Ant Climate Project

Path analysis: Tropical vs Temperate vs Both

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Contents

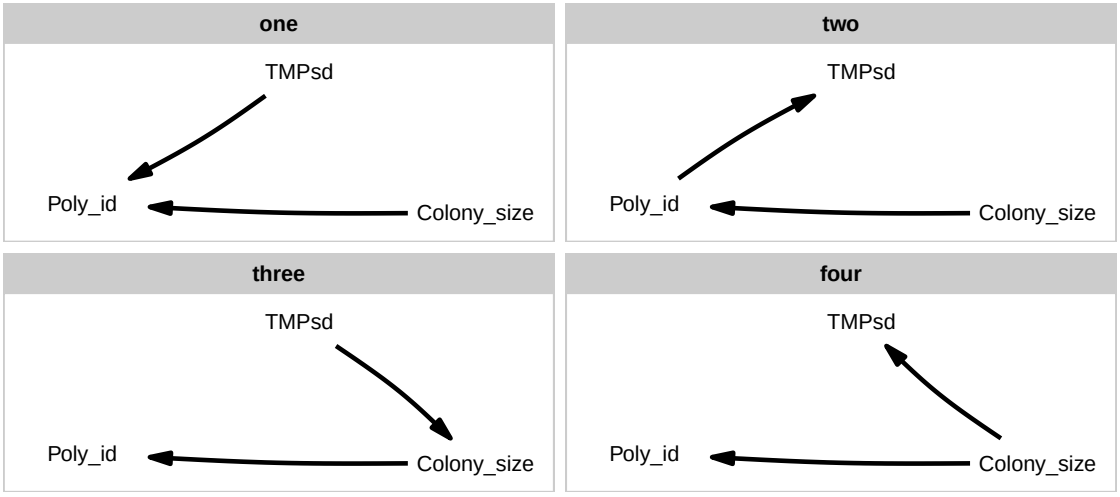
Read in the ant data and prepare the variables for path analysis. There are 474 species (116 Tropical, 190 for Temperate and 168 for 'Both') for which data is available for colony size and climatic variables, excluding special ants.

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 multiple different analyses. 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 four models for each analysis, based on all of the possible models given that colony size has a direct 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

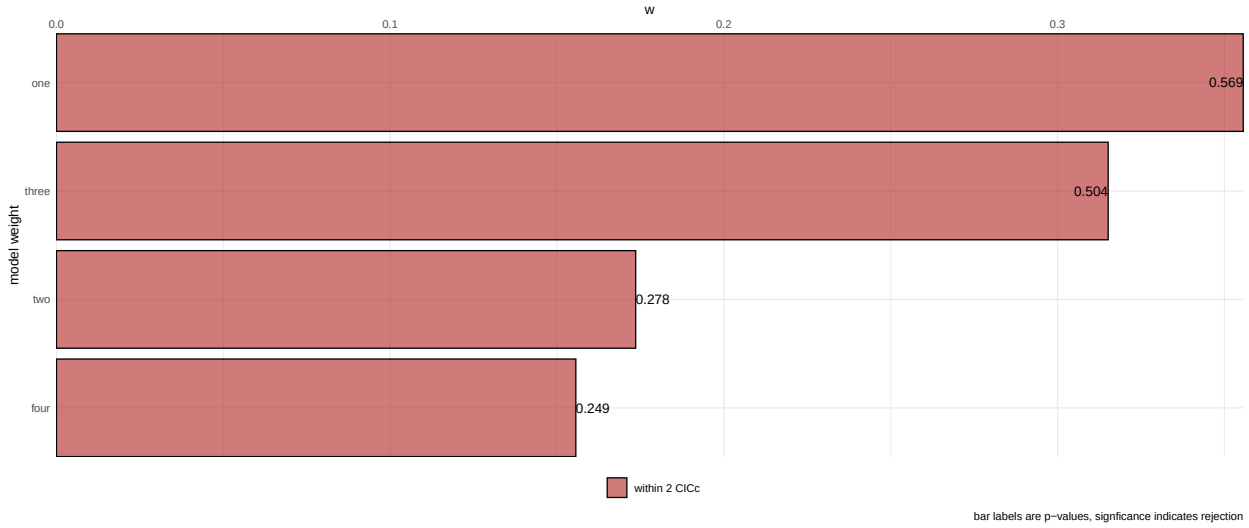
```
##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7      0.000 1.000 0.356
## three three 1 5 1.37 0.504 11.9      0.242 0.886 0.315
## two     two 1 5 2.56 0.278 13.1      1.435 0.488 0.174
## four   four 1 5 2.78 0.249 13.3      1.653 0.438 0.156
```

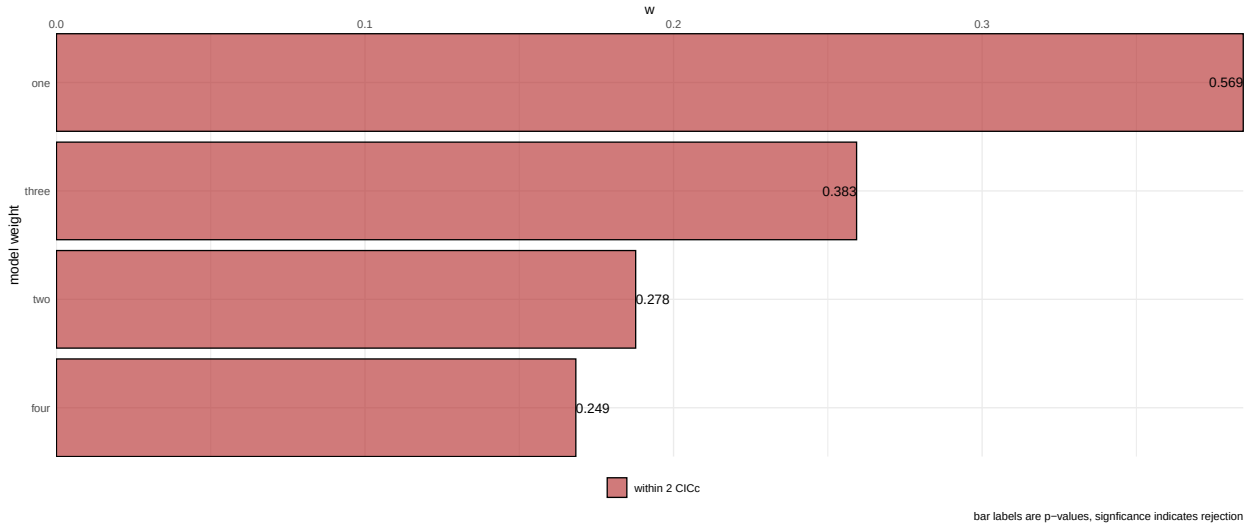
```
##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7      0.000 1.000 0.385
## three three 1 5 1.92 0.383 12.5      0.788 0.674 0.259
```

