

Ant Climate Project

Path analysis using PCA - Global.

Louis Bell-Roberts

November 27, 2023

Contents

1	Initial comments	2
2	Summary	2
3	Create alternative causal models	2
4	Path analysis	3
4.1	NCuniform stem tree	3
4.2	NCuniform crown tree	4
4.3	FBD stem tree	5
4.4	FBD crown tree	7
5	Panel plots	8

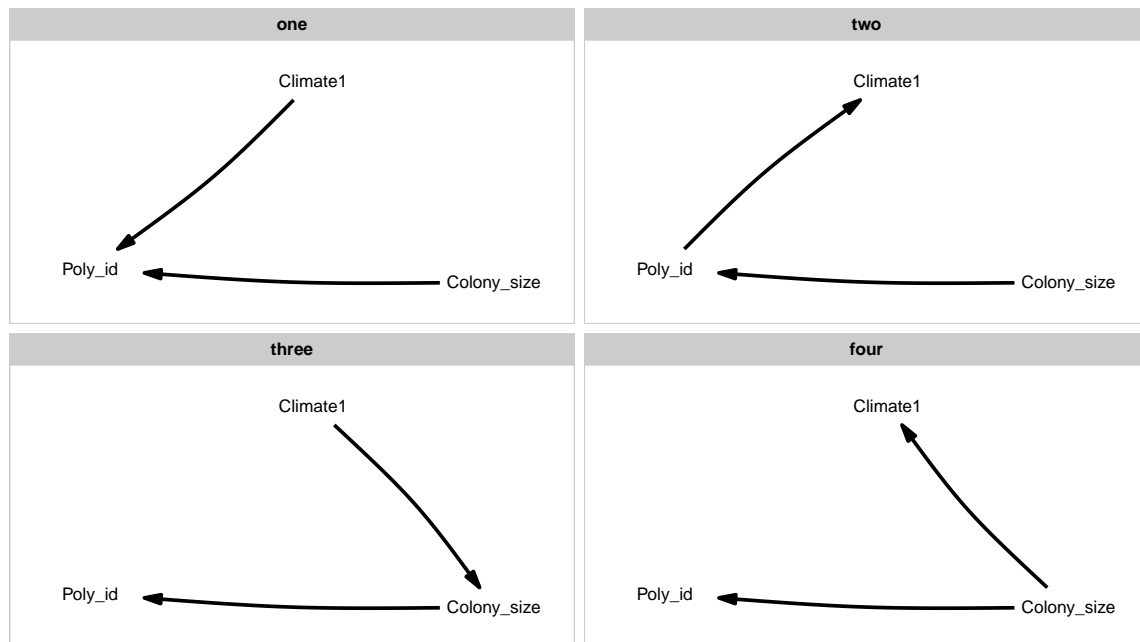
1 Initial comments

- 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. Process repeated on the 4 different PCA datasets created using the 4 different MCC trees.
- We use PCA for phylogenetic path analysis as path analysis with both temperature and rainfall variables in the same models were always rejected, unless causal paths were drawn between climatic variables. This is likely because of the correlation between climatic variables. Path analysis with PCA allows us to analyse both temperature and rainfall in the same causal models.
- The potential model set is reduced to just four models for each analysis, assuming that colony size has a direct effect on the number of worker castes (Bell-Roberts et al., 2023).

2 Summary

- Model 3 (climate affects colony size) most often comes out as the best model across trees. But there is no real pattern of any strong effect of climate and social complexity. Results also quite sensitive to phylogenetic uncertainty.

