Ant Climate Project

Path analysis

Louis Bell-Roberts

July 26, 2023

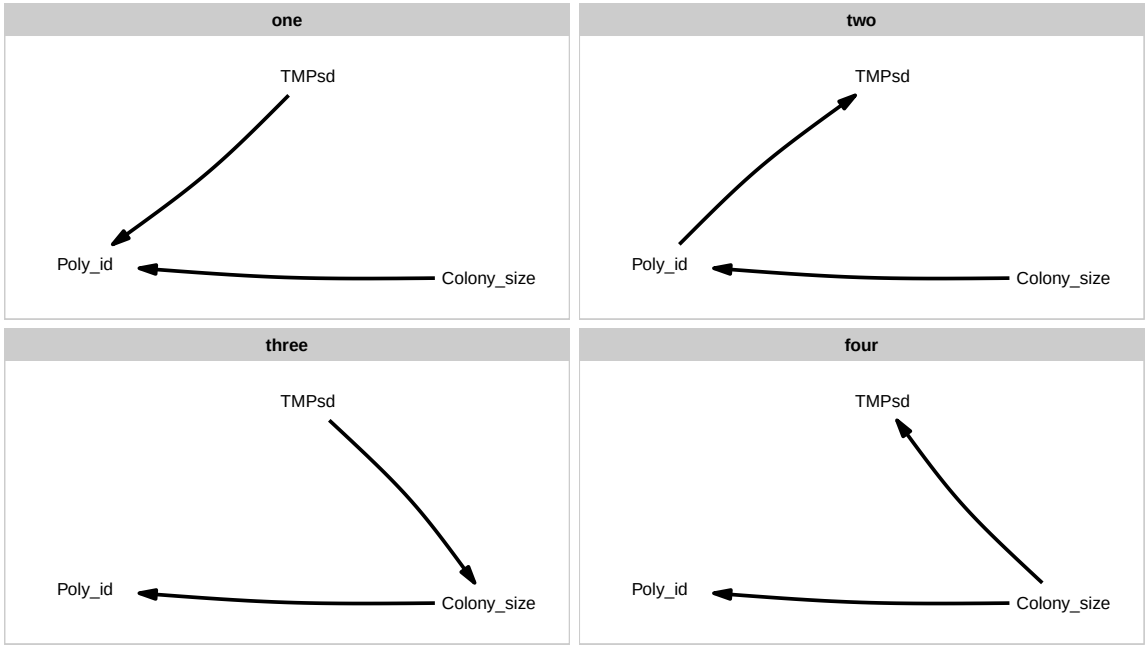
Contents

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

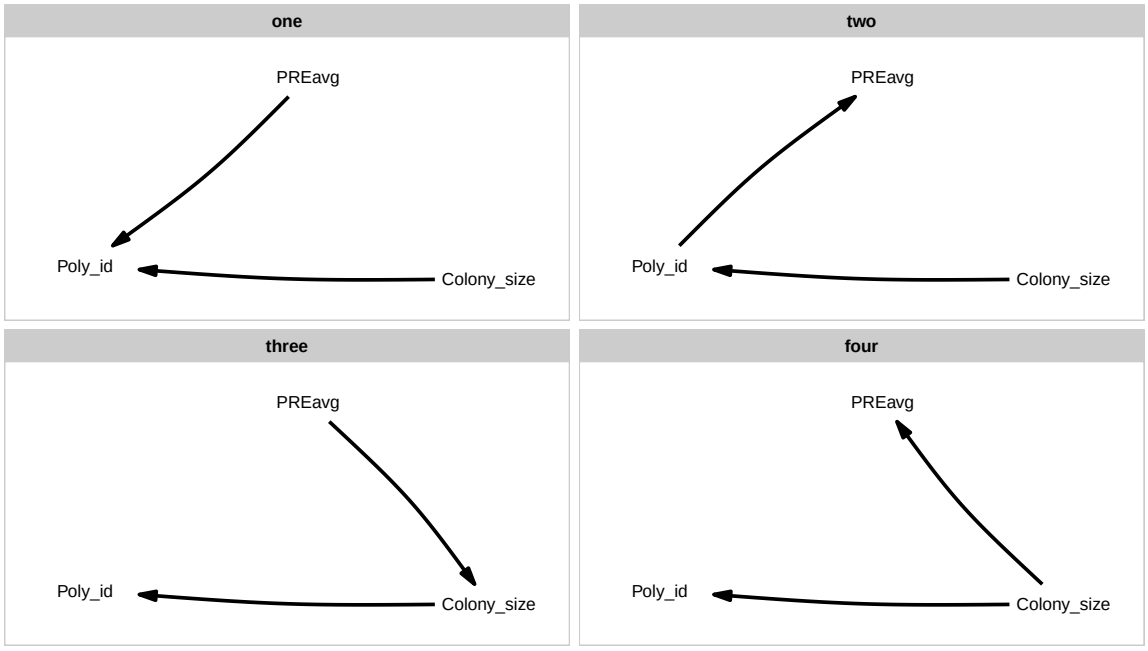
1 Create alternative causal models

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.

