qap_usa_canada

2025-01-05

R Markdown

get the data

```
library(readxl)
library(statnet)
library(igraph)
library(intergraph)

data_usa_ce <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testcode/s

data_usa_cc <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testcode/s

data_usa_ii <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testcode/s

data_usa_combined <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1tes

data_canada_ce <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testco

data_canada_combined <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1


data_canada_ii <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testco

data_canada_cc <- read_excel(path = "/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testco


data_china_ce <- read_excel("/Users/wumengmeng/Desktop/project-MediaAgenda/two-mode/step1testcode/step2_
```

```
matrix_data_usa_ce <- as.matrix(data_usa_ce)

matrix_data_canada_ce <- as.matrix(data_canada_ce)

matrix_data_china_ce <- as.matrix(data_china_ce)

matrix_data_usa_ii <- as.matrix(data_usa_ii)
matrix_data_usa_cc <- as.matrix(data_usa_cc)

matrix_data_canada_ii <- as.matrix(data_canada_ii)
matrix_data_canada_cc <- as.matrix(data_canada_cc)

matrix_data_usa_combined <- as.matrix(data_usa_combined)
matrix_data_canada_combined <- as.matrix(data_canada_combined)
```

```r
#construct a function to convert data type
convert_to_numeric_matrix <- function(matrix_two_mode) {


  issue_labels <- colnames(matrix_two_mode)[-1]

  country_labels <- matrix_two_mode[, 1]

  numeric_data <- matrix_two_mode[, -1]
  numeric_data <- apply(numeric_data, c(1, 2), trimws)

  numeric_matrix <- apply(numeric_data, 2, as.numeric)
  length(country_labels)
  dim(numeric_matrix)
  rownames(numeric_matrix) <- country_labels
  colnames(numeric_matrix) <- issue_labels
  return(numeric_matrix)
}
```

```r
#convert data type in matrix

numeric_matrix_usa_ce <- convert_to_numeric_matrix(matrix_data_usa_ce)
numeric_matrix_usa_cc <- convert_to_numeric_matrix(matrix_data_usa_cc)
numeric_matrix_usa_ii <- convert_to_numeric_matrix(matrix_data_usa_ii)
numeric_matrix_canada_ce <- convert_to_numeric_matrix(matrix_data_canada_ce)
numeric_matrix_canada_cc <- convert_to_numeric_matrix(matrix_data_canada_cc)
numeric_matrix_canada_ii <- convert_to_numeric_matrix(matrix_data_canada_ii)
numeric_matrix_china_ce <- convert_to_numeric_matrix(matrix_data_china_ce)

numeric_matrix_usa_combined <- convert_to_numeric_matrix(matrix_data_usa_combined)
numeric_matrix_canada_combined <- convert_to_numeric_matrix(matrix_data_canada_combined)
```

```r
#
normalize_matrix <- function(matrix) {
  #
  O <- matrix / sum(matrix)

  #
  E <- outer(rowSums(O), colSums(O))

  #   E
  Z <- (O - E) / sqrt(E)
  Z[is.infinite(Z) | is.nan(Z)] <- 0 #   NaN   Inf    0

  return(Z)
}
```