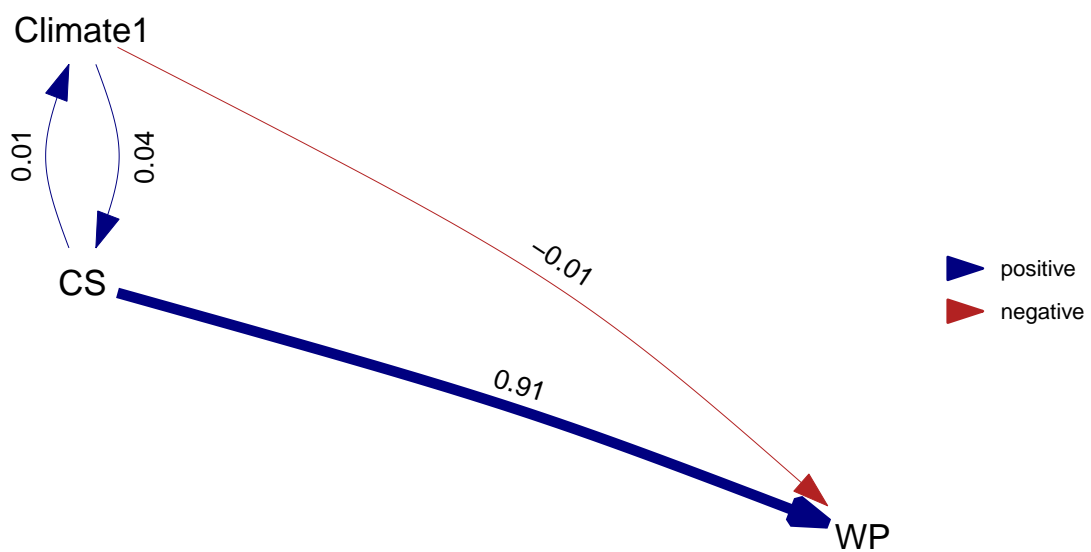
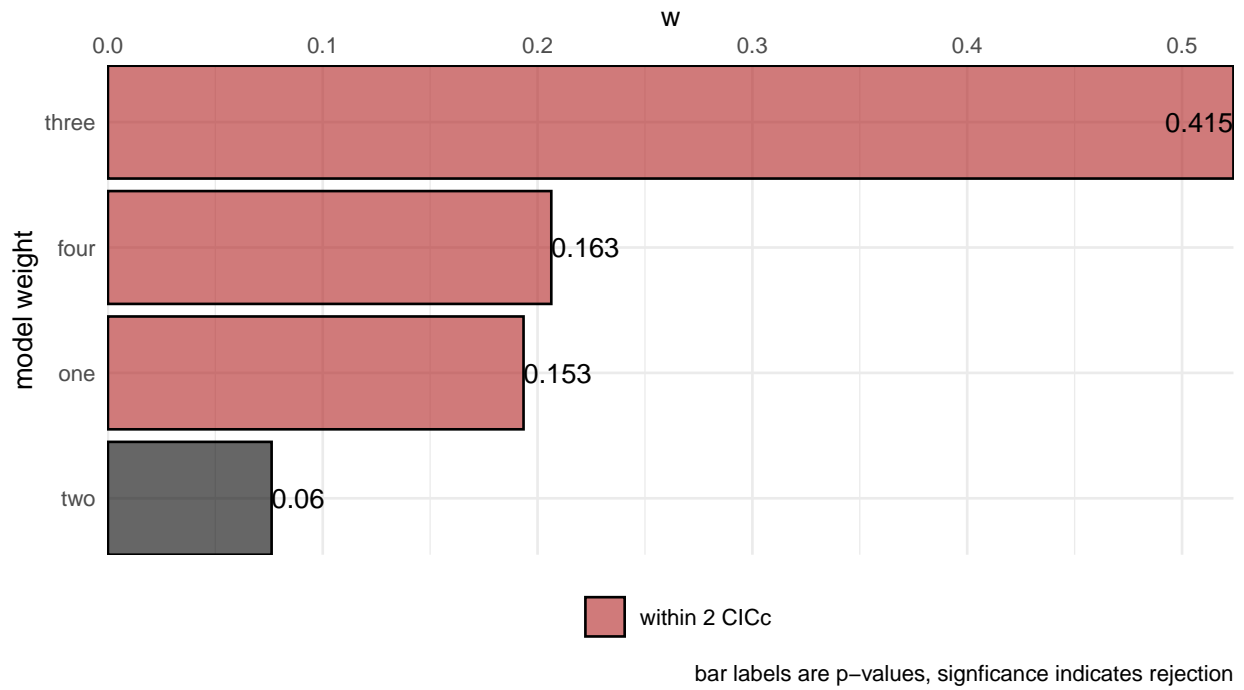
3 Create alternative causal models

