Supporting Information for Structural changes within trophic levels are constrained by within-family assembly rules at lower trophic levels

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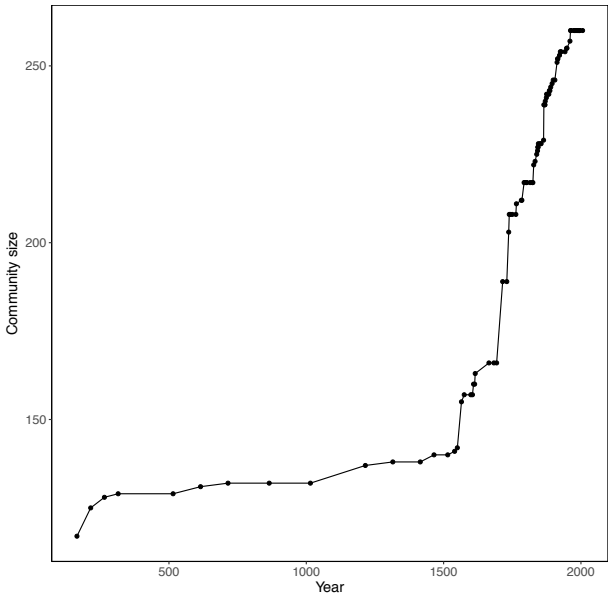

Figure S1: [Supplementary Figure] **Number of species at the herbivore trophic level across time**. Each point corresponds to the number of herbivore species (i.e., community size) at a give point in time across our observational period.

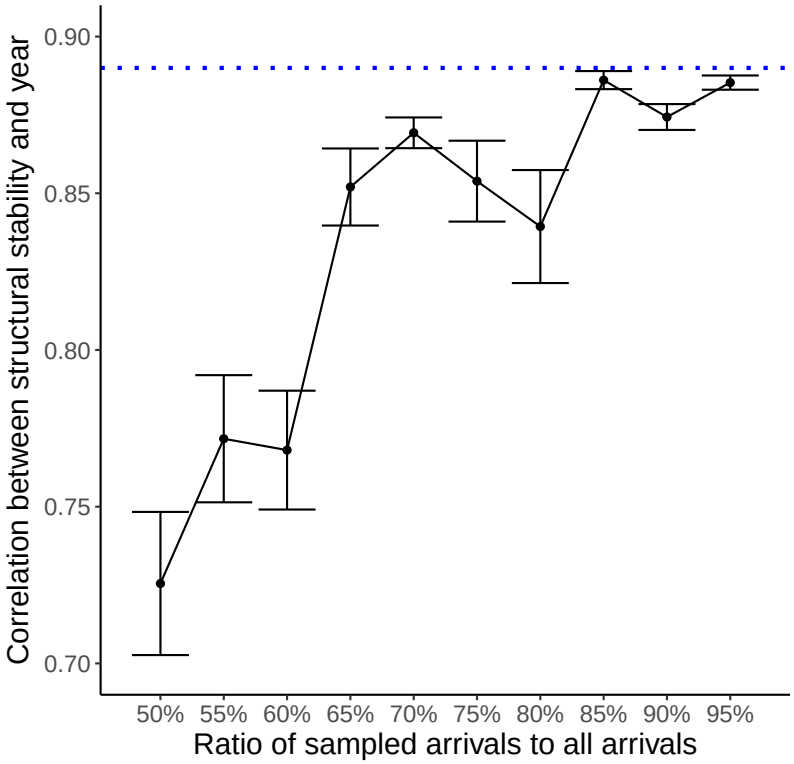

Figure S2: [Supplementary Figure] **Sensitivity analysis to sampling error**. To perform a sensitivity analysis of the effect of sampling error on the observed correlation between structural stability and time, we systematically sampled different fractions of randomly chosen plants (mimicking the process that some plants might not be documented due to sampling error). Each point corresponds to the mean correlation of 50 randomizations with the standard error depicted as error bars. The red line corresponds to the Pearson correlation of structural stability and year in the observed data. Note that even for a lost of 50% of the data, the correlation continues to be highly positive.