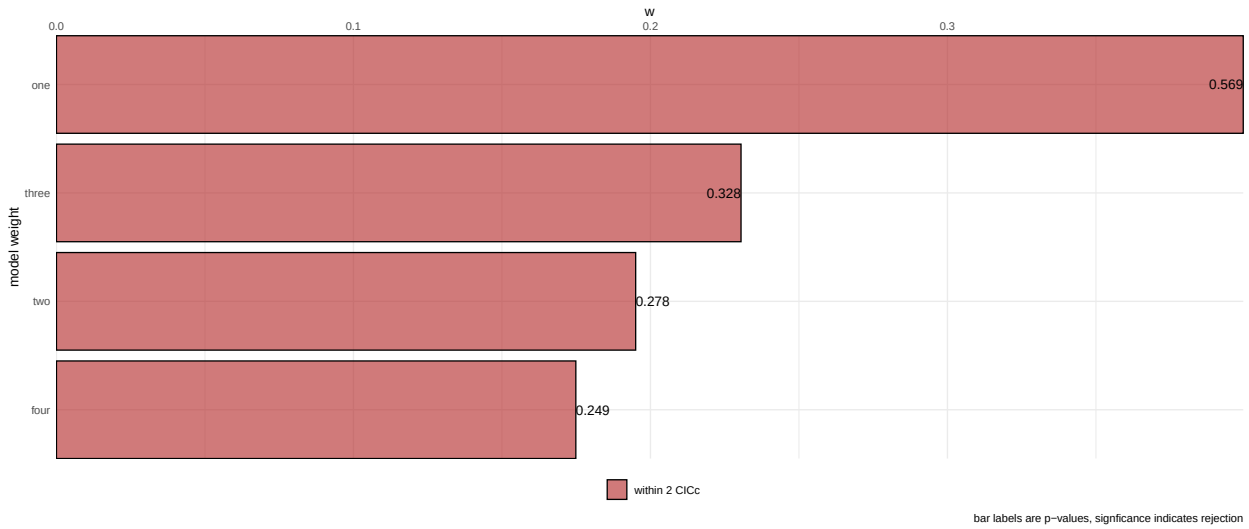
```
## two     two 1 5 2.56 0.278 13.1      1.435 0.488 0.188
## four   four 1 5 2.78 0.249 13.3      1.653 0.438 0.168
```

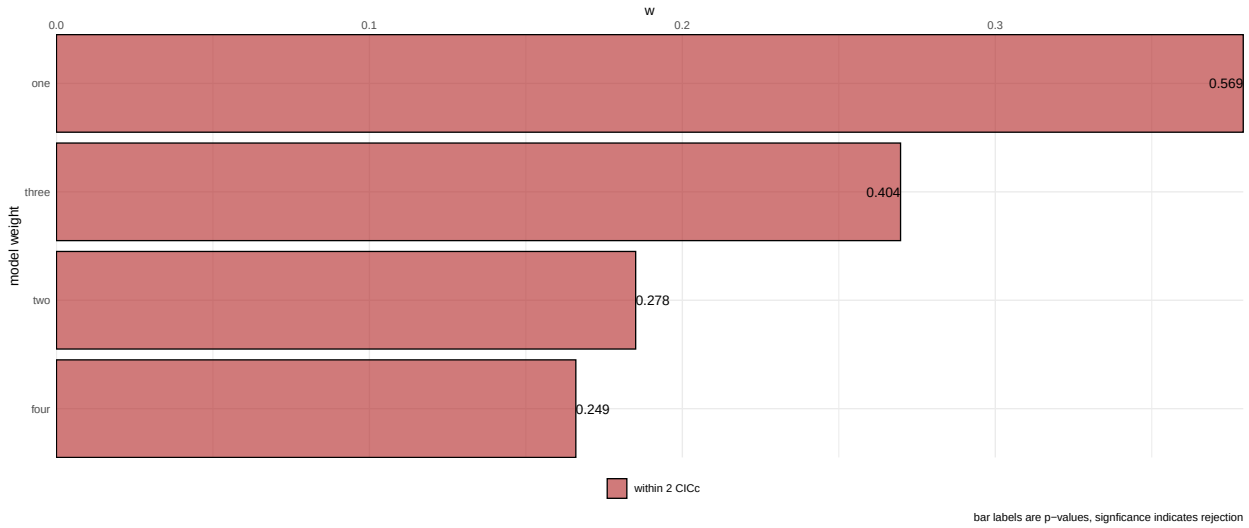
```
##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7       0.00 1.000 0.400
## three three 1 5 2.23 0.328 12.8       1.10 0.577 0.230
## two     two 1 5 2.56 0.278 13.1       1.43 0.488 0.195
## four   four 1 5 2.78 0.249 13.3       1.65 0.438 0.175
```

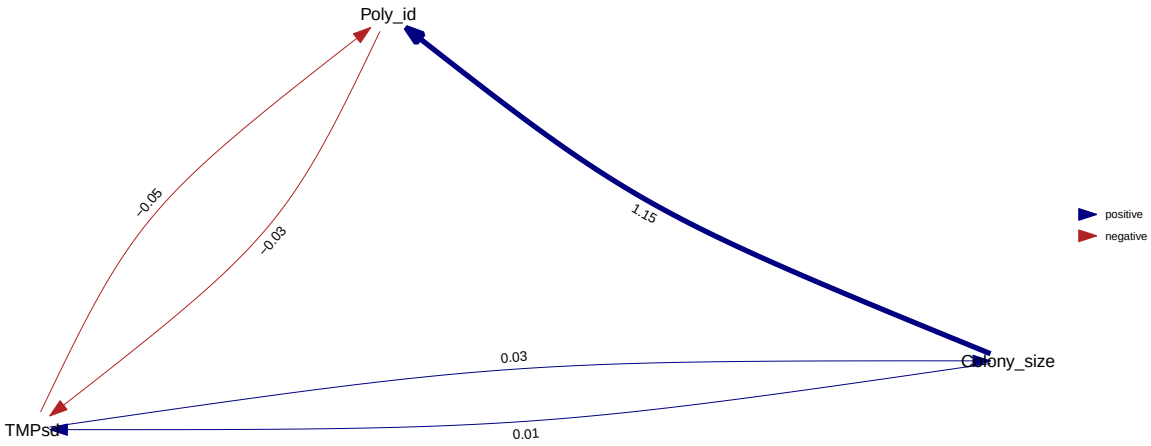
```
##       model k q    C     p CICc delta_CICc     l     w
## one     one 1 5 1.13 0.569 11.7      0.000 1.000 0.379
## three three 1 5 1.81 0.404 12.4      0.681 0.711 0.270
## two     two 1 5 2.56 0.278 13.1      1.435 0.488 0.185
## four   four 1 5 2.78 0.249 13.3      1.653 0.438 0.166
```