1.1 TMPsd



1.2 PREavg

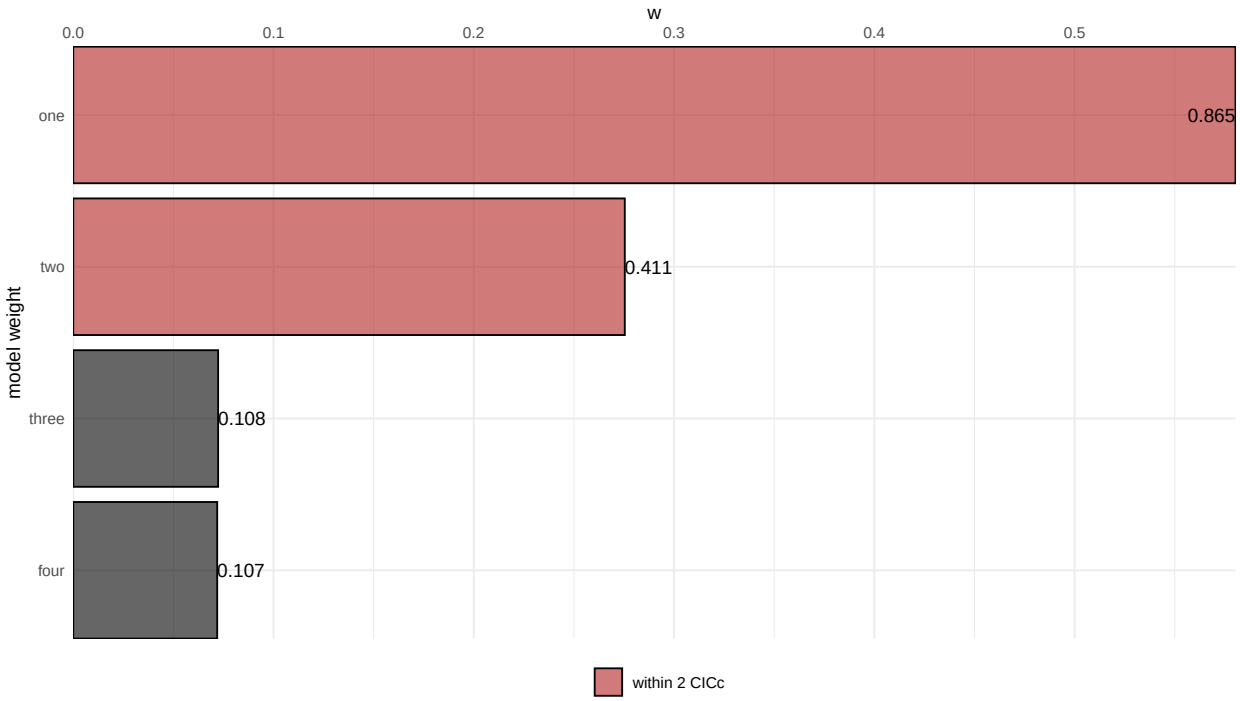


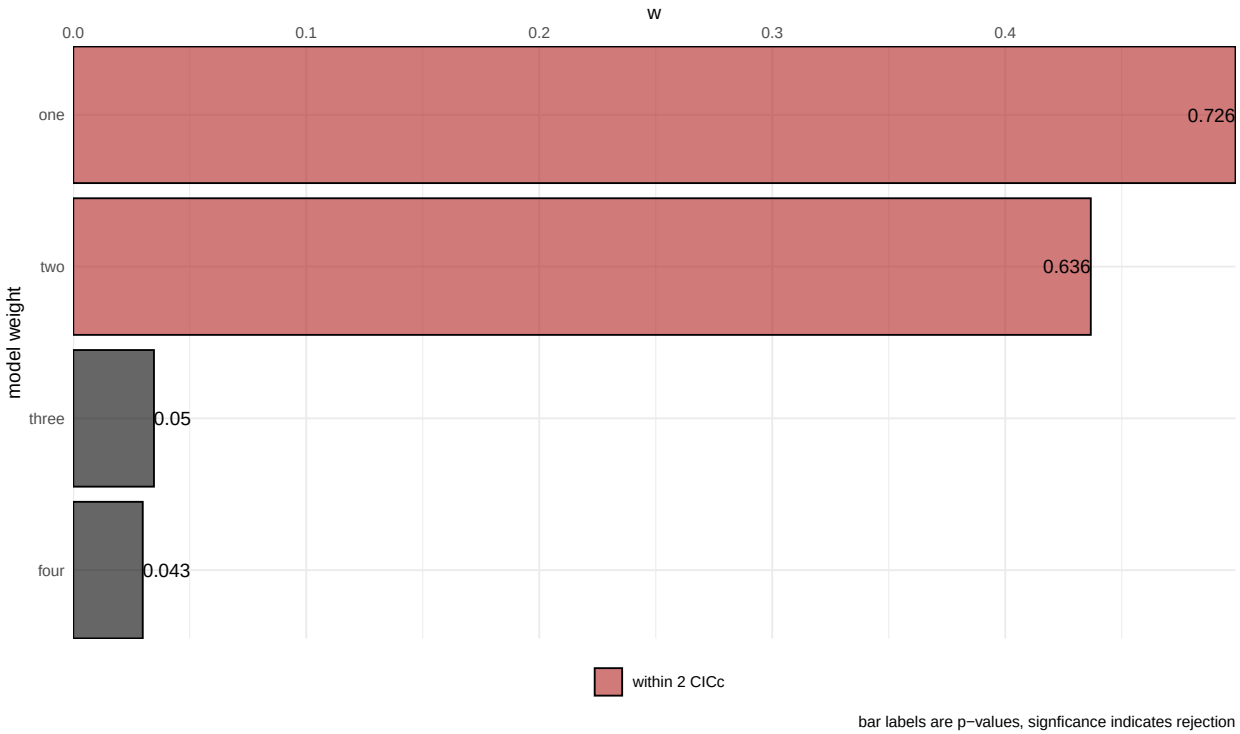
2 Path analysis

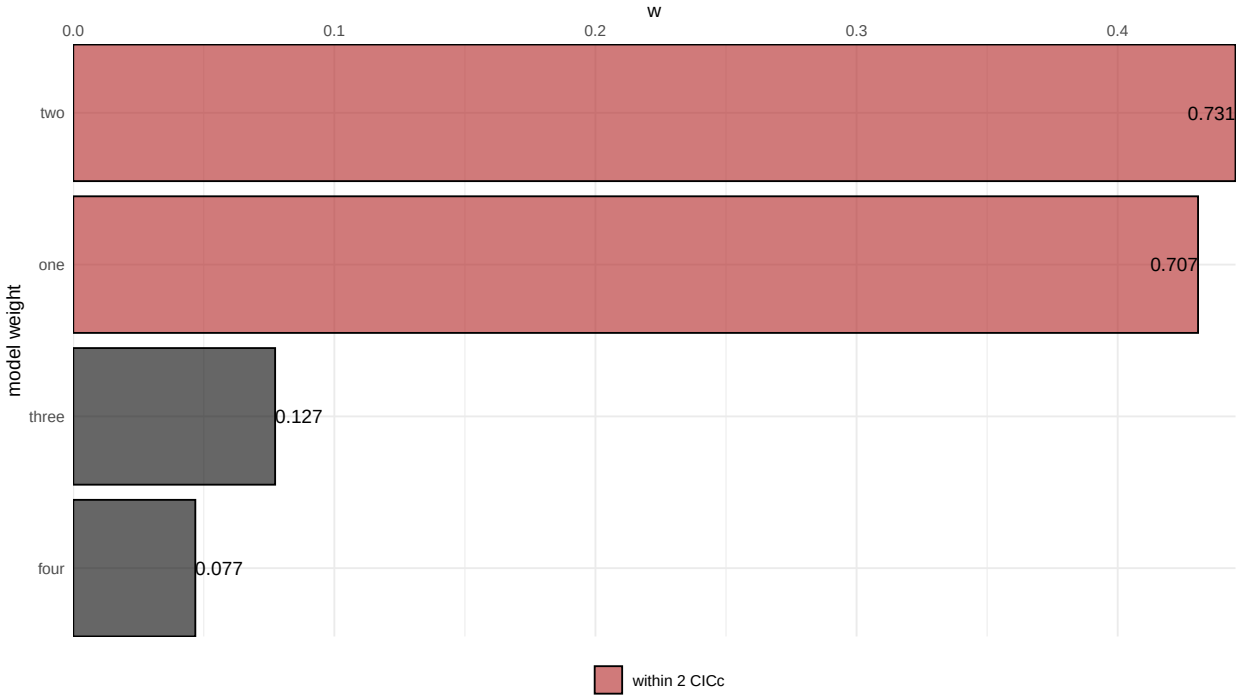
2.1 TMPsd

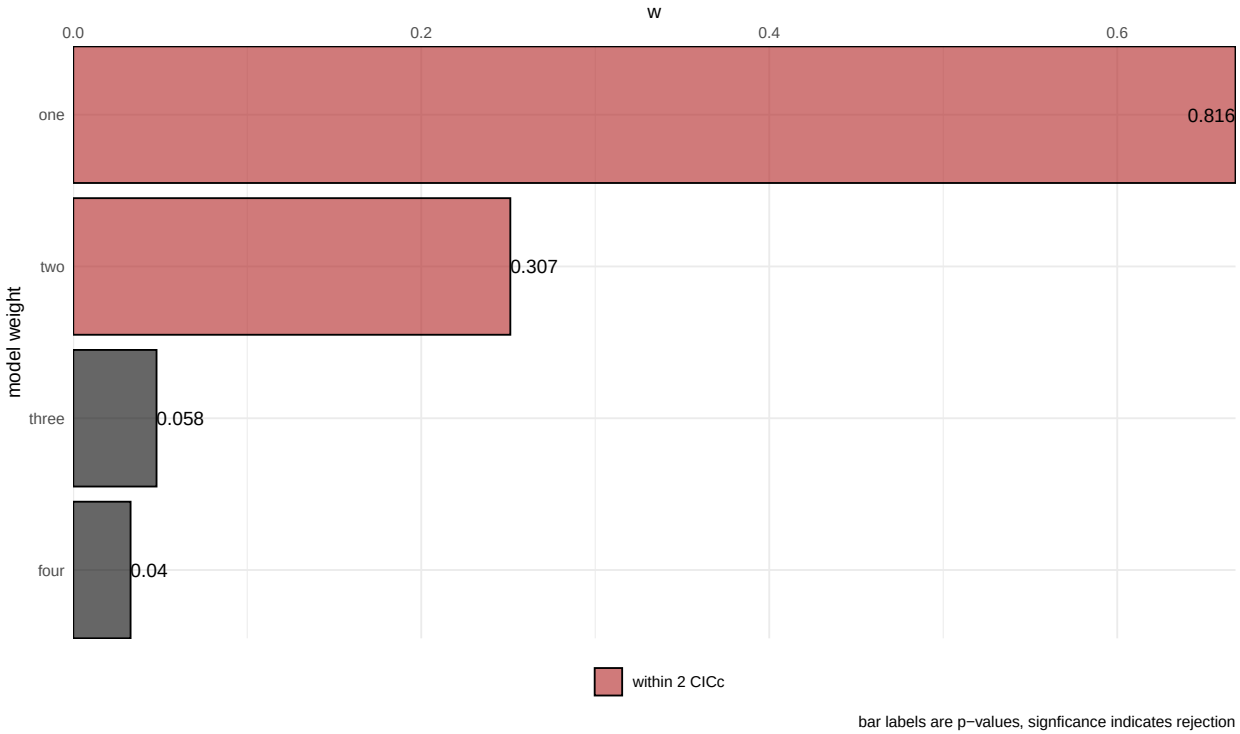
```
##       model k q     C     p CICc delta_CICc     l      w
## one     one 1 5 0.289 0.865 10.4       0.00 1.000 0.5804
## two     two 1 5 1.780 0.411 11.9       1.49 0.475 0.2754
## three three 1 5 4.453 0.108 14.6       4.16 0.125 0.0724
## four   four 1 5 4.466 0.107 14.6       4.18 0.124 0.0719

##       model k q     C      p CICc delta_CICc      l      w
## one     one 1 5 0.640 0.7260 10.8      0.000 1.0000 0.4988
## two     two 1 5 0.906 0.6356 11.0      0.266 0.8755 0.4367
## three three 1 5 5.974 0.0504 16.1      