Supplementary Materials for

Positive Biodiversity–Productivity Relationship Predominant in Global Forests

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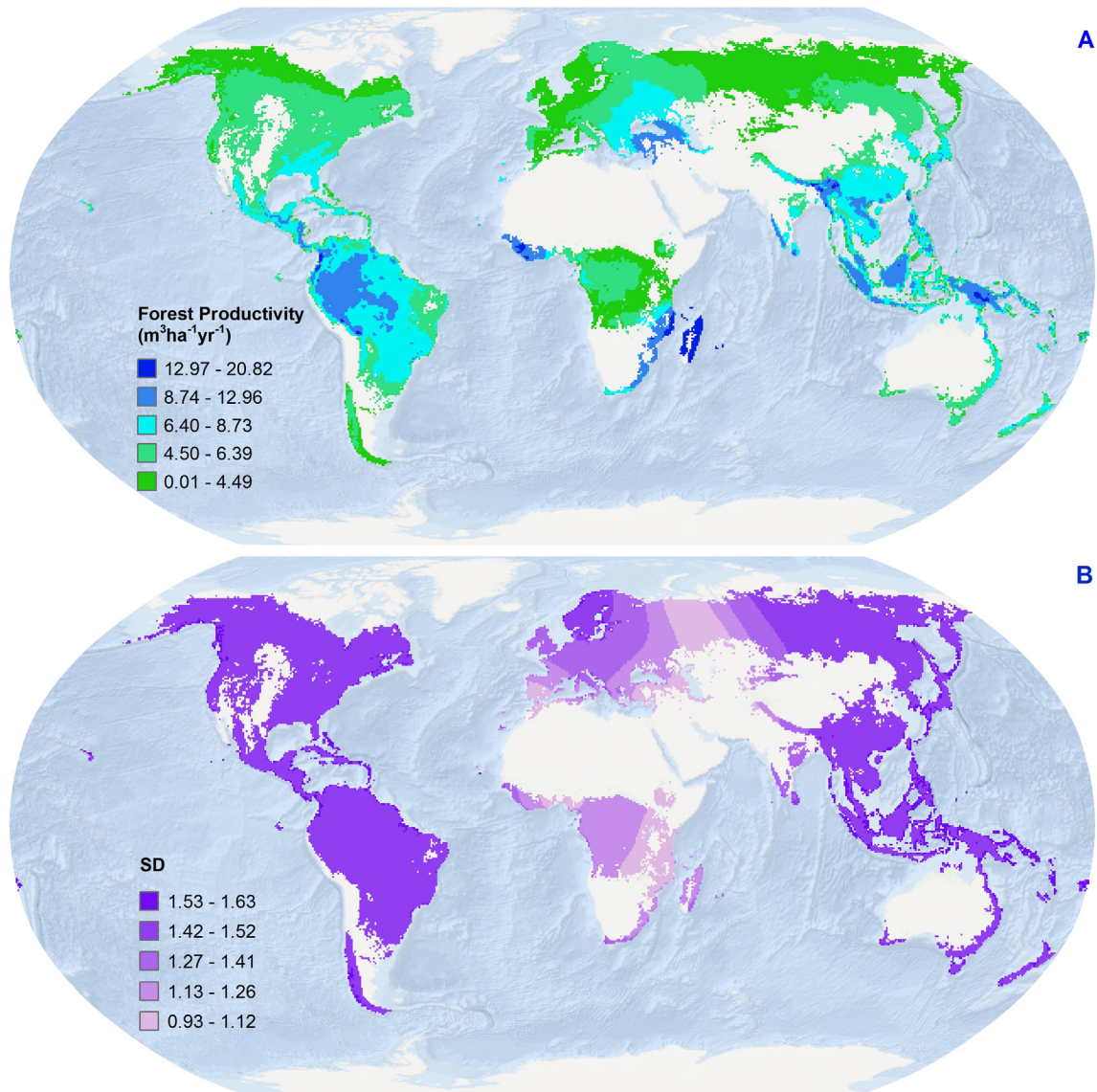
Figs. S1 to S4
Captions for database S1-S2

