of freedom
## Residual deviance: 706.29  on 597  degrees of freedom
## AIC: 716.29
##
## Number of Fisher Scoring iterations: 4
```

```
##
##
## 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 Effect Magnitudes Across Pools

```
## === WALD TEST: EQUAL MAGNITUDE OF TREATMENT EFFECTS ===

## Testing H0: B_underrep + B_overrep = 0

## (i.e., treatment effects are equal in magnitude but opposite in direction)

## Treatment Effect (Underrep Pool): 0.2414 (SE = 0.0396)

## Treatment Effect (Overrep Pool):  -0.1063 (SE = 0.0367)

## Sum of Treatment Effects:         0.1351

## Standard Error of Sum:            0.0540

## Wald Statistic (z):               2.5016

## P-value (two-tailed):             0.0124

## 95% CI for Sum:                   [0.0292, 0.2410]

## Interpretation: A non-significant p-value indicates the treatment effects

## are approximately equal in magnitude (opposite in direction).
```

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

```r
# 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")
```

```
## ============================================================
```

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

```
## MEDIATION ANALYSIS: WOMEN OVERREPRESENTED POOL
```

```r
cat("============================================================\n\n")
```

```
## ============================================================
```

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

```
## Sample size for mediation analysis: 602
```

```r
# 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)
```

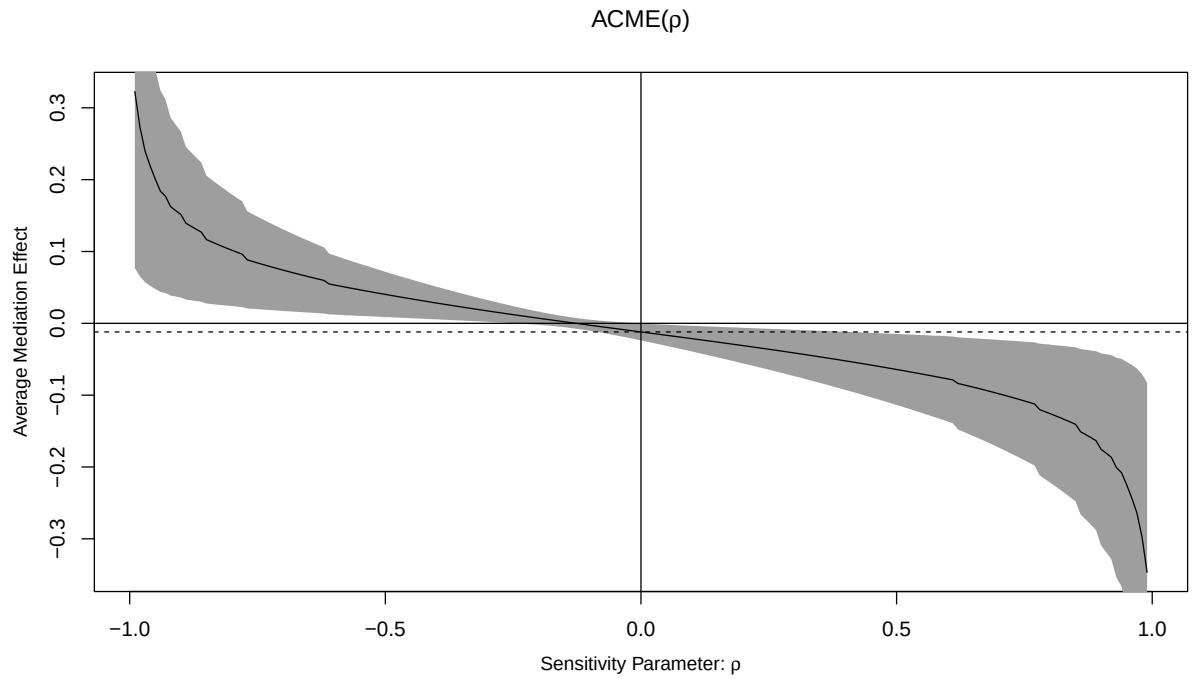
```
## $statistic
##  fairness
## -3.133809
##
## $p_value
##    fairness
## 0.001725531
##
## $se
##   fairness
## 0.01167607
```

```
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
```

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




```r
# ------------------------------
# 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")
```