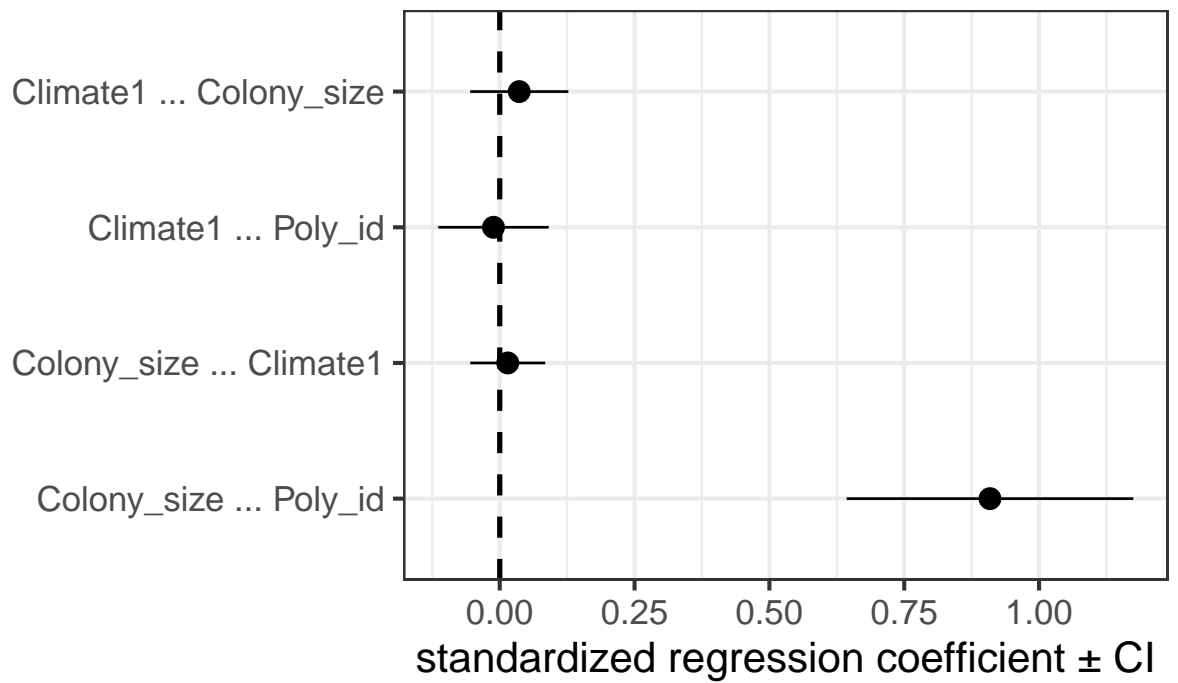


4 Path analysis

4.1 NCuniform stem tree

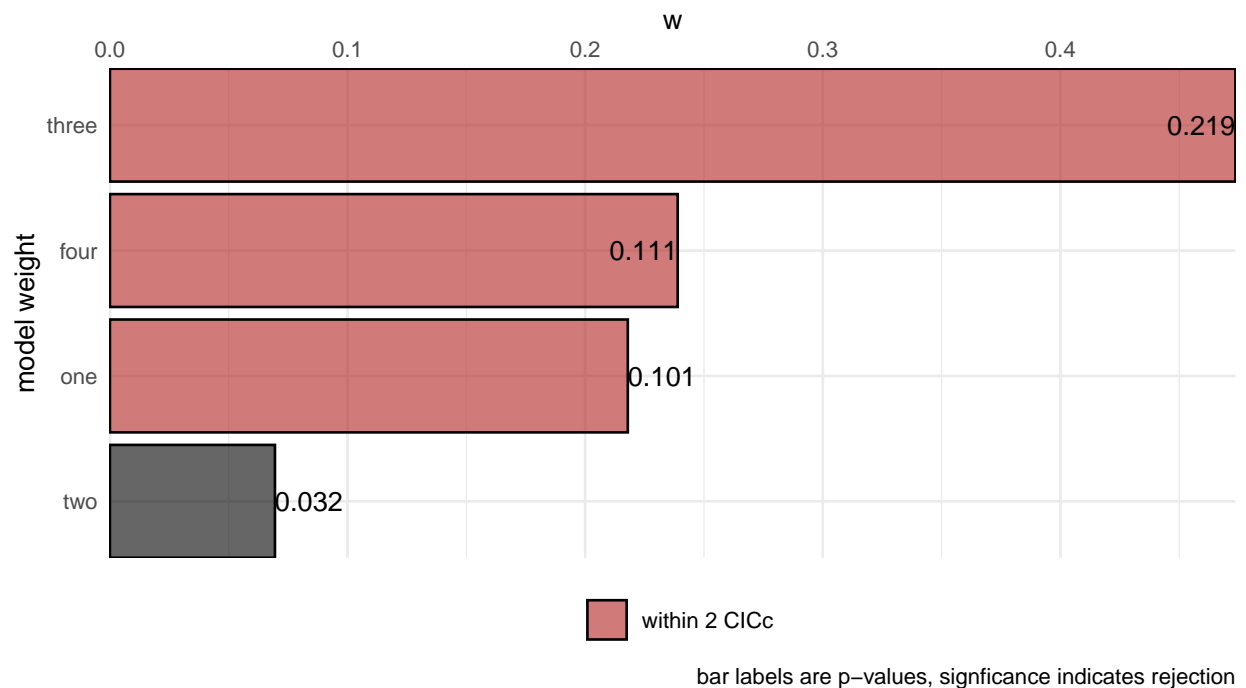
Factor loading PC1: TMP: negative; PRE: negative