5.334 0.0695 0.0346
## four   four 1 5 6.273 0.0434 16.4      5.633 0.0598 0.0298

##       model k q     C      p CICc delta_CICc     l      w
## two     two 1 5 0.628 0.7306 10.8     0.0000 1.000 0.4451
## one     one 1 5 0.693 0.7071 10.8     0.0655 0.968 0.4308
## three three 1 5 4.129 0.1269 14.3     3.5008 0.174 0.0773
## four   four 1 5 5.134 0.0767 15.3     4.5067 0.105 0.0468

##       model k q     C      p CICc delta_CICc      l      w
## one     one 1 5 0.407 0.8158 10.5       0.00 1.0000 0.6680
```

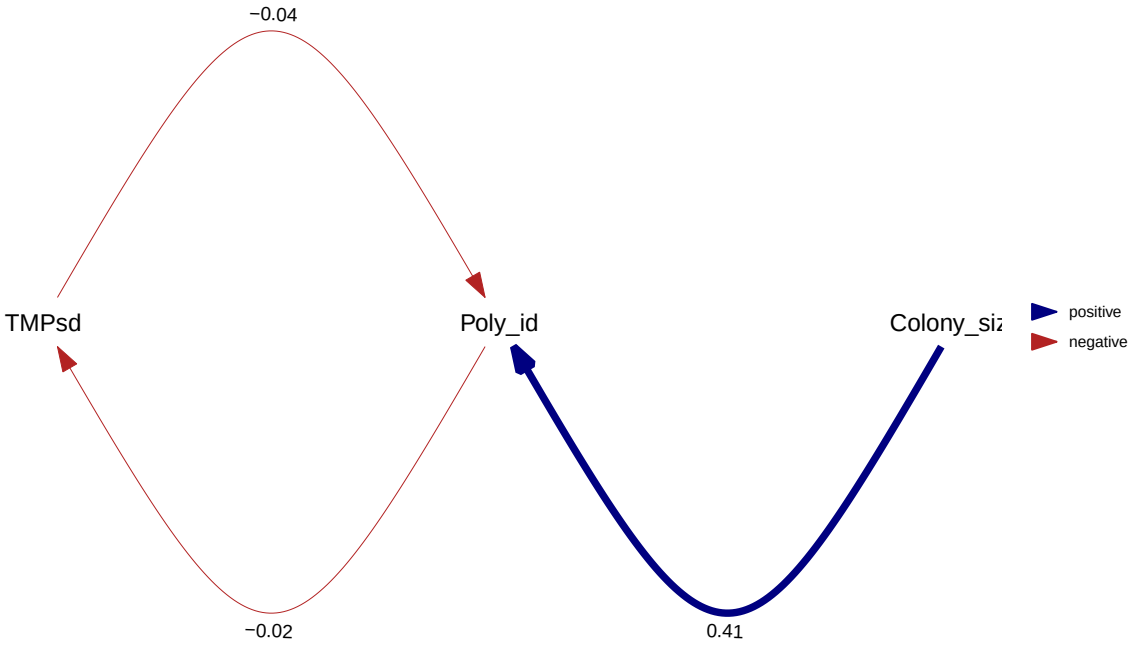
```
## two     two 1 5 2.363 0.3068 12.5       1.96 0.3761 0.2512
## three three 1 5 5.679 0.0585 15.8       5.27 0.0717 0.0479
## four   four 1 5 6.425 0.0402 16.6       6.02 0.0493 0.0330
```

