Ant Climate Project

Path analysis: Tropical vs Temperate vs Both. No transformations

Louis Bell-Roberts

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Initial comments:

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.

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 Summary

1.1 PRE

- Path analysis not necessary for tropical regions as 'phylogeny-only' model is best
- In temperate regions, greater colony size favours both greater worker size variation and allows invasion into drier regions. Both path coefficients are significant.
- In species that occur in both regions, greater worker size variation allows invasion into drier regions and drier climates favour greater colony size. However, neither of these paths are significant.

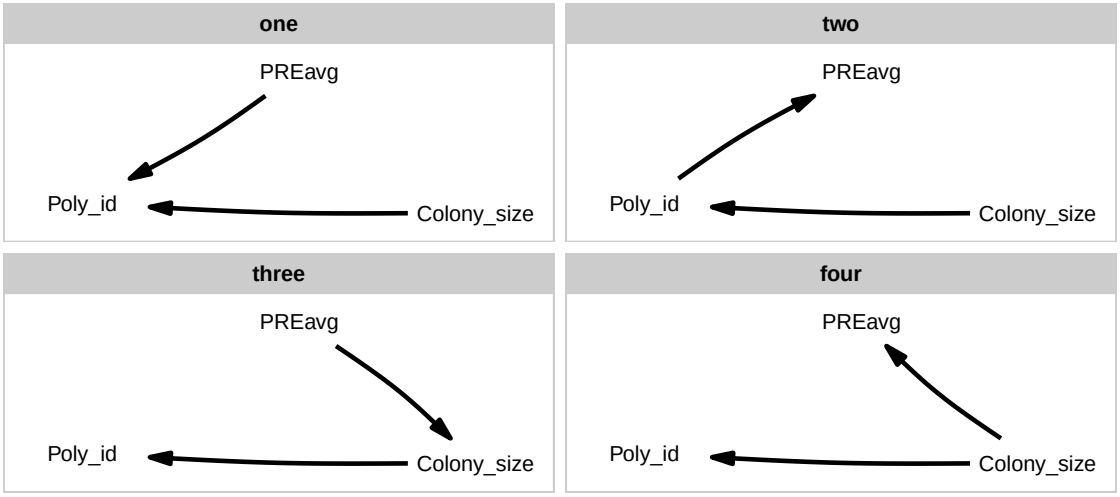
1.2 TMP

- No significant paths between TMP and either colony size or variation in worker size.

2 PRE

2.1 Tropical

2.1.1 Alternative causal models



2.1.2 Path analysis

Table 1: NCuniform stem path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.47	0.79	11.02	0.00	1.00	0.32
three	1	5	0.58	0.75	11.13	0.11	0.95	0.30
two	1	5	1.20	0.55	11.75	0.73	0.69	0.22
one	1	5	1.91	0.39	12.45	1.43	0.49	0.16

Table 2: NCuniform crown path analysis model selection summary table

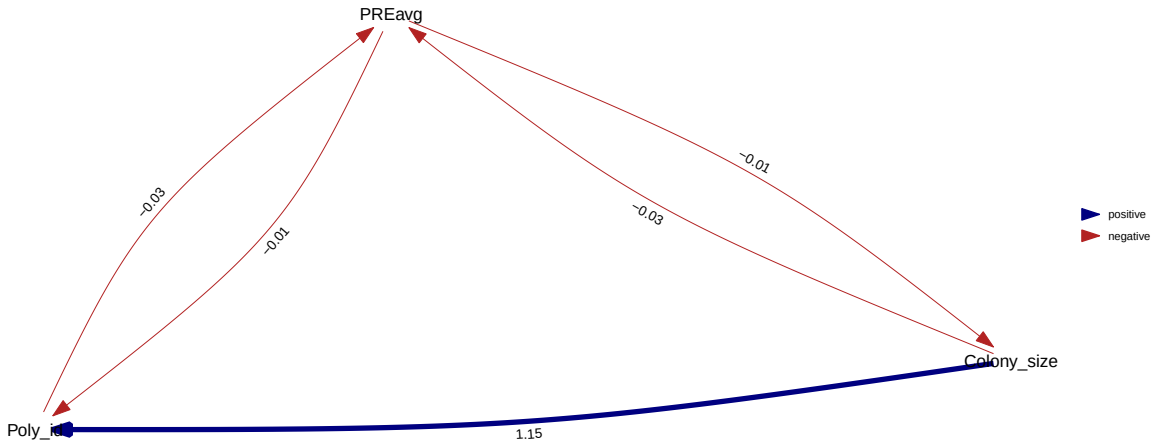
model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.47	0.79	11.02	0.00	1.00	0.34
three	1	5	0.91	0.63	11.46	0.44	0.80	0.27
two	1	5	1.20	0.55	11.75	0.73	0.69	0.23
one	1	5	1.91	0.39	12.45	1.43	0.49	0.16

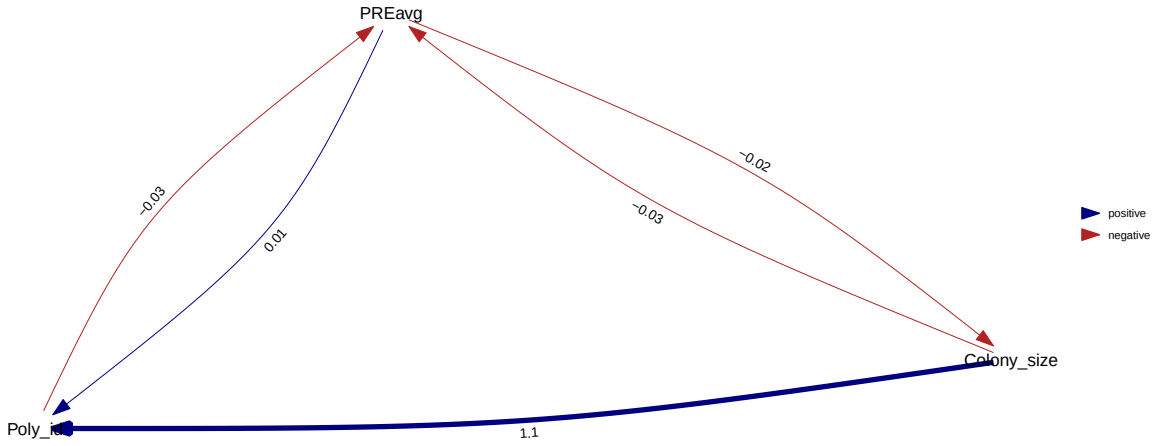
Table 3: FBD stem path analysis model selection summary table

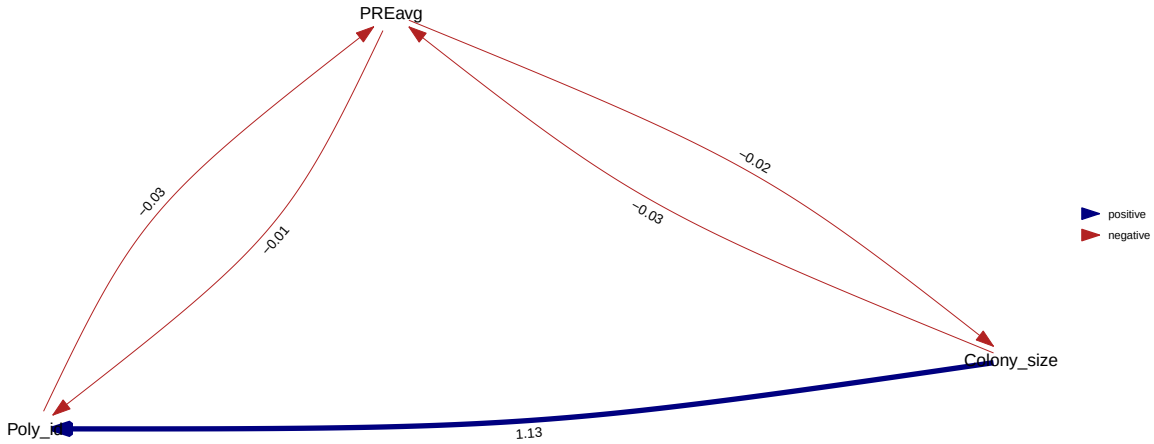
model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.47	0.79	11.02	0.00	1.00	0.32
three	1	5	0.67	0.72	11.22	0.20	0.91	0.29
two	1	5	1.20	0.55	11.75	0.73	0.69	0.22
one	1	5	1.91	0.39	12.45	1.43	0.49	0.16

