Appendix S2. Efficiency of indices to distinguish between binary random and nested matrices

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METHODS

In our novel perspective, the main function of a nestedness index is to distinguish between matrices with randomly distributed cell values (non-significant nestedness, equiprobable model), matrices in which cell values are partially defined by the marginal sums (significant nestedness), and matrices in which cell values are fully determined by marginal sums (nested matrices, proportional model). Here, we analyzed the capacity of several indices in distinguishing these topologies.

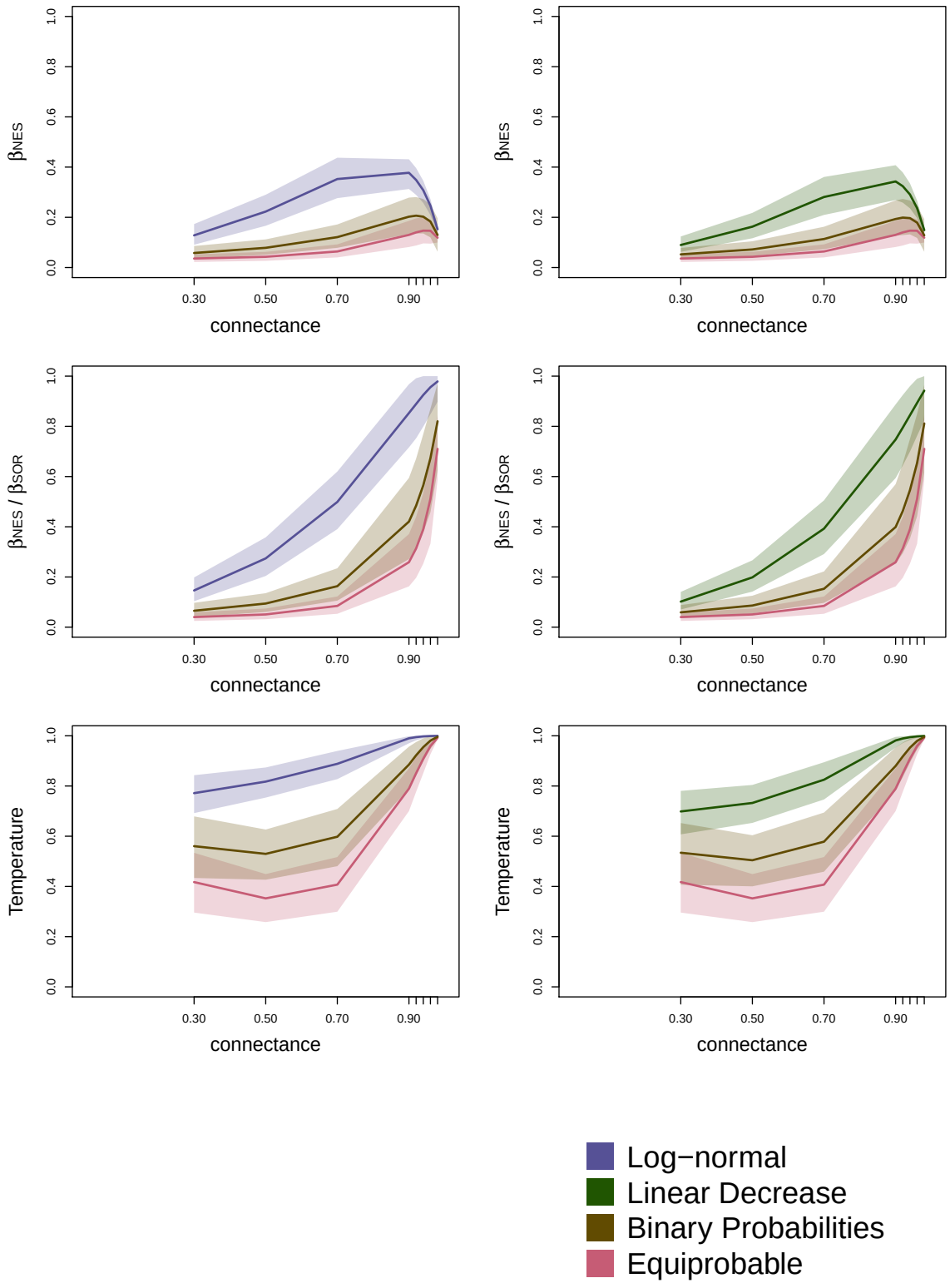
We produced probability matrices with dimensions: 5x5, 10x10, and 20x20, based on three different marginal probabilities: lognormal, linear decrease, and equiprobable. In Appendix S1 we generated weighted matrices from these probability matrices with fixed total sampling. Here, we produced binary matrices for a more appropriate comparison of binary indices.