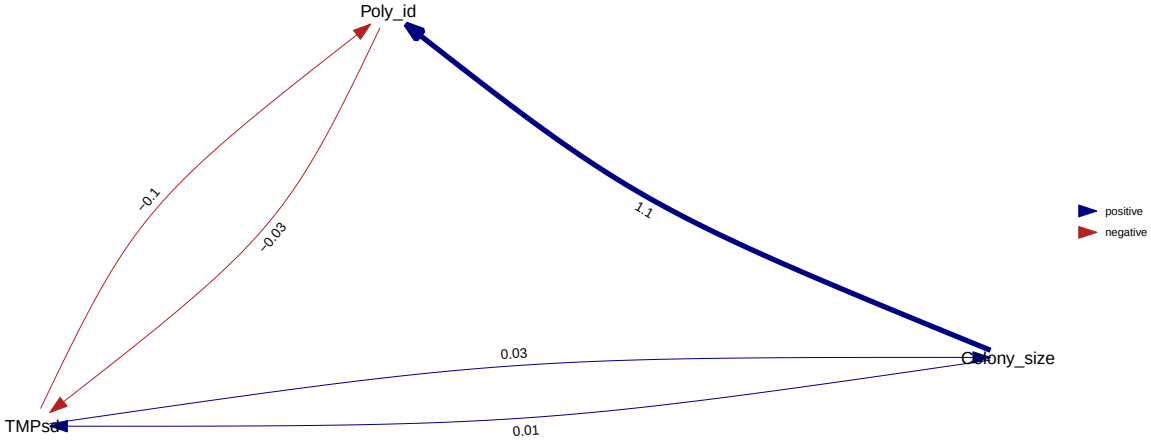


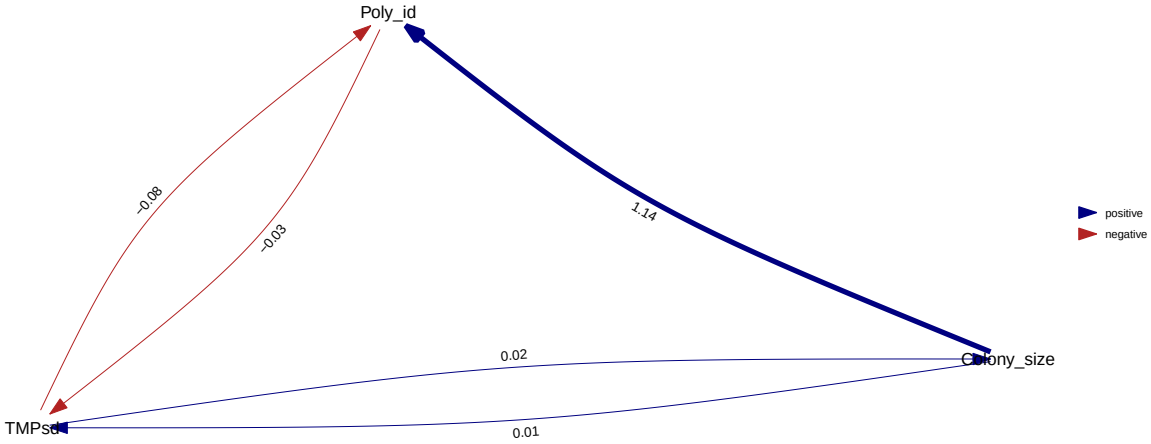


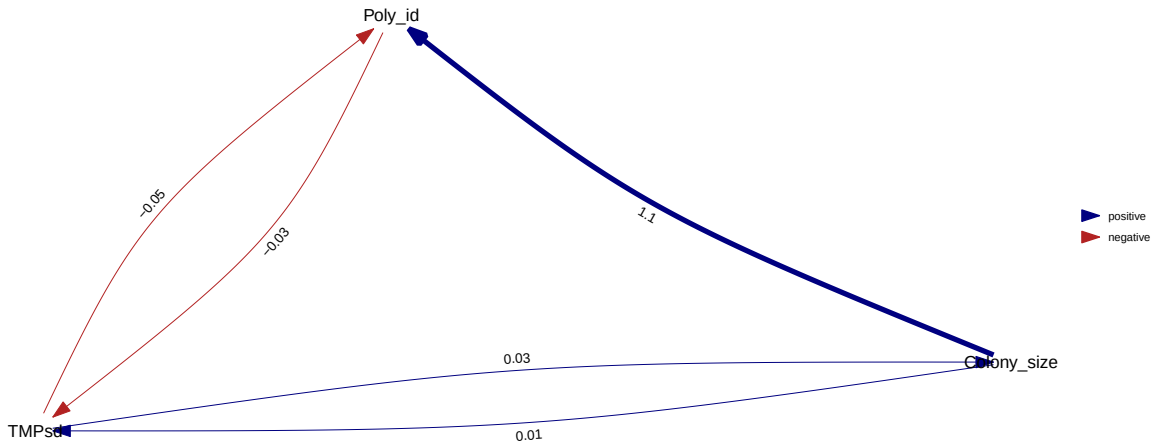

w
0.0
0.1
0.2
0.3
model weight
one
three
two
four
0.569
0.328
0.278
0.249
within 2 CICc
bar labels are p−values, signficance indicates rejection