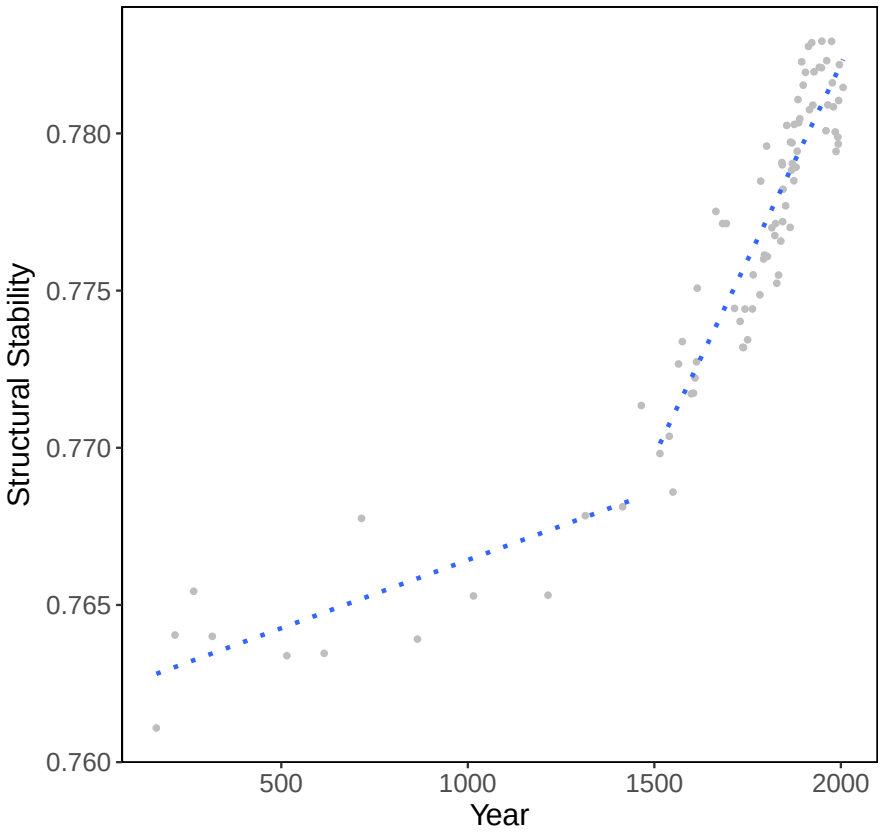

Figure S3: [Supplementary Figure] **Sensitivity analysis to time series division.** Identical to Figure 2 in the main text except that the correlations are calculated separately for the periods before and after 1500 AD. The correlation before 1500 AD is 0.76 ([0.37, 0.93] 95% confidence interval), and the correlation after 1500 AD is 0.89 ([0.83, 0.93] 95% confidence interval). The (scaled) estimated linear effect of year on structural stability before 1500 AD is 0.33 (0.08 standard error), and after 1500 AD is 1.91 (0.11 standard error).

