Ant Climate Project

Path analysis: Tropical vs other

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Contents

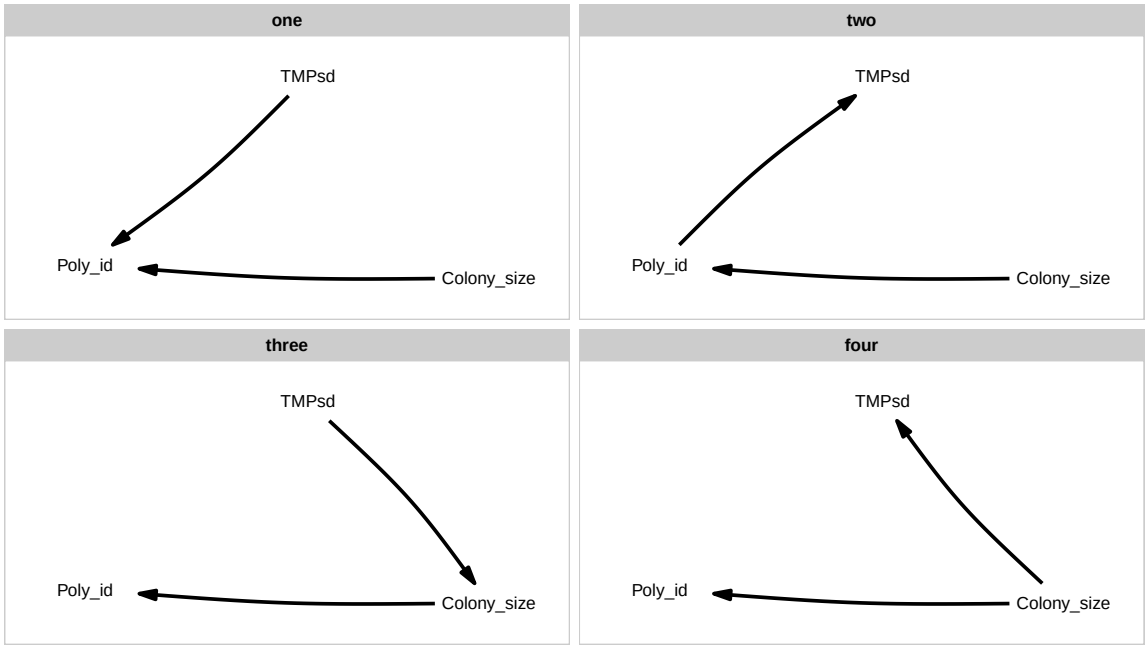
Read in the ant data and prepare the variables for path analysis. There are 474 species (116 tropical, 358 other) for which data is available for colony size and climatic variables, excluding special ants.

1 Create alternative causal models

When more than on climatic variable is present in the best model (based on AIC model selection), we divide the path analysis into two analyses: (i) Analysis with only the temperature climatic variable (TMPsd) and (ii) Analysis with only the rainfall climatic variable (PREavg). This is because path analysis would not accept having more than one climatic predictor in the analysis because the linear models produced had highly significant relationships between the multiple climatic predictors being analysed. The potential model set is reduced to just two models for each analysis, based on all of the possible models given that colony size has an effect on the number of worker castes.

