

Appendix S2

Supplementary Figures

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Figure S1: Relation between persistence times and local abundance. Species mean persistence times plotted against their abundance at the end of the simulation. No correlation is observed in the H_0 assemblage (left) (correlation index $\rho_{\log(N),\log(T)} = 0.008$), in contrast with a clear positive correlation in the H_1 assemblage (right) ($\rho_{\log(N),\log(T)} = 0.86$). Abundances and persistence times are logged for better visualization. Results shown for the baseline scenarios.

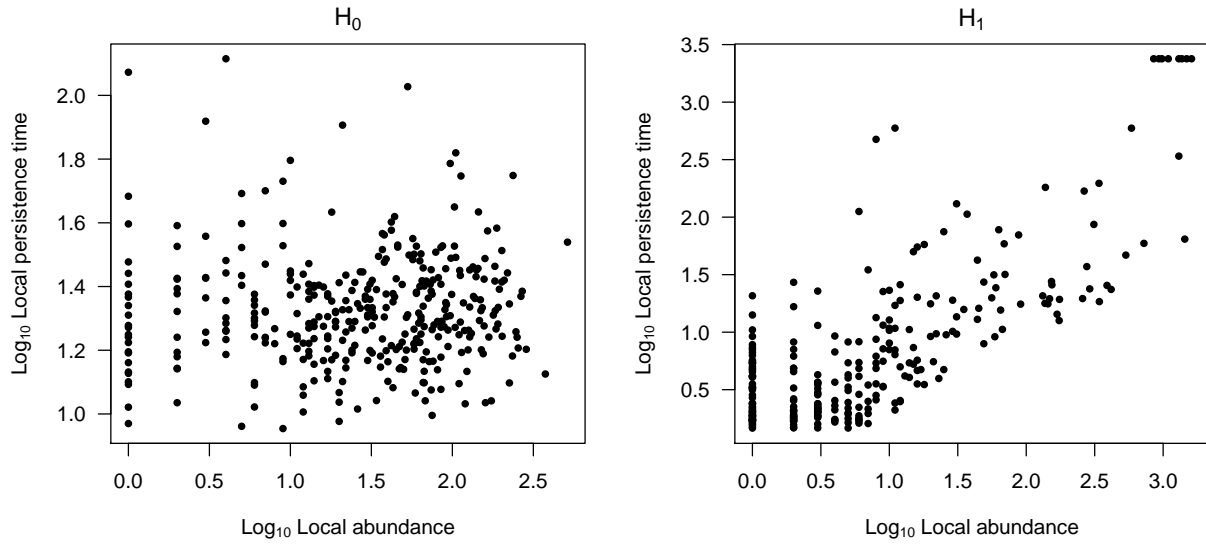


Figure S2: Effect of regional abundances. Species that are rare in the pool tend to have the lowest persistence times, while the most regionally common species tend to be residents locally. The effect is seen both in H_0 and H_1 assemblages, but the correspondence is much tighter in the neutral case (left) than in the partially stabilized assemblage (right). Notice in particular that in the H_1 assemblage some residents are not particularly abundant in the regional pool. Simulation parameters are identical to the baseline cases except for the regional pool.