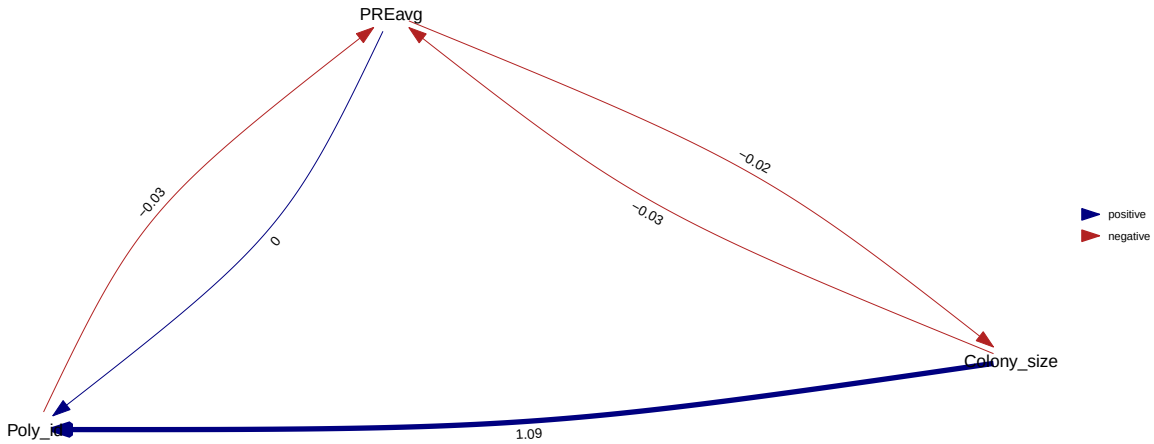
Table 4: FBD crown path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.47	0.79	11.02	0.00	1.00	0.33
three	1	5	0.74	0.69	11.29	0.27	0.87	0.29
two	1	5	1.20	0.55	11.75	0.73	0.69	0.23
one	1	5	1.91	0.39	12.45	1.43	0.49	0.16

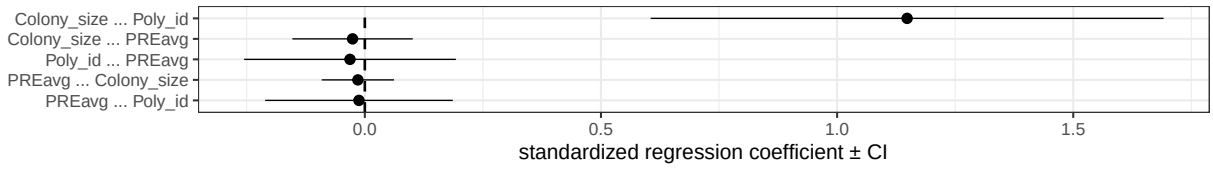


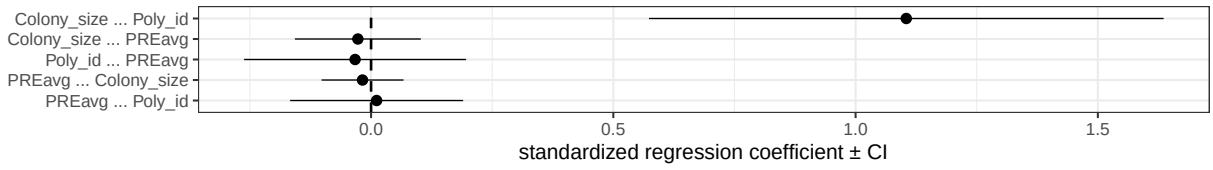


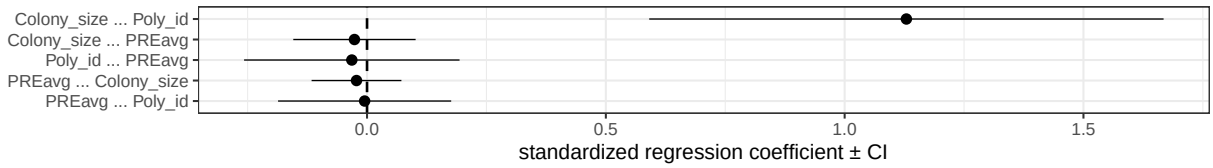


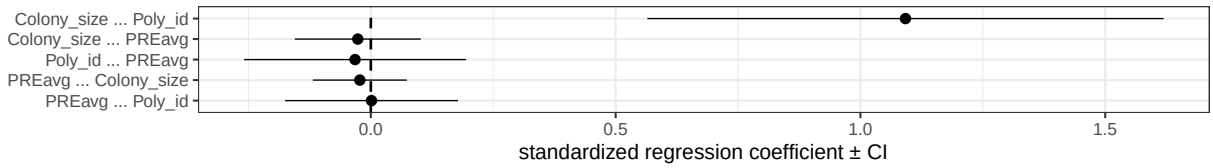


2.1.2.1 Estimate confidence intervals for path coefficients



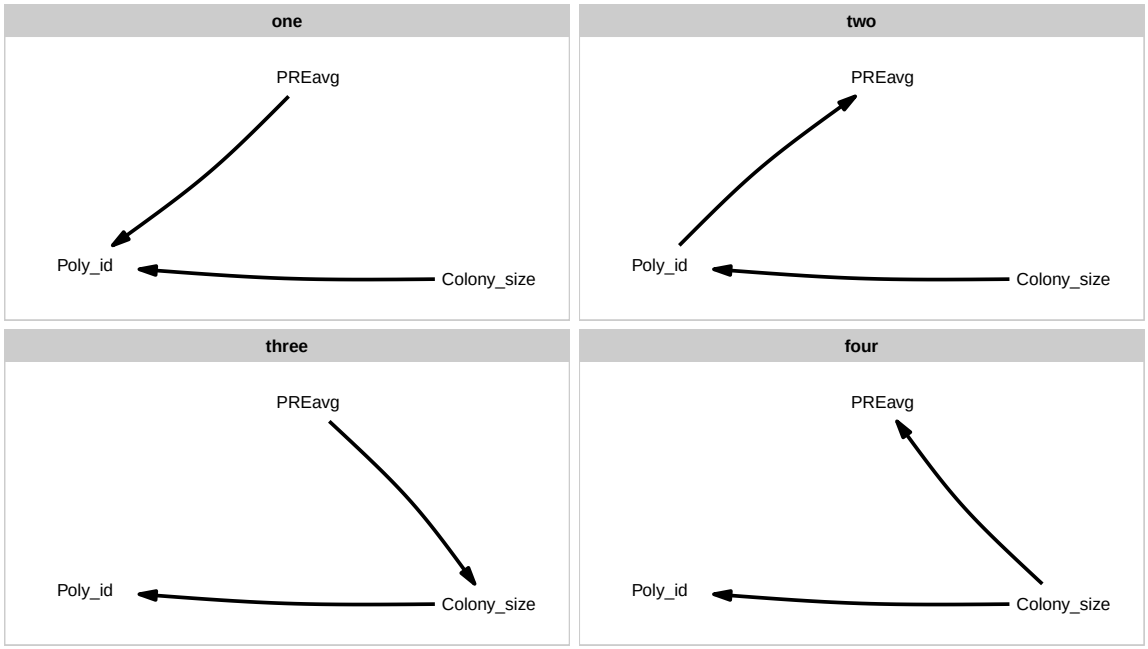






2.2 Temperate

2.2.1 Alternative causal models



2.2.2 Path analysis

Table 5: NCuniform stem path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.14	0.93	10.46	0	1	0.86

Table 6: NCuniform crown path analysis model selection summary table

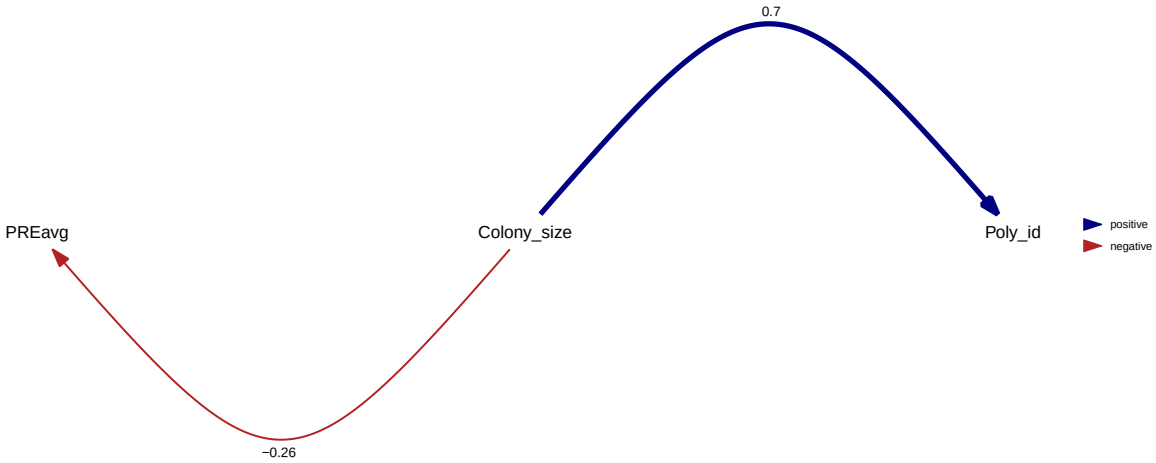
model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.3	0.86	10.63	0	1	0.78