Fig. S1. Mean (A) and standard deviation (SD, B) of global forest productivity in 50-km resolution, estimated using in situ measurements of the 777,126 GFB permanent sample plots and universal kriging. Productivity (*P*) was measured as volume productivity in terms of periodic annual increment (PAI) calculated from individual tree stem volume (see Materials and Methods). *P*, although only represents a fraction of total forest net primary production, has been an important and widely used measure of forest productivity, because it reflects the dominant aboveground biomass component and the long-lived biomass pool in most forest ecosystems. Global forest extent (white) shows areas with 50 percent or more forest cover.
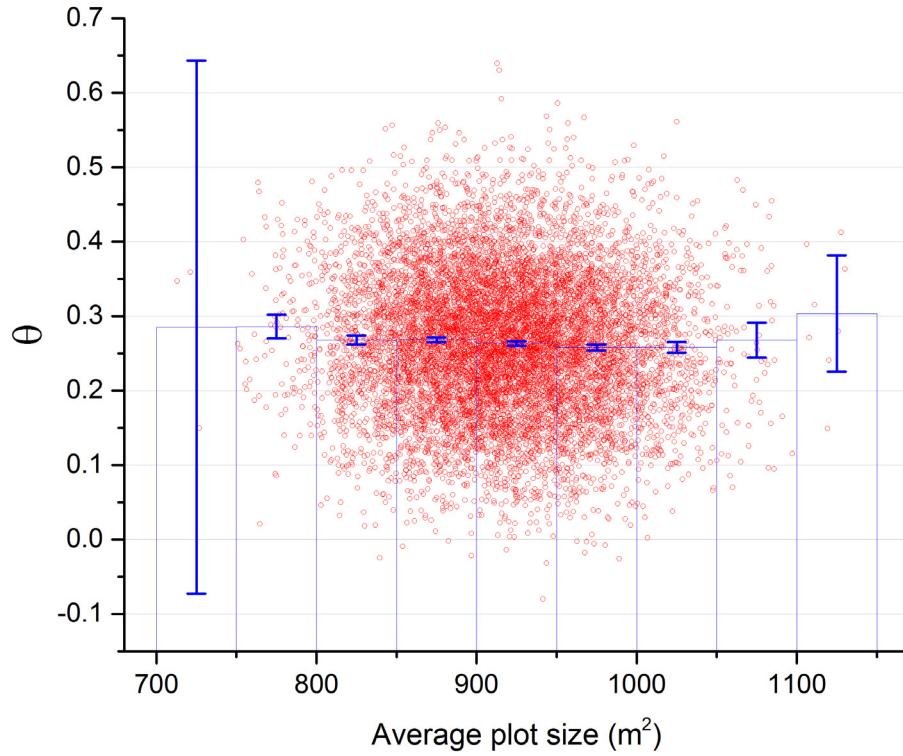
Fig. S2. Estimated elasticity of substitution (θ) and its relationship with the average plot size. Red circles in the scatter plot represent 10,000 estimates from the geospatial random forest model. Each θ value was estimated from 500 randomly selected (with replacement) GFB plots. Of the 10,000 iterations, the θ values ranged from -0.1 to 0.7, and the average plot sizes ranged from 700 to 1,150 m^2. The normally distributed scatter plot reveals no discernable pattern. The column plot, which represents the mean estimated θ and its 95 percent confidence internal for the nine plot size ranges, shows little effect of plot size on the estimated θ values.
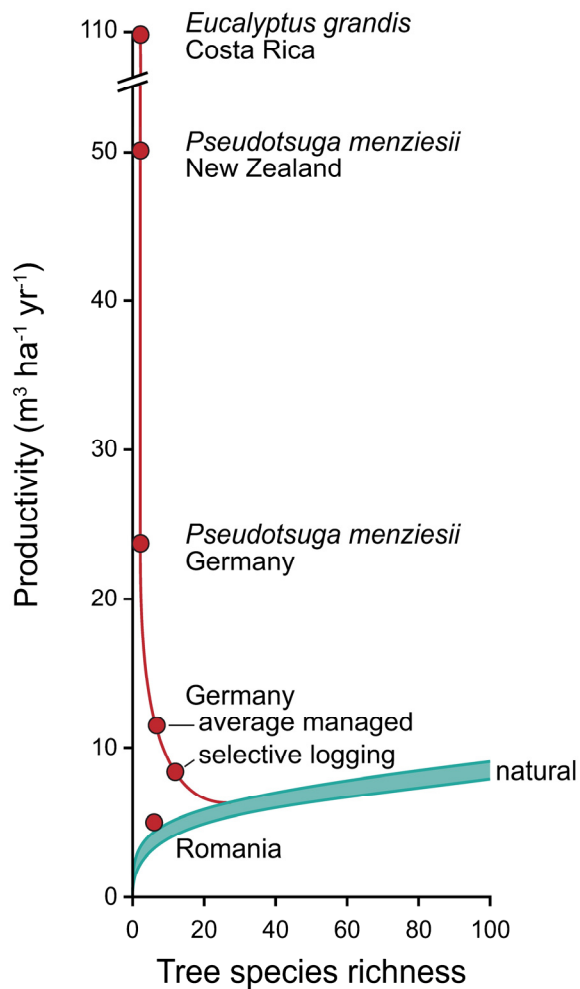