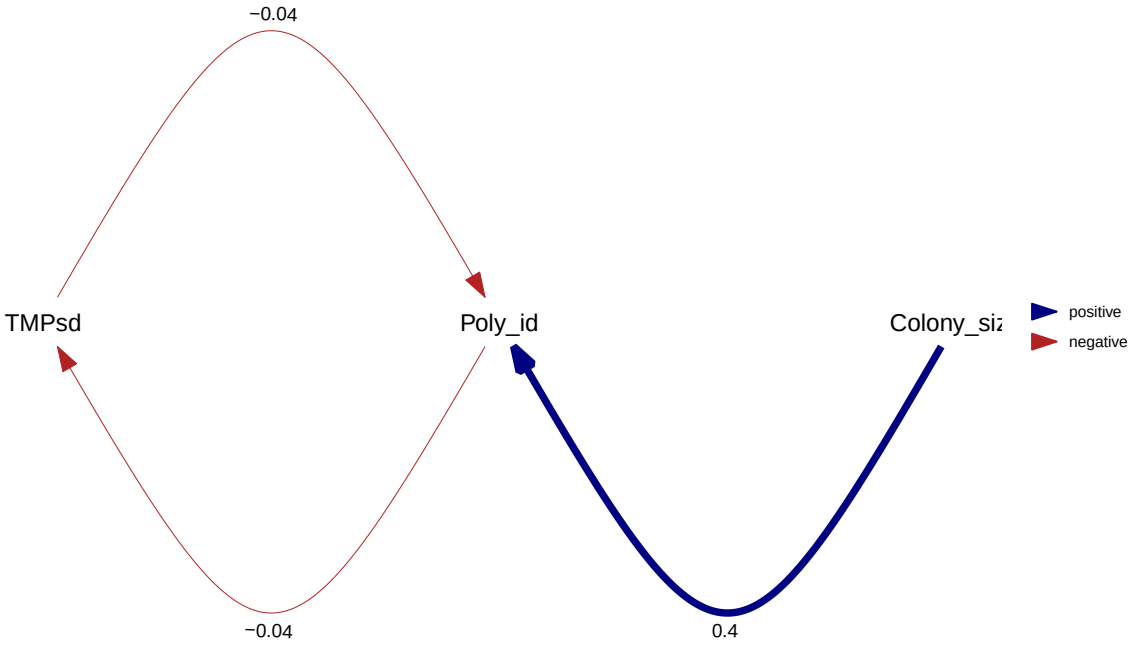


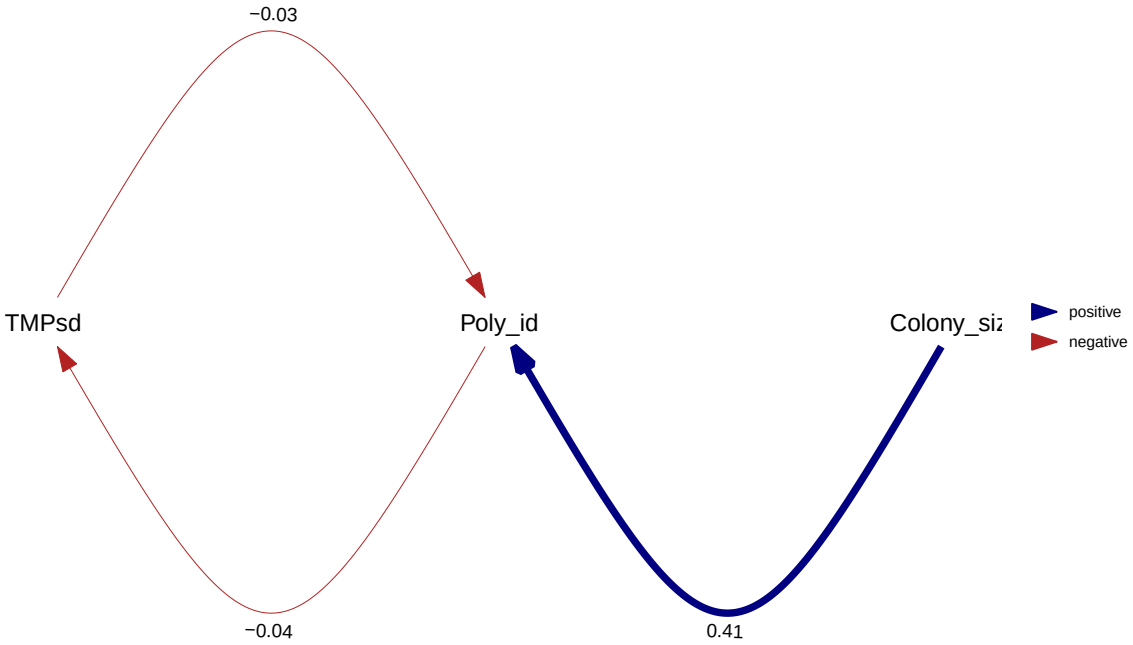


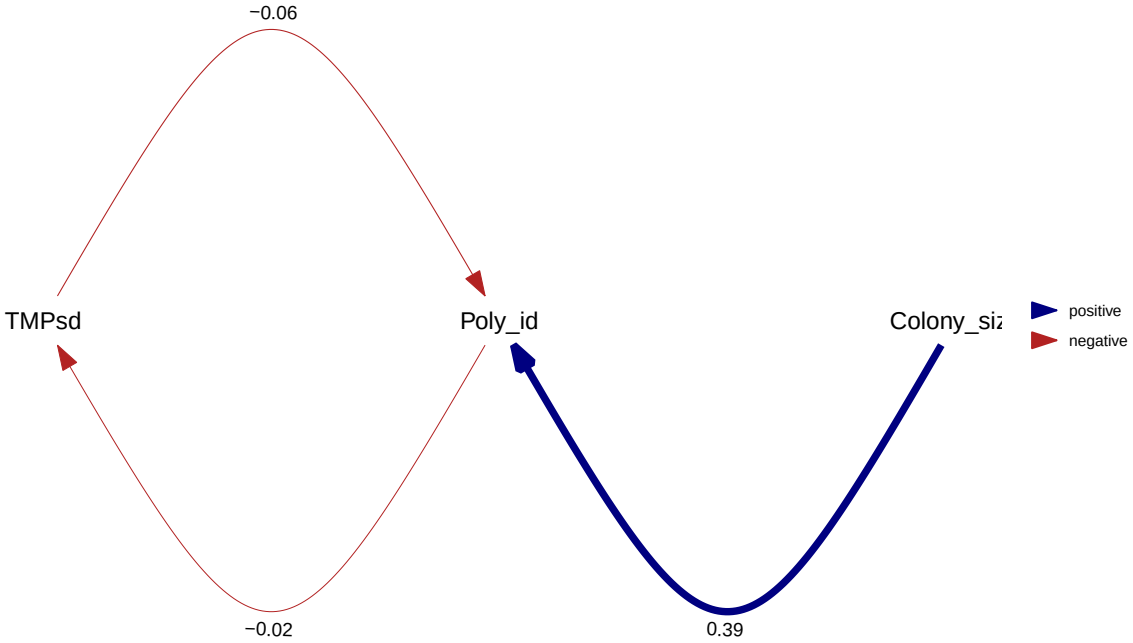

w
0.0
0.1
0.2
0.3
0.4
two
one
three
four
model weight
0.731
0.707
0.127
0.077
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.2
0.4
0.6
one
two
three
four
model weight
0.816
0.307
0.058
0.04