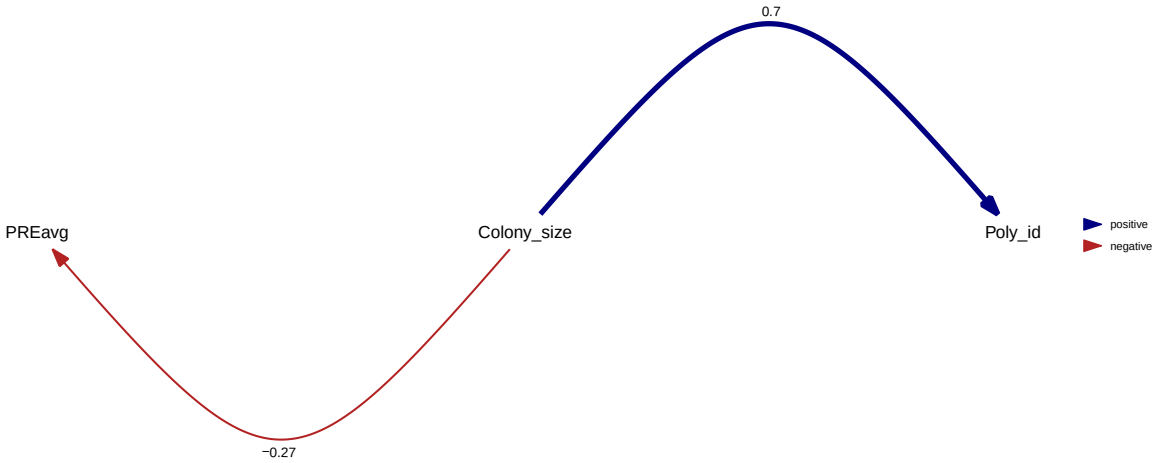
Table 7: FBD stem path analysis model selection summary table

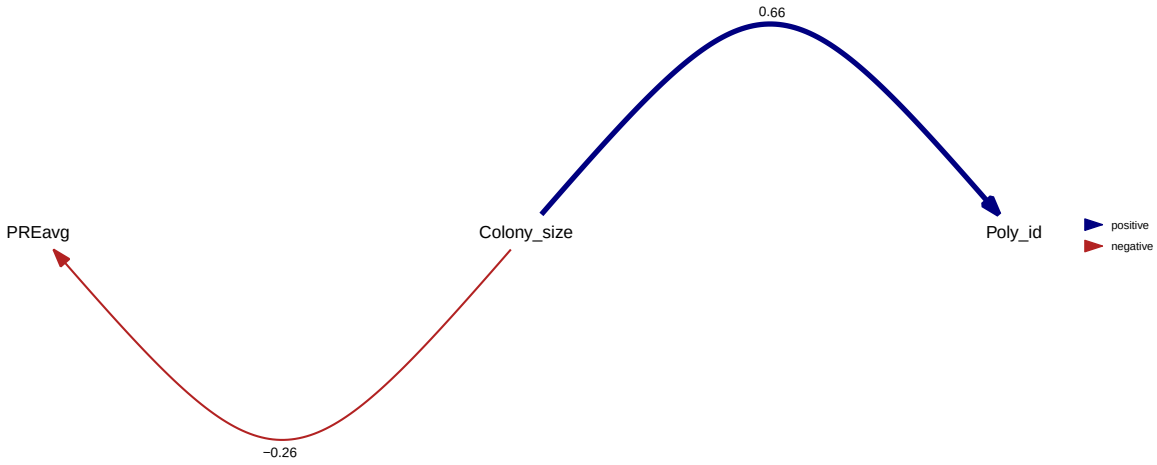
model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.38	0.83	10.7	0	1	0.78

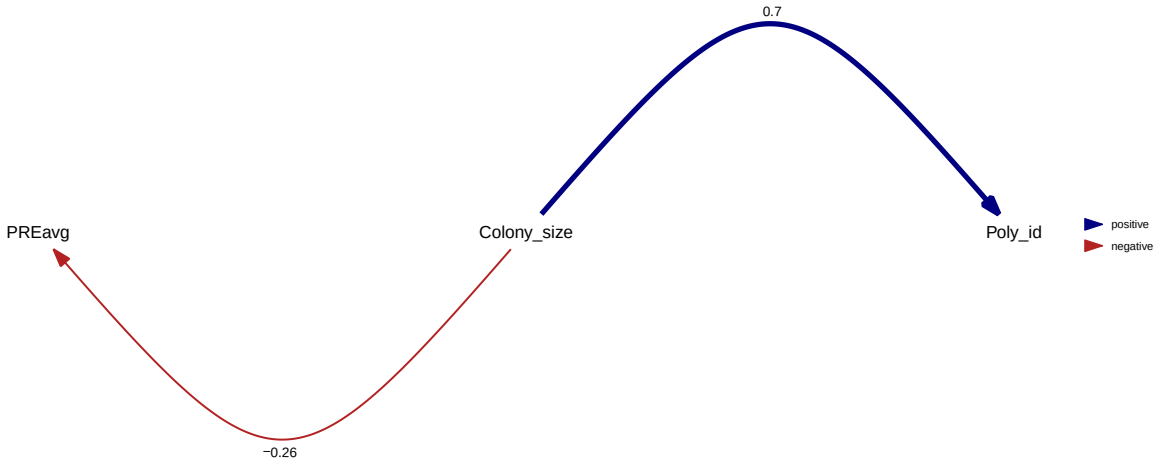
Table 8: FBD crown path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
four	1	5	0.5	0.78	10.82	0	1	0.79