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

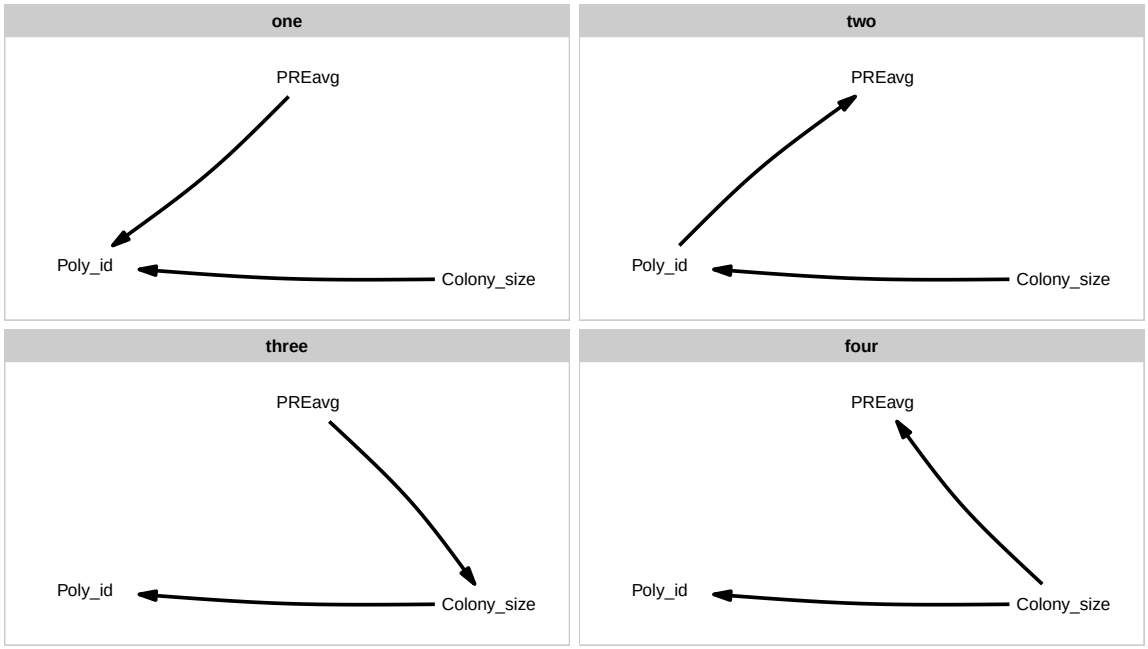

Poly_id
−0.1
−0.03
1.1
positive
negative
0.03
Colony_size
TMPsd
0.01


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



1.2 Temperate

1.2.1 Alternative causal models - PREavg



1.2.2 Path analysis

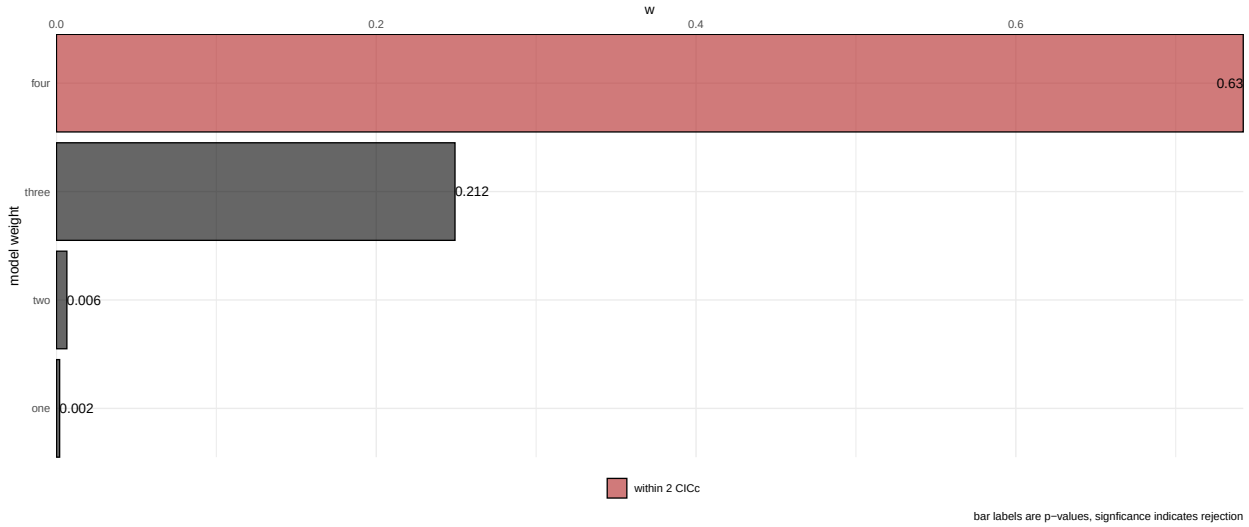
1.2.2.1 PREavg

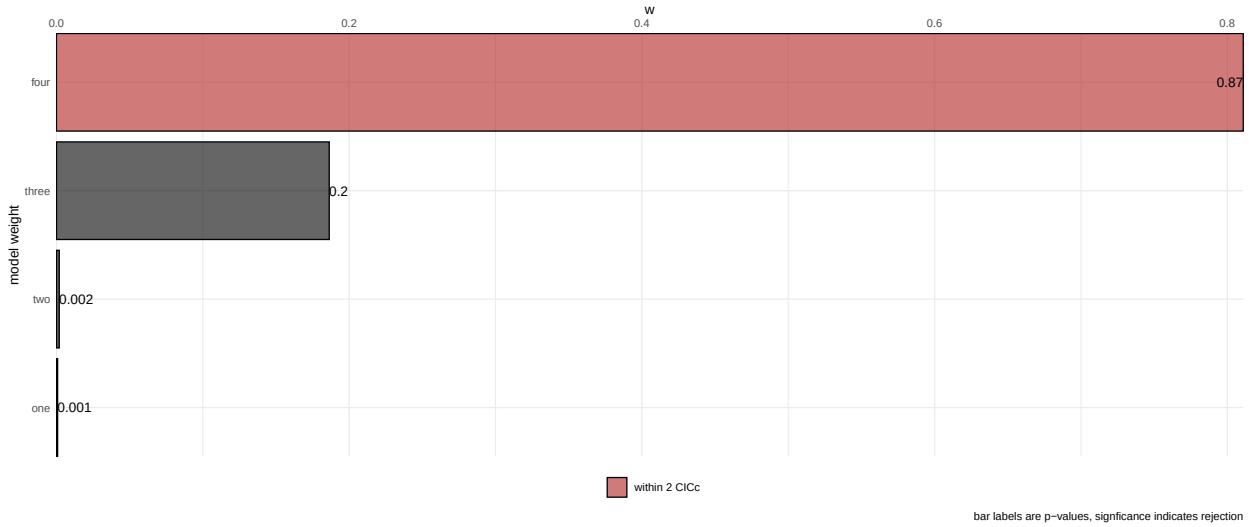
```
##       model k q      C       p CICc delta_CICc       l       w
## four   four 1 5  0.923 0.63031 11.2       0.00 1.00000 0.74222
## three three 1 5  3.105 0.21167 13.4       2.18 0.33583 0.24926
## two     two 1 5 10.392 0.00554 20.7       9.47 0.00879 0.00652
## one     one 1 5 12.759 0.00170 23.1      11.84 0.00269 0.00200
```

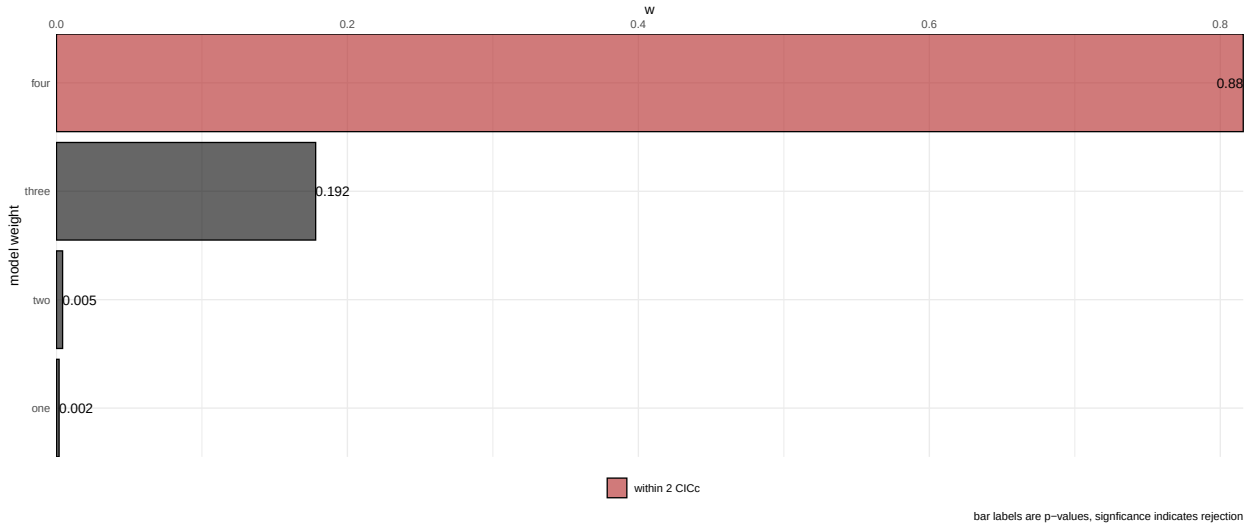
```
##       model k q      C        p CICc delta_CICc        l        w
## four   four 1 5  0.278 0.870283 10.6       0.00 1.000000 0.810905
## three three 1 5  3.219 0.200033 13.5       2.94 0.229848 0.186385
## two     two 1 5 12.378 0.002052 22.7      12.10 0.002357 0.001912
## one     one 1 5 14.125 0.000857 24.5      13.85 0.000984 0.000798
```