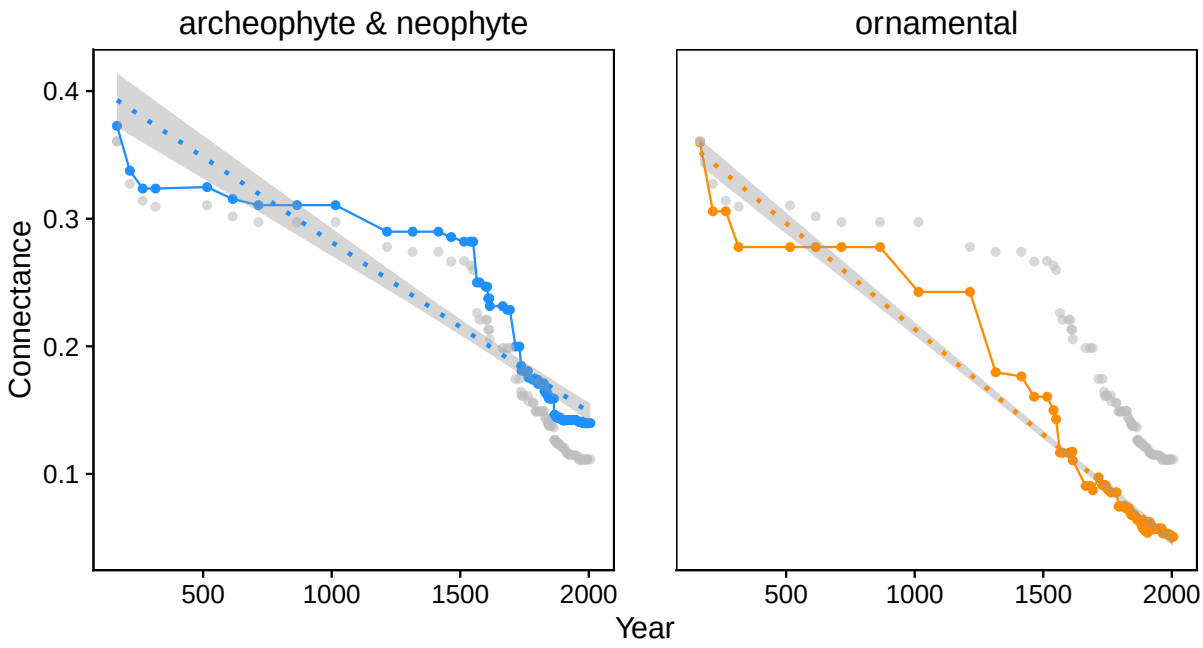

Figure S4: [Supplementary Figure] **Using standard network metrics**. Similar to Figure 3 in the main text. Here the colored symbols represent changes of network connectance (defined as the observed number of direct interactions over the maximum possible number) calculated over the inferred competition networks from the subsets of wild self-sustained and ornamental plants, respectively. The correlation in Panel **(a)** is -0.90 ($[-0.94, -0.86]$ 95% confidence interval), and the correlation in Panel **(b)** is 0.27 ($[-0.99, -0.97]$ 95% confidence interval). The partial correlation between the two panels is 0.62, revealing no difference in connectance changes between the two time series. The gray points in the background show the pattern generated by the two subsets together. The linear-regression lines are depicted with shaded 95% confidence intervals.