within 2 CICc
bar labels are p−values, signficance indicates rejection


−0.04
TMPsd
Poly_id
Colony_siz
positive
negative
−0.02
0.41


−0.04
TMPsd
Poly_id
Colony_siz
positive
negative
−0.04
0.4





2.2 PREavg

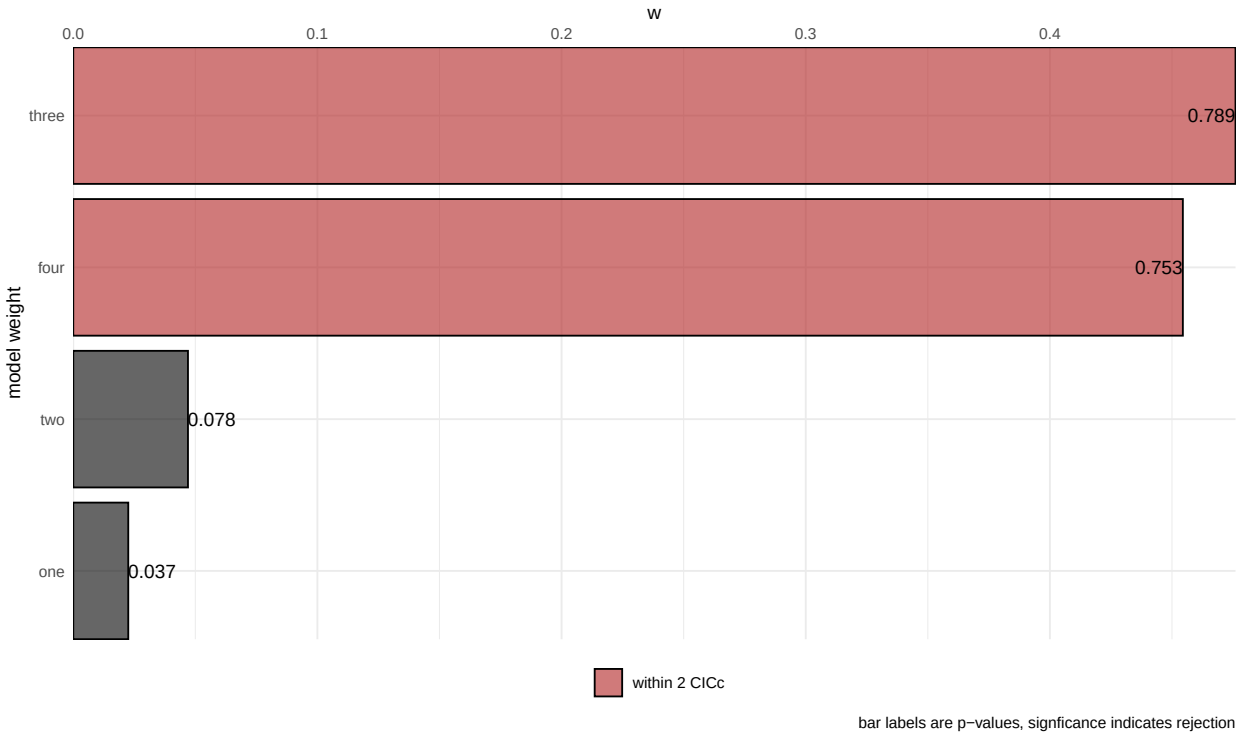
```
##       model k q     C      p CICc delta_CICc      l      w
```