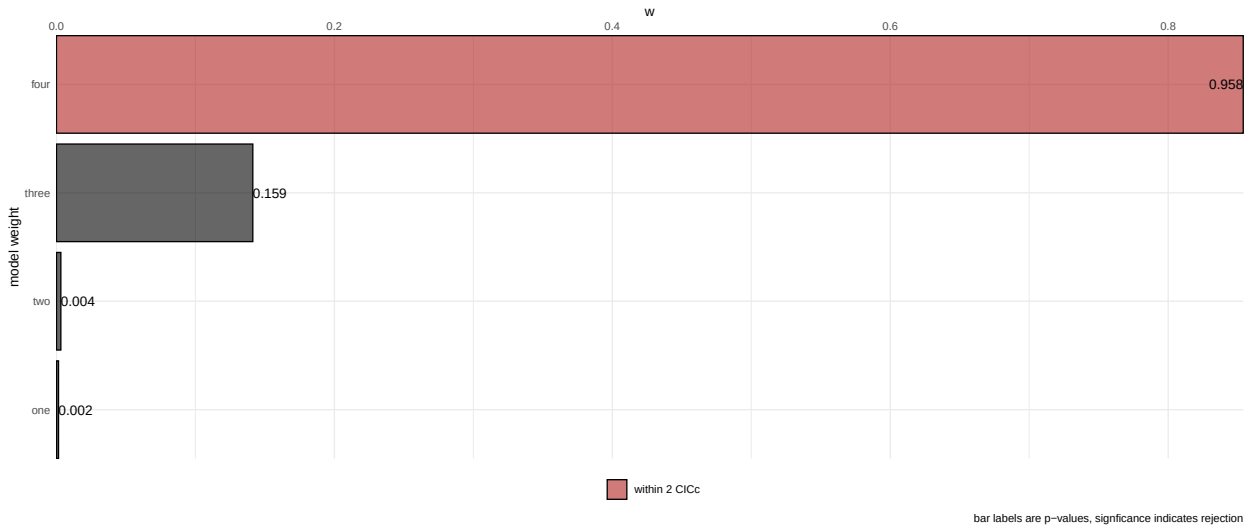
```
##       model k q      C       p CICc delta_CICc       l       w
## four   four 1 5  0.256 0.87998 10.6       0.00 1.00000 0.81577
## three three 1 5  3.298 0.19220 13.6       3.04 0.21841 0.17817
## two     two 1 5 10.778 0.00457 21.1      10.52 0.00519 0.00423
## one     one 1 5 12.462 0.00197 22.8      12.21 0.00224 0.00182
```

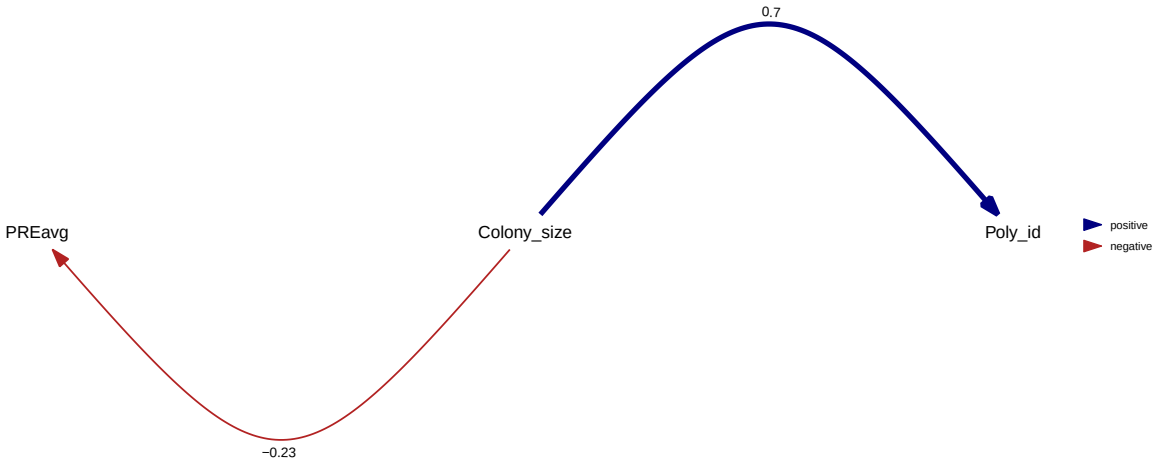
```
##       model k q      C       p CICc delta_CICc       l       w
## four   four 1 5  0.086 0.95792 10.4        0.0 1.00000 0.85402
## three three 1 5  3.684 0.15850 14.0        3.6 0.16546 0.14131
## two     two 1 5 11.275 0.00356 21.6       11.2 0.00372 0.00318
## one     one 1 5 12.778 0.00168 23.1       12.7 0.00175 0.00150
```

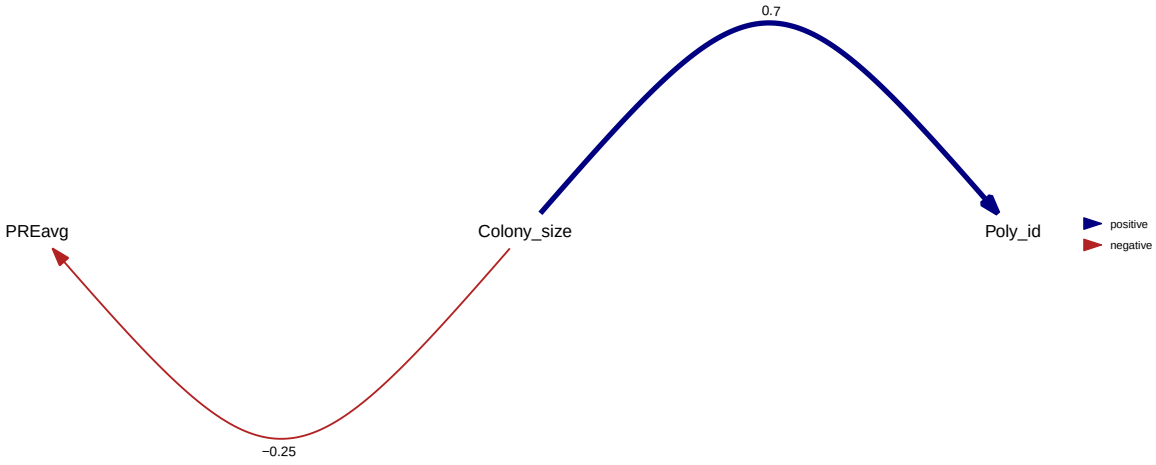


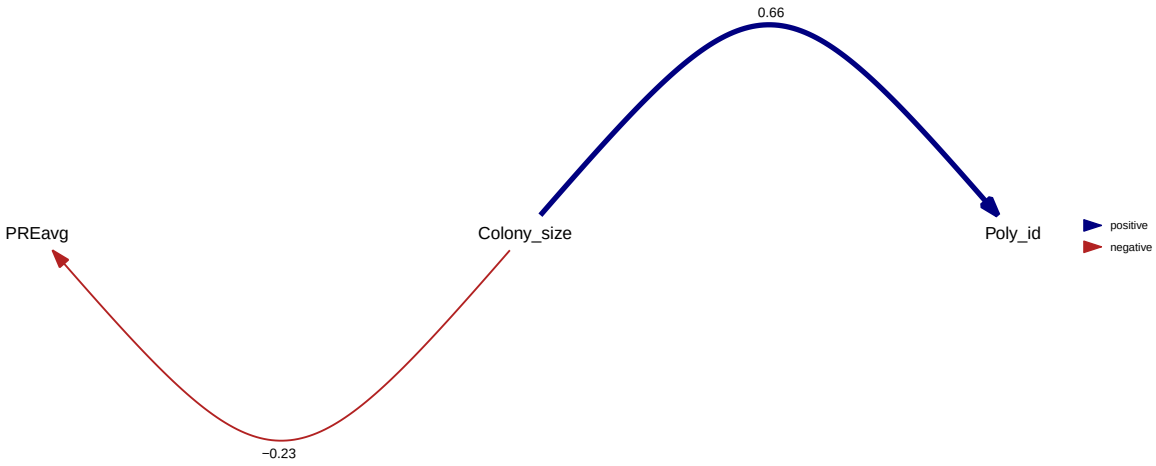

w
0.0
0.2
0.4
0.6
0.8
four
three
two
one
model weight
0.87
0.2
0.002
0.001
within 2 CICc
bar labels are p−values, signficance indicates rejection