1.1 Tropical

1.1.1 Alternative causal models - TMPsd

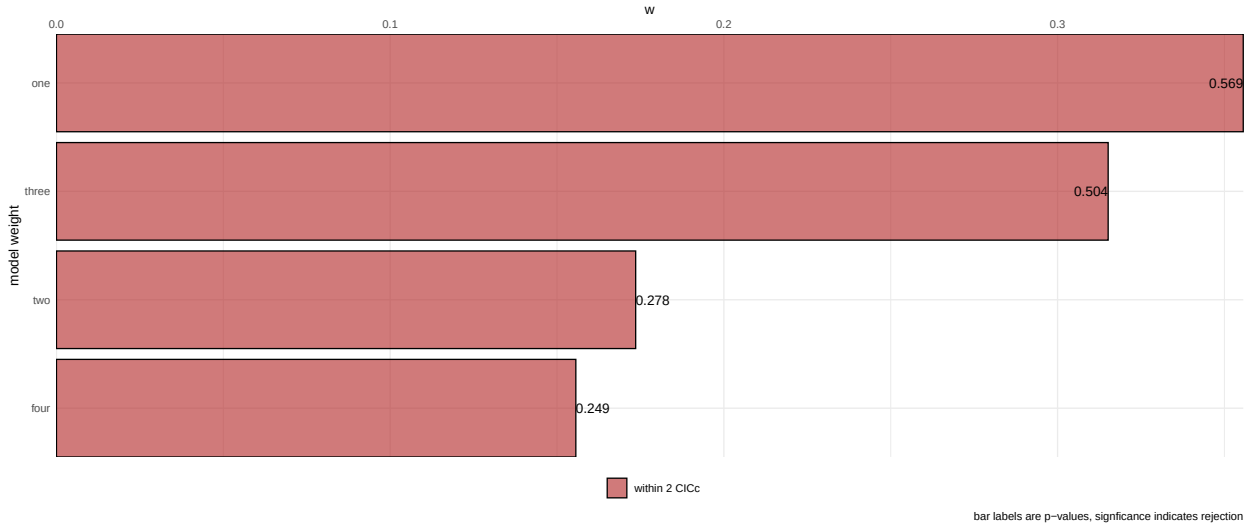


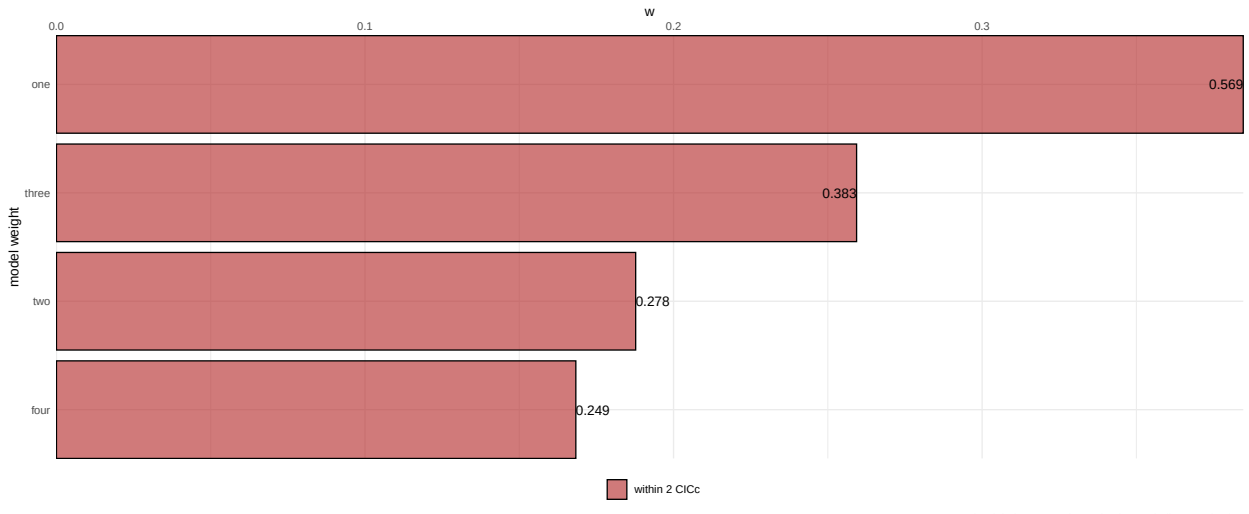
1.1.2 Path analysis

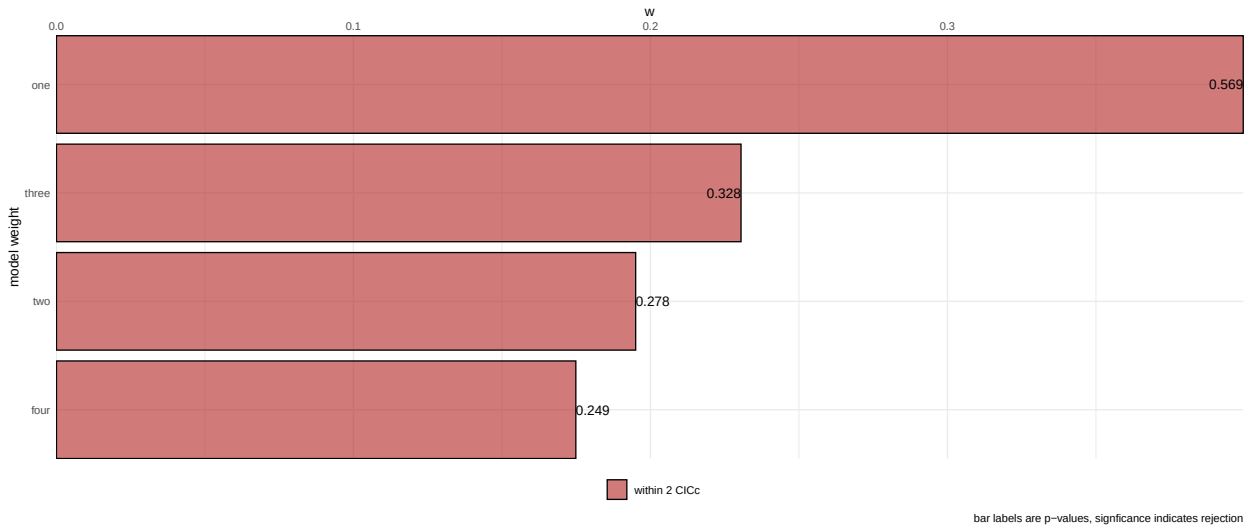
1.1.2.1 TMPsd

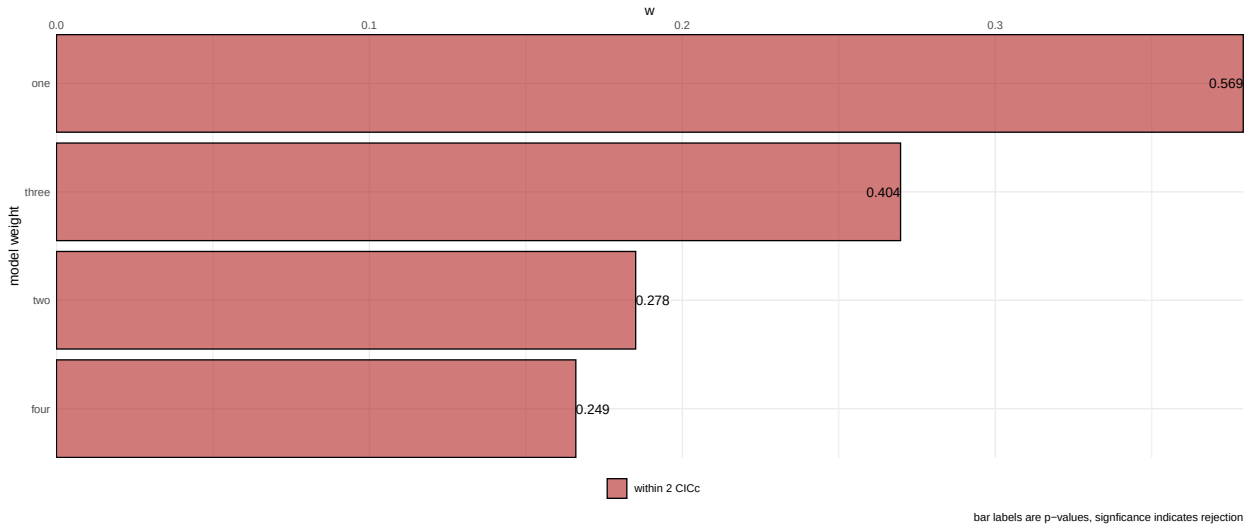
```
##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7      0.000 1.000 0.356
## three three 1 5 1.37 0.504 11.9      0.242 0.886 0.315
## two     two 1 5 2.56 0.278 13.1      1.435 0.488 0.174
## four   four 1 5 2.78 0.249 13.3      1.653 0.438 0.156
```

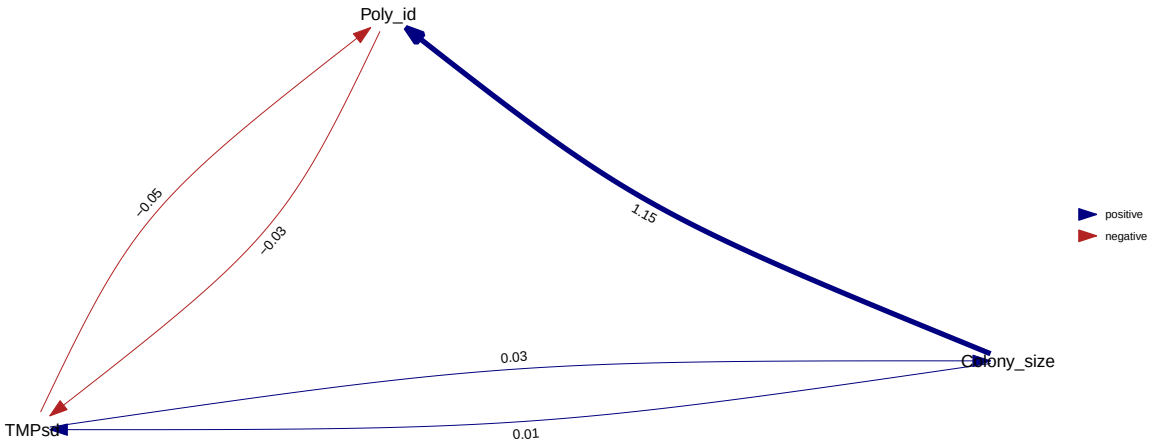
```
##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7      0.000 1.000 0.385
## three three 1 5 1.92 0.383 12.5      0.788 0.674 0.259
## two     two 1 5 2.56 0.278 13.1      1.435 0.488 0.188
## four   four 1 5 2.78 0.249 13.3      1.653 0.438 0.168

##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7       0.00 1.000 0.400
## three three 1 5 2.23 0.328 12.8       1.10 0.577 0.230
## two     two 1 5 2.56 0.278 13.1       1.43 0.488 0.195
## four   four 1 5 2.78 0.249 13.3       1.65 0.438 0.175

##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7      0.000 1.000 0.379
## three three 1 5 1.81 0.404 12.4      0.681 0.711 0.270
## two     two 1 5 2.56 0.278 13.1      1.435 0.488 0.185
## four   four 1 5 2.78 0.249 13.3      1.653 0.438 0.166
```