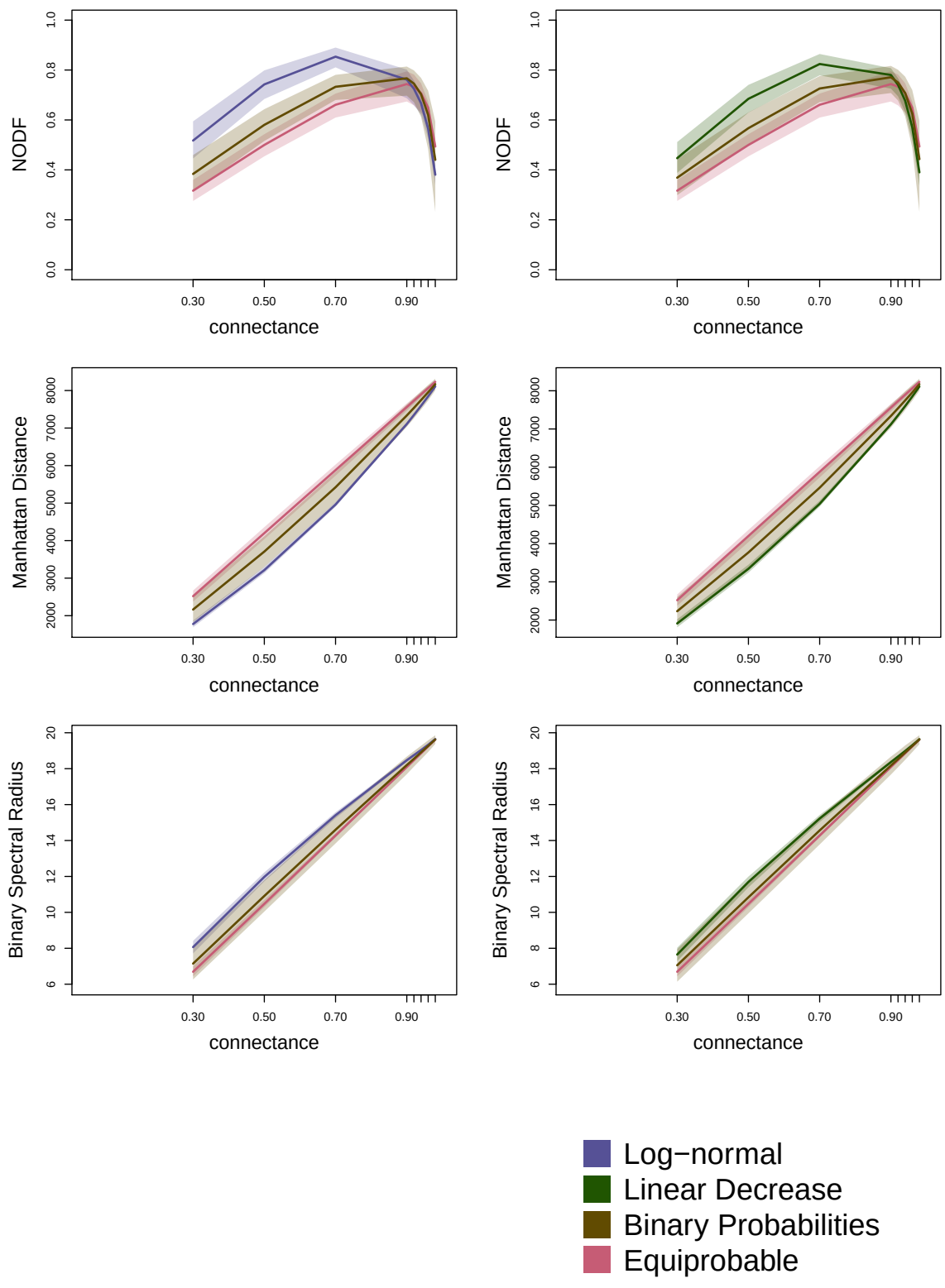
As binary matrices do not present weighted information we can only fix the connectance. We produced binary matrices with connectances: 0.3, 0.5, 0.7, 0.9, 0.92, 0.94, 0.96, and 0.98. For each matrix we calculated a set of binary nestedness indices (Table 1).