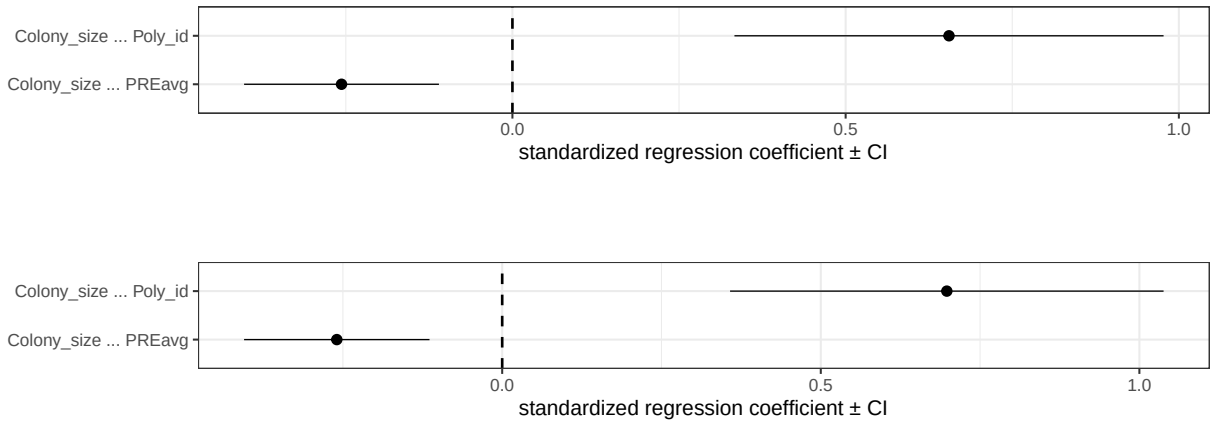








2.2.2.1 Estimate confidence intervals for path coefficients



2.3 Both

2.3.1 Alternative causal models

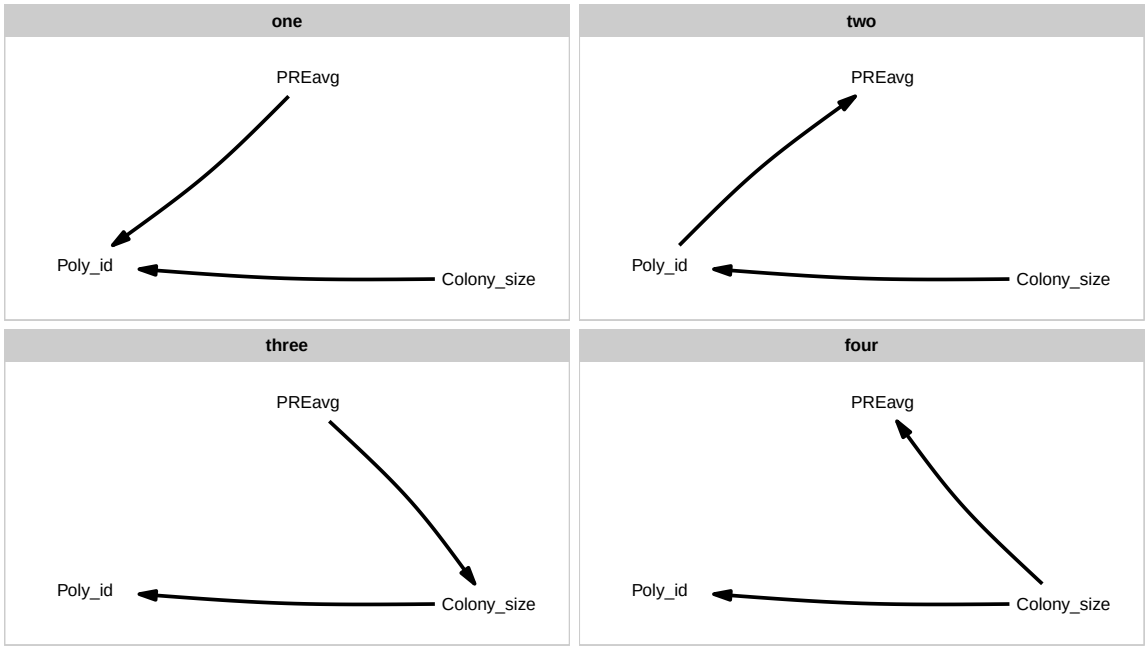


Table 9: NCuniform stem path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
three	1	5	0.29	0.86	10.67	0.0	1.00	0.47
two	1	5	0.59	0.74	10.96	0.3	0.86	0.40

Table 10: NCuniform crown path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
three	1	5	0.06	0.97	10.43	0.00	1.00	0.46
two	1	5	0.25	0.88	10.62	0.19	0.91	0.42

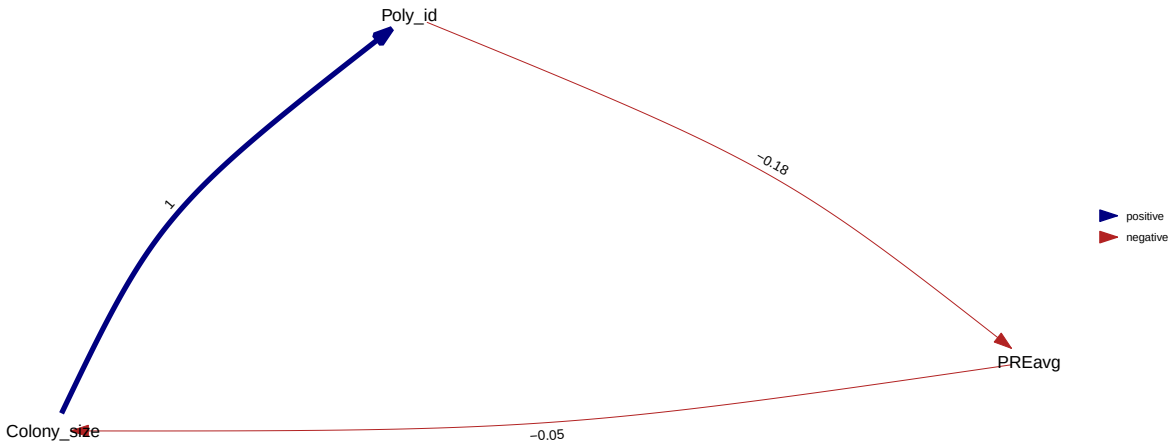
Table 11: FBD stem path analysis model selection summary table

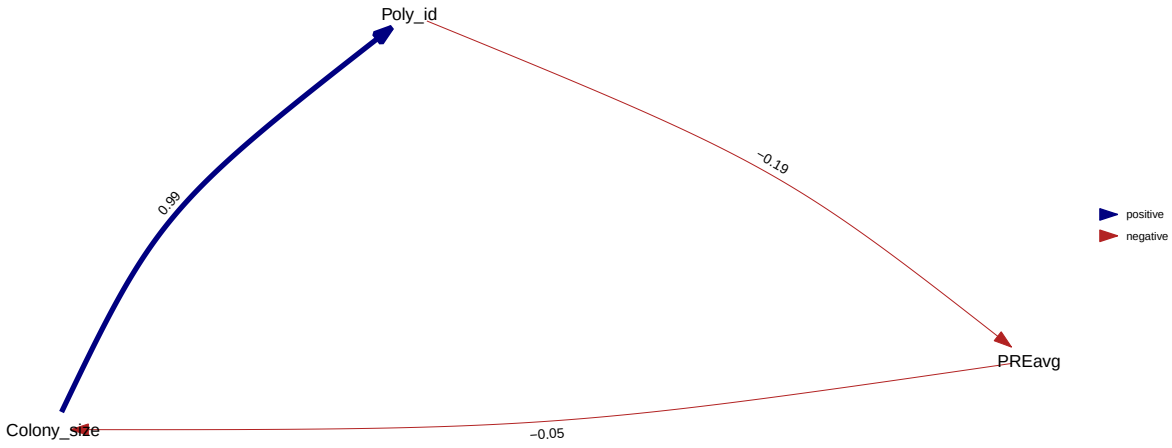
model	k	q	C	p	CICc	CICc difference	l	w
three	1	5	0.31	0.86	10.68	0.00	1.00	0.45
two	1	5	0.63	0.73	11.00	0.32	0.85	0.39

Table 12: FBD crown path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
three	1	5	0.09	0.96	10.46	0.00	1.00	0.48
two	1	5	0.64	0.73	11.01	0.55	0.76	0.37