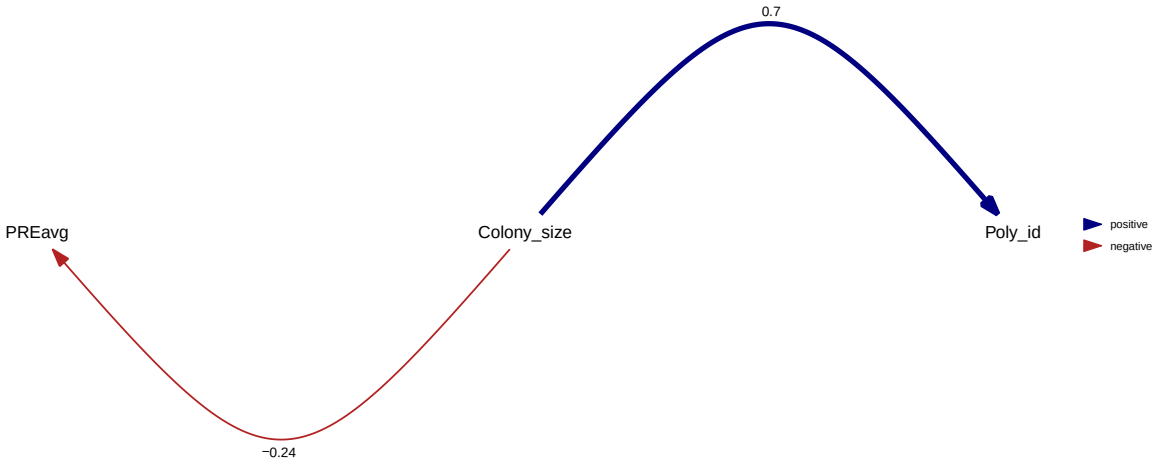

w
0.0
0.2
0.4
0.6
0.8
four
three
two
one
model weight
0.88
0.192
0.005
0.002
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.2
0.4
0.6
0.8
four
three
two
one
model weight
0.958
0.159
0.004
0.002
within 2 CICc
bar labels are p−values, signficance indicates rejection


0.7
PREavg
Colony_size
Poly_id
positive
negative
−0.23

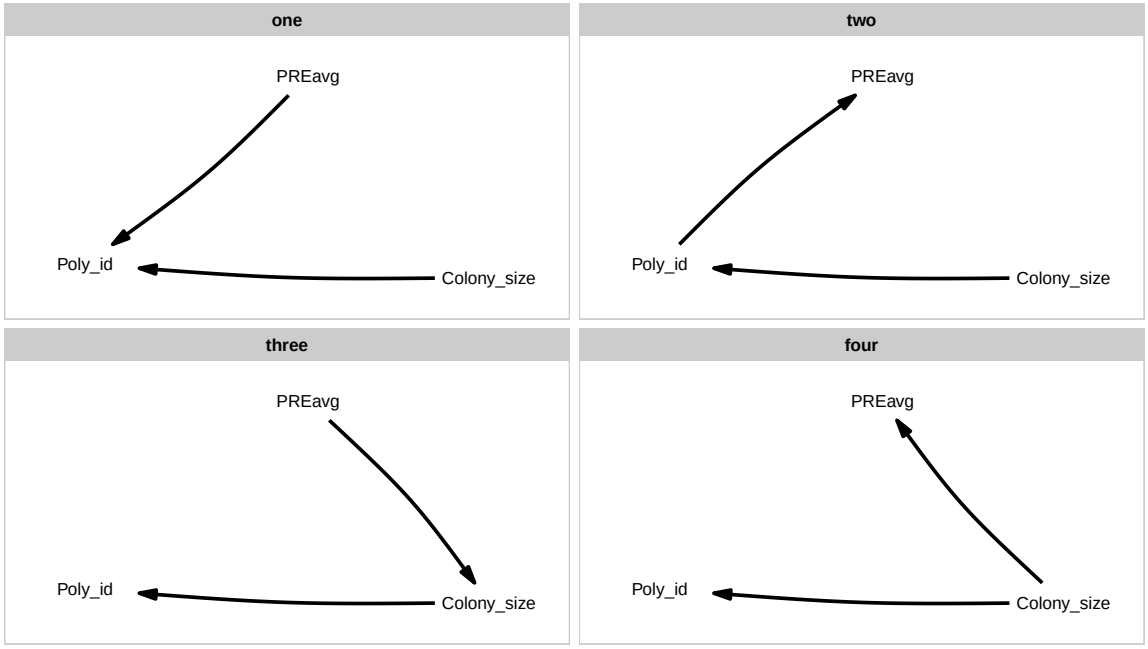

0.7
PREavg
Colony_size
Poly_id
positive
negative
−0.25


0.66
PREavg
Colony_size
Poly_id
positive
negative
−0.23


0.7
PREavg
Colony_size
Poly_id
positive
negative
−0.24

1.3 Both

1.3.1 Alternative causal models - PREavg



1.3.2 Path analysis

1.3.2.1 PREavg

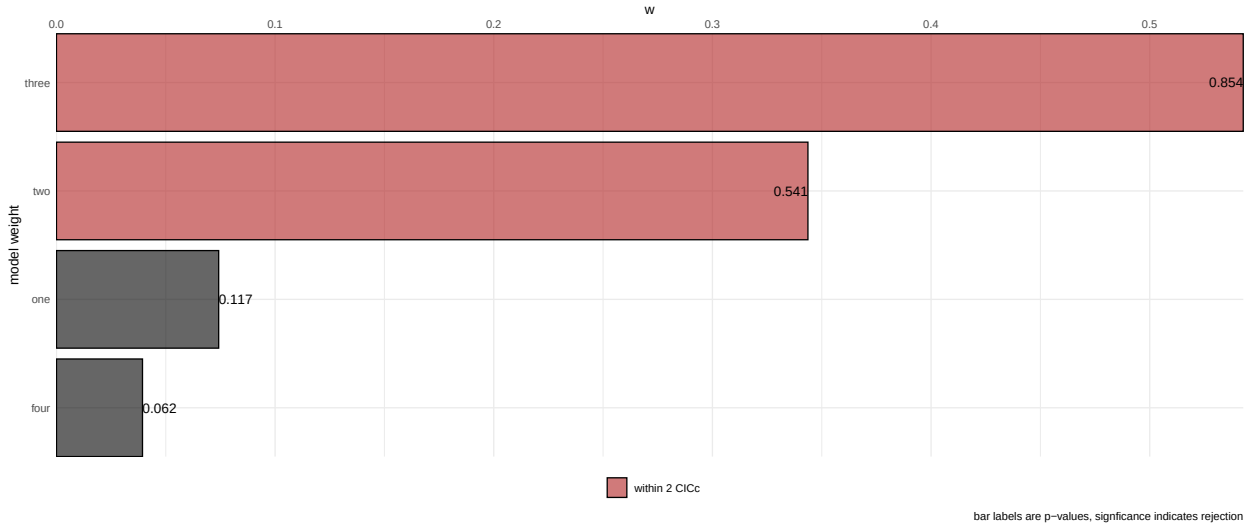
```
##       model k q     C      p CICc delta_CICc      l      w
## three three 1 5 0.315 0.8542 10.7      0.000 1.0000 0.5428
## two     two 1 5 1.229 0.5409 11.6      0.914 0.6332 0.3437
## one     one 1 5 4.295 0.1168 14.7      3.980 0.1367 0.0742
## four   four 1 5 5.563 0.0619 15.9      5.248 0.0725 0.0394
```