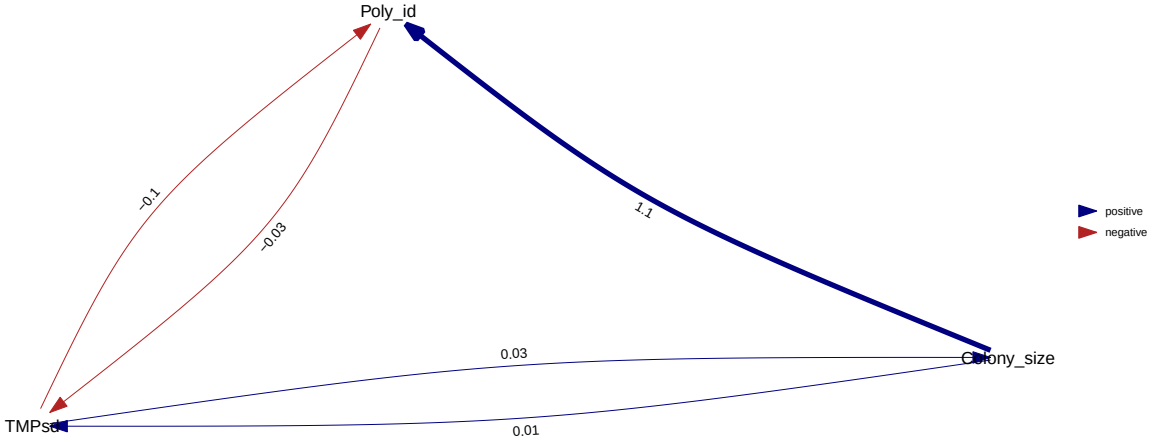


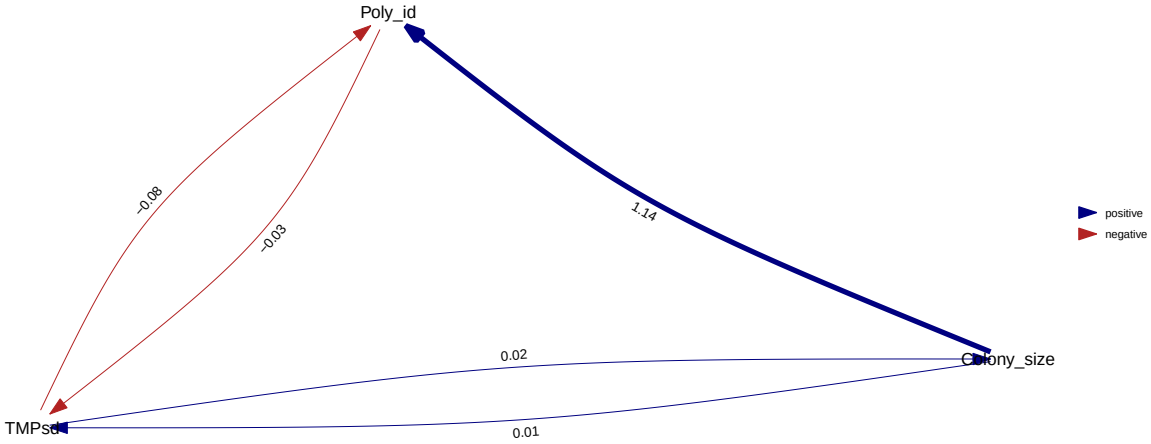


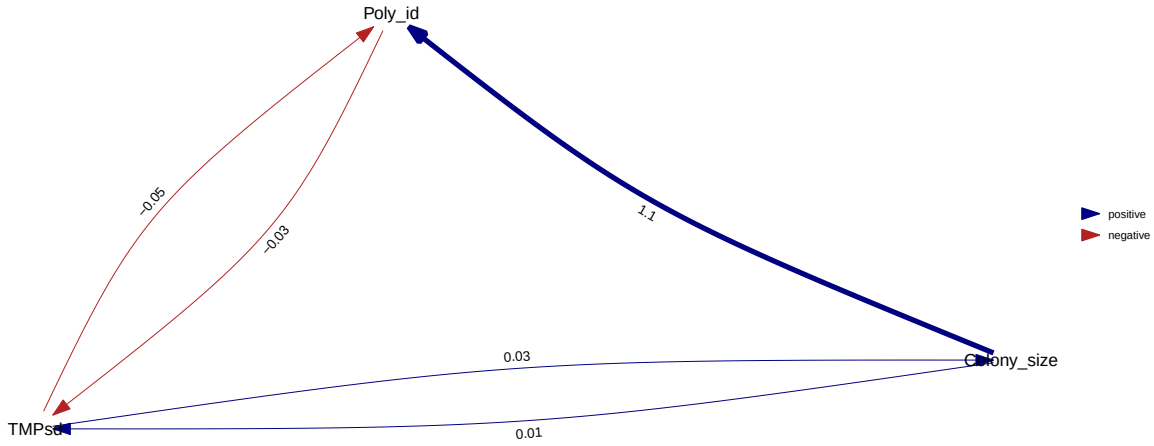

w
0.0
0.1
0.2
0.3
model weight
one
three
two
four
0.569
0.328
0.278
0.249
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.1
0.2
0.3
model weight
one
three
two
four
0.569
0.404
0.278
0.249
within 2 CICc
bar labels are p−values, signficance indicates rejection


