Supporting Figures for:

When three traits make a line: Evolution of phenotypic plasticity and genetic assimilation through linear reaction norms in stochastic environments

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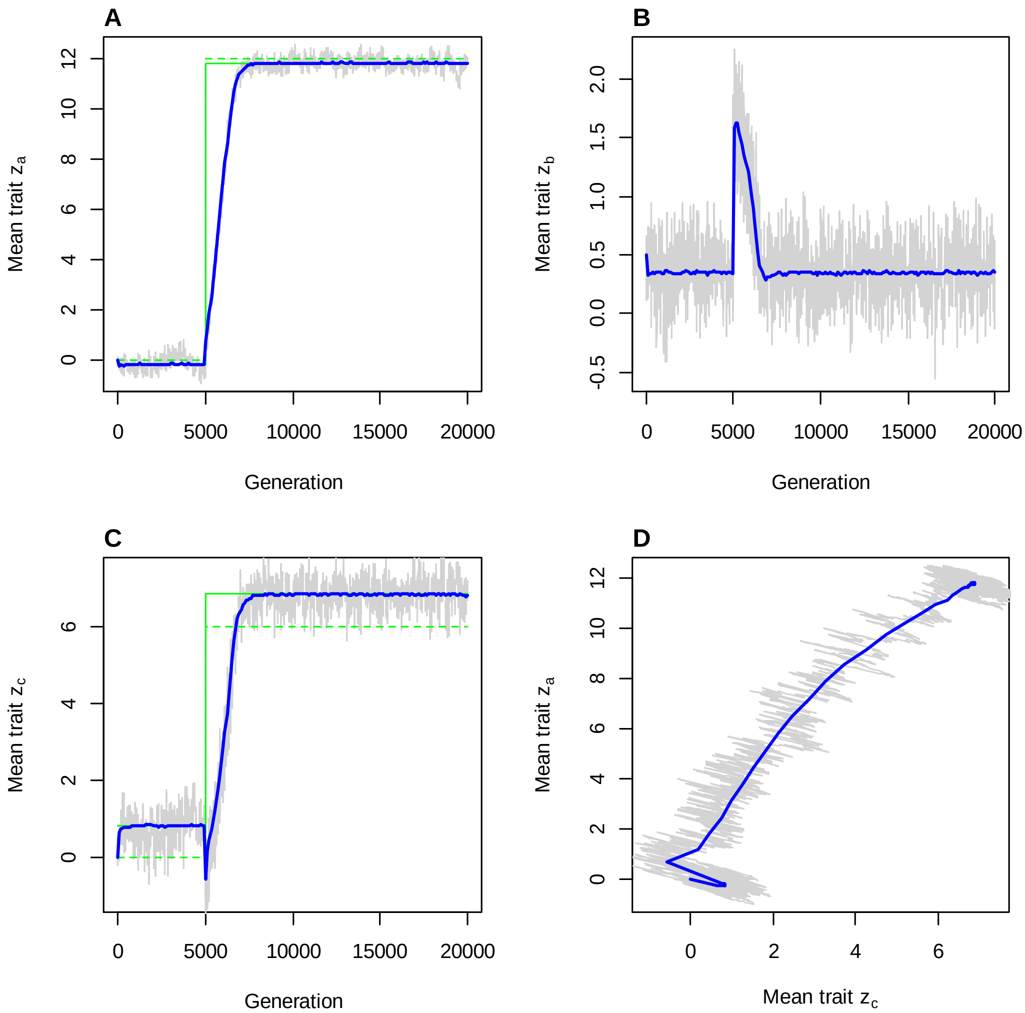

Figure S1. Simulation results with non-diagonal variance-covariance matrices $\boldsymbol{G}$ and $\boldsymbol{P}$. Parameter values and initial values are the same as in Figure 2 in the main text except that the additive genetic and phenotypic variance-covariance matrices are respectively $\boldsymbol{G} = \begin{bmatrix} 0.50 & 0.25 & -0.50 \\ 0.25 & 0.50 & -0.50 \\ -0.50 & -0.50 & 2.00 \end{bmatrix}$ and $\boldsymbol{P} = \boldsymbol{G} + \begin{bmatrix} 0.50 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$, which gives a highly skewed phenotypic distribution (Figure S2). Panels A-C: Trajectories (blue lines) of the population mean trait values with a sudden environmental change at generation 5000. Panel D: Phase plane diagram showing mean of trait z_a plotted against the mean of trait z_c through all generations. The trajectories were calculated as the median of 1000 independent simulations. Grey lines show the realization of a single simulation. Solid green lines in panels A and C show the approximate expected equilibrium values $E[\bar{z}_a^*]$ and $E[\bar{z}_c^*]$, respectively, derived in Supporting Information S2 (eqs.

