



Figure S2: Increasing the Hill coefficient leads to slower response times unless binding strength is weak. The x-axis shows the binding strength in the resident allele, in units of  $p_{max}/K$ , and the y-axis shows the ratio of response times for a heterozygote in which one allele has a Hill coefficient  $n = 1$  and the other has a Hill coefficient  $n = 2$ , to a homozygote with Hill coefficient  $n = 1$ . Below the gray dashed line, mutations result in increased response time in the mutant compared to the resident allele. Weak binding occurs when  $p_{max}/K \gtrsim 10^0$ . Response times are calculated by numerically integrating Eq. 1 from zero protein concentration to 99% of the equilibrium. The optimal binding strength in these graphs is  $p_{max}/K = 1250$  corresponding to a background transcription rate  $k_l/k_0 = 10^{-3}$