Poly_id
−0.05
−0.03
1.15
positive
negative
0.03
Colony_size
TMPsd
0.01

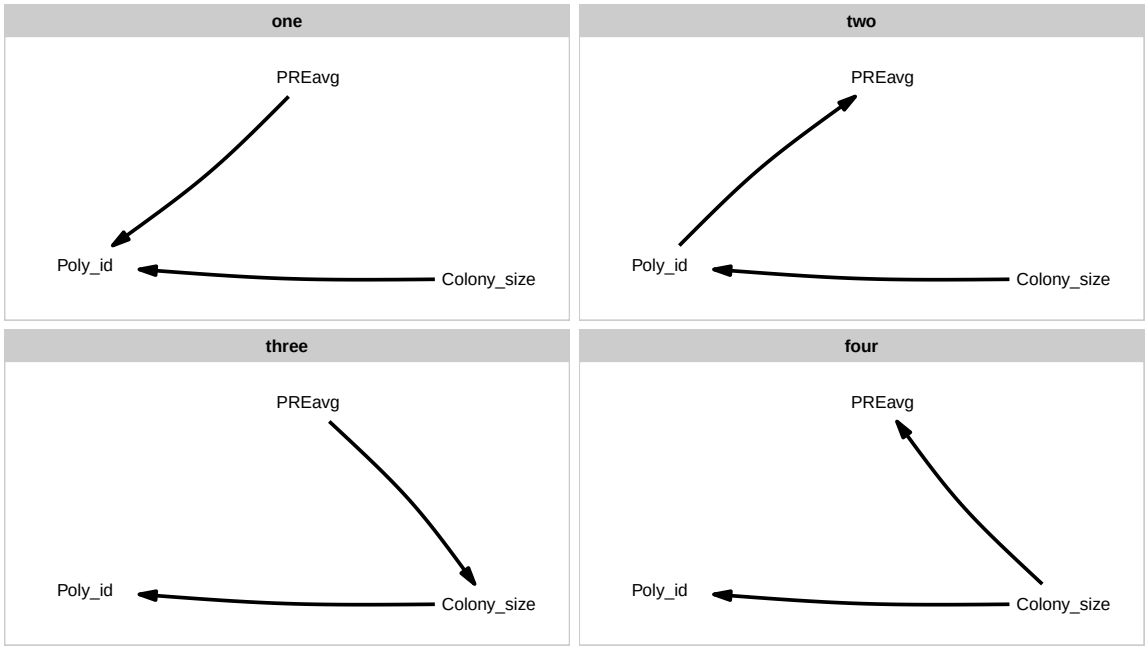

Poly_id
−0.1
−0.03
1.1
positive
negative
0.03
Colony_size
TMPsd
0.01


Poly_id
−0.08
−0.03
1.14
positive
negative
0.02
Colony_size
TMPsd
0.01

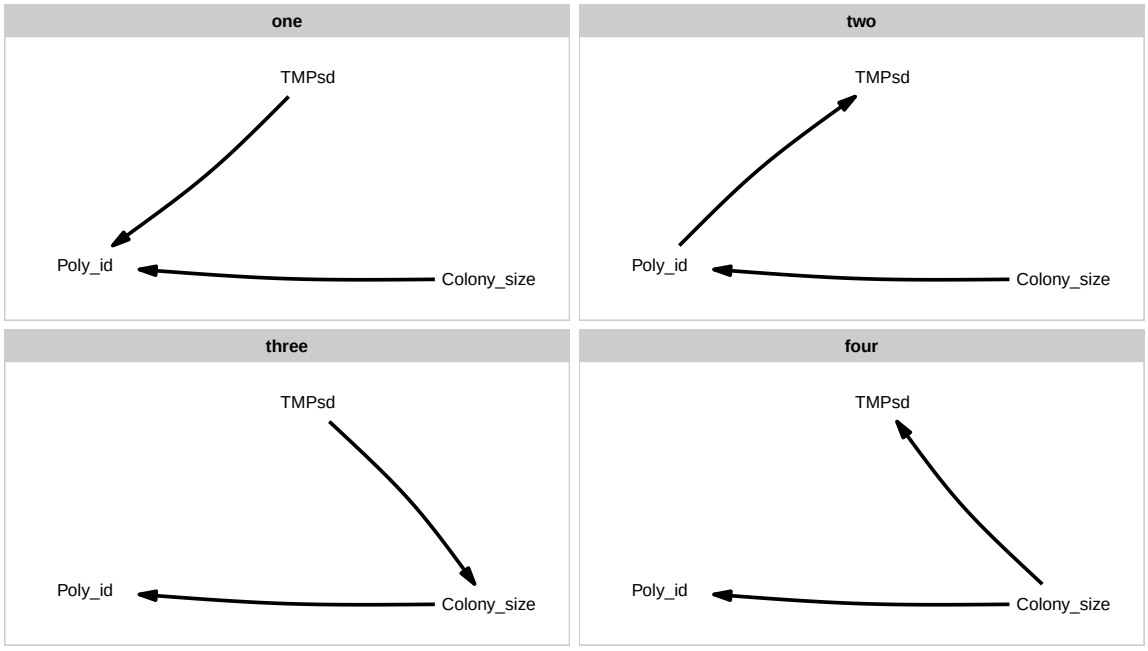


1.2 Other

1.2.1 Alternative causal models - PREavg



1.2.2 Alternative causal models - TMPsd



1.2.3 Path analysis

1.2.3.1 PREavg

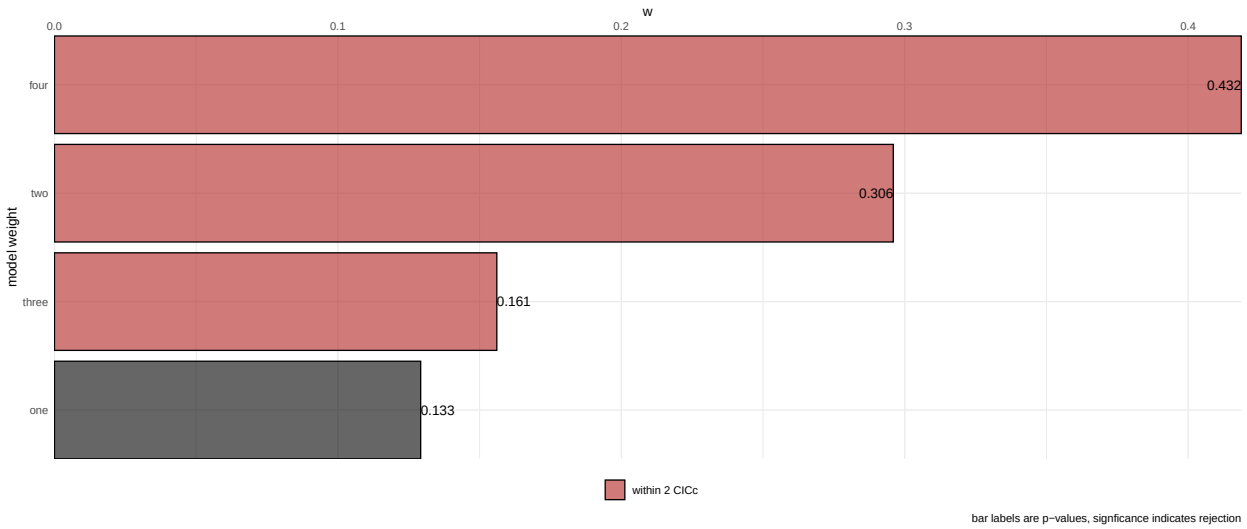
```
##       model k q    C     p CICc delta_CICc     l     w
## four   four 1 5 1.68 0.432 11.8      0.000 1.000 0.419
## two     two 1 5 2.37 0.306 12.5      0.694 0.707 0.296
## three three 1 5 3.65 0.161 13.8      1.974 0.373 0.156
## one     one 1 5 4.03 0.133 14.2      2.352 0.309 0.129
```

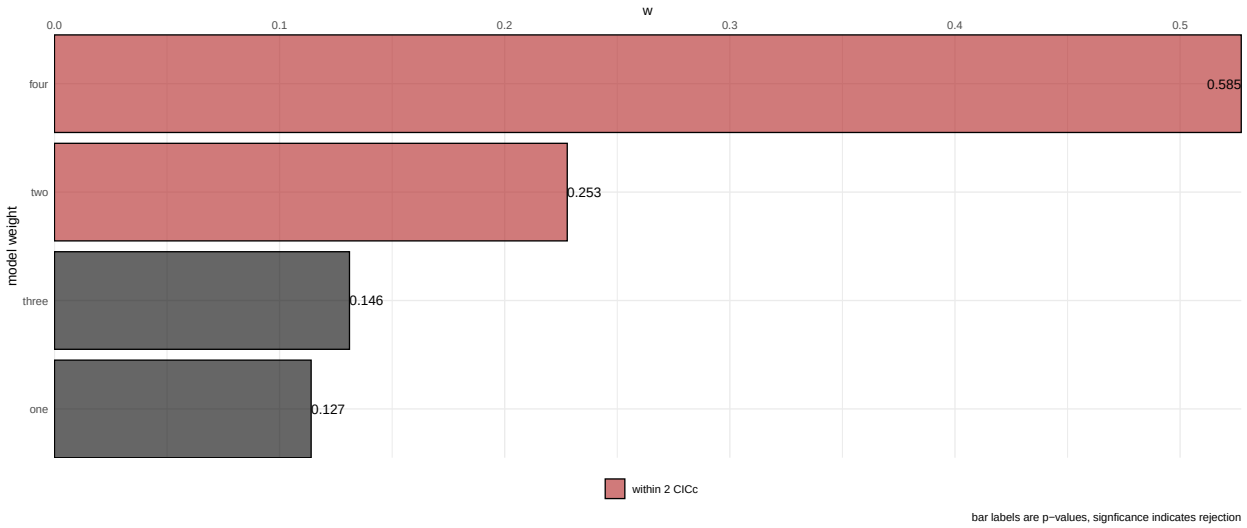
```
##       model k q    C     p CICc delta_CICc     l     w
## four   four 1 5 1.07 0.585 11.2       0.00 1.000 0.527
## two     two 1 5 2.75 0.253 12.9       1.68 0.432 0.228
## three three 1 5 3.85 0.146 14.0       2.78 0.249 0.131
## one     one 1 5 4.13 0.127 14.3       3.06 0.216 0.114
```