2.3.2 Path analysis




Poly_id
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positive
negative
PREavg
Colony_size
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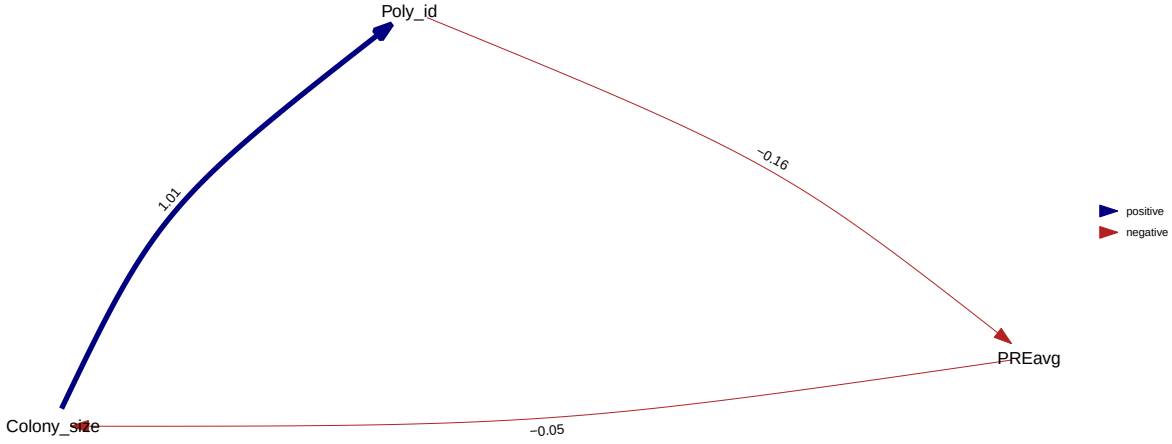
Poly_id
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positive
negative
PREavg
Colony_size
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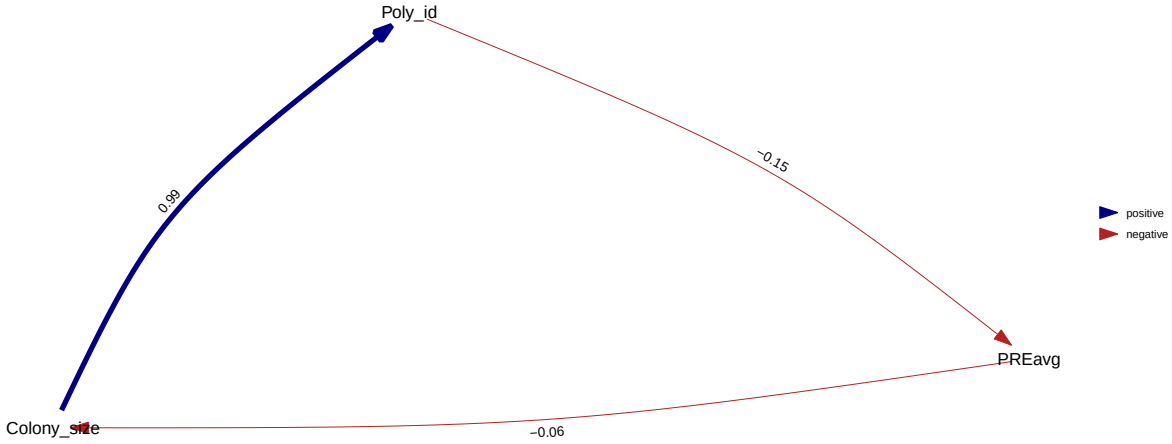
Poly_id
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positive
negative
PREavg
Colony_size
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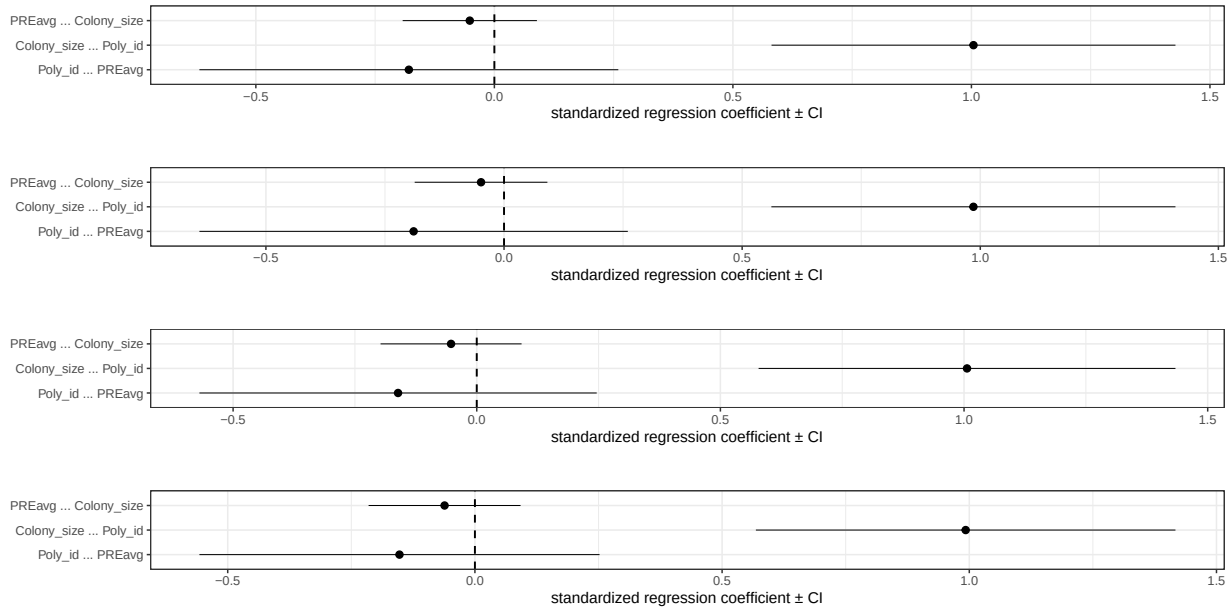
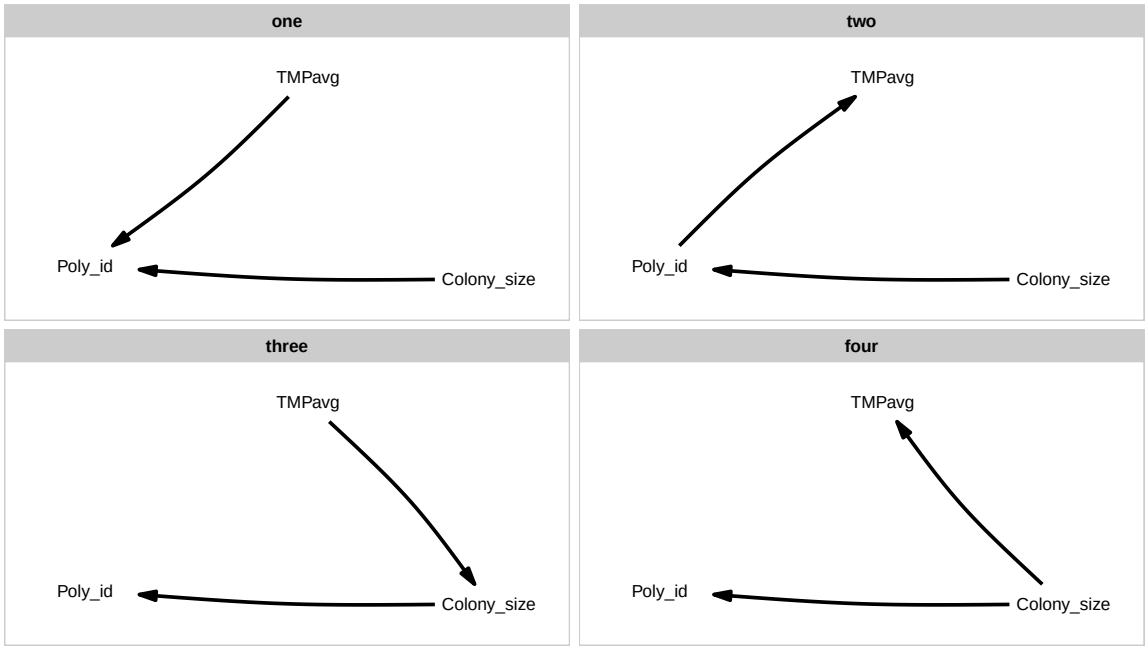
2.3.2.1 Estimate confidence intervals for path coefficients



3 TMP

3.1 Tropical

3.1.1 Alternative causal models



3.1.2 Path analysis

Table 13: NCuniform stem path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.69	0.71	11.24	0	1	0.67

Table 14: NCuniform crown path analysis model selection summary table

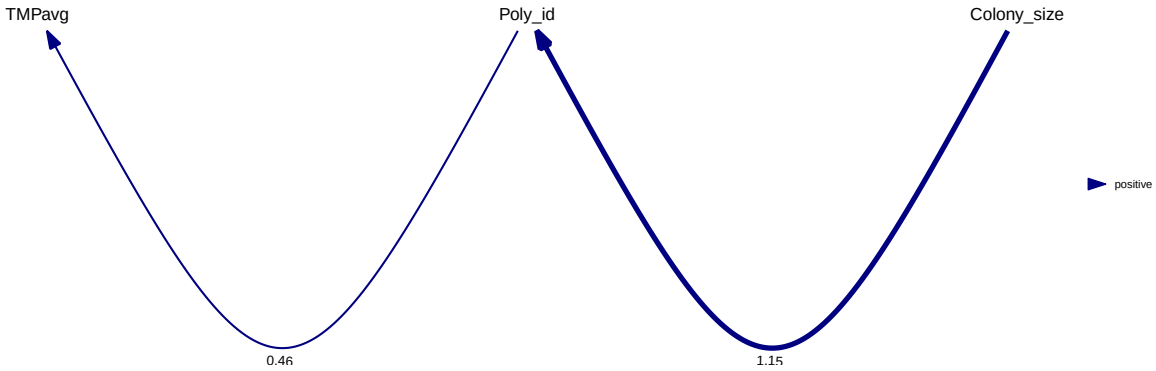
model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.69	0.71	11.24	0.00	1.0	0.64
one	1	5	2.53	0.28	13.07	1.83	0.4	0.26

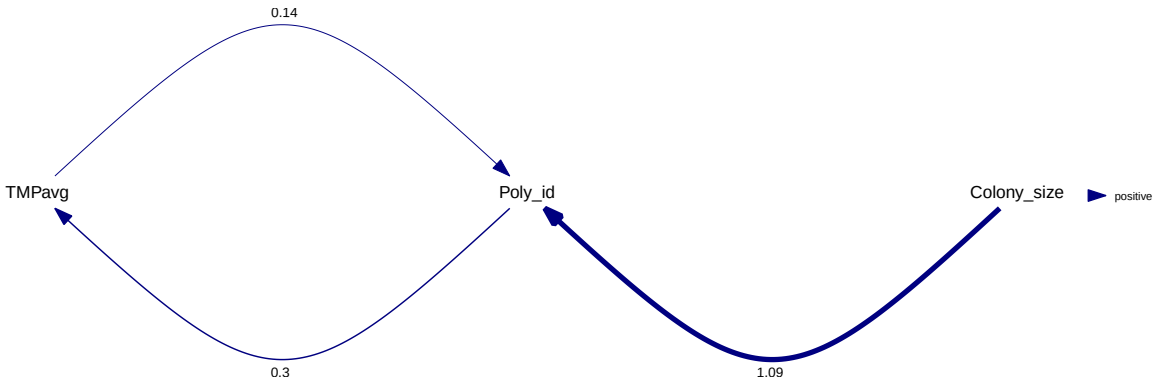
Table 15: FBD stem path analysis model selection summary table