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

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

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

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

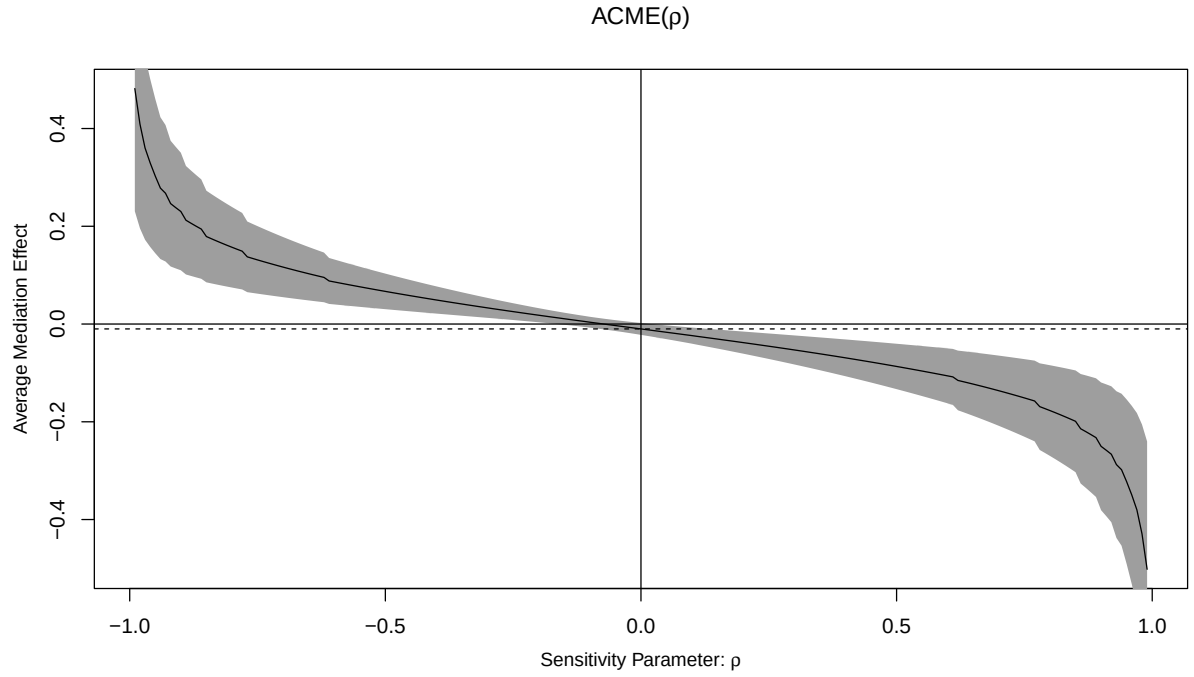
```r
print(sobel.internal)
```

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

```r
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
```

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




```r
# ------------------------------
# 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 ---
```

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

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

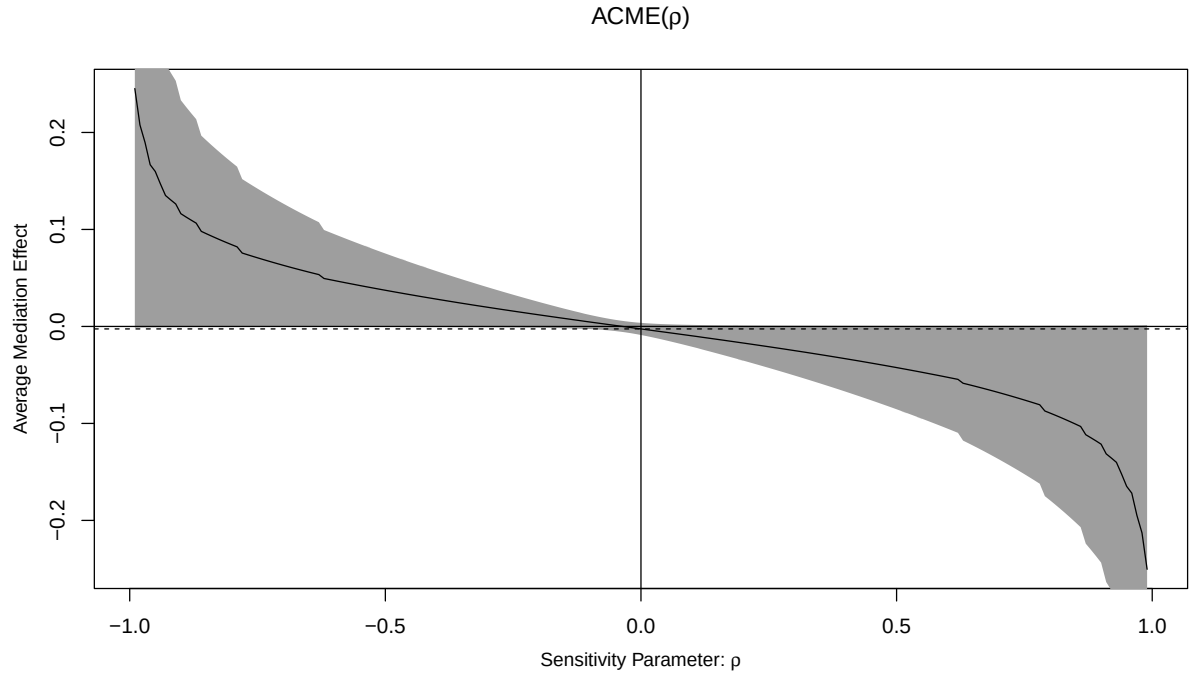
```r
print(sobel.external)
```

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

```r
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
```

```r
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
```

```r
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
```

```r
# 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 ---
```