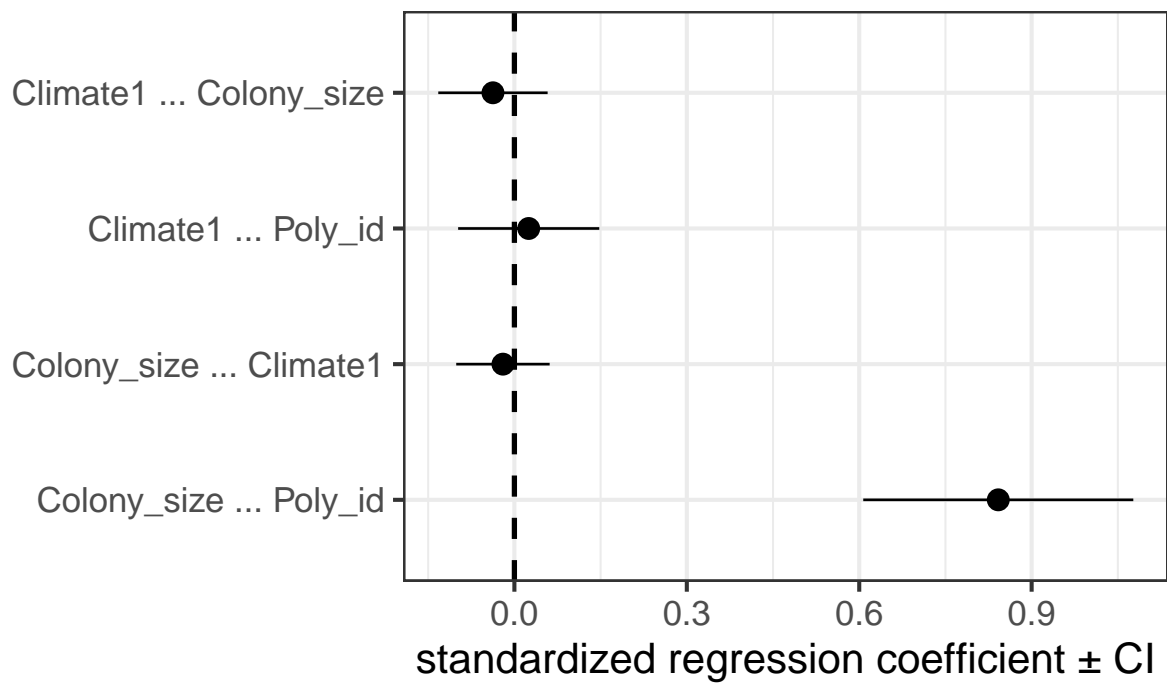
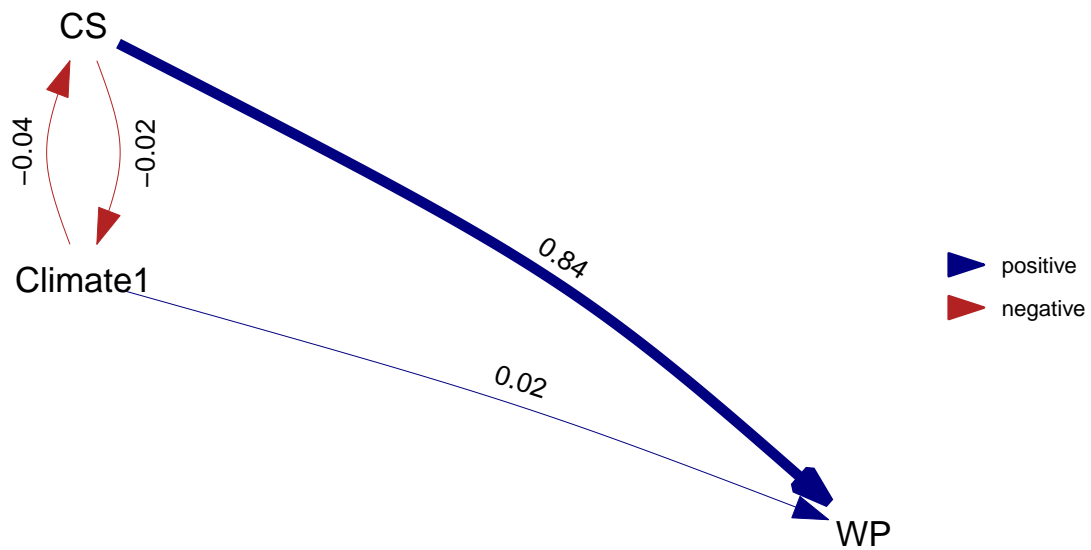