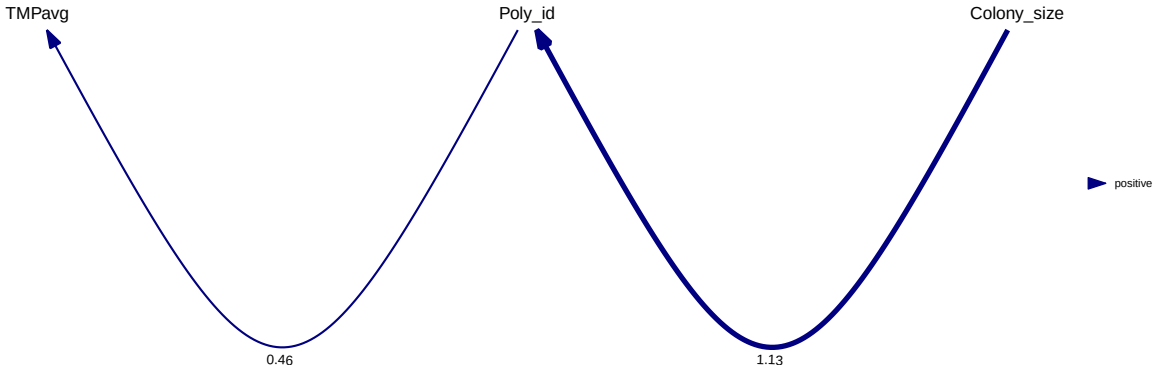
model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.69	0.71	11.24	0	1	0.73

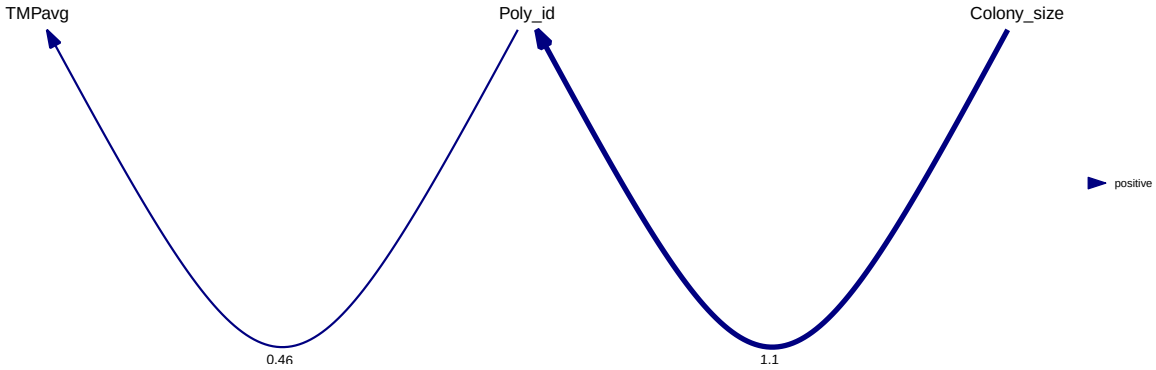
Table 16: FBD crown path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.69	0.71	11.24	0	1	0.74



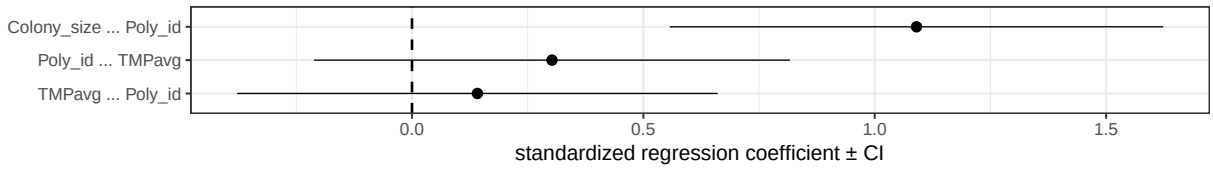






3.1.2.1 Estimate confidence intervals for path coefficients

Colony_size ... Poly_id
Poly_id ... TMPavg
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI

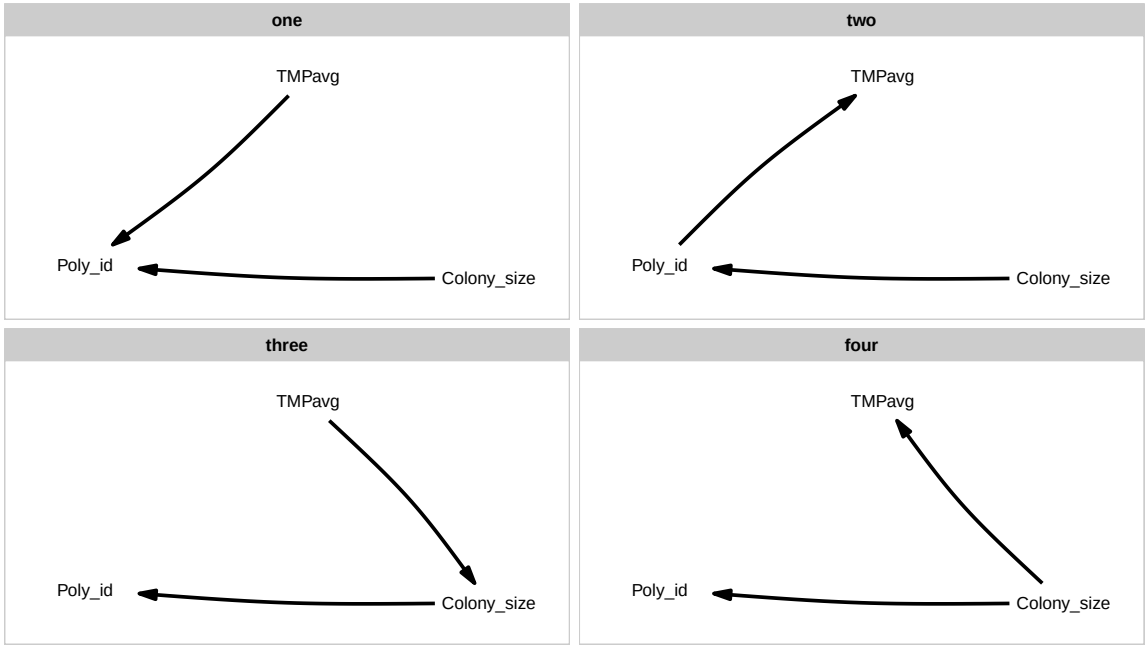

Colony_size ... Poly_id
Poly_id ... TMPavg
TMPavg ... Poly_id
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI

Colony_size ... Poly_id
Poly_id ... TMPavg
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI

Colony_size ... Poly_id
Poly_id ... TMPavg
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI

3.2 Temperate

3.2.1 Alternative causal models



3.2.2 Path analysis

Table 17: NCuniform stem path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
one	1	5	4.44	0.11	14.77	0	1	0.62

Table 18: NCuniform crown path analysis model selection summary table

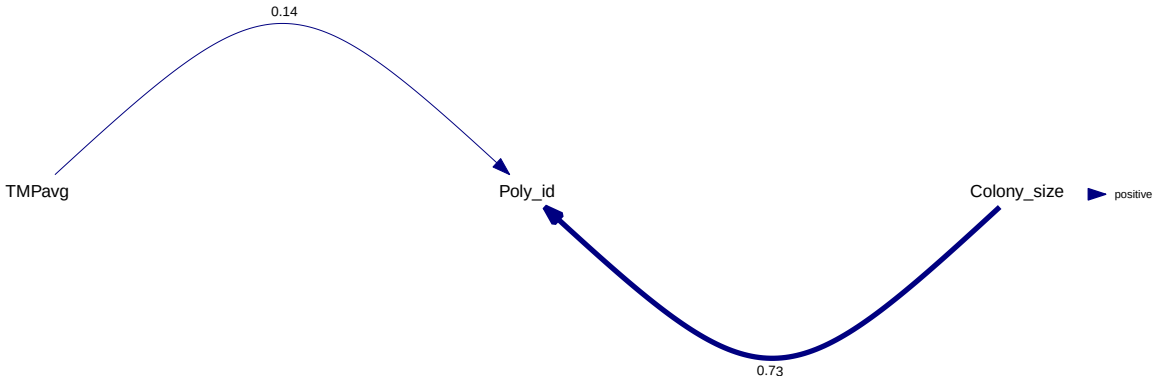
model	k	q	C	p	CICc	CICc difference	l	w
one	1	5	4.4	0.11	14.73	0	1	0.63

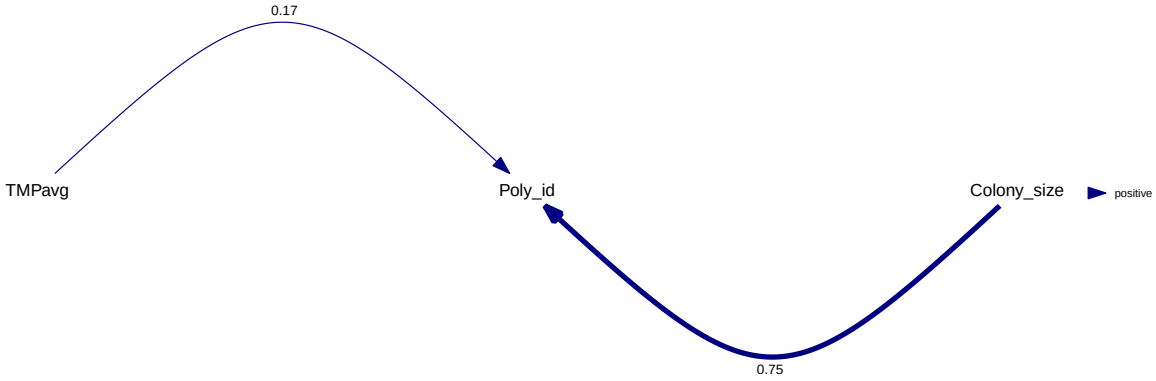
Table 19: FBD stem path analysis model selection summary table

