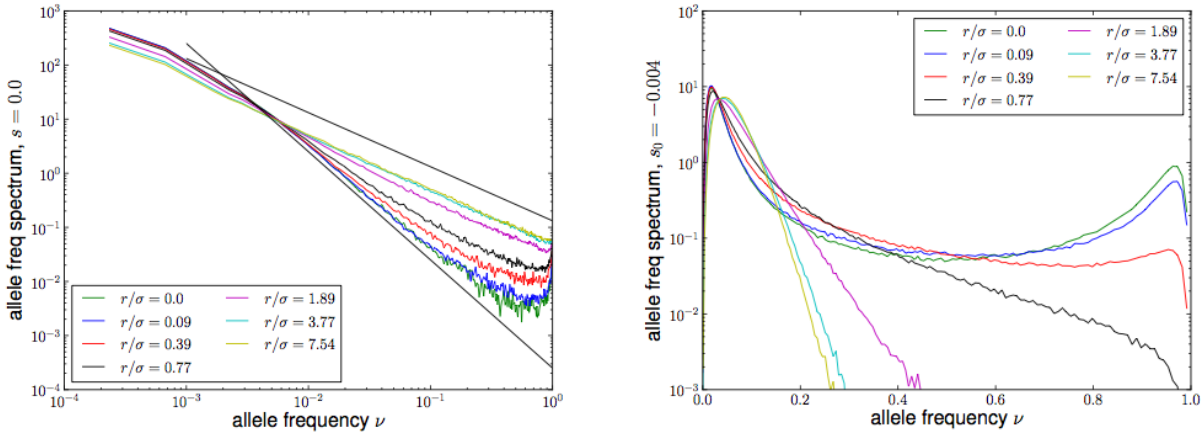


**Figure S3** Allele frequency spectra of neutral (left) and deleterious mutations (right) in a background selection scenario, in analogy to Fig. 3b of the manuscript. At low recombination rates ($r/\sigma < 1$), the frequency spectrum of neutral mutations falls off much more rapidly than expected in a neutral model, very similar to what is observed for the scenario of continuous adaptation. The predicted behavior $\sim \nu^{-2}$ is indicated by the steeper black line. Only when $r/\sigma \gg 1$ does the spectrum agree with the neutral prediction ( $\sim \nu^{-1}$ indicated by upper straight black line). The right panel shows the frequency spectrum of the deleterious mutations responsible for the fitness variation with effect size $s_0 = -0.004$. At low recombination rates, allele frequencies are close to fixation, either in the bad ($\nu = 1$) or the good ($\nu = 0$) state. At high recombination rates, the allele frequency spectra are distributed around their equilibrium value $\nu = \mu/s_0 = 0.0625$.