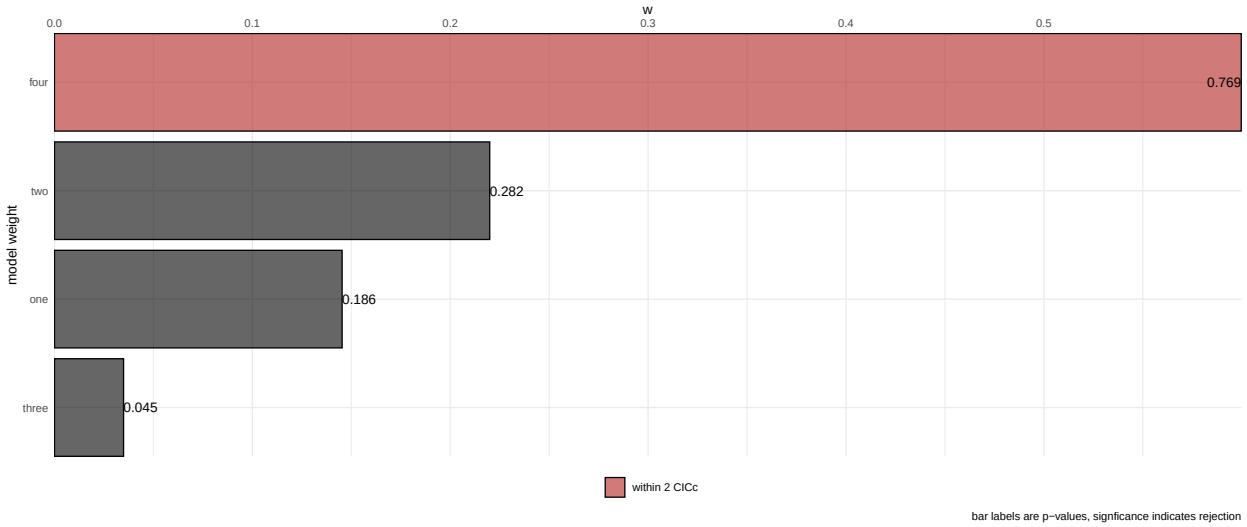
```
##       model k q     C      p CICc delta_CICc      l      w
## four   four 1 5 0.526 0.7688 10.7       0.00 1.0000 0.5997
## two     two 1 5 2.532 0.2820 12.7       2.01 0.3668 0.2200
## one     one 1 5 3.360 0.1863 13.5       2.83 0.2424 0.1454
## three three 1 5 6.213 0.0448 16.4       5.69 0.0582 0.0349
```

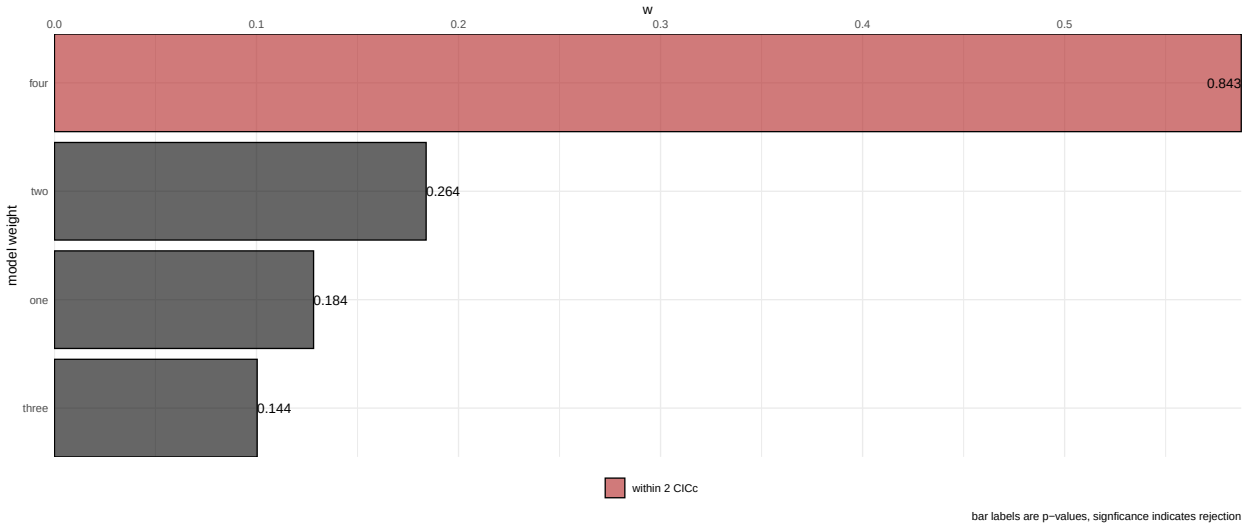
```
##       model k q     C     p CICc delta_CICc     l     w
## four   four 1 5 0.342 0.843 10.5       0.00 1.000 0.587
## two     two 1 5 2.663 0.264 12.8       2.32 0.313 0.184
```

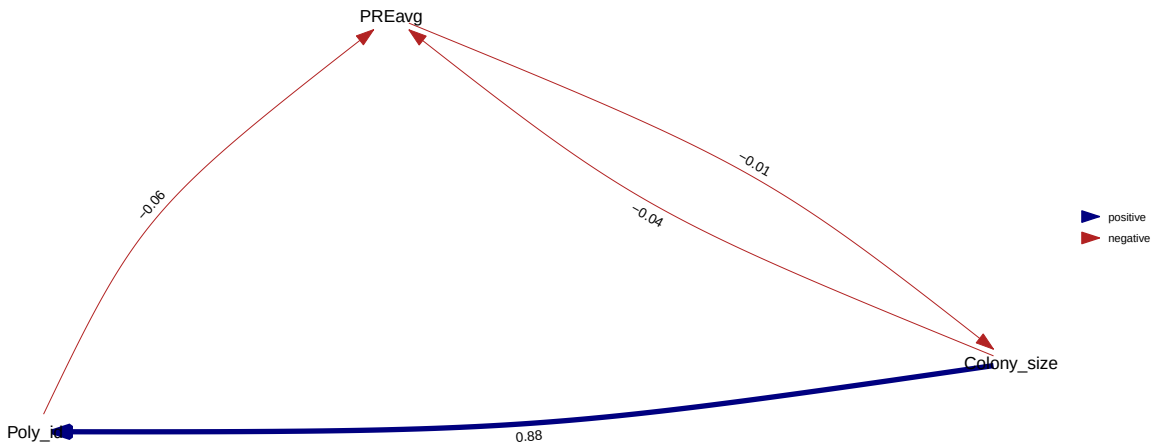
```
## one     one 1 5 3.385 0.184 13.6       3.04 0.218 0.128
## three three 1 5 3.876 0.144 14.0       3.53 0.171 0.100
```