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

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

```r
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
```

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

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

```r
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
```

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

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

```r
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

```r
# 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")
```

```
## ============================================================
```

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

```
## MEDIATION ANALYSIS: WOMEN UNDERREPRESENTED POOL
```

```r
cat("============================================================\n\n")
```

```
## ============================================================
```

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

```
## Sample size for mediation analysis: 598
```

```r
# ----------------------------
# 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")
```

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

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

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

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

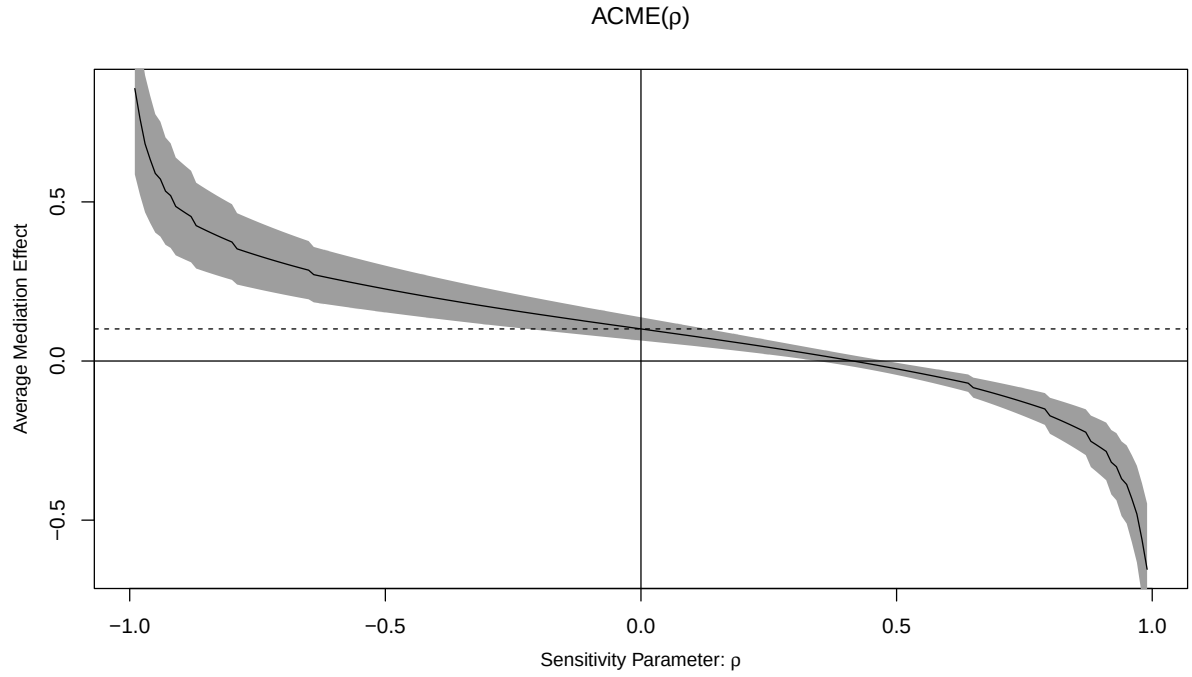
```r
print(sobel.fairness.underrep)
```

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

```r
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
```

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