Moreover, in analysis of binary matrices, we cannot know the original marginal probabilities, only the binary marginal sums (node degrees). To inspect the distortion caused by this approximation, for each matrix produced with fixed connectance, we produced a randomized matrix using a proportional algorithm based on binary marginal sums (binary proportional).

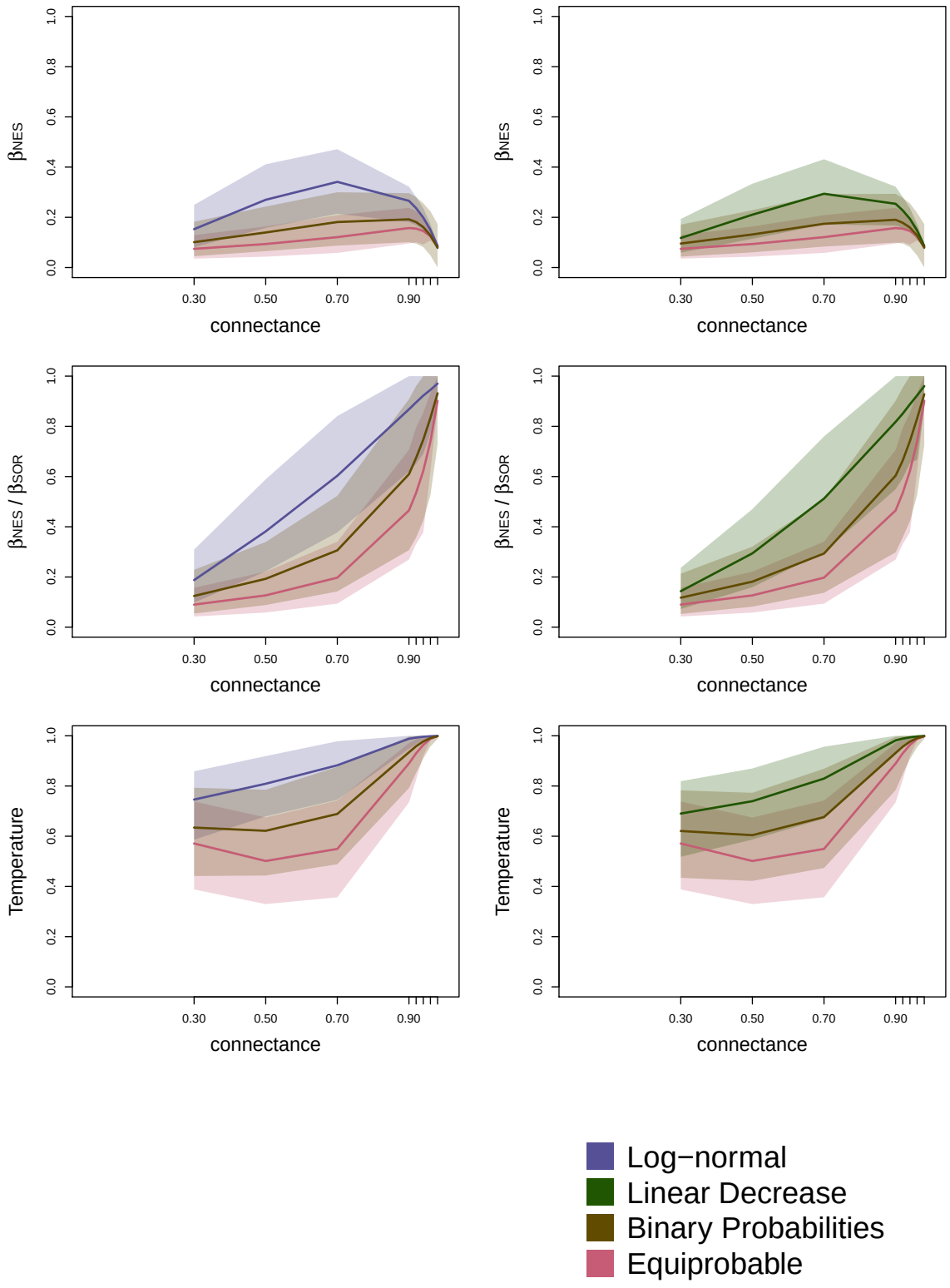
Here we present plots for a graphycal evaluation of the capacity of binary indices to separate between the proportional (lognormal and linear decrease) and the equiprobable null models. We also present values of the binary proportional null model. Indices in the y-axis and connectance on the x-axis. Each plot present median and intervals containing 95% of points. NODF values were divided by 100. For temperature we present 1 minus the raw value divided by 100 (so that it is directly related to nestedness).