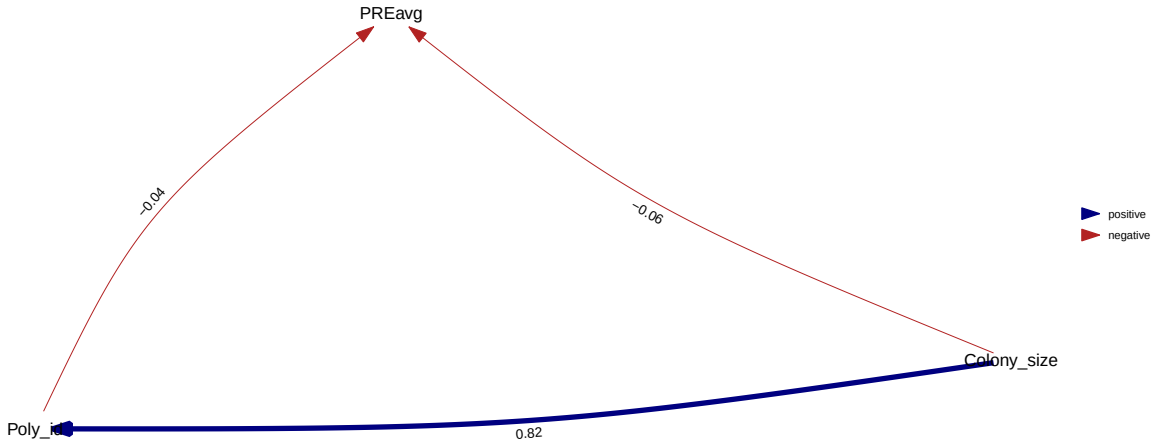


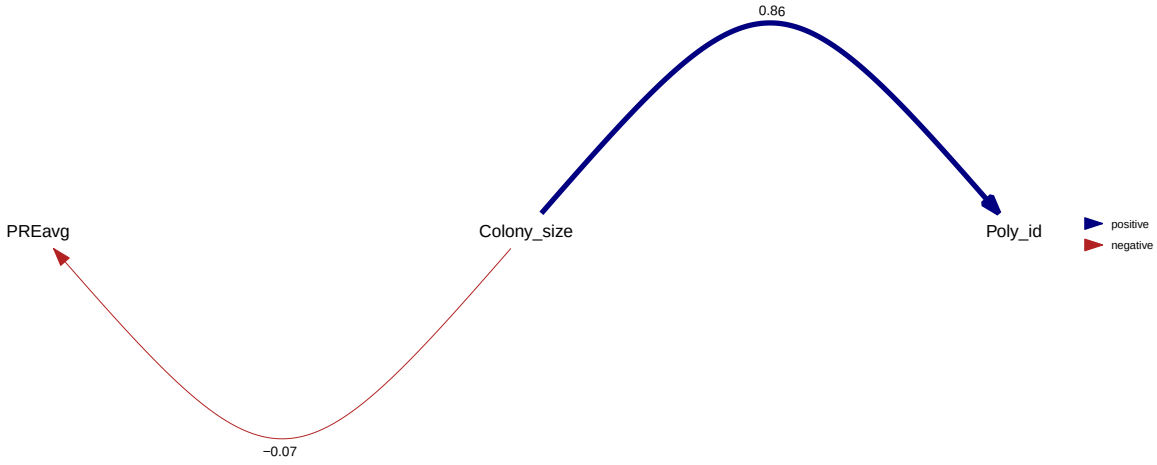


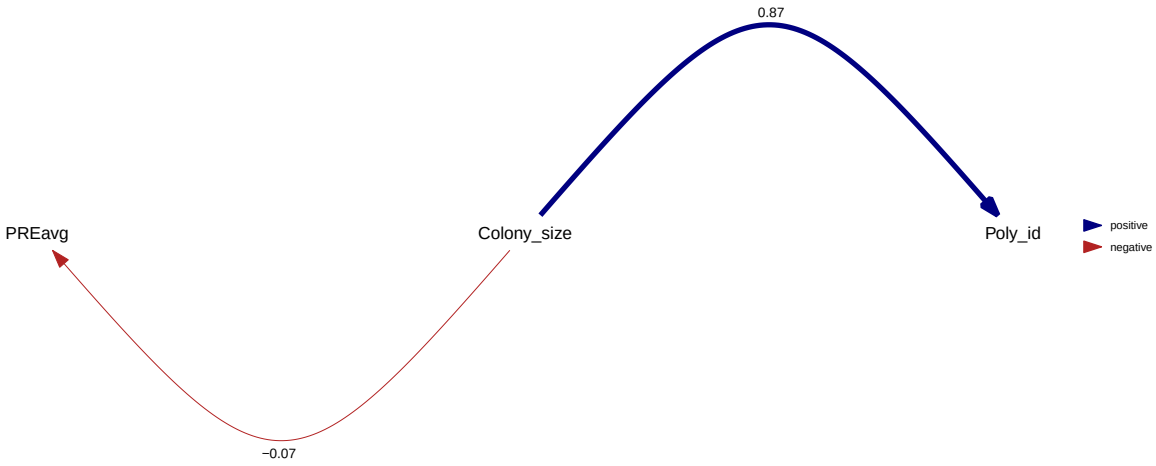

w
0.0
0.1
0.2
0.3
0.4
0.5
four
two
one
three
model weight
0.769
0.282
0.186
0.045
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.1
0.2
0.3
0.4
0.5
four
two
one
three
model weight
0.843
0.264
0.184
0.144
within 2 CICc
bar labels are p−values, signficance indicates rejection