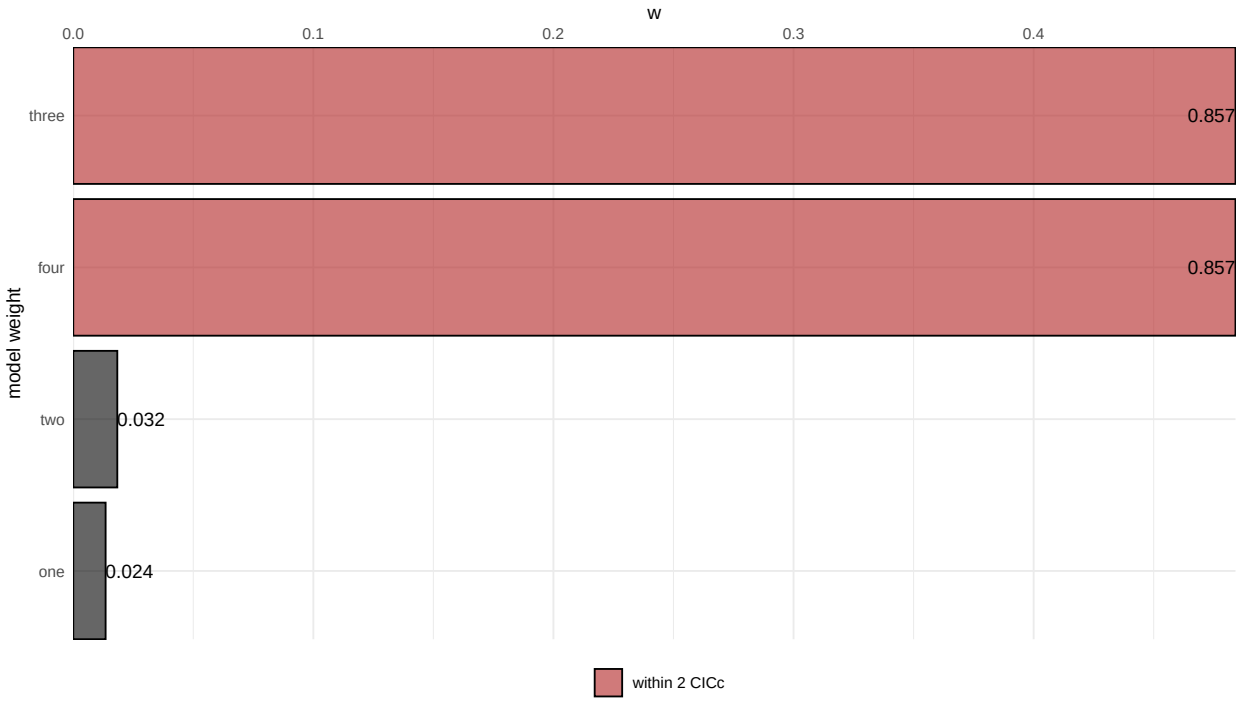
```
## three three 1 5 0.474 0.7890 10.6     0.0000 1.0000 0.4760
## four   four 1 5 0.567 0.7533 10.7     0.0927 0.9547 0.4545
## two     two 1 5 5.105 0.0779 15.2     4.6310 0.0987 0.0470
## one     one 1 5 6.574 0.0374 16.7     6.1005 0.0473 0.0225
```

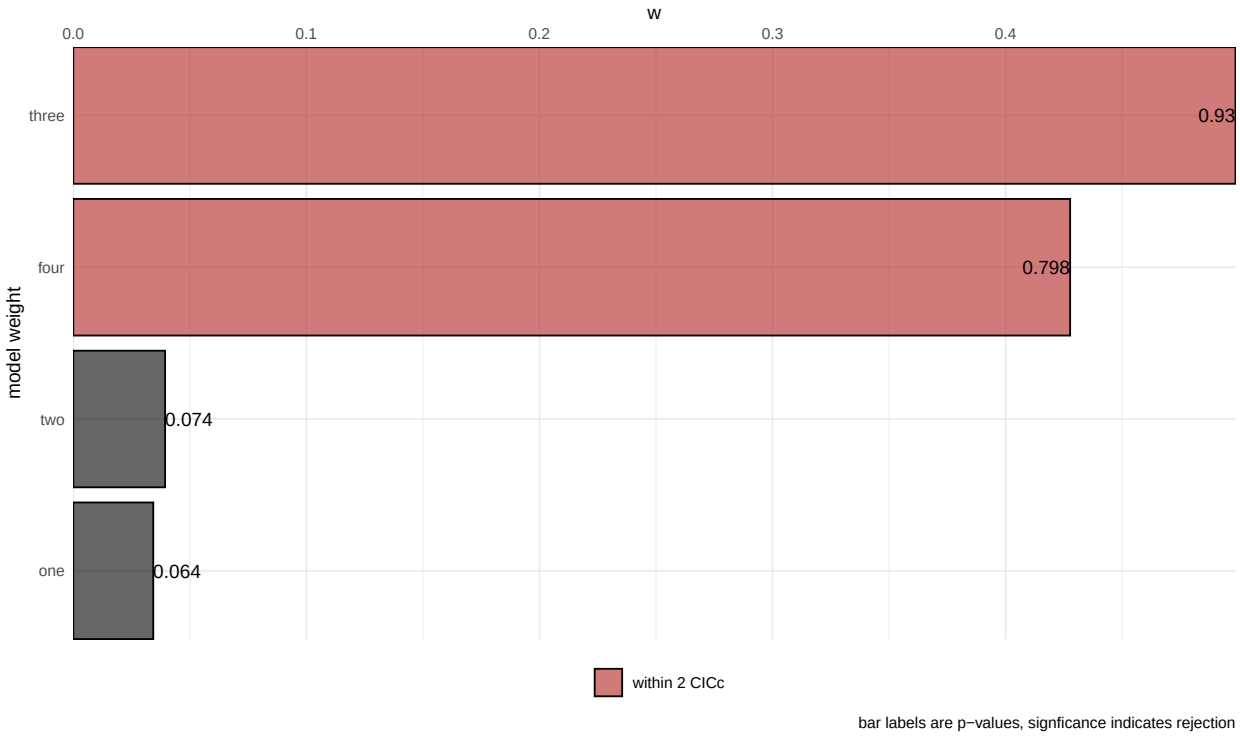
```
##       model k q     C      p CICc delta_CICc      l      w
## three three 1 5 0.309 0.8567 10.4   0.00e+00 1.0000 0.4841
## four   four 1 5 0.309 0.8567 10.4   6.08e-05 1.0000 0.4841
## two     two 1 5 6.854 0.0325 17.0   6.54e+00 0.0379 0.0184
## one     one 1 5 7.470 0.0239 17.6   7.16e+00 0.0279 0.0135
```