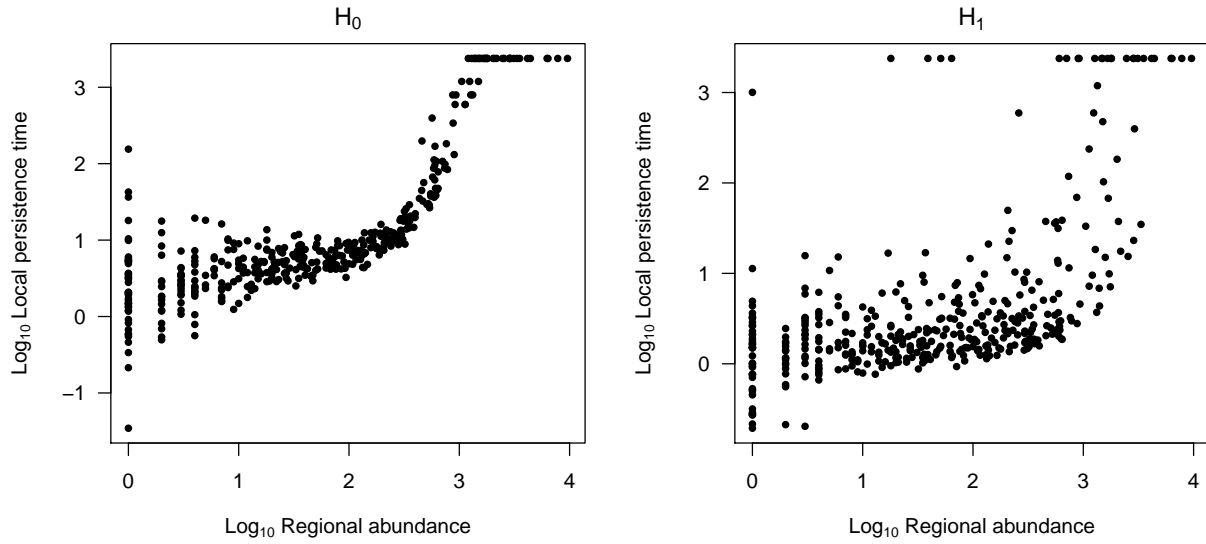


Figure S3: Effect of immigration rate. Points represent the same species across two immigration scenarios, $m = 0.01$ and $m = 0.1$, and their position indicates the base-10 logarithm of their persistence times, in community turnovers. In both the H_0 and H_1 assemblages, points mostly fall above the 1-to-1 line (red), indicating that most species had longer persistence times in the high immigration case. In particular, notice that many species are promoted to resident status when $m = 0.1$. Having a persistence time above a certain cutoff in the low immigration case seems to be a better determiner of resident status in the high immigration case in the H_0 assemblage than in the H_1 assemblage, indicating that stabilization may counter the effects of immigration on persistence times. Simulation parameters are identical to the baseline cases except for the regional pool and immigration rates.

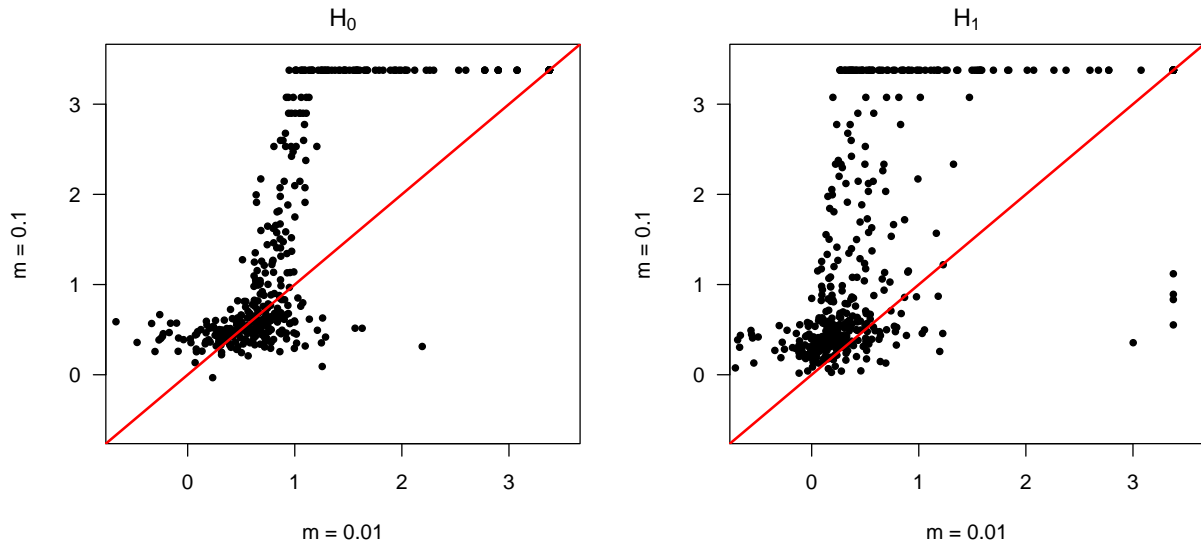


Figure S4: Effect of intrinsic growth rates. Distribution of abundances (stems) and persistence times (red curves) as a function of species trait value in H_0 (top) and H_1 (bottom) assemblages where intrinsic growth rates differ between species (other parameters are set as in our baseline case). Notice the stark contrast between the impact of the intrinsic growth rates r_i on the neutral and stabilized assemblages. While in the neutral assemblage both persistence times and abundances are dominated by r_i both in the parabolic and random r_i treatments, in the stabilized assemblage the r_i distribution has a much subtler effect. In the H_1 , neither r_i forming a parabolic trend along the niche axis (left) nor randomly assigned r_i (right) interfere with the resident status of niche differentiated species. The r_i do have an impact, however. In the parabolic case, the persistence times increase towards the edges of the axis, where the r_i are actually smaller. This is possibly due to stronger competitive interactions among higher-abundance species near the center of the axis. Abundances and persistence times logged to facilitate visualization.

