## *New Phytologist* Supporting Information

Article title: Structural diversity and tree density drives variation in the biodiversity-ecosystem function relationship of woodlands and savannas

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The following Supporting Information is available for this article:

**Fig. S1** Histograms of raw untransformed observed variables used in final analyses.

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**Fig. S2** Histograms of observed variables transformed to achieve a normal frequency distribution.



**Fig. S3** Bivariate scatter plots for each observed variable used in SEMs, based on hypothesised paths of causality. Points are coloured according to vegetation type. A single linear regression combining all vegetation types is presented as a black line. Loess trend lines are fitted for each vegetation type. An orange loess trend line combines all data. All data is standardised and variables are transformed where it was appropriate for analysis.



**Fig. S4** Unstandardised path coefficients for the full model including tree species diversity, environmental covariates and stem density. Error bar intervals are ±1 standard error. Path coefficients where the interval does not overlap zero are considered to be significant effects.

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**Table S1** Table of correlation fit statistics for each pairwise Pearson correlation test of observed variables used in Structural Equation Models.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X | Y | r | lower 95% CI | Upper 95% CI | n | Prob. |
| Soil CEC | Soil C | 0.46 | 0.42 | 0.5 | 1224 | p <0.01 |
| Soil N | Soil C | 0.6 | 0.56 | 0.63 | 1224 | p <0.01 |
| Fire freq. | Soil C | -0.28 | -0.33 | -0.22 | 1224 | p <0.01 |
| MAP | Soil C | 0.44 | 0.39 | 0.48 | 1224 | p <0.01 |
| Precip. seas. | Soil C | -0.42 | -0.46 | -0.37 | 1224 | p <0.01 |
| Temp. stress | Soil C | -0.48 | -0.52 | -0.44 | 1224 | p <0.01 |
| Sand % | Soil C | -0.62 | -0.65 | -0.58 | 1224 | p <0.01 |
| Extrap. sp. rich. | Soil C | 0.15 | 0.09 | 0.2 | 1224 | p <0.01 |
| Shannon equit | Soil C | 0.17 | 0.11 | 0.22 | 1224 | p <0.01 |
| Tree height CoV | Soil C | 0.19 | 0.13 | 0.25 | 970 | p <0.01 |
| DBH CoV | Soil C | 0.14 | 0.08 | 0.19 | 1222 | p <0.01 |
| Stem density | Soil C | 0.09 | 0.03 | 0.14 | 1224 | p <0.01 |
| AGB | Soil C | 0.28 | 0.23 | 0.33 | 1224 | p <0.01 |
| Soil N | Soil CEC | 0.55 | 0.51 | 0.59 | 1224 | p <0.01 |
| Fire freq. | Soil CEC | -0.28 | -0.33 | -0.23 | 1224 | p <0.01 |
| MAP | Soil CEC | -0.07 | -0.13 | -0.01 | 1224 | p <0.05 |
| Precip. seas. | Soil CEC | -0.6 | -0.63 | -0.56 | 1224 | p <0.01 |
| Temp. stress | Soil CEC | -0.45 | -0.5 | -0.41 | 1224 | p <0.01 |
| Sand % | Soil CEC | -0.51 | -0.55 | -0.47 | 1224 | p <0.01 |
| Extrap. sp. rich. | Soil CEC | -0.1 | -0.16 | -0.05 | 1224 | p <0.01 |
| Shannon equit | Soil CEC | 0.13 | 0.07 | 0.18 | 1224 | p <0.01 |
| Tree height CoV | Soil CEC | 0.09 | 0.03 | 0.16 | 970 | p <0.01 |
| DBH CoV | Soil CEC | 0.14 | 0.08 | 0.19 | 1222 | p <0.01 |
| Stem density | Soil CEC | -0.09 | -0.15 | -0.04 | 1224 | p <0.01 |
| AGB | Soil CEC | 0.09 | 0.03 | 0.14 | 1224 | p <0.01 |
| Fire freq. | Soil N | -0.19 | -0.25 | -0.14 | 1224 | p <0.01 |
| MAP | Soil N | 0.35 | 0.29 | 0.39 | 1224 | p <0.01 |
| Precip. seas. | Soil N | -0.57 | -0.61 | -0.53 | 1224 | p <0.01 |
| Temp. stress | Soil N | -0.69 | -0.72 | -0.66 | 1224 | p <0.01 |
| Sand % | Soil N | -0.58 | -0.62 | -0.55 | 1224 | p <0.01 |
| Extrap. sp. rich. | Soil N | 0.08 | 0.02 | 0.13 | 1224 | p <0.01 |
| Shannon equit | Soil N | 0.14 | 0.08 | 0.19 | 1224 | p <0.01 |
| Tree height CoV | Soil N | 0.18 | 0.12 | 0.24 | 970 | p <0.01 |
| DBH CoV | Soil N | 0.1 | 0.04 | 0.15 | 1222 | p <0.01 |