4.2 NCuniform crown tree

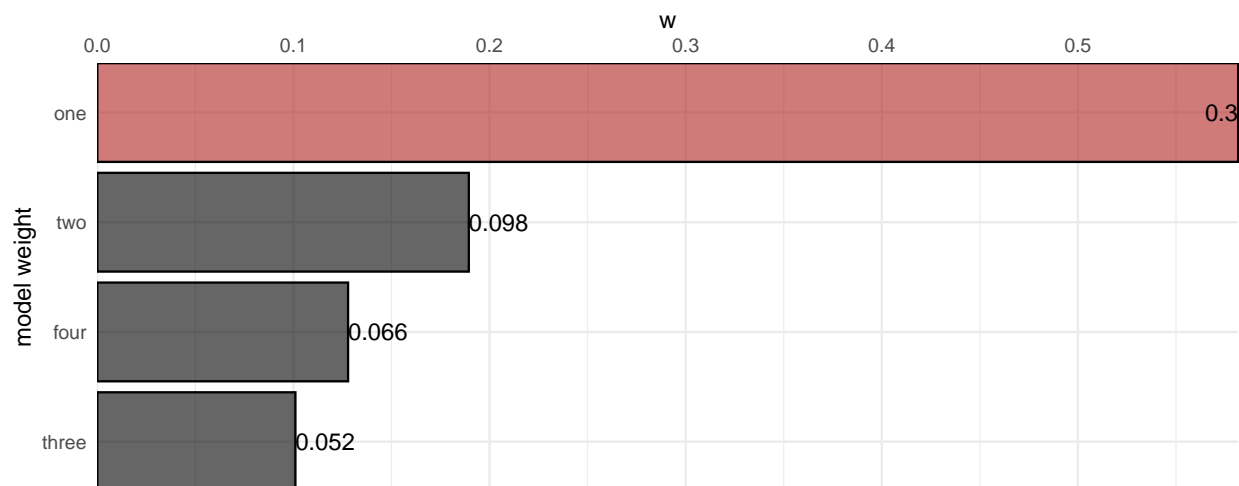
Factor loading PC1: TMP: positive; PRE: positive