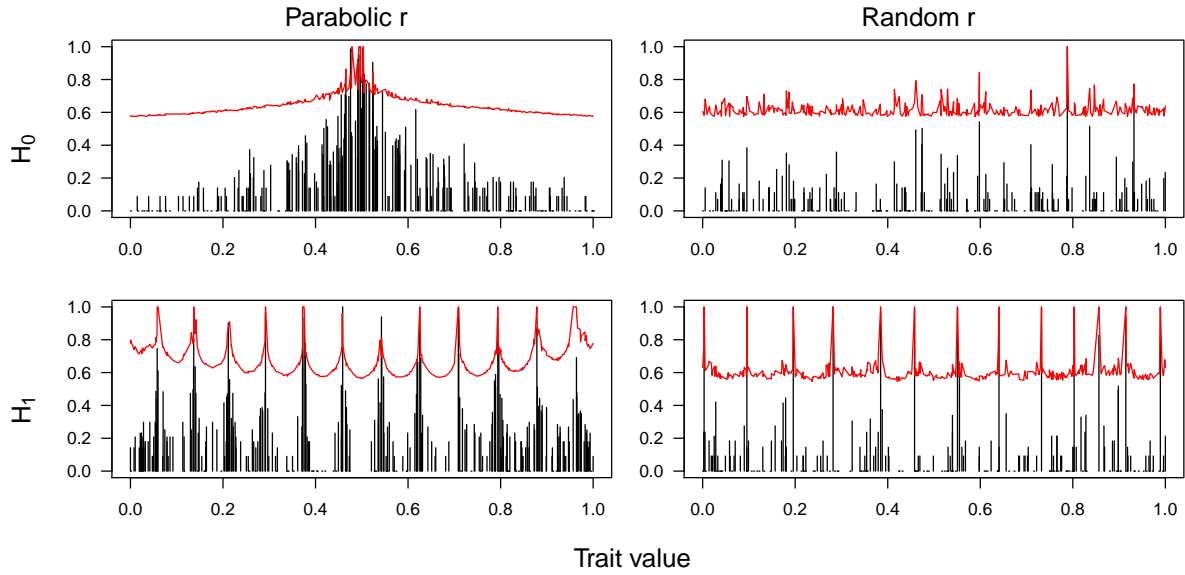


Figure S5: Effect of number of niches. Comparison between assemblages with different numbers of niches and 400 species in the regional pool. As the number of niches increases, more species are able to acquire high abundance and become residents (stem plots and red dots). As a result, the community-averaged persistence time increases from lower to higher than neutral (vertical red and blue lines). This change in the mean is driven almost entirely by the increase in residents, as they have a persistence time that is orders of magnitude longer than most of the transients. Persistence among transients remains similar or shorter than neutral until the number of niches approaches the number of species (see Supplementary Figure S10). Red and blue bars correspond to the niche (H_1) and neutral (H_0) community, respectively.