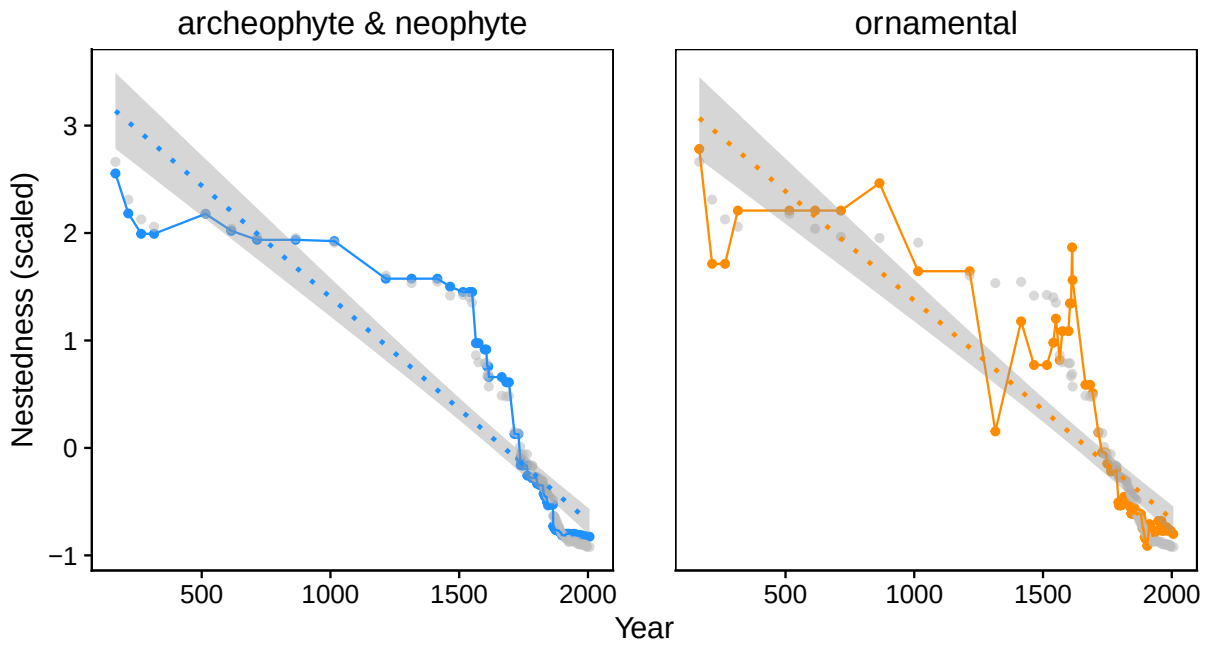

Figure S5: [Supplementary Figure] **Using standard network metrics**. Similar to Figure 3 in the main text. Here the colored symbols represent changes in nestedness of the herbivore-plant binary interaction matrix (measured as NODF (Almeida-Neto et al., 2008)) generated by the subsets of wild self-sustained and ornamental plants, respectively. The values of nestedness are scaled for visualization purposes. The correlation in Panel **(a)** is -0.89 ($[-0.93, -0.84]$ 95% confidence interval), and the correlation in Panel **(b)** is -0.87 ($[-0.91, -0.81]$ 95% confidence interval). The partial correlation between the two panels is 0.81, revealing no difference in nestedness changes between the two time series. The gray points in the background show the pattern generated by the two subsets together. The linear-regression lines are depicted with shaded 95% confidence intervals.

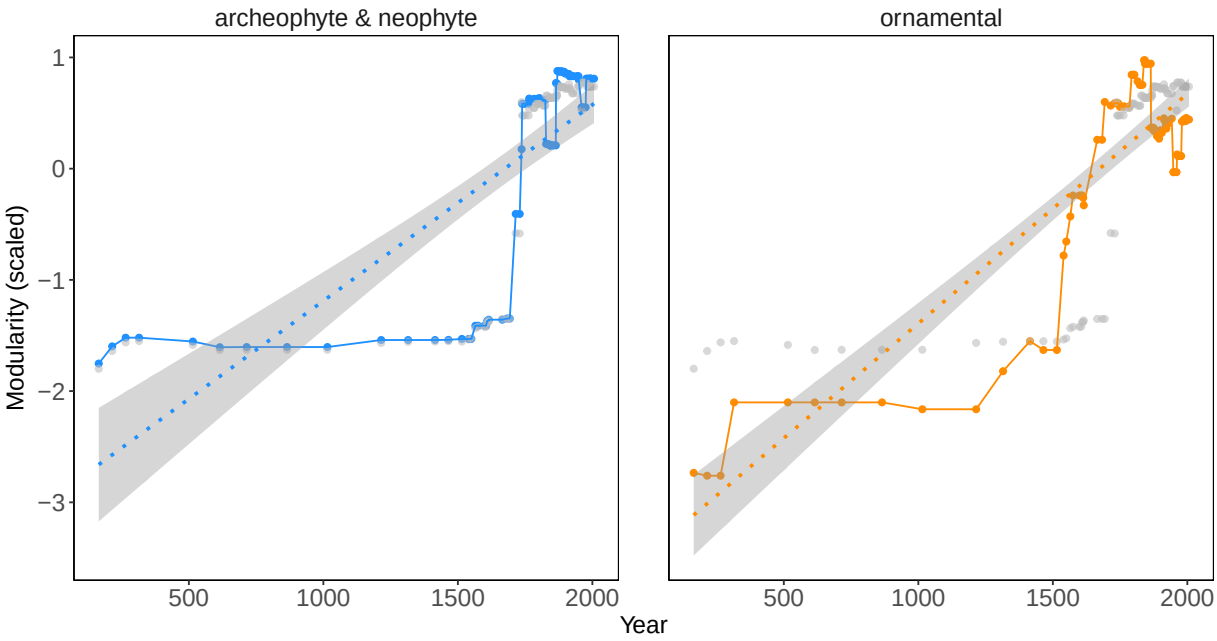

Figure S6: [Supplementary Figure] **Using standard network metrics**. Similar to Figure 3 in the main text. Here the colored symbols represent changes in modularity of the inferred competition matrices from the subsets of wild self-sustained and ornamental plants (measured following Refs. (Clauset et al., 2004; Pons and Latapy, 2005)). The values of modularity are scaled for visualization purposes. The correlation in Panel **(a)** is 0.76 ($[0.65, 0.83]$ 95% confidence interval) and the correlation in Panel **(b)** is 0.88 ($[0.83, 0.92]$ 95% confidence interval). The partial correlation between the two panels is 0.32, revealing no difference in modularity changes between the two time series. The gray points in the background show the pattern generated by the two subsets together. The linear-regression lines are depicted with shaded 95% confidence intervals.