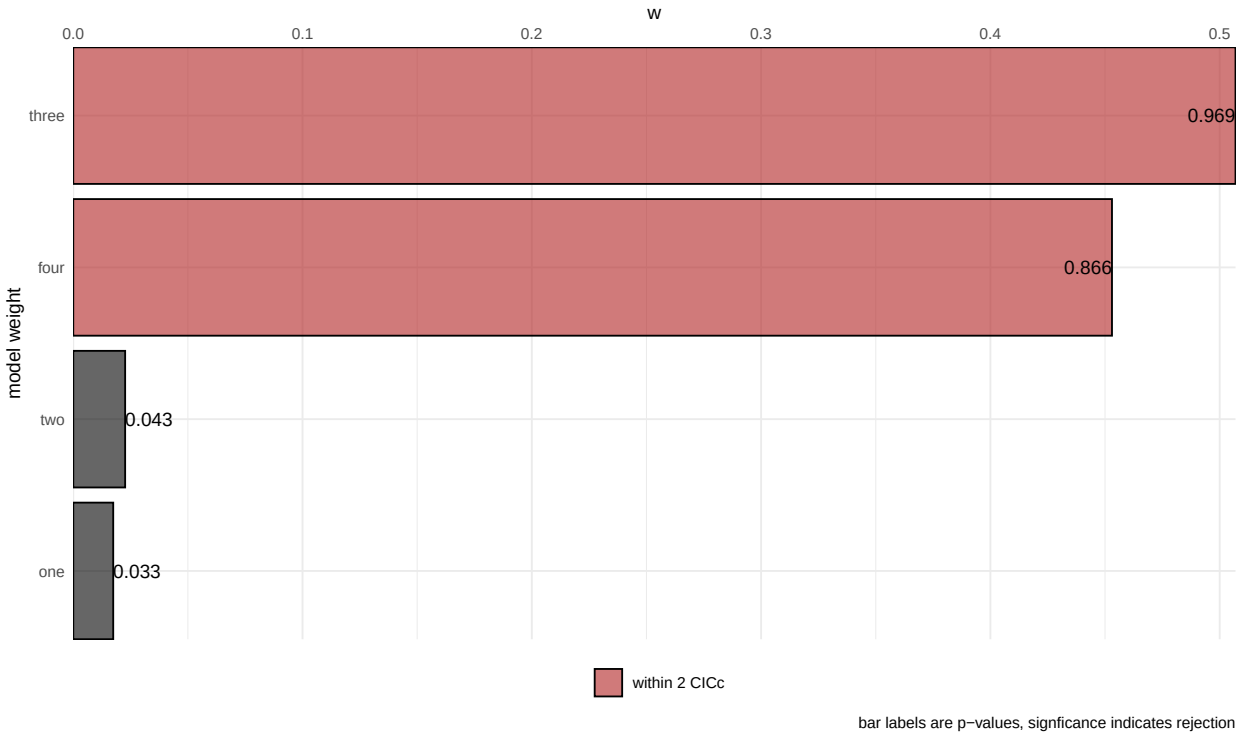
```
##       model k q     C      p CICc delta_CICc      l      w
## three three 1 5 0.145 0.9299 10.3      0.000 1.0000 0.4986
## four   four 1 5 0.452 0.7976 10.6      0.307 0.8577 0.4277
## two     two 1 5 5.221 0.0735 15.3      5.075 0.0791 0.0394
## one     one 1 5 5.497 0.0640 15.6      5.352 0.0689 0.0343
```

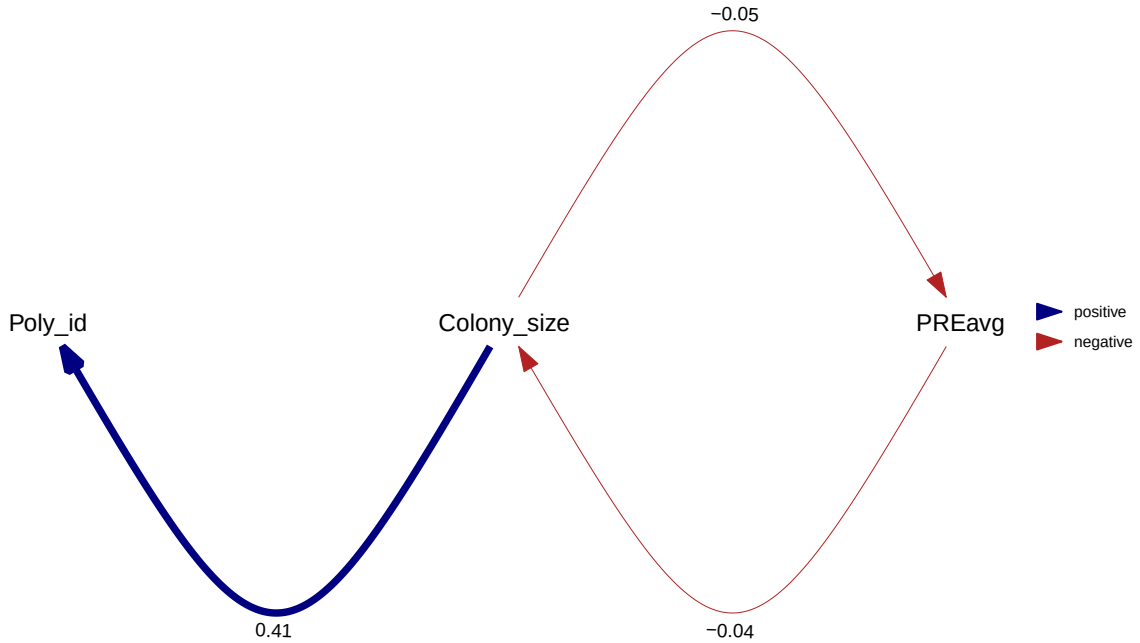
```
##       model k q      C      p CICc delta_CICc      l      w
## three three 1 5 0.0638 0.9686 10.2      0.000 1.0000 0.5069
## four   four 1 5 0.2885 0.8657 10.4      0.225 0.8937 0.4530
## two     two 1 5 6.2808 0.0433 16.4      6.217 0.0447 0.0226
## one     one 1 5 6.8028 0.0333 16.9      6.739 0.0344 0.0174
```