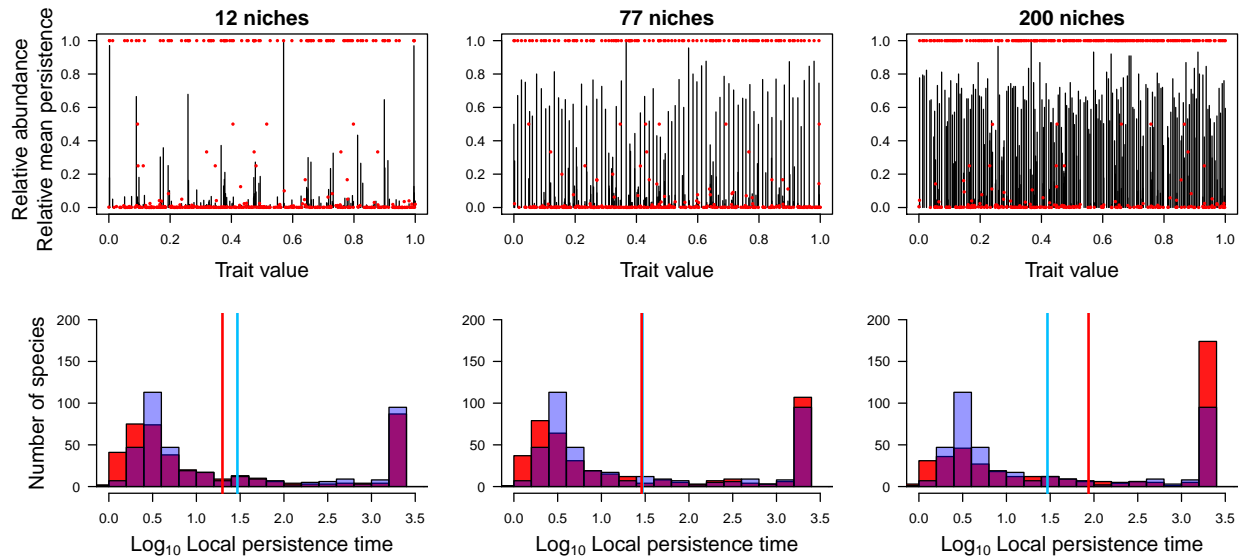


Figure S6: Effect of niche axis geometry. Comparison between simulation results for a finite niche axis (left) and a circular axis (right). Competitive coefficients in the niche model used in the paper are a function of trait difference d_{ij} . In the finite axis case, $d_{ij} = |x_i - x_j|$, while in the circular case $d_{ij} = \min(|x_i - x_j|, 1 - |x_i - x_j|)$, where $x_i, x_j \in [0, 1]$ are the trait values of species i and j . The complete symmetry of the circular niche axis prevents it from spontaneously sorting into niches and gaps, whereas in the finite case the edge effects break that symmetry. A circular axis is typically used to avoid edge effects, but in our paper we use finite axis for realism. When the axis is finite the niche structure is more evident, and the persistence times (red curves) confirm that the positions of the niches are set: species located at the niches are residents, while others come and go between competitive exclusion and recolonization events. Particularly in gaps, exclusion is very fast. By contrast, in the circular case no species is a resident, and all species have similar persistence times. Simulation parameters identical to our baseline cases.