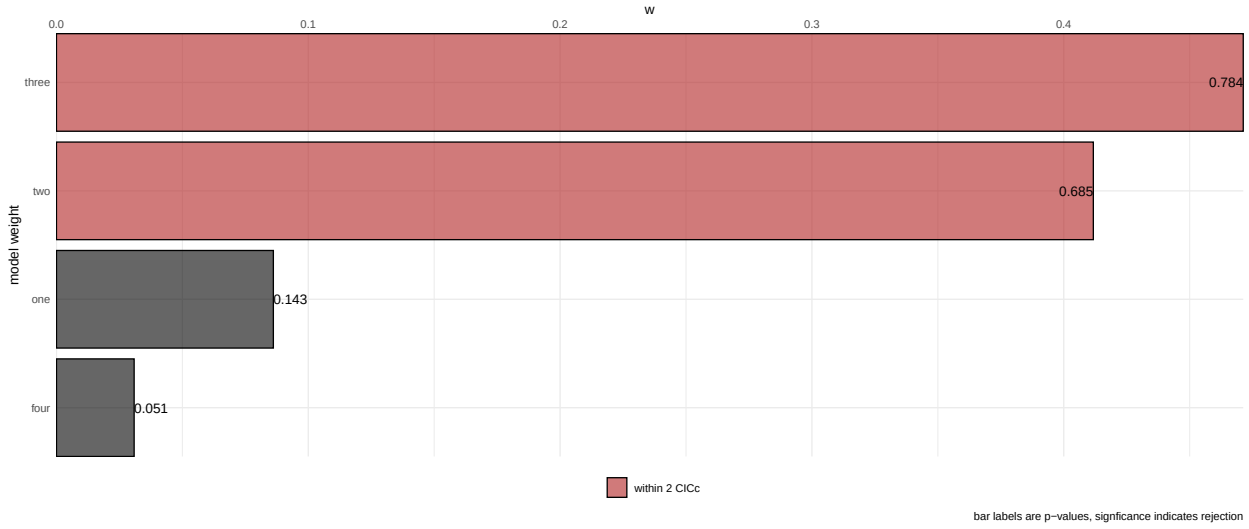
```
##       model k q     C      p CICc delta_CICc      l      w
## three three 1 5 0.487 0.7838 10.9       0.00 1.0000 0.4713
## two     two 1 5 0.757 0.6848 11.1       0.27 0.8737 0.4117
## one     one 1 5 3.886 0.1432 14.3       3.40 0.1828 0.0861
## four   four 1 5 5.940 0.0513 16.3       5.45 0.0655 0.0309
```

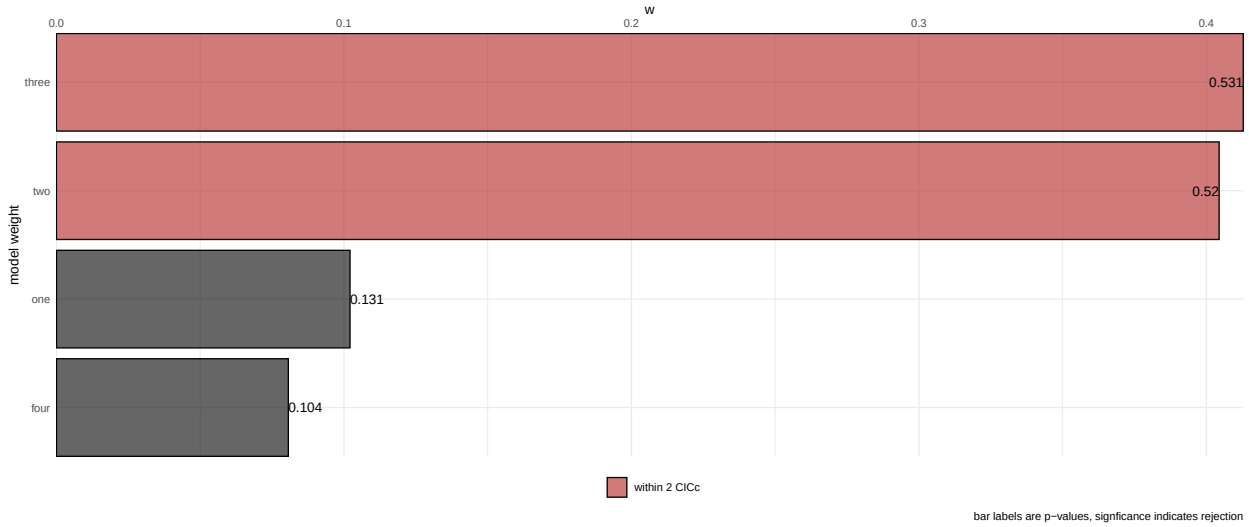
```
##       model k q    C     p CICc delta_CICc     l      w
## three three 1 5 1.27 0.531 11.6     0.0000 1.000 0.4128
## two     two 1 5 1.31 0.520 11.7     0.0411 0.980 0.4044
## one     one 1 5 4.06 0.131 14.4     2.7937 0.247 0.1021
## four   four 1 5 4.53 0.104 14.9     3.2655 0.195 0.0807
```

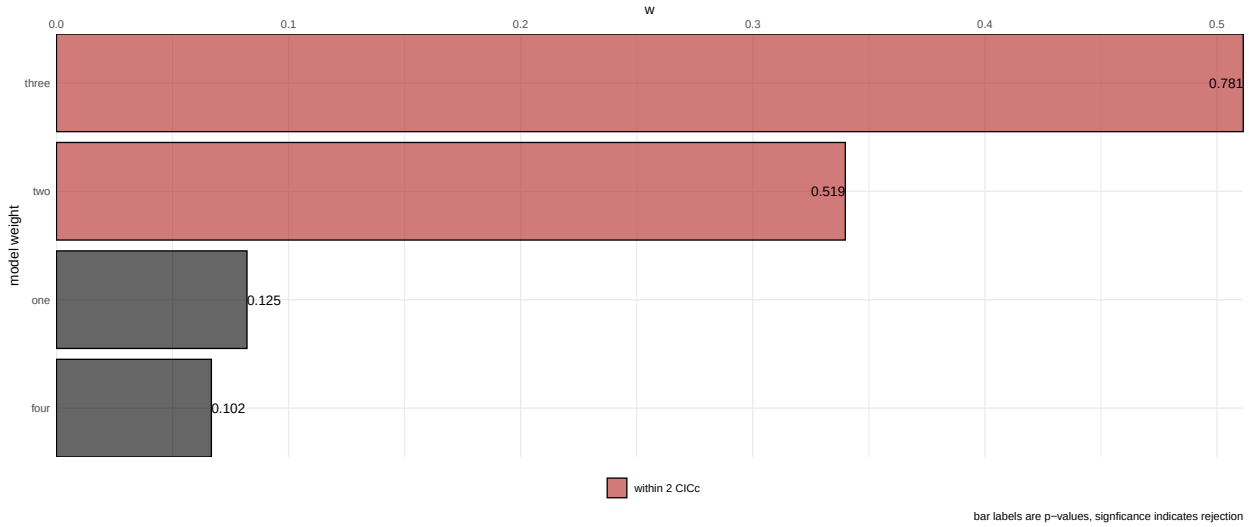
```
##       model k q     C     p CICc delta_CICc     l      w
```