Fig. S3 Potential difference in BPR between natural and managed forests. Positive concave-down BPR under natural self-thinning condition (blue) was compared to a negative BPR derived from a sample of managed forests in Romania, Germany, New Zealand, and Costa Rica. In this study, negative BPR patterns accounted for 0.13% of the 10,000 estimated BPR's across the world.
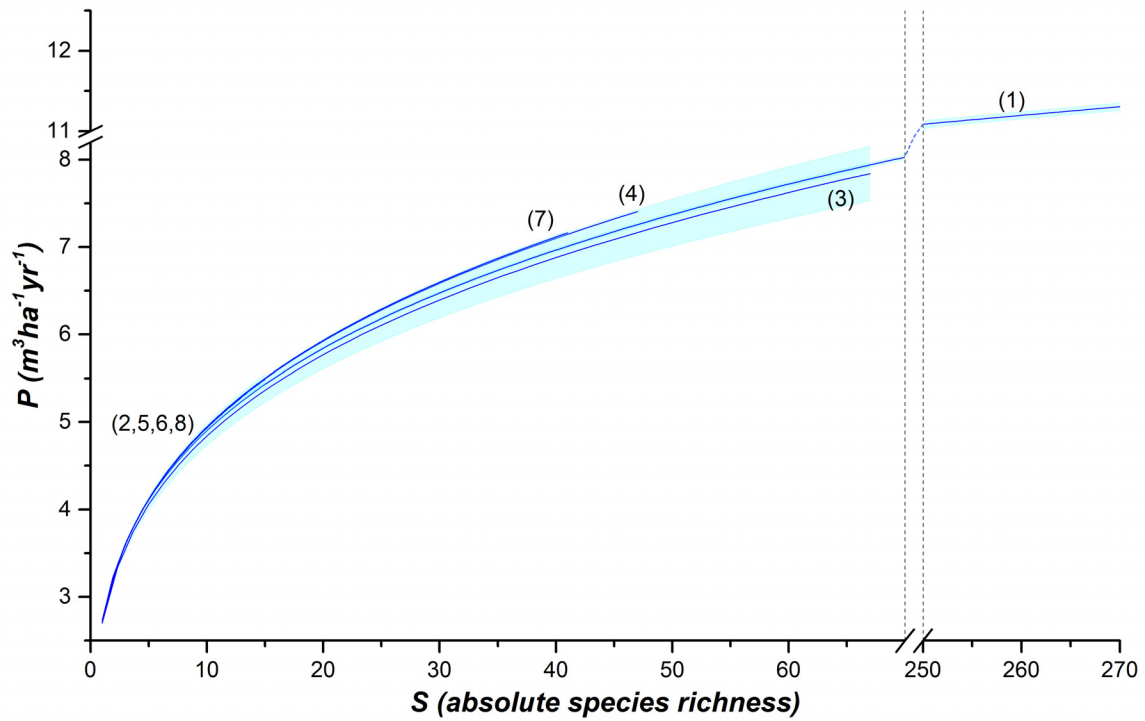
Fig. S4. Estimated effects of biodiversity (in terms of absolute species richness) on forest productivity across the eight ecoregions that contribute substantially to global commercial forestry. The effects were estimated for each ecoregion (ecoregion number in parentheses corresponds to Fig.1) using Eq. 5 and absolute species richness (S, the horizontal axis, ranging from 1 to the 99th percentile of each ecoregion), with productivity (P, m^{3}ha^{-1}yr^{-1}) in the vertical axis, and climatic, soil, and other plot covariates being accounted for and kept constant at sample mean.

Additional Data table S1 (separate file)

Characteristics and references of GFB datasets

Additional Data table S2 (separate file)

List of tree species present in the GFB database. Score signifies the taxonomic matching score calculated based on the comparison between a given name and the official names from 60 taxonomic databases (the higher the score, the higher a given name matches existing records). See §Data collection and standardization for details.