(S2-45) and (S2-46), respectively), using the mean of the median values of $\bar{z}_b$ over the last 5000 generations as an estimate of $E[\bar{z}_b^*]$. Stippled green lines show μ_Θ (panel A) and μ_U (panel C).

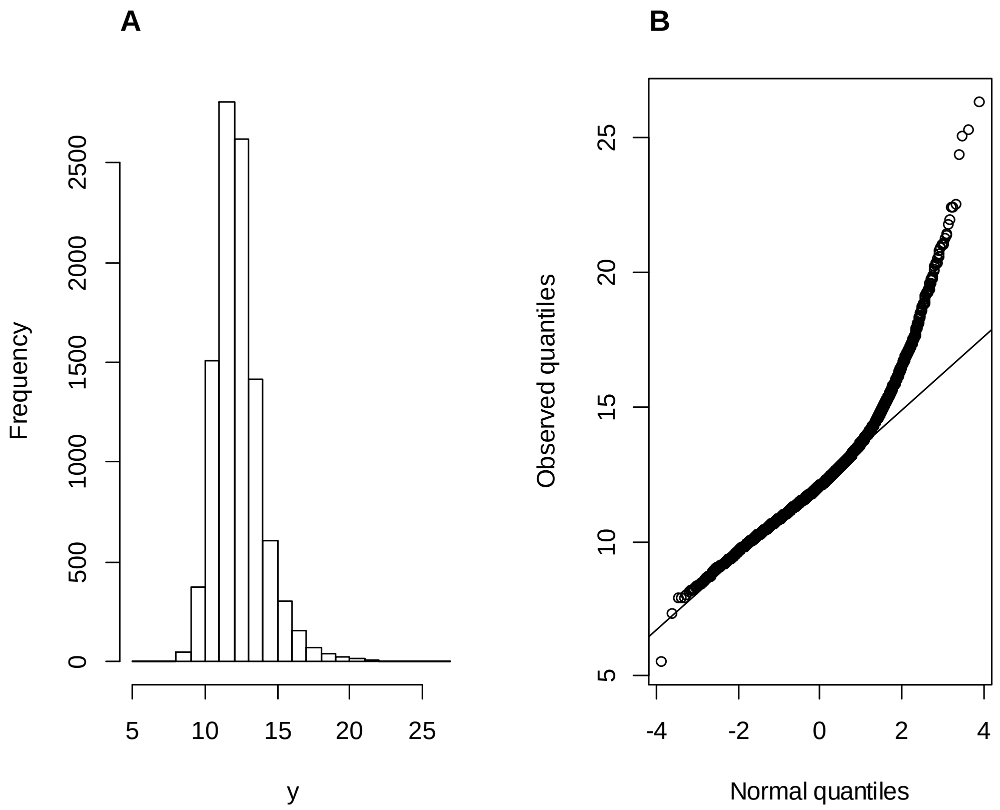

Figure S2. Histogram (A) and normal qq-plot (B) of 10,000 samples of the phenotypic distribution at $u = \bar{z}_c^*$ and mean trait values equal to the mean of the median trait means over the last 5000 generations of the 1000 independent simulations presented in Figure S1.

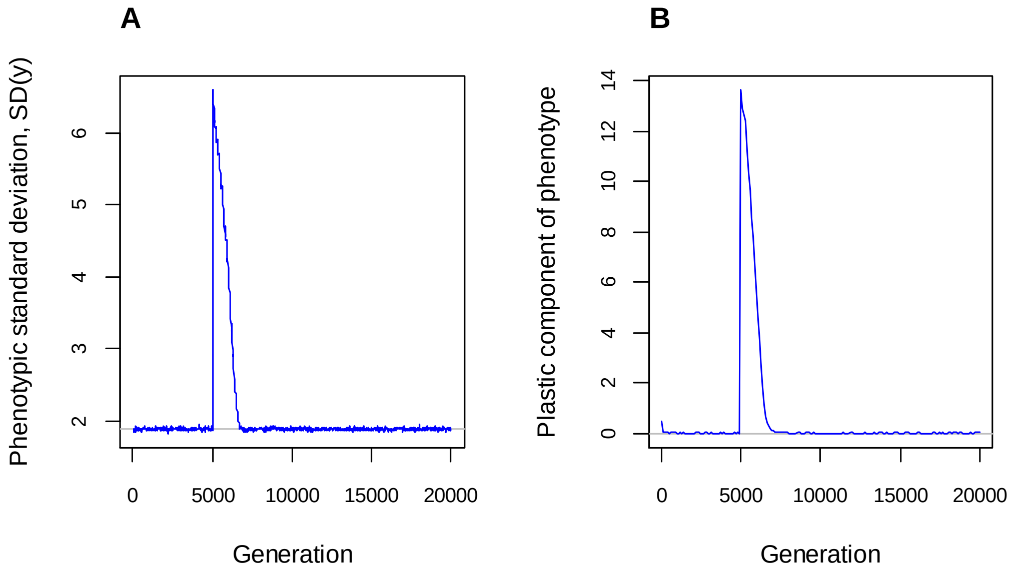

Figure S3: Phenotypic standard deviation, $SD(y)$ (**A**), and the expected plastic component of the phenotype, $\bar{z}_b(\mu_U - u_0)$ (**B**) in the simulations represented in Supporting Figure S1. Lines show the median of 1000 independent simulations plotted at every 100th generation.