| Stem density | Soil N | -0.01 | -0.06 | 0.05 | 1224 | p = 0.77 |
| AGB | Soil N | 0.2 | 0.15 | 0.26 | 1224 | p <0.01 |
| MAP | Fire freq. | 0.21 | 0.15 | 0.26 | 1224 | p <0.01 |
| Precip. seas. | Fire freq. | 0.25 | 0.19 | 0.3 | 1224 | p <0.01 |
| Temp. stress | Fire freq. | 0.12 | 0.06 | 0.17 | 1224 | p <0.01 |
| Sand % | Fire freq. | 0.11 | 0.05 | 0.16 | 1224 | p <0.01 |
| Extrap. sp. rich. | Fire freq. | 0.3 | 0.25 | 0.35 | 1224 | p <0.01 |
| Shannon equit | Fire freq. | 0.11 | 0.06 | 0.17 | 1224 | p <0.01 |
| Tree height CoV | Fire freq. | 0.08 | 0.02 | 0.14 | 970 | p <0.05 |
| DBH CoV | Fire freq. | 0.15 | 0.09 | 0.2 | 1222 | p <0.01 |
| Stem density | Fire freq. | -0.06 | -0.12 | -0.01 | 1224 | p <0.05 |
| AGB | Fire freq. | -0.04 | -0.1 | 0.01 | 1224 | p = 0.14 |
| Precip. seas. | MAP | -0.07 | -0.13 | -0.02 | 1224 | p <0.01 |
| Temp. stress | MAP | -0.49 | -0.53 | -0.44 | 1224 | p <0.01 |
| Sand % | MAP | -0.5 | -0.54 | -0.46 | 1224 | p <0.01 |
| Extrap. sp. rich. | MAP | 0.4 | 0.35 | 0.45 | 1224 | p <0.01 |
| Shannon equit | MAP | 0.12 | 0.07 | 0.18 | 1224 | p <0.01 |
| Tree height CoV | MAP | 0.24 | 0.18 | 0.3 | 970 | p <0.01 |
| DBH CoV | MAP | 0.11 | 0.06 | 0.17 | 1222 | p <0.01 |
| Stem density | MAP | 0.07 | 0.01 | 0.12 | 1224 | p <0.05 |
| AGB | MAP | 0.23 | 0.18 | 0.28 | 1224 | p <0.01 |
| Temp. stress | Precip. seas. | 0.51 | 0.46 | 0.55 | 1224 | p <0.01 |
| Sand % | Precip. seas. | 0.35 | 0.3 | 0.4 | 1224 | p <0.01 |
| Extrap. sp. rich. | Precip. seas. | 0.13 | 0.07 | 0.18 | 1224 | p <0.01 |
| Shannon equit | Precip. seas. | -0.07 | -0.12 | -0.01 | 1224 | p <0.05 |
| Tree height CoV | Precip. seas. | -0.06 | -0.12 | 0 | 970 | p = 0.07 |
| DBH CoV | Precip. seas. | -0.1 | -0.15 | -0.04 | 1222 | p <0.01 |
| Stem density | Precip. seas. | -0.03 | -0.09 | 0.03 | 1224 | p = 0.29 |
| AGB | Precip. seas. | -0.19 | -0.24 | -0.14 | 1224 | p <0.01 |
| Sand % | Temp. stress | 0.46 | 0.42 | 0.5 | 1224 | p <0.01 |
| Extrap. sp. rich. | Temp. stress | -0.13 | -0.18 | -0.07 | 1224 | p <0.01 |
| Shannon equit | Temp. stress | -0.13 | -0.18 | -0.07 | 1224 | p <0.01 |
| Tree height CoV | Temp. stress | -0.15 | -0.21 | -0.09 | 970 | p <0.01 |
| DBH CoV | Temp. stress | -0.04 | -0.1 | 0.01 | 1222 | p = 0.12 |
| Stem density | Temp. stress | 0.03 | -0.02 | 0.09 | 1224 | p = 0.28 |
| AGB | Temp. stress | -0.17 | -0.23 | -0.12 | 1224 | p <0.01 |
| Extrap. sp. rich. | Sand % | -0.33 | -0.38 | -0.28 | 1224 | p <0.01 |
| Shannon equit | Sand % | -0.24 | -0.29 | -0.19 | 1224 | p <0.01 |
| Tree height CoV | Sand % | -0.24 | -0.3 | -0.18 | 970 | p <0.01 |
| DBH CoV | Sand % | -0.17 | -0.23 | -0.12 | 1222 | p <0.01 |
| Stem density | Sand % | -0.1 | -0.16 | -0.05 | 1224 | p <0.01 |
| AGB | Sand % | -0.27 | -0.32 | -0.22 | 1224 | p <0.01 |
| Shannon equit | Extrap. sp. rich. | 0.58 | 0.54 | 0.61 | 1224 | p <0.01 |
| Tree height CoV | Extrap. sp. rich. | 0.3 | 0.24 | 0.35 | 970 | p <0.01 |
| DBH CoV | Extrap. sp. rich. | 0.3 | 0.25 | 0.35 | 1222 | p <0.01 |
| Stem density | Extrap. sp. rich. | 0.24 | 0.18 | 0.29 | 1224 | p <0.01 |
| AGB | Extrap. sp. rich. | 0.3 | 0.25 | 0.35 | 1224 | p <0.01 |
| Tree height CoV | Shannon equit | 0.12 | 0.06 | 0.18 | 970 | p <0.01 |
| DBH CoV | Shannon equit | 0.21 | 0.15 | 0.26 | 1222 | p <0.01 |
| Stem density | Shannon equit | 0.41 | 0.36 | 0.45 | 1224 | p <0.01 |
| AGB | Shannon equit | 0.35 | 0.3 | 0.4 | 1224 | p <0.01 |
| DBH CoV | Tree height CoV | 0.48 | 0.44 | 0.53 | 970 | p <0.01 |
| Stem density | Tree height CoV | -0.01 | -0.07 | 0.06 | 970 | p = 0.85 |
| AGB | Tree height CoV | 0.22 | 0.16 | 0.28 | 970 | p <0.01 |
| Stem density | DBH CoV | 0.11 | 0.05 | 0.16 | 1222 | p <0.01 |
| AGB | DBH CoV | 0.43 | 0.38 | 0.47 | 1222 | p <0.01 |
| AGB | Stem density | 0.58 | 0.54 | 0.62 | 1224 | p <0.01 |