combined_matrix

```r
#
normalize_matrix_in_steps <- function(matrix) {
  #   1:    1:43   1:43
  matrix <- normalize_submatrix(matrix, 1:43, 1:43)
```

```
  #   2:    44:57   44:57
  matrix <- normalize_submatrix(matrix, 44:57, 44:57)

  #   3:    44:57   1:43
  matrix <- normalize_submatrix(matrix, 44:57, 1:43)

  #   4:    1:43   44:57
  matrix <- normalize_submatrix(matrix, 1:43, 44:57)

  #
  return(matrix)
}

#
normalize_submatrix <- function(matrix, row_range, col_range) {
  #
  sub_matrix <- matrix[row_range, col_range]

  #
  O <- sub_matrix / sum(sub_matrix)

  #
  E <- outer(rowSums(O), colSums(O))

  #   E
  Z <- (O - E) / sqrt(E)
  Z[is.infinite(Z) | is.nan(Z)] <- 0 #   NaN   Inf    0

  #
  matrix[row_range, col_range] <- Z

  return(matrix)
}
```

```
zn_matrix_usa_combined <- normalize_matrix_in_steps(numeric_matrix_usa_combined)
zn_matrix_canada_combined <- normalize_matrix_in_steps(numeric_matrix_canada_combined)
```

```
zn_matrix_usa_ce <- normalize_matrix(numeric_matrix_usa_ce)
zn_matrix_canada_ce  <- normalize_matrix(numeric_matrix_canada_ce)
zn_matrix_usa_cc <- normalize_matrix(numeric_matrix_usa_cc)
zn_matrix_usa_ii <- normalize_matrix(numeric_matrix_usa_ii)


zn_matrix_canada_cc  <- normalize_matrix(numeric_matrix_canada_cc)
zn_matrix_canada_ii  <- normalize_matrix(numeric_matrix_canada_ii)

zn_matrix_china_ce <- normalize_matrix(numeric_matrix_china_ce)
```

```
convert_two_mode <- function(matrix) {
  #
  if (!is.matrix(matrix)) {
    stop("Input must be a matrix.")
```

```
  }

  #    CC    (Column-Column Matrix)
  cc_matrix <- t(matrix) %*% matrix

  #    II    (Item-Item Matrix)
  ii_matrix <- matrix %*% t(matrix)

  #       CC   II
  list(cc = cc_matrix, ii = ii_matrix)
}
```

```
zn_matrix_usa_cct <- convert_two_mode(zn_matrix_usa_ce)$cc

zn_matrix_usa_iit <- convert_two_mode(zn_matrix_usa_ce)$ii

zn_matrix_canada_cct <- convert_two_mode(zn_matrix_canada_ce)$cc

zn_matrix_canada_iit <- convert_two_mode(zn_matrix_canada_ce)$ii

zn_matrix_china_cct <- convert_two_mode(zn_matrix_china_ce)$cc

zn_matrix_china_iit <- convert_two_mode(zn_matrix_china_ce)$ii
```

```
correlation_ce_usa_canada <- cor.test(as.vector(zn_matrix_usa_ce), as.vector(zn_matrix_canada_ce), metho
cat("Pearson Correlation Coefficient:\n", correlation_ce_usa_canada$estimate, "\n")
```

```
## Pearson Correlation Coefficient:
##  0.364806
```

```
cat("P-value:\n", correlation_ce_usa_canada$p.value, "\n")
```

```
## P-value:
##  2.183918e-20
```

```
correlation_ce_usa_china <- cor.test(as.vector(zn_matrix_usa_ce), as.vector(zn_matrix_china_ce), method
cat("Pearson Correlation Coefficient:\n", correlation_ce_usa_china$estimate, "\n")
```

```
## Pearson Correlation Coefficient:
##  0.0604405
```

```
cat("P-value:\n", correlation_ce_usa_china$p.value, "\n")
```

```
## P-value:
##  0.1385475
```

```
correlation_ce_ca_china <- cor.test(as.vector(zn_matrix_canada_ce), as.vector(zn_matrix_china_ce), metho
cat("Pearson Correlation Coefficient:\n", correlation_ce_ca_china$estimate, "\n")
```

```
## Pearson Correlation Coefficient:
##  0.001569392
```

```r
cat("P-value:\n", correlation_ce_ca_china$p.value, "\n")
```

```
## P-value:
##  0.969348
```

```r
gcor(zn_matrix_usa_combined, zn_matrix_canada_combined)
```

```
## [1] 0.5157919
```

qap test

```r
gcor(zn_matrix_usa_cct, zn_matrix_canada_cct)
```

```
## [1] 0.6590421
```

```r
gcor(zn_matrix_usa_iit, zn_matrix_canada_iit)
```

```
## [1] 0.149415
```

```r
gcor(zn_matrix_usa_cc, zn_matrix_canada_cc)
```

```
## [1] 0.536476
```

```r
gcor(zn_matrix_usa_ii, zn_matrix_canada_ii)
```

```
## [1] 0.776628
```

```r
gcor(zn_matrix_usa_cct, zn_matrix_china_cct)
```

```
## [1] 0.2023577
```

```r
gcor(zn_matrix_usa_iit, zn_matrix_china_iit)
```

```
## [1] 0.05348407
```

```r
gcor(zn_matrix_china_cct, zn_matrix_canada_cct)
```

```
## [1] 0.03031349
```

```r
gcor(zn_matrix_china_iit, zn_matrix_canada_iit)
```

```
## [1] 0.09654612
```

```r
q_test_combined_usca <- qaptest(list(zn_matrix_usa_combined, zn_matrix_canada_combined),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_combined_usca)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0
##  p(f(perm) <= f(d)): 1
##
## Test Diagnostics:
##  Test Value (f(d)): 0.5157919
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.1048834
##      1stQ:    -0.02132525
##      Med:     -0.002520842
##      Mean:    3.969609e-06
##      3rdQ:    0.01800215
##      Max:     0.1782332
```

```r
q_test_iit_usca <- qaptest(list(zn_matrix_usa_iit, zn_matrix_canada_iit),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_iit_usca)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0.0034
##  p(f(perm) <= f(d)): 0.9966
##
## Test Diagnostics:
##  Test Value (f(d)): 0.149415
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.1177429
##      1stQ:    -0.02367378
##      Med:     -0.003301947
##      Mean:    5.876543e-05
##      3rdQ:    0.01939627
##      Max:     0.2243325
```

```r
q_test_iit_usca <- qaptest(list(zn_matrix_usa_iit, zn_matrix_canada_iit),
                          gcor,
```

```
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_iit_usca)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0.0039
##  p(f(perm) <= f(d)): 0.9961
##
## Test Diagnostics:
##  Test Value (f(d)): 0.149415
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.1190092
##      1stQ:    -0.02408792
##      Med:     -0.003326566
##      Mean:    0.0003496983
##      3rdQ:    0.02001198
##      Max:     0.2310396
```