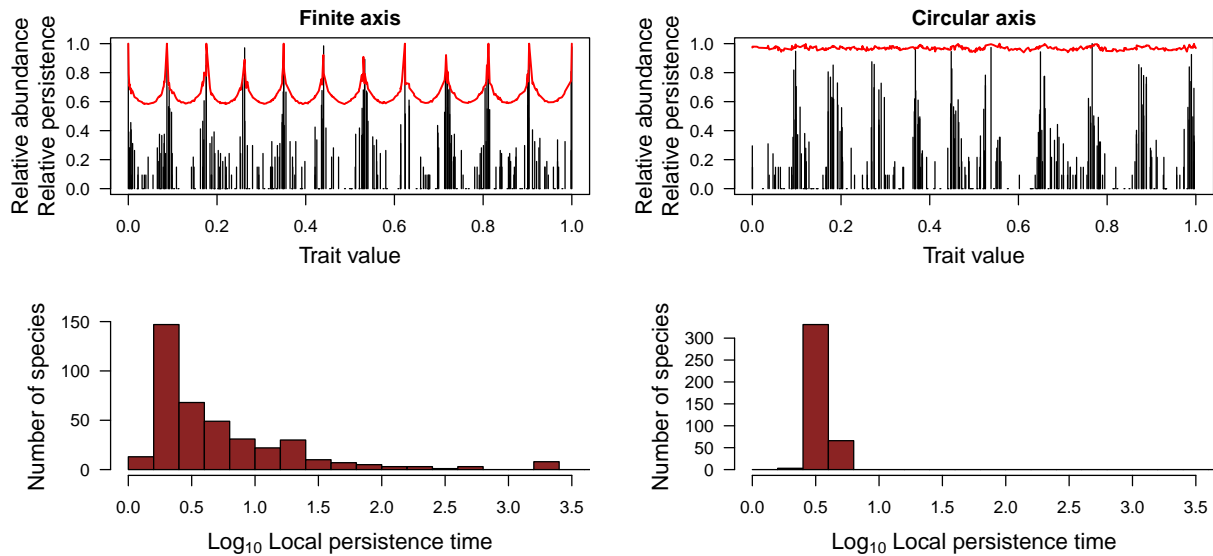


Figure S7: Combined effects. Comparison between H_0 and H_1 assemblages as we raise the number of niches in H_1 . **Left:** Variant 1 with a finite linear axis, as shown in Figure 3 in the main text (see Table 1 in main text for description of scenarios). **Center:** Variant 1 with a circular axis (see Table 1 in main text for description of scenarios). Results are essentially identical to the finite linear axis. This indicates that the choice of niche axis geometry is of no consequence when there are asymmetries in the model. **Right:** Variant 2, which is identical to Variant 1 except for higher immigration ($m = 0.1$ as opposed to $m = 0.01$). Results are similar except that the H_1 assemblage is closer to the H_0 assemblage throughout. This makes sense, as immigration is an external force acting on top of local dynamics. In general the curves will differ based on other model parameters such as intrinsic growth rates and the competition function, but our results support the conclusion that all indices measured (richness, persistence, extinction) may be lower or higher in a community with niches than in a neutral community depending on the degree of stabilization.

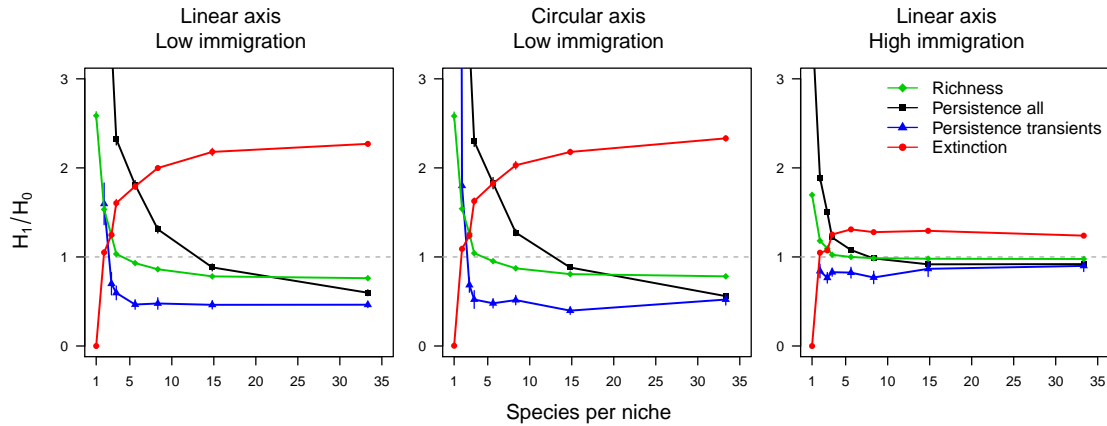


Figure S8: Effect of shape of competition function. Comparison between using exponent $\rho = 4$ in the competition coefficients as done in the main text, and using $\rho = 2$, as in the classical model studied by MacArthur and Levins (1967). In a deterministic formulation without immigration, both parameter choices lead to similar final states where only niche-differentiated species survive, but the sorting is much faster for $\rho = 4$ (compare **A** and **B**, which are snapshots taken after the same number of simulation steps). As a result, stochastic dynamics under immigration differ considerably between these models. Comparing **C** and **D**, we notice that the abundance structure is much less marked in the $\rho = 2$ case. In fact, except for edge effects, there is hardly any abundance structure at all. This is confirmed by the persistence time curve (in red): the edge species persist throughout the entire tracking period; those species in their immediate vicinity, being in strong competition with them, have particularly short persistence times; and the remainder of the community have mostly undifferentiated persistence times. This suggests that niche dynamics in the $\rho = 2$ model are so slow and weak that other forces such as immigration and edge effects dominate. The histograms (**E**) highlight the stark contrast between the persistence time distribution of the $\rho = 2$ and $\rho = 4$ niche models, as well as $\rho = 2$ similarity to neutral dynamics (compare with Fig. 1C). We conclude that slow niche dynamics may be indistinguishable from neutrality in both abundance structure and persistence times in the context of stochasticity with immigration, even though they would lead to the same final state in the corresponding deterministic closed community model.