```r
# ------------------------------
# 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
```

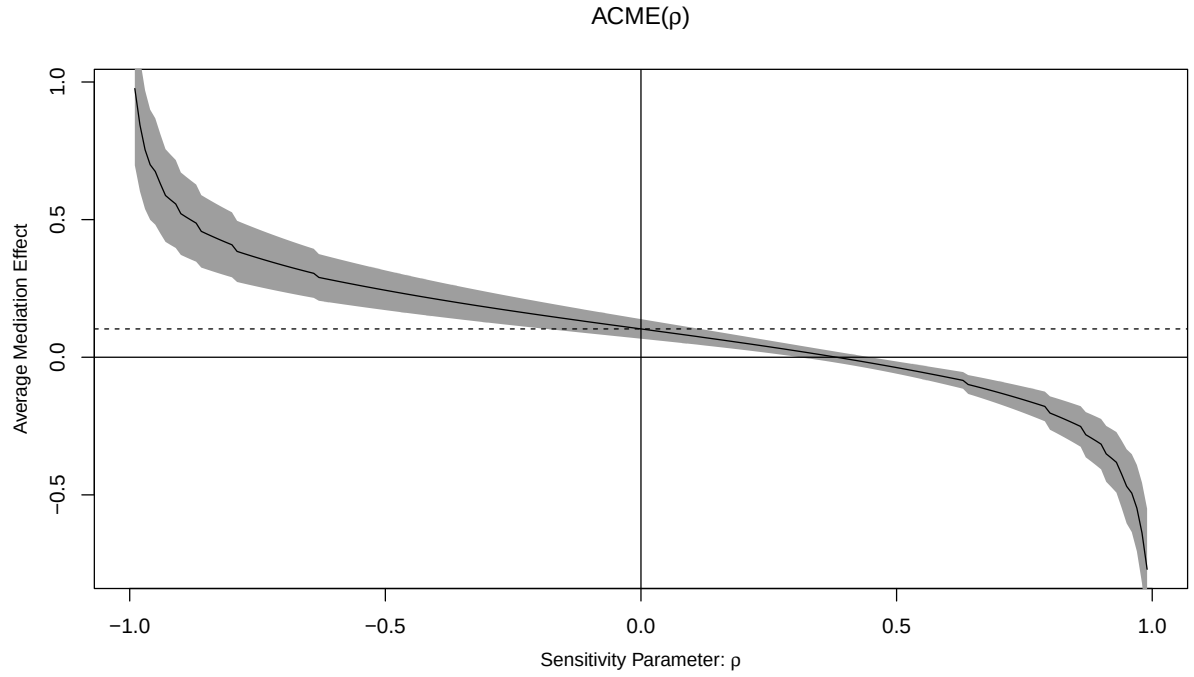
```
print(sobel.internal.underrep)
```

```
## $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)
```




```r
# ------------------------------
# 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
```

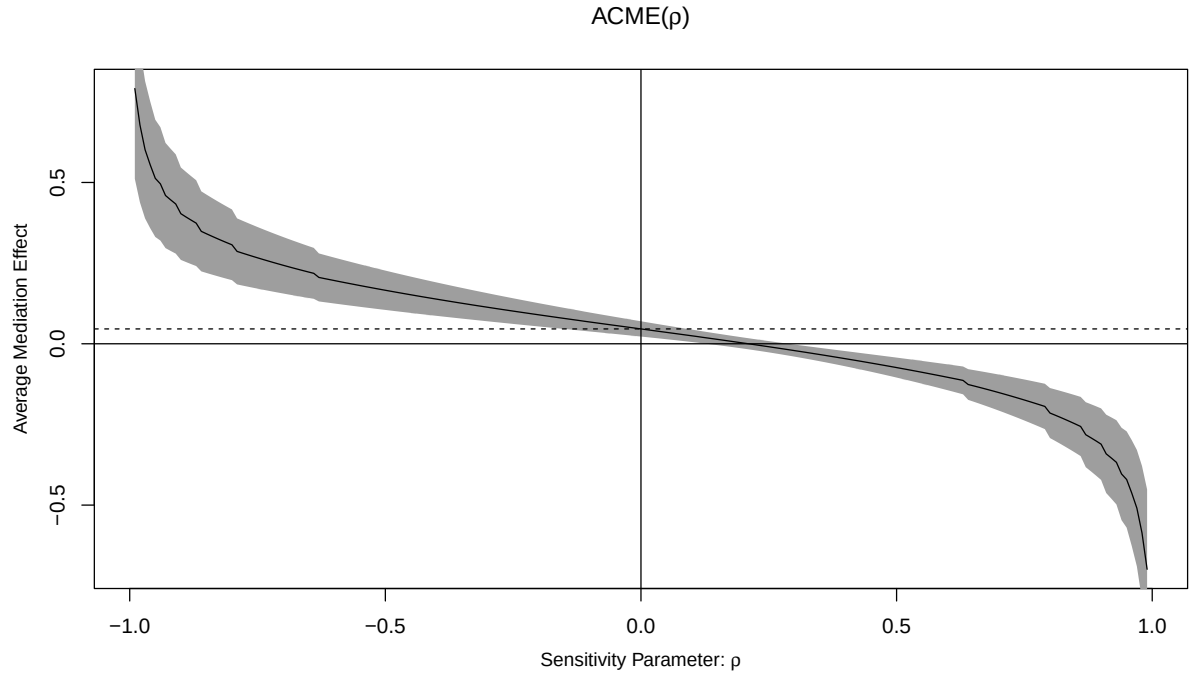
```
print(sobel.external.underrep)
```

```
## $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
```

```r
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
```

```r
# 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 ---
```

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

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

```r
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
```

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

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

```r
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
```

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

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

```r
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
```