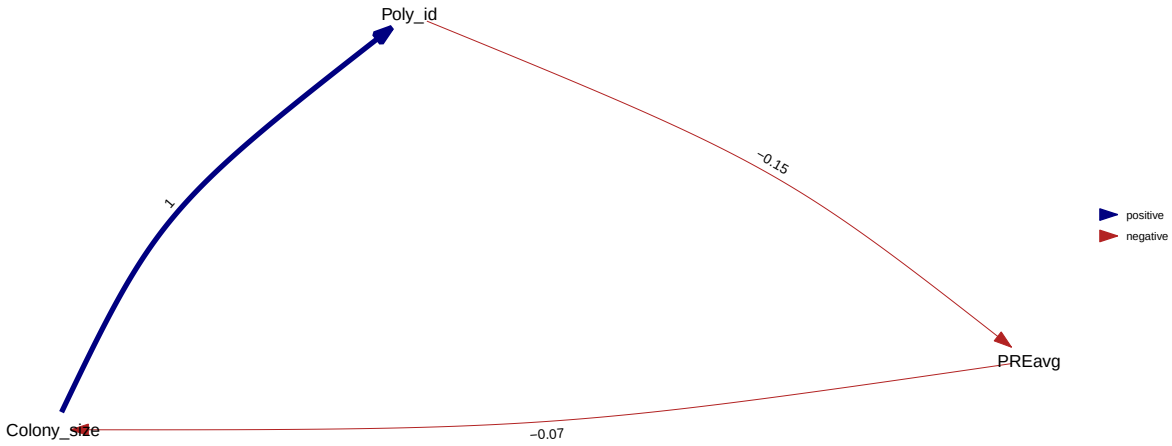
```
## three three 1 5 0.494 0.781 10.9      0.000 1.000 0.5113
## two     two 1 5 1.311 0.519 11.7      0.817 0.665 0.3399
## one     one 1 5 4.152 0.125 14.5      3.658 0.161 0.0821
## four   four 1 5 4.566 0.102 14.9      4.072 0.131 0.0667
```

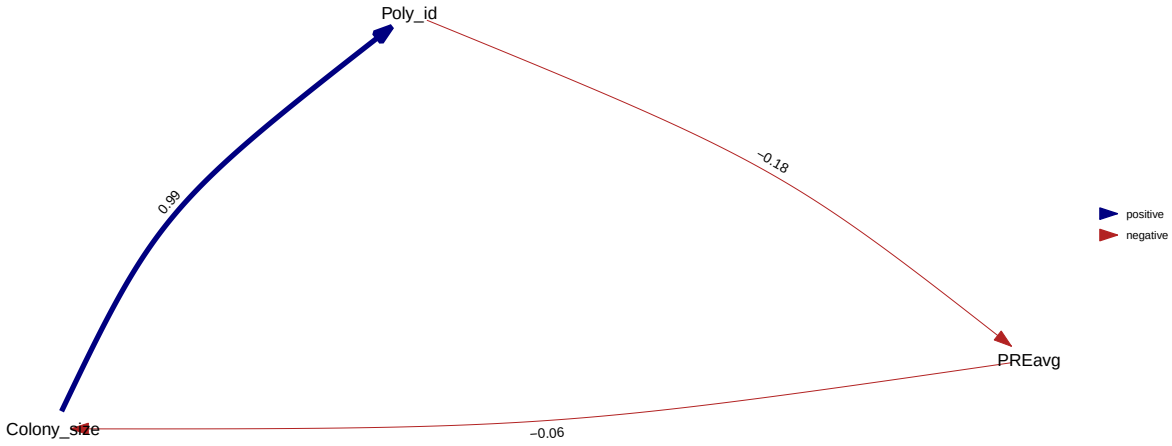


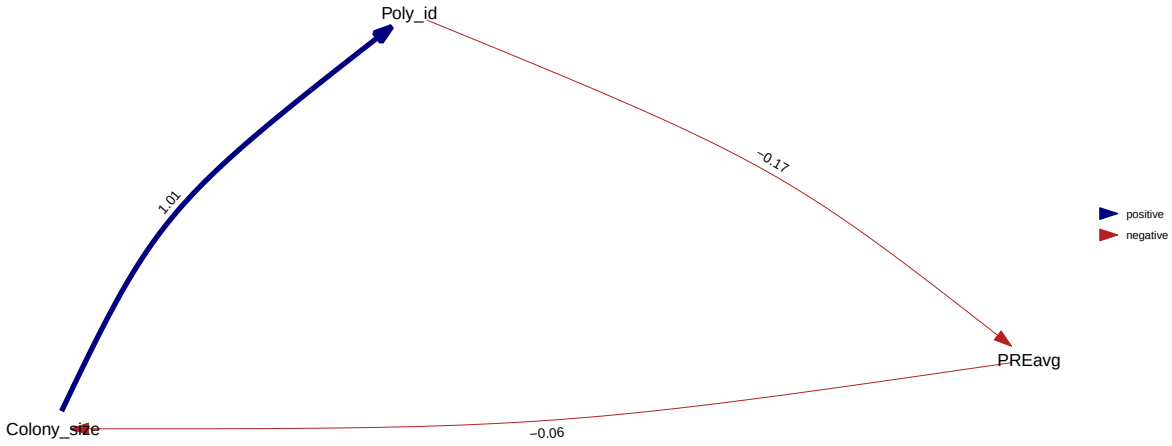


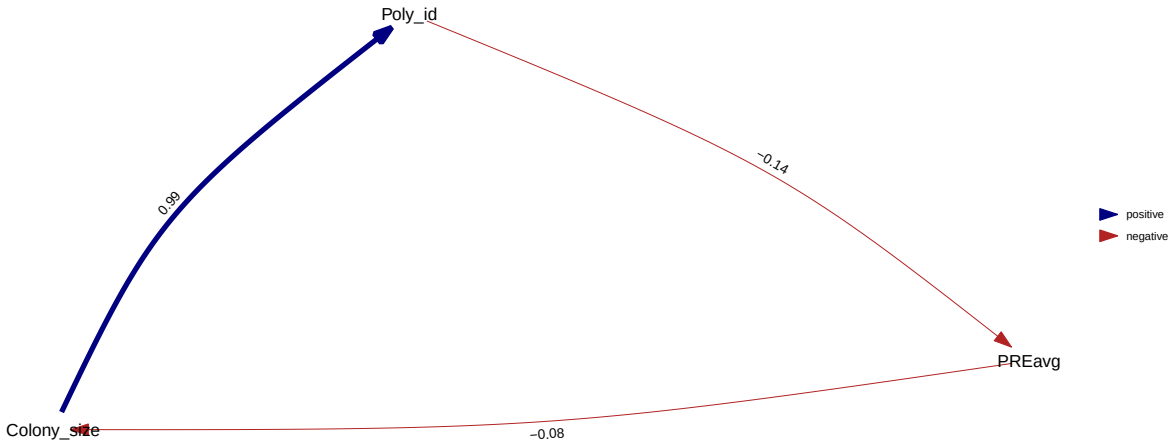

w
0.0
0.1
0.2
0.3
0.4
three
two
one
four
model weight
0.531
0.52
0.131
0.104
within 2 CICc
bar labels are p−values, signficance indicates rejection


w
0.0
0.1
0.2
0.3
0.4
0.5
three
two
one
four
model weight
0.781
0.519
0.125
0.102
within 2 CICc
bar labels are p−values, signficance indicates rejection


Poly_id
PREavg
Colony_size
1
−0.15
−0.07
positive
negative


Poly_id
0.99
−0.18
positive
negative
PREavg
Colony_size
−0.06


Poly_id
1.01
−0.17
positive
negative
PREavg
Colony_size
−0.06


Poly_id
0.99
−0.14
positive
negative
PREavg
Colony_size
−0.08