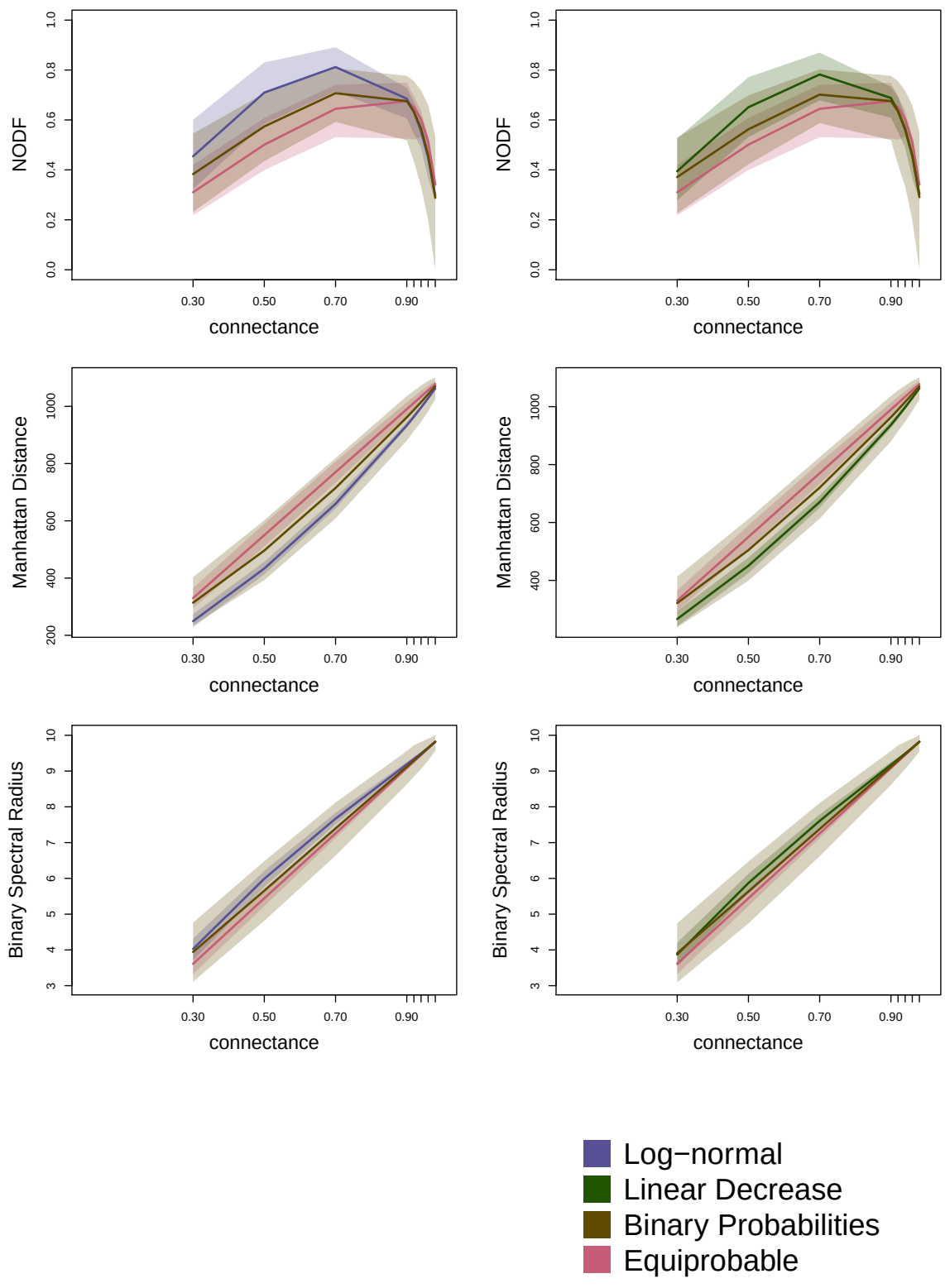
MATRIX SIZE: 20 x 20



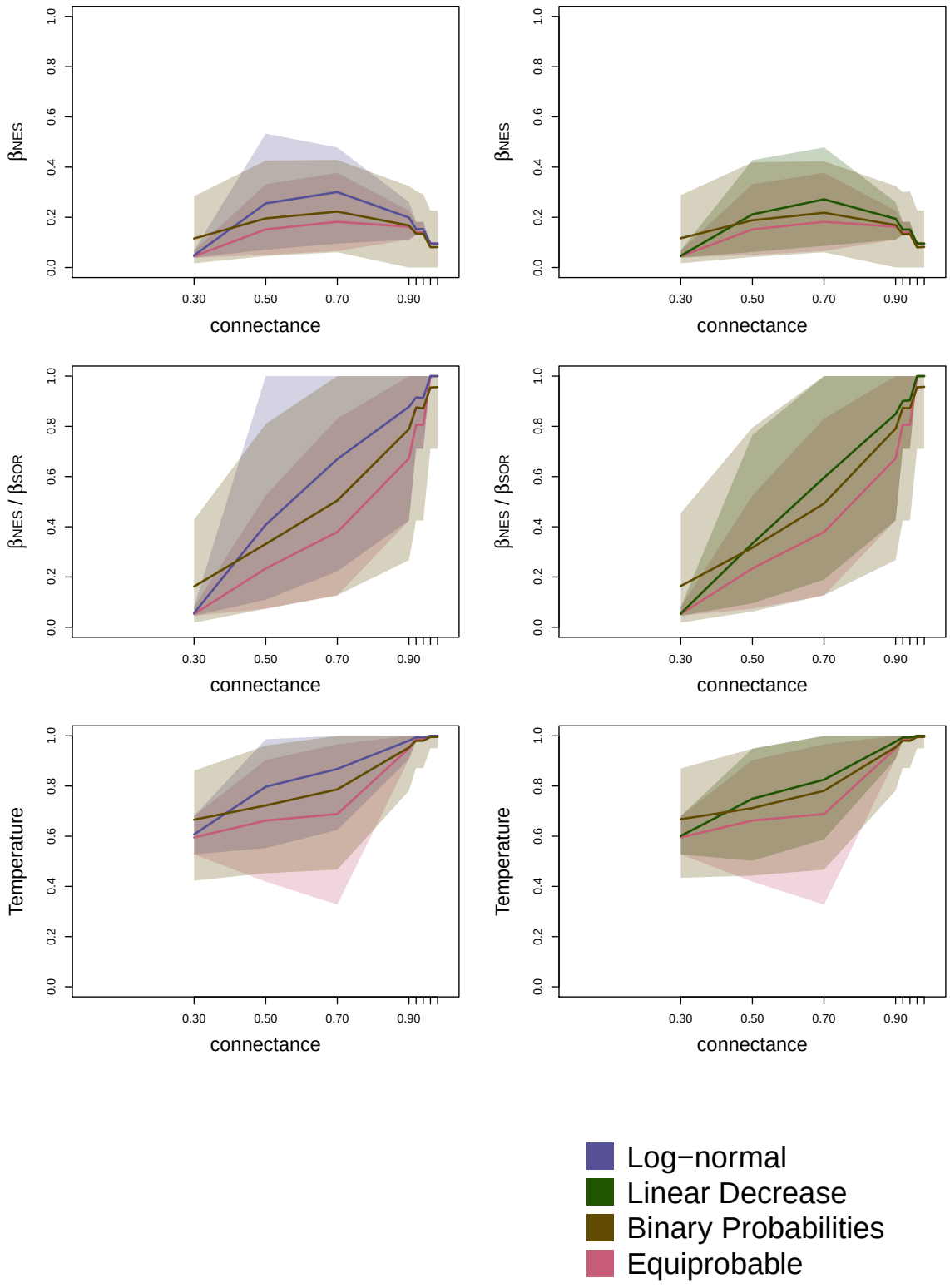

NODF
0.0
0.2
0.4
0.6
0.8
1.0
0.30
0.50
0.70
0.90
connectance
Manhattan Distance
2000
3000
4000
5000
6000
7000
8000
Binary Spectral Radius
6
8
10
12
14
16
18
20
Log−normal
Linear Decrease
Binary Probabilities
Equiprobable