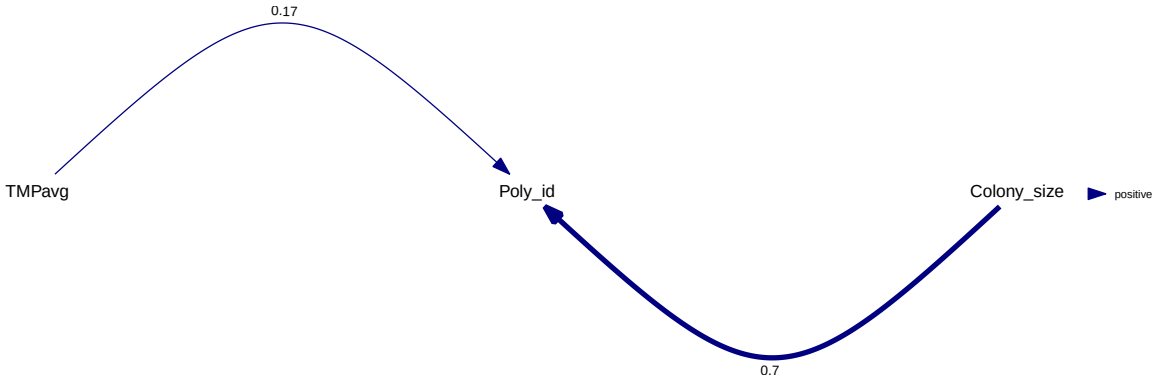
model	k	q	C	p	CICc	CICc difference	l	w
one	1	5	4.03	0.13	14.36	0	1	0.6

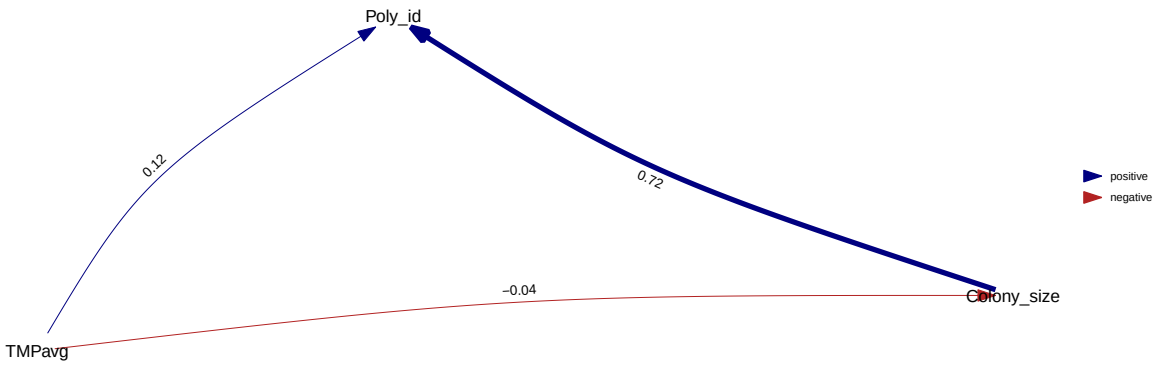
Table 20: FBD crown path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
one	1	5	3.71	0.16	14.03	0.00	1.00	0.56
three	1	5	5.19	0.07	15.52	1.49	0.48	0.27