PREavg
−0.06
−0.01
−0.04
positive
negative
Colony_size
0.88


PREavg
−0.04
−0.06
positive
negative
Colony_size
Poly_id
0.82


0.86
PREavg
Colony_size
Poly_id
positive
negative
−0.07



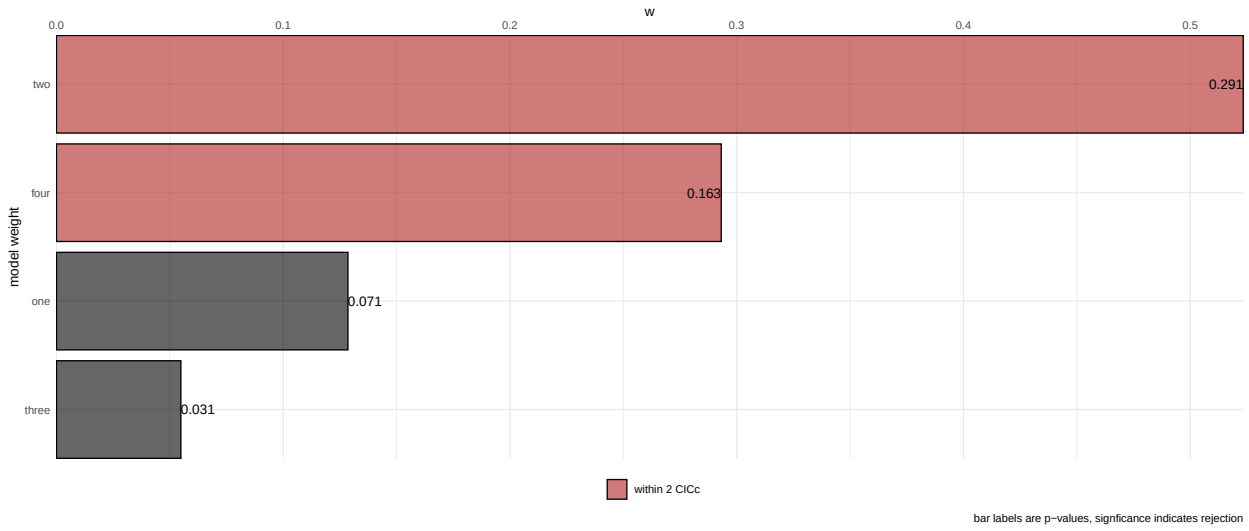
1.2.3.2 TMPsd

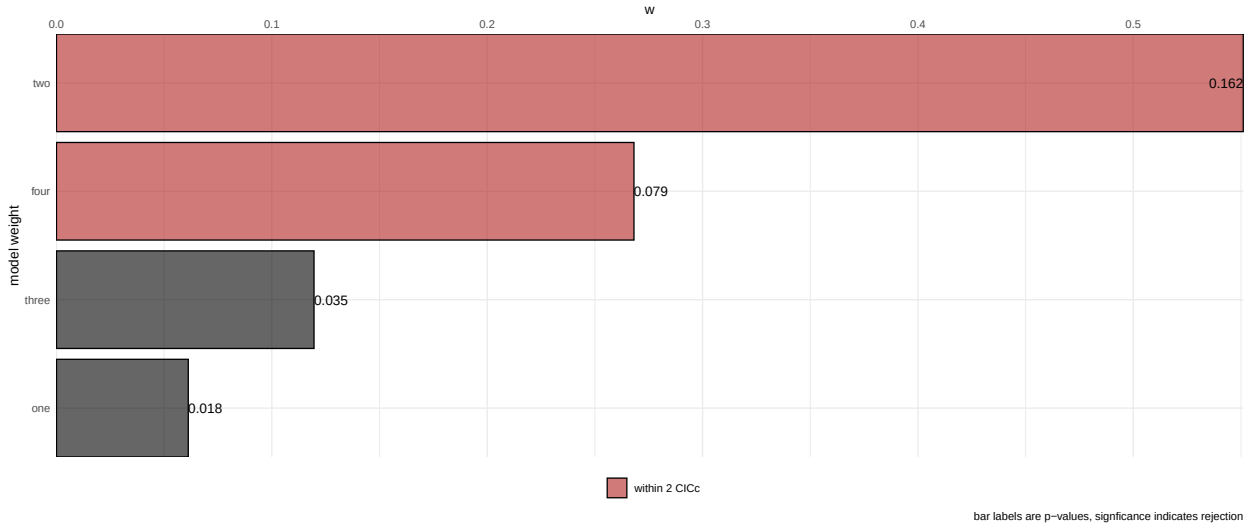
```
##       model k q    C      p CICc delta_CICc     l      w
## two     two 1 5 2.47 0.2909 12.6       0.00 1.000 0.5234
## four   four 1 5 3.63 0.1629 13.8       1.16 0.560 0.2932
## one     one 1 5 5.28 0.0714 15.4       2.81 0.246 0.1286
## three three 1 5 6.98 0.0305 17.2       4.51 0.105 0.0549
```

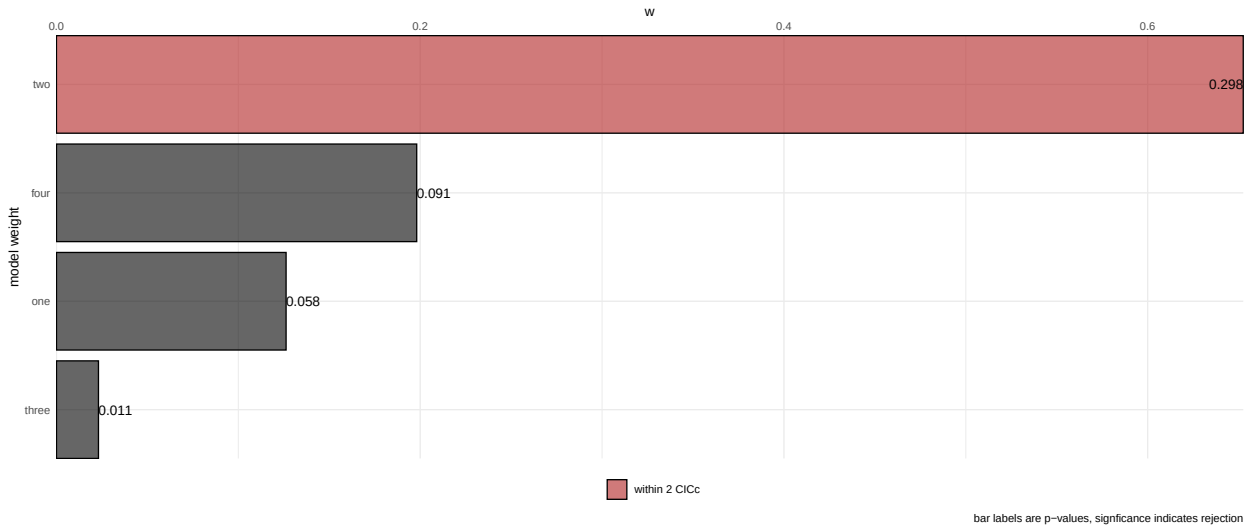
```
##       model k q    C      p CICc delta_CICc     l      w
## two     two 1 5 3.65 0.1615 13.8       0.00 1.000 0.5510
## four   four 1 5 5.09 0.0786 15.3       1.44 0.487 0.2682
## three three 1 5 6.70 0.0351 16.9       3.06 0.217 0.1196
## one     one 1 5 8.04 0.0179 18.2       4.40 0.111 0.0612
```

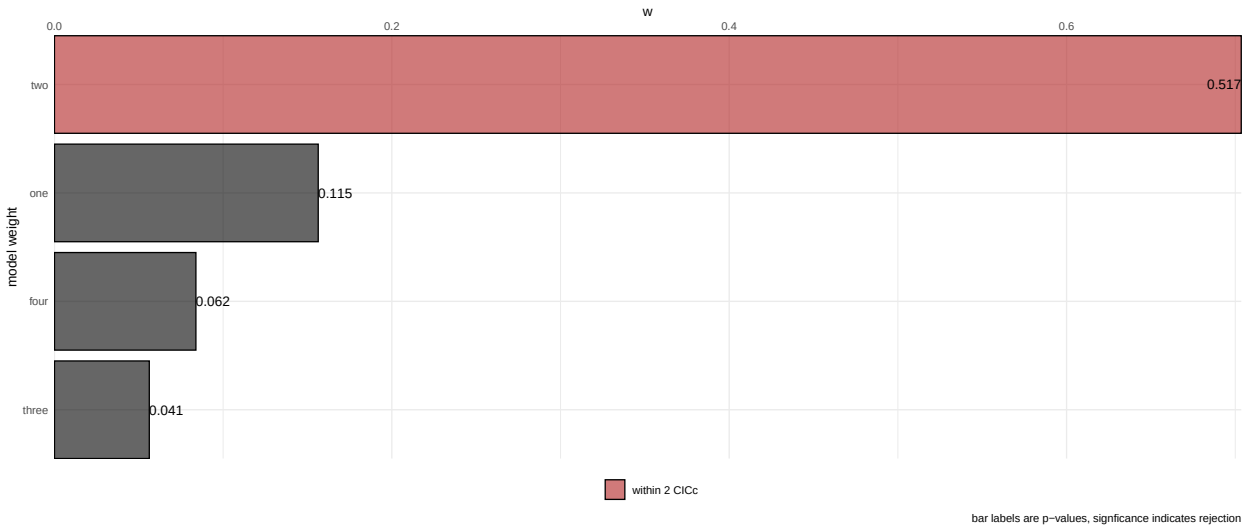
```
##       model k q    C      p CICc delta_CICc      l      w
## two     two 1 5 2.42 0.2982 12.6       0.00 1.0000 0.6525
## four   four 1 5 4.80 0.0905 15.0       2.38 0.3036 0.1981
## one     one 1 5 5.71 0.0577 15.9       3.29 0.1935 0.1263
## three three 1 5 9.10 0.0106 19.3       6.68 0.0354 0.0231
```