The observed test value (0.659) is significantly larger than the permuted distribution, as shown by the p-values (0 and 1). This indicates a strong and significant relationship in the data.

```
q_test_cct_usca <- qaptest(list(zn_matrix_usa_cct, zn_matrix_canada_cct),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_cct_usca)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0
##  p(f(perm) <= f(d)): 1
##
## Test Diagnostics:
##  Test Value (f(d)): 0.6590421
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.2985534
##      1stQ:    -0.07475066
##      Med:     -0.01110507
##      Mean:    0.001472528
##      3rdQ:    0.06341709
##      Max:     0.6332452
```

```r
q_test_cct_usch <- qaptest(list(zn_matrix_usa_cct, zn_matrix_china_cct),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_cct_usch)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0.0438
##  p(f(perm) <= f(d)): 0.9562
##
## Test Diagnostics:
##  Test Value (f(d)): 0.2023577
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.3298761
##      1stQ:    -0.07388519
##      Med:     -0.005378602
##      Mean:    0.001733795
##      3rdQ:    0.07057107
##      Max:     0.4255492
```

```r
q_test_iit_usch <- qaptest(list(zn_matrix_usa_iit, zn_matrix_china_iit),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_iit_usch)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0.0597
##  p(f(perm) <= f(d)): 0.9403
##
## Test Diagnostics:
##  Test Value (f(d)): 0.05348407
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.1015578
##      1stQ:    -0.02249557
##      Med:     -0.002515108
##      Mean:    -4.627994e-05
##      3rdQ:    0.01984032
##      Max:     0.1706677
```

```r
q_test_cct_cach <- qaptest(list(zn_matrix_canada_cct, zn_matrix_china_cct),
                          gcor,
```

```
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_cct_cach)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0.3705
##  p(f(perm) <= f(d)): 0.6295
##
## Test Diagnostics:
##  Test Value (f(d)): 0.03031349
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.330651
##      1stQ:    -0.07337226
##      Med:     -0.004566445
##      Mean:    0.000585464
##      3rdQ:    0.06971771
##      Max:     0.450415
```

```
q_test_iit_cach <- qaptest(list(zn_matrix_canada_iit, zn_matrix_china_iit),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_iit_cach)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0.0068
##  p(f(perm) <= f(d)): 0.9932
##
## Test Diagnostics:
##  Test Value (f(d)): 0.09654612
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.1020744
##      1stQ:    -0.02304447
##      Med:     -0.00227111
##      Mean:    5.526661e-05
##      3rdQ:    0.02076072
##      Max:     0.1681027
```

```
q_test_cc <- qaptest(list(zn_matrix_usa_cc, zn_matrix_canada_cc),
                          gcor,
                          g1=1,
                          g2=2,
```

```
                          reps=10000)
summary(q_test_cc)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0
##  p(f(perm) <= f(d)): 1
##
## Test Diagnostics:
##  Test Value (f(d)): 0.536476
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.1396496
##      1stQ:    -0.03547257
##      Med:     -0.007663432
##      Mean:    -0.0001004705
##      3rdQ:    0.02396825
##      Max:     0.2837243
```

```
q_test_ii <- qaptest(list(zn_matrix_usa_ii, zn_matrix_canada_ii),
                          gcor,
                          g1=1,
                          g2=2,
                          reps=10000)
summary(q_test_ii)
```

```
##
## QAP Test Results
##
## Estimated p-values:
##  p(f(perm) >= f(d)): 0
##  p(f(perm) <= f(d)): 1
##
## Test Diagnostics:
##  Test Value (f(d)): 0.776628
##  Replications: 10000
##  Distribution Summary:
##      Min:     -0.3725553
##      1stQ:    -0.07354089
##      Med:     -0.007960572
##      Mean:    -0.002126702
##      3rdQ:    0.06454985
##      Max:     0.4435706
```