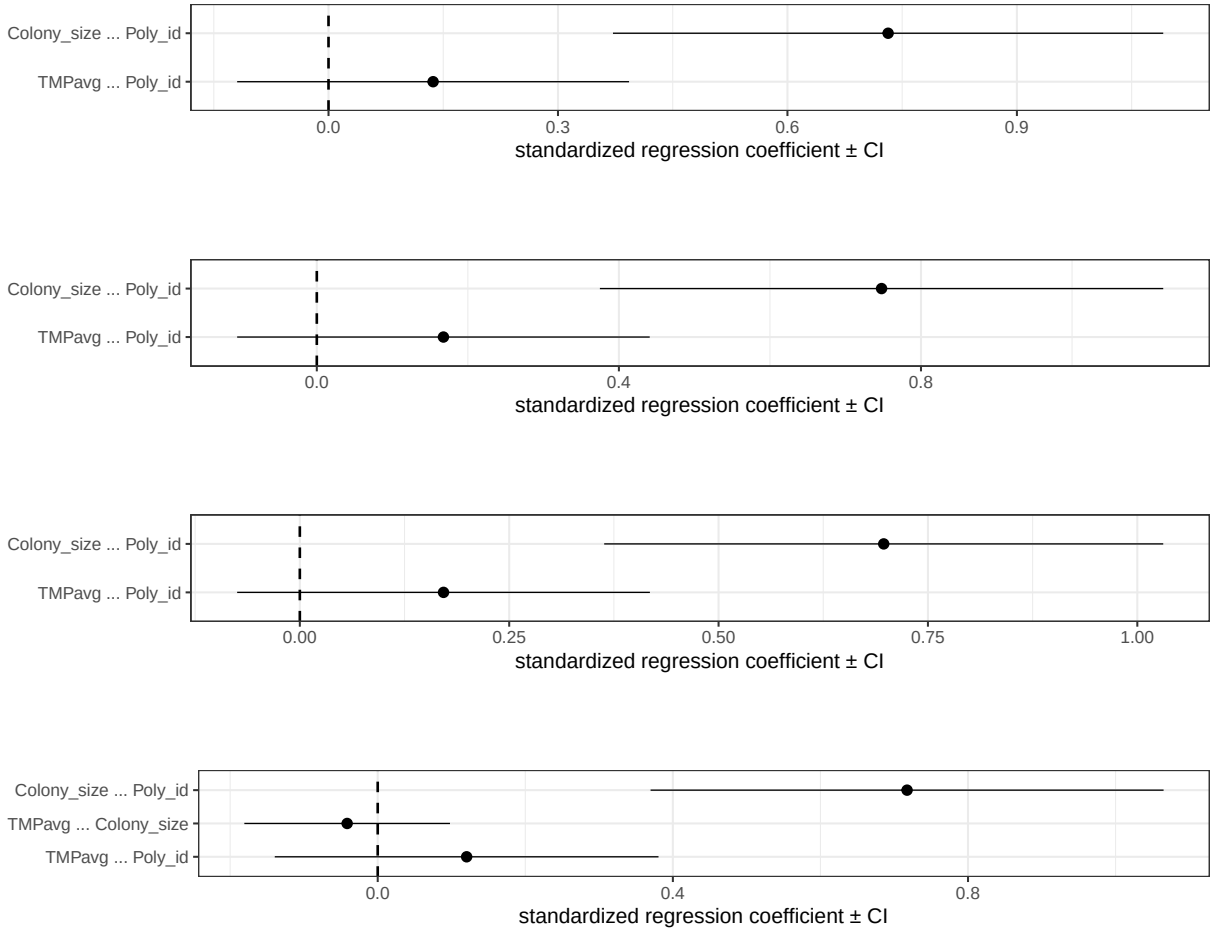






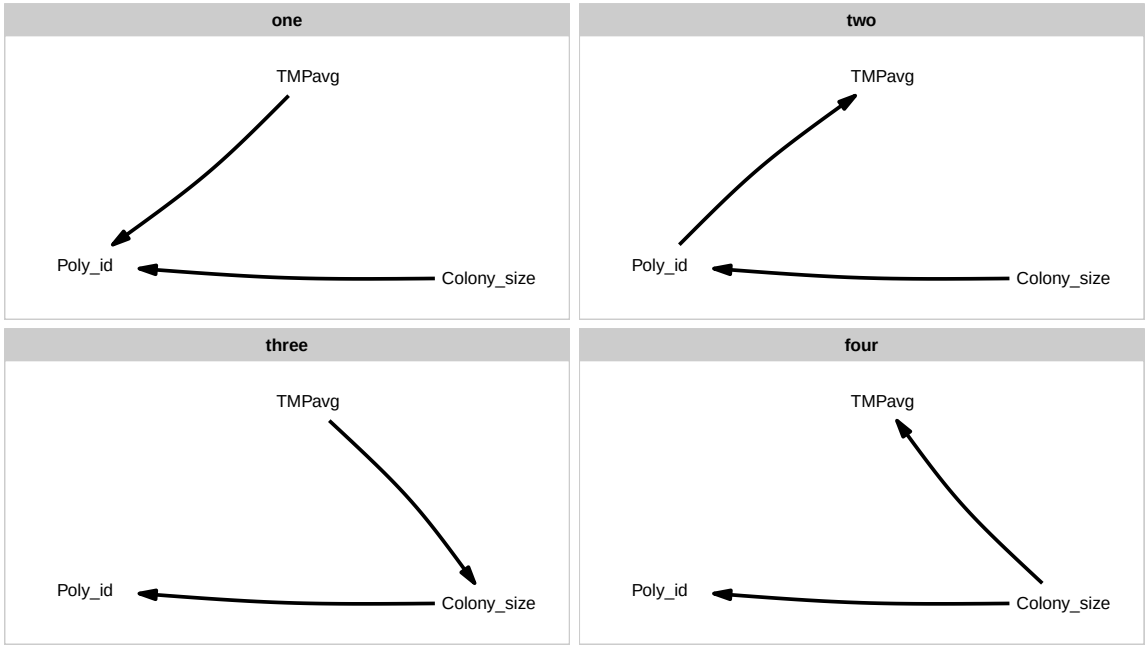


3.2.2.1 Estimate confidence intervals for path coefficients



3.3 Both

3.3.1 Alternative causal models



3.3.2 Path analysis

Table 21: NCuniform stem path analysis model selection summary table

model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.58	0.75	10.95	0.00	1.00	0.48
one	1	5	0.85	0.66	11.22	0.26	0.88	0.42

Table 22: NCuniform crown path analysis model selection summary table

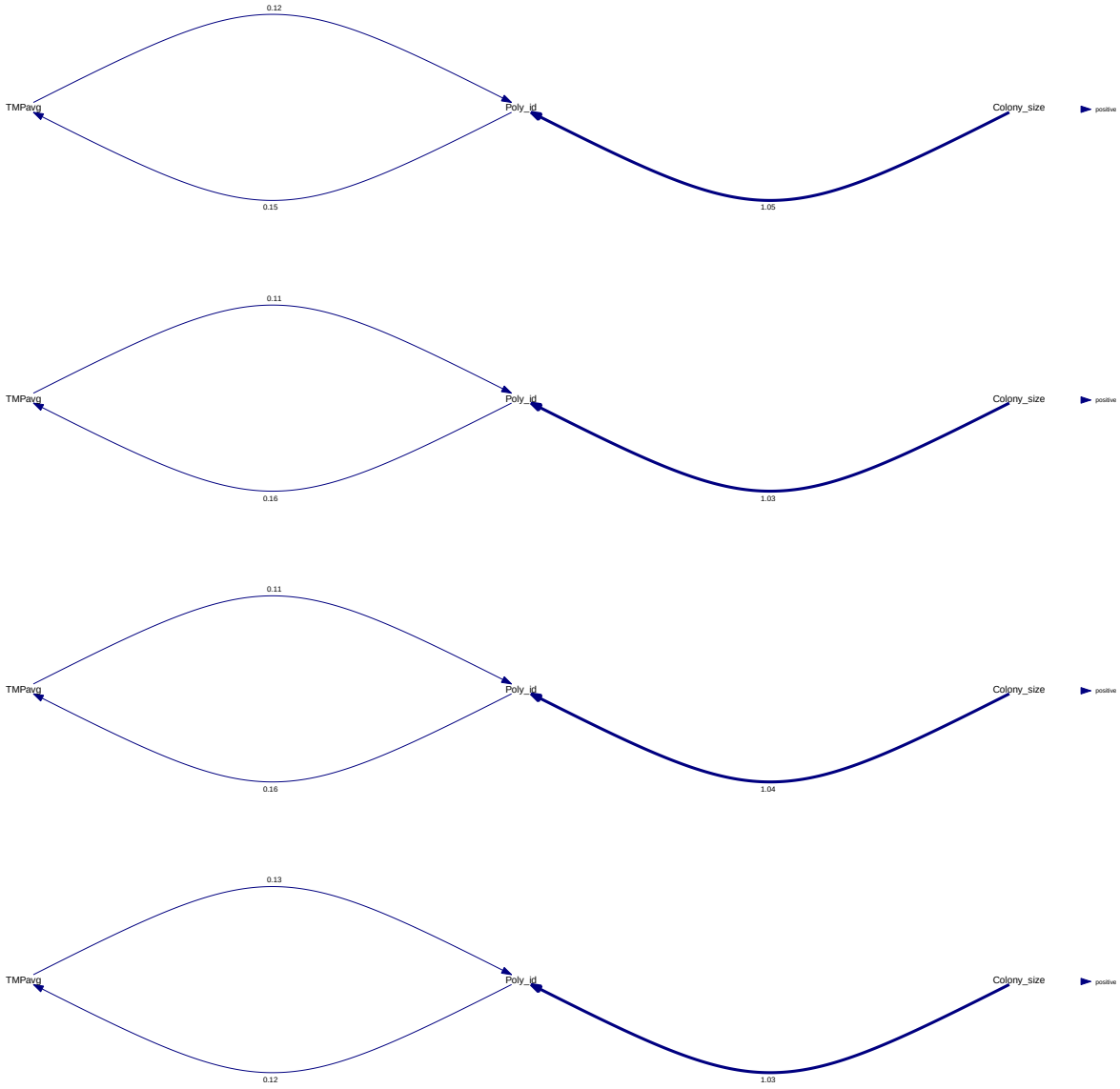
model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.58	0.75	10.95	0.00	1.00	0.50
one	1	5	0.97	0.61	11.34	0.39	0.82	0.41

Table 23: FBD stem path analysis model selection summary table

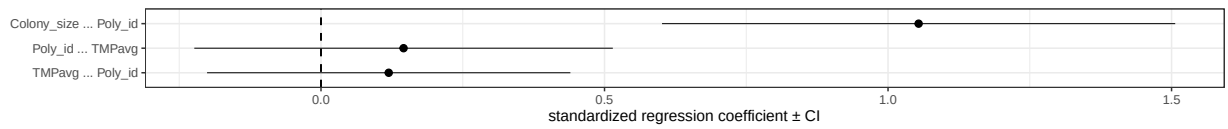
model	k	q	C	p	CICc	CICc difference	l	w
two	1	5	0.42	0.81	10.79	0.00	1.00	0.51
one	1	5	0.96	0.62	11.33	0.54	0.77	0.39

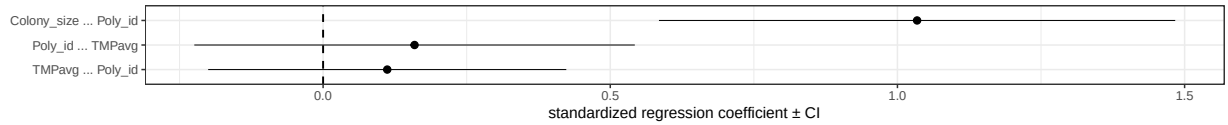
Table 24: FBD crown path analysis model selection summary table

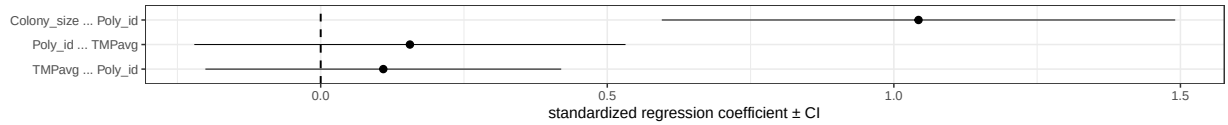
model	k	q	C	p	CICc	CICc difference	l	w
one	1	5	0.51	0.77	10.88	0.00	1.00	0.50
two	1	5	0.92	0.63	11.29	0.41	0.82	0.41

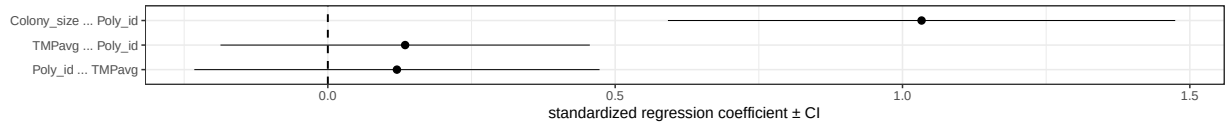


3.3.2.1 Estimate confidence intervals for path coefficients




Colony_size ... Poly_id
Poly_id ... TMPavg
TMPavg ... Poly_id
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI


Colony_size ... Poly_id
Poly_id ... TMPavg
TMPavg ... Poly_id
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI


Colony_size ... Poly_id
TMPavg ... Poly_id
Poly_id ... TMPavg
0.0
0.5
1.0
1.5
standardized regression coefficient ± CI