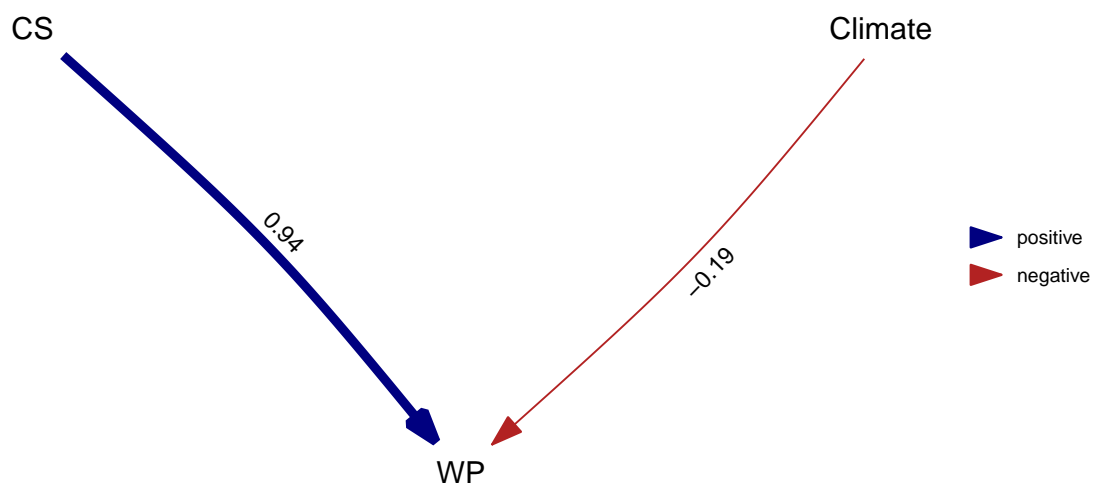
4.3 FBD stem tree

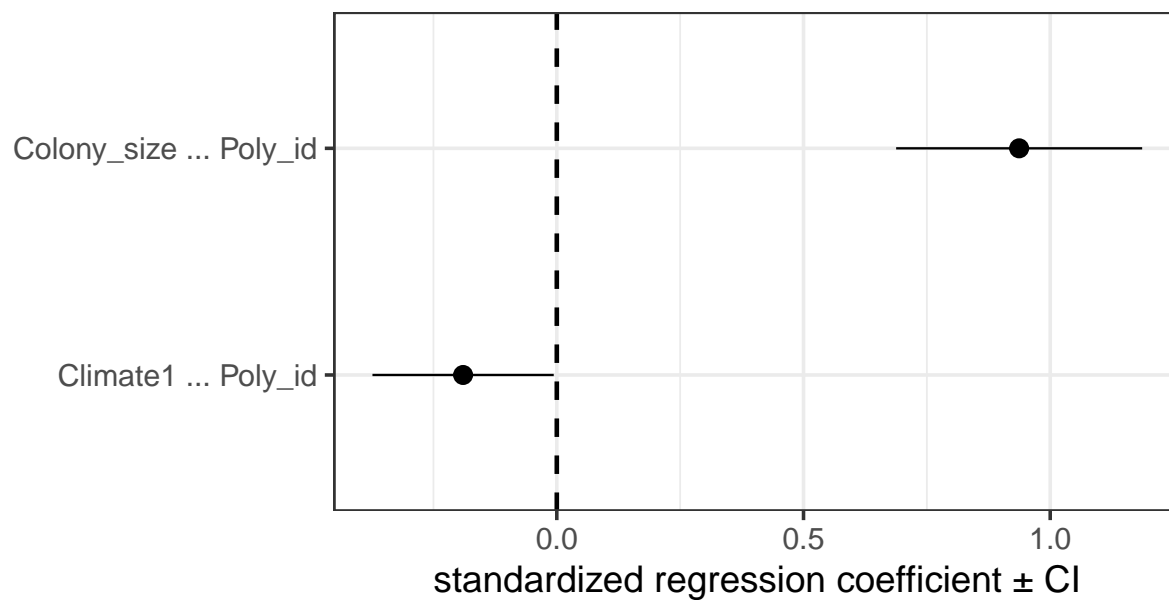
Factor loading PC1: TMP: negative; PRE: negative