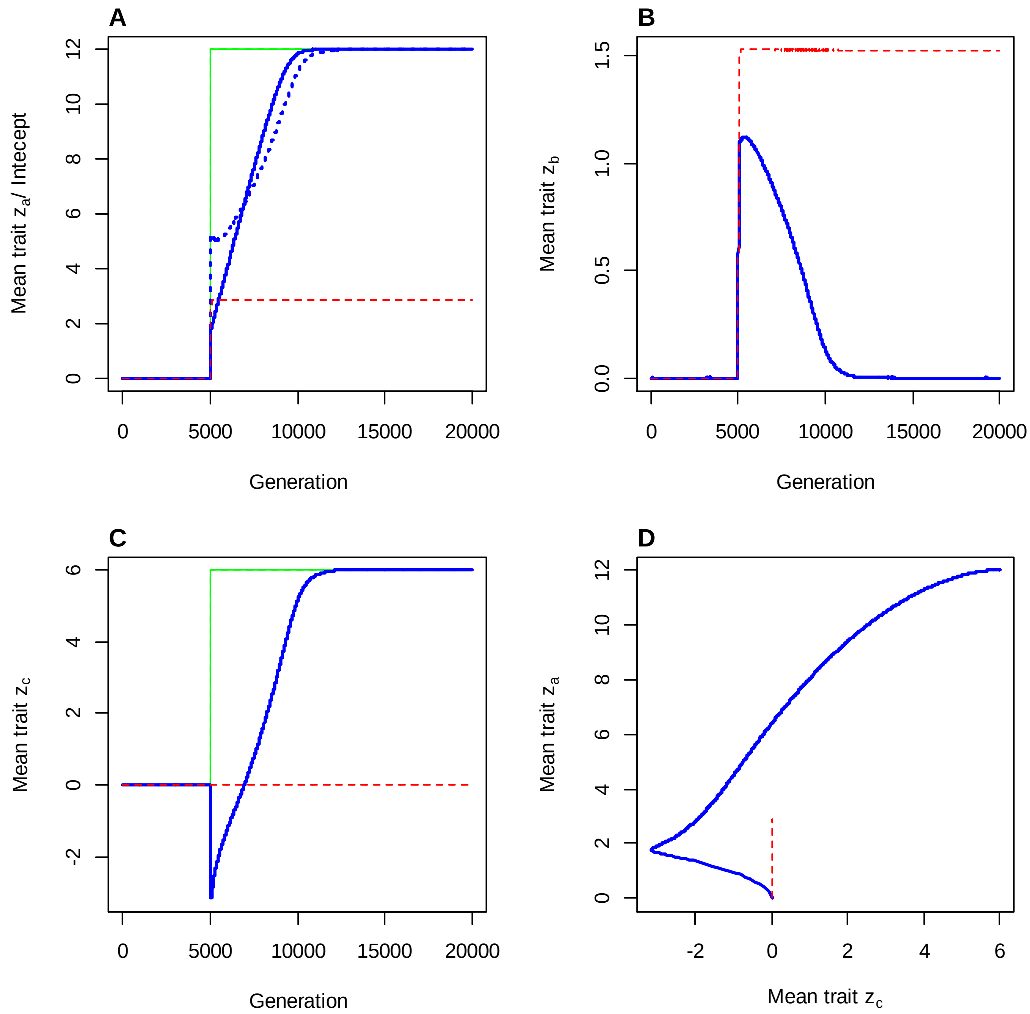

Figure S4. Simulation results for a scenario where there is no environmental variation before and after the sudden environmental change and the traits are independent (diagonal ***P***). Parameter values and initial values are the same as in Figure 2 in the main text except that $\sigma_U^2 = \sigma_\Theta^2 = \sigma_{U\Theta} = 0$. See explanation in the caption of Figure 2 in the main text. Note that directional selection in the two trait model (red stippled lines) stops when $E[y(\mu_U)] = \mu_\Theta$ and reaction norm slope remains high, after which mean intercept and slope may drift slowly to other values that give $E[y(\mu_U)] = \mu_\Theta$. This is because the phenotypic variance in the two trait model, $var\big(y(u)\big) = P_{\alpha\alpha} + u^2 P_{\beta\beta} + 2uP_{\alpha\beta}$, is independent of the trait means (see Figure S5). Note, however, that any variation in the environmental cue at stationarity ($\sigma_U^2 > 0$) will select the mean slope towards $\sigma_{