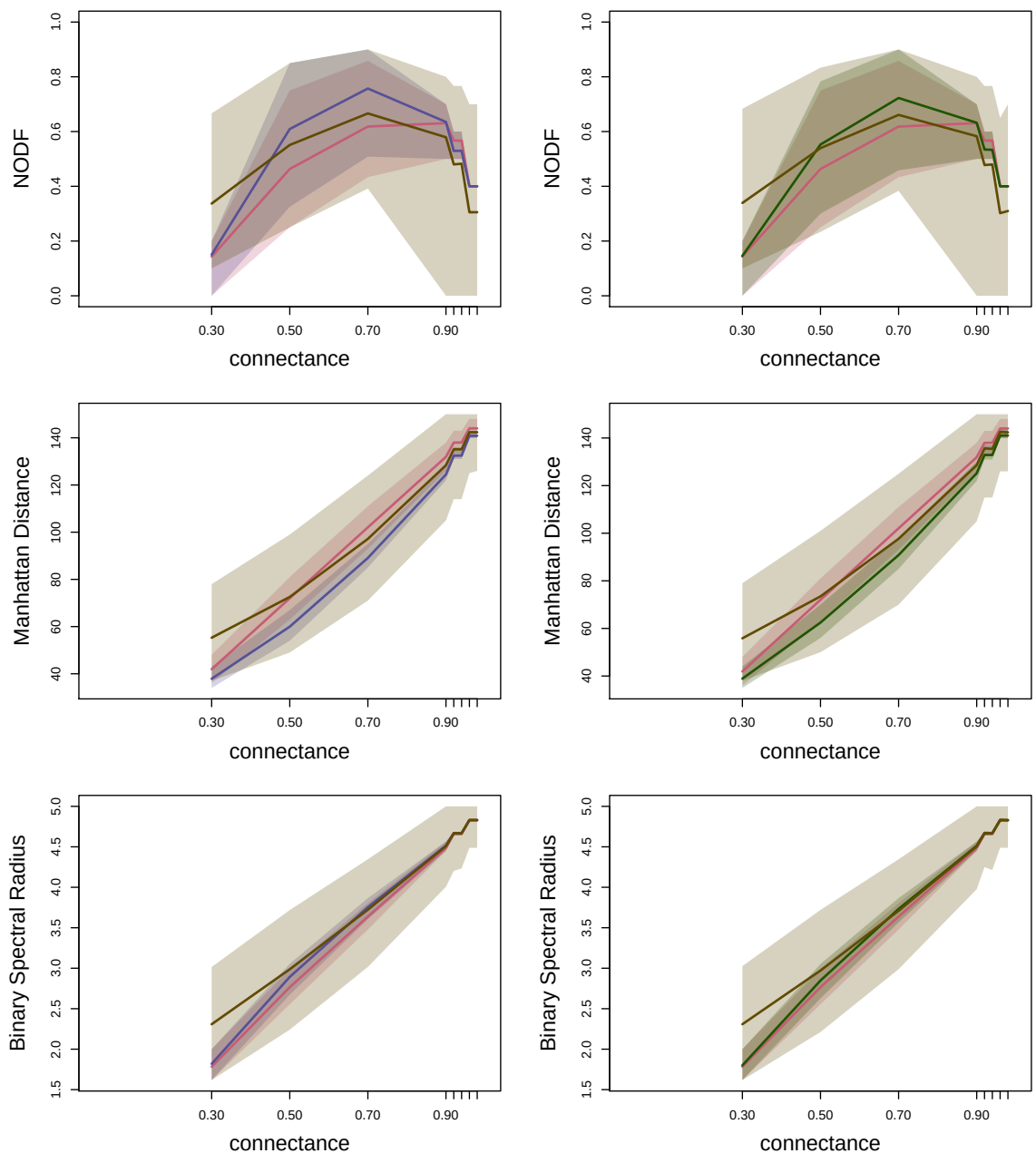
MATRIX SIZE: 10 x 10




NODF
0.0
0.2
0.4
0.6
0.8
1.0
0.30
0.50
0.70
0.90
connectance
Manhattan Distance
200
400
600
800
1000
Binary Spectral Radius
3
4
5
6
7
8
9
10
Log−normal
Linear Decrease
Binary Probabilities
Equiprobable

MATRIX SIZE: 5 x 5




NODF
0.0
0.2
0.4
0.6
0.8
1.0
0.30
0.50
0.70
0.90
connectance
NODF
0.0
0.2
0.4
0.6
0.8
1.0
0.30
0.50
0.70
0.90
connectance
Manhattan Distance
40
60
80
100
120
140
0.30
0.50
0.70
0.90
connectance
Manhattan Distance
40
60
80
100
120
140
0.30
0.50
0.70
0.90
connectance
Binary Spectral Radius
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
0.30
0.50
0.70
0.90
connectance
Binary Spectral Radius
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
0.30
0.50
0.70
0.90
connectance
Log−normal
Linear Decrease
Binary Probabilities
Equiprobable