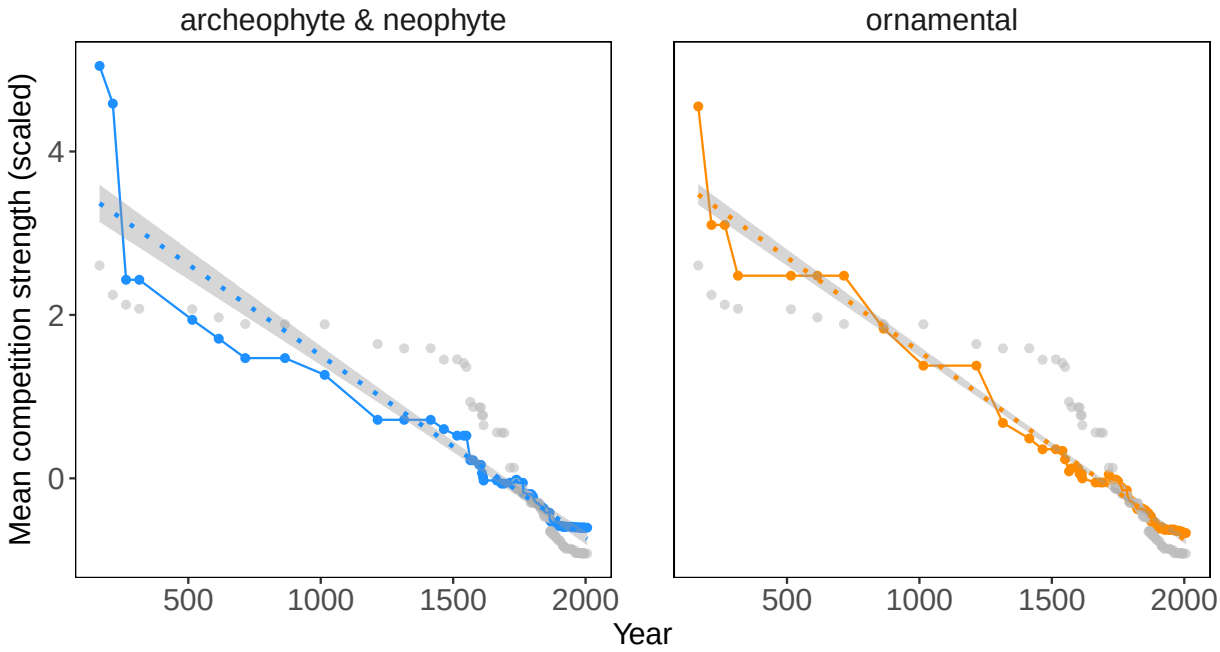

Figure S7: [Supplementary Figure] **Using standard network metrics**. Similar to Figure 3 in the main text. Here the colored symbols represent changes in mean interspecific competition strength generated by the inferred competition matrices from the subsets of wild non-native and ornamental plants, respectively. The values of mean competition strength are scaled for visualization purposes. The correlation in Panel **(a)** is -0.95 ($[-0.97, -.94]$ 95% confidence interval), and the correlation in Panel **(b)** is -0.99 ($[-0.99, -0.98]$ 95% confidence interval). The partial correlation between the two panels is 0.5, revealing no difference in competition-strength changes between the two time series. The gray points in the background show the pattern generated by the two subsets together. The linear-regression lines are depicted with shaded 95% confidence intervals.