within 2 CICc

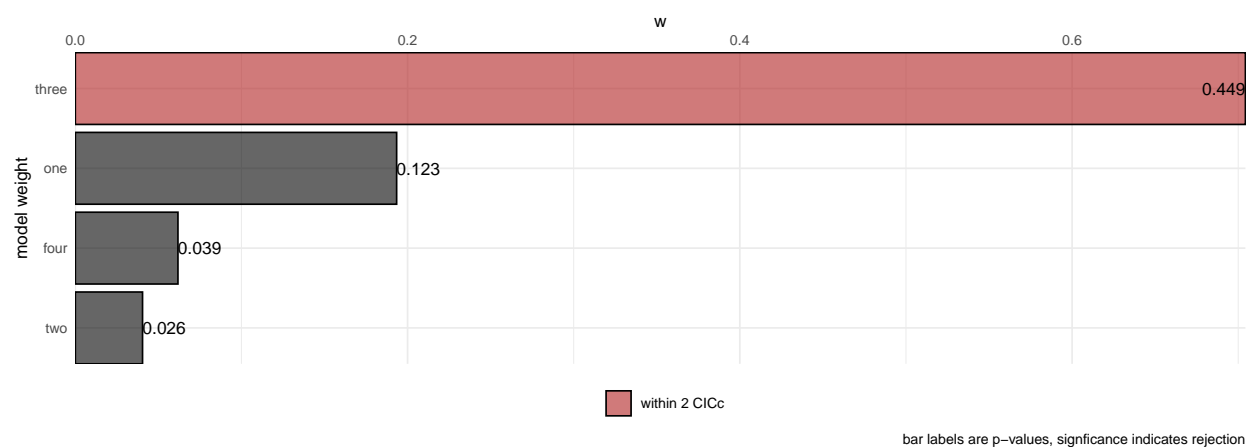
bar labels are p-values, significance indicates rejection

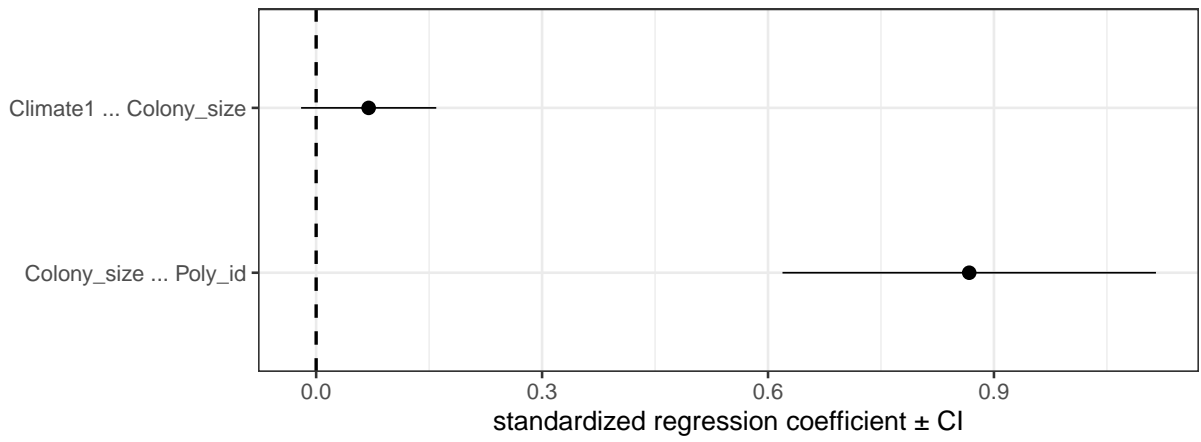
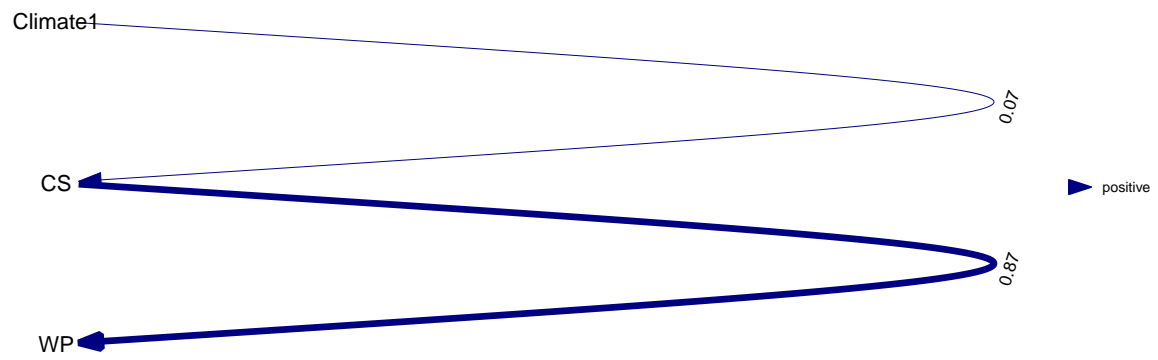




4.4 FBD crown tree

Factor loading PC1: TMP: negative; PRE: negative





5 Panel plots

pdf
2