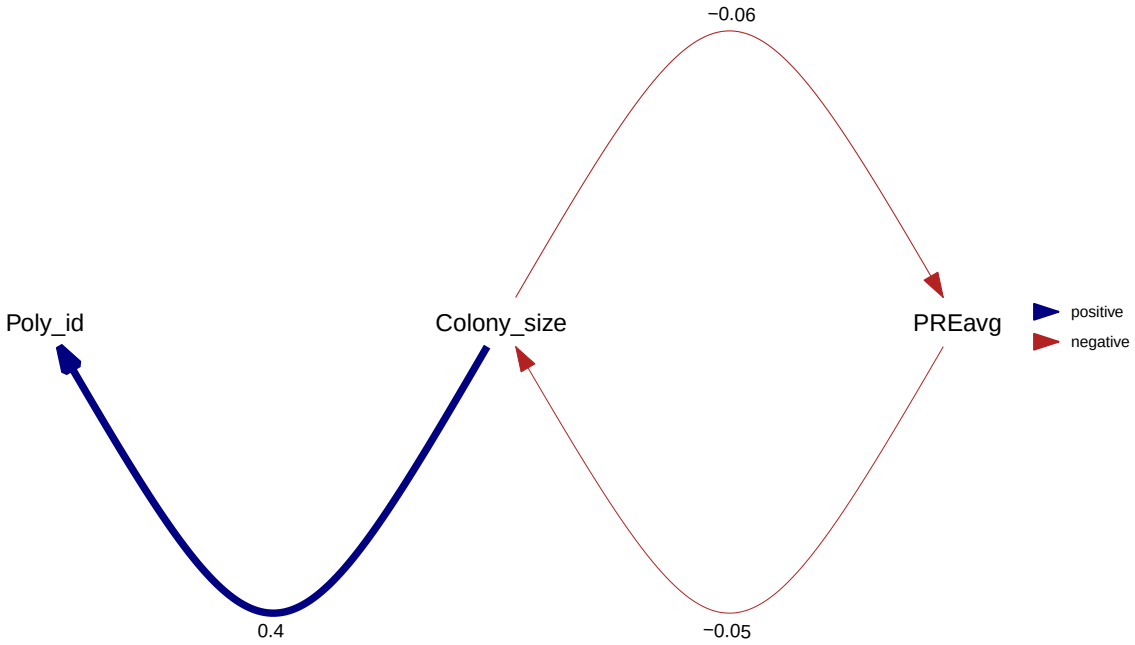


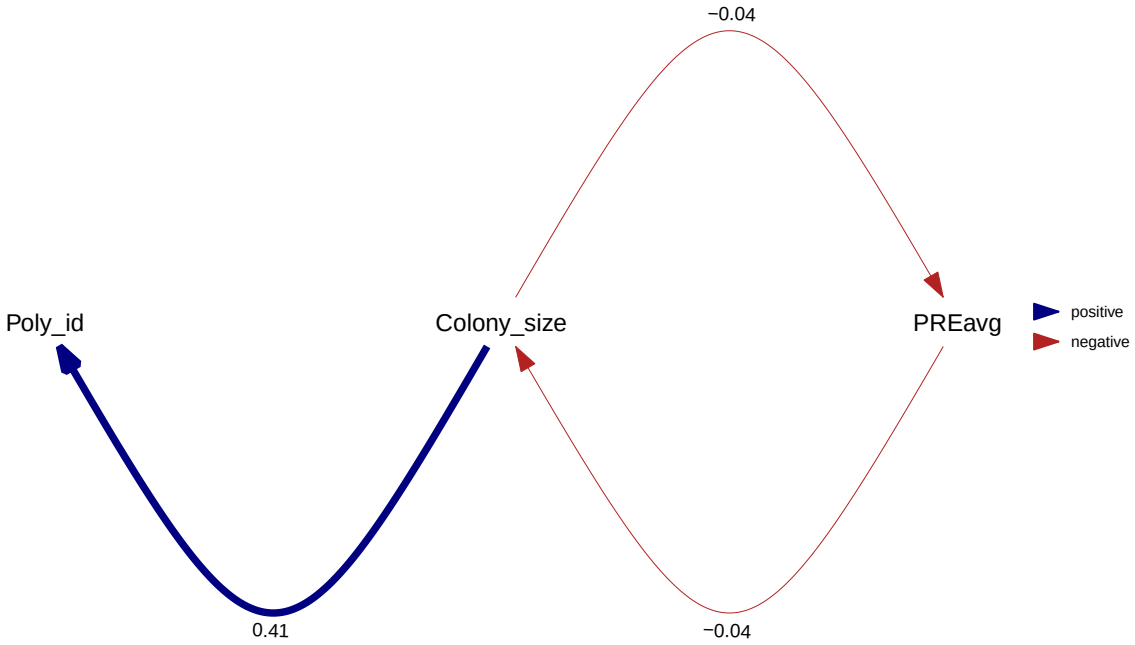

w
0.0
0.1
0.2
0.3
0.4
three
four
two
one
model weight
0.857
0.857
0.032
0.024
within 2 CICc
bar labels are p−values, signficance indicates rejection

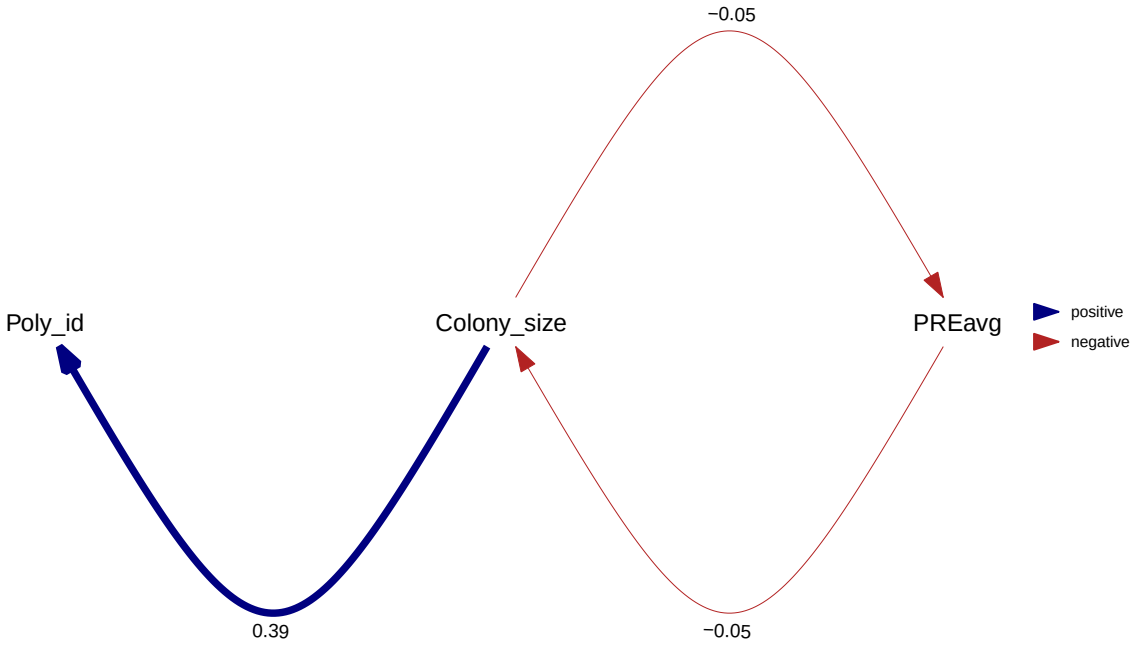

w
0.0
0.1
0.2
0.3
0.4
three
four
two
one
model weight
0.93
0.798
0.074
0.064
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.1
0.2
0.3
0.4
0.5
three
four
two
one
model weight
0.969
0.866
0.043
0.033
within 2 CICc
bar labels are p−values, signficance indicates rejection


−0.05
Poly_id
Colony_size
PREavg
positive
negative
0.41
−0.04


−0.06
Poly_id
Colony_size
PREavg
positive
negative
0.4
−0.05


−0.04
Poly_id
Colony_size
PREavg
positive
negative
0.41
−0.04


−0.05
Poly_id
Colony_size
PREavg
positive
negative
0.39
−0.05