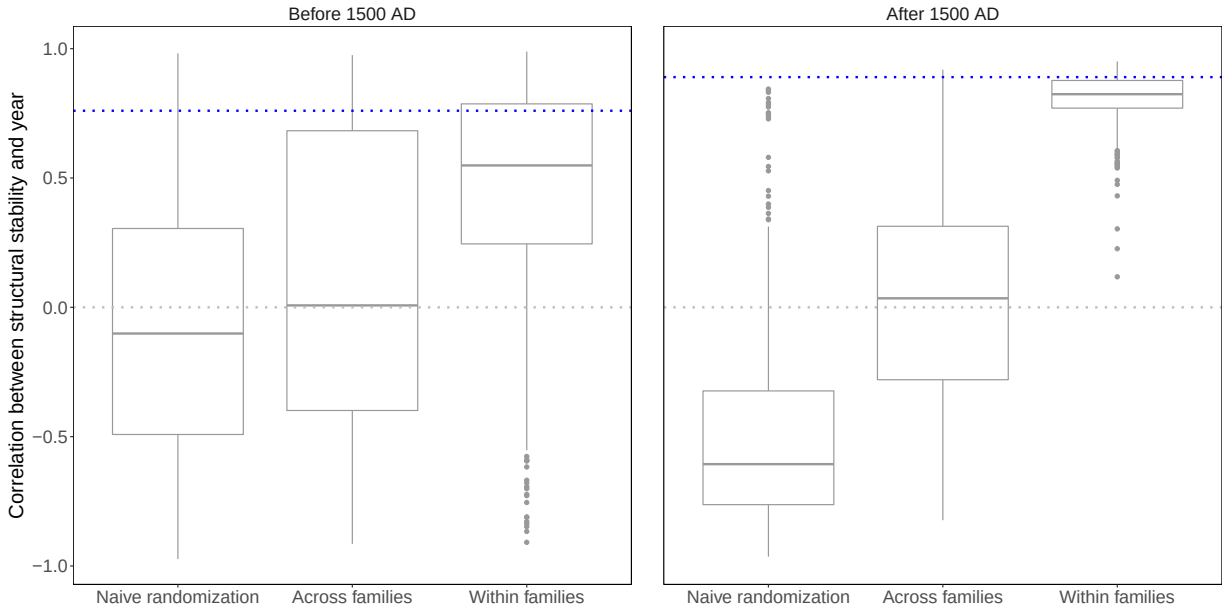

Figure S8: [Supplementary Figure] **Split sample test about the positive trend of structural stability**. Similar to Figure 4 in the main text except that the analysis is performed for the two periods before and after 1500 AD (see Figure S3). The qualitative result remains the same as in Figure 4.

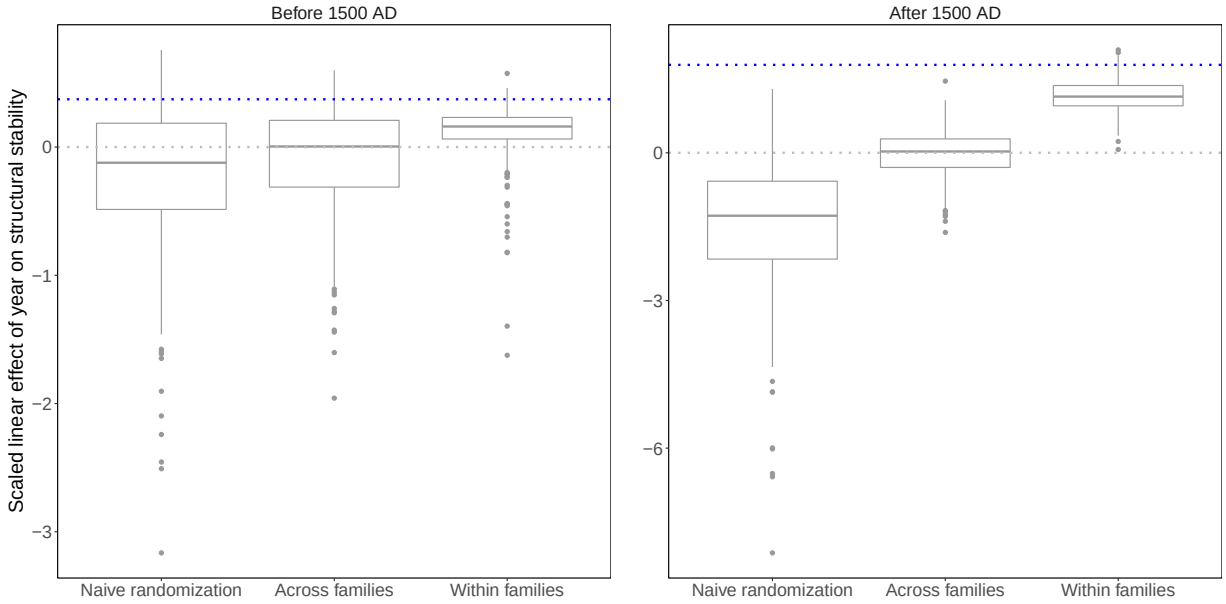

Figure S9: [Supplementary Figure] **Split sample test about the positive trend of structural stability**. Similar to Figure 4 in the main text except that the analysis is performed for the two periods before and after 1500 AD (see Figure S3), and the y-axis corresponds to the estimated linear effect of year on structural stability. The qualitative result remains the same as in Figure 4.