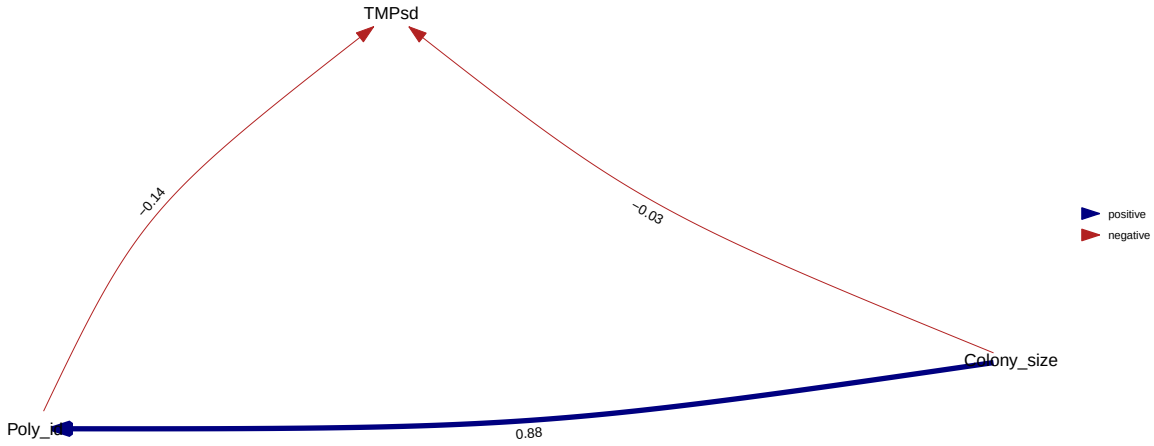
```
##       model k q    C      p CICc delta_CICc      l      w
## two     two 1 5 1.32 0.5175 11.5       0.00 1.0000 0.7036
## one     one 1 5 4.33 0.1150 14.5       3.01 0.2223 0.1564
## four   four 1 5 5.57 0.0617 15.7       4.25 0.1192 0.0839
## three three 1 5 6.37 0.0414 16.5       5.05 0.0799 0.0562
```

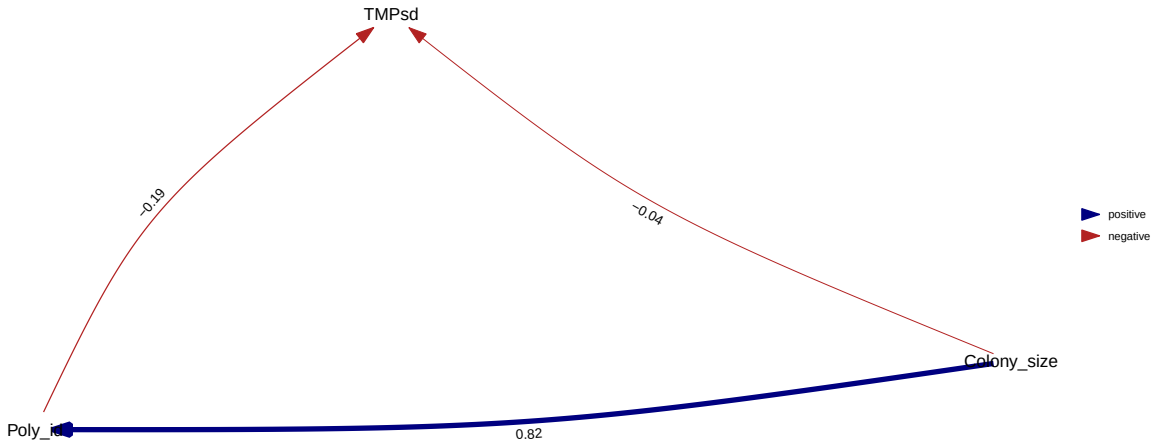

w
0.0
0.1
0.2
0.3
0.4
0.5
two
four
one
three
model weight
0.291
0.163
0.071
0.031
within 2 CICc
bar labels are p−values, signficance indicates rejection

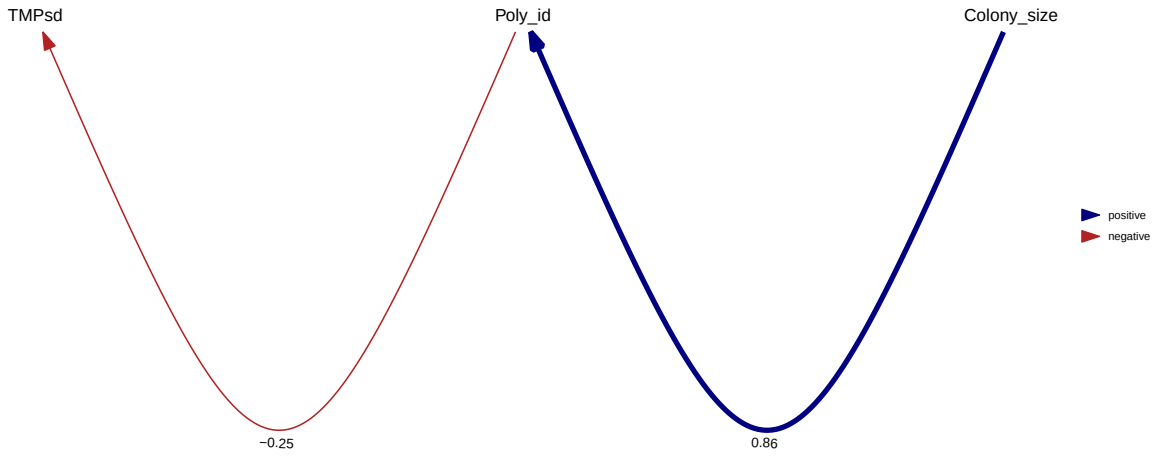

w
0.0
0.1
0.2
0.3
0.4
0.5
two
four
three
one
model weight
0.162
0.079
0.035
0.018
within 2 CICc
bar labels are p−values, signficance indicates rejection

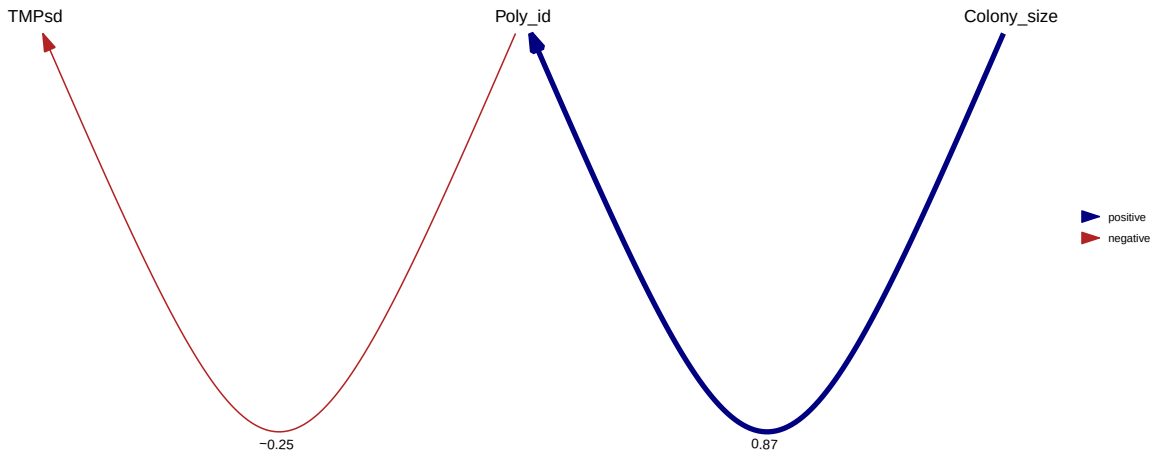

w
0.0
0.2
0.4
0.6
two
four
one
three
model weight
0.298
0.091
0.058
0.011
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.2
0.4
0.6
two
one
four
three
0.517
0.115
0.062
0.041
model weight
within 2 CICc
bar labels are p−values, signficance indicates rejection


TMPsd
−0.14
−0.03
positive
negative
Colony_size
0.88


TMPsd
−0.19
−0.04
Colony_size
Poly_id
0.82
positive
negative


TMPsd
Poly_id
Colony_size
−0.25
0.86
positive
negative


TMPsd
Poly_id
Colony_size
−0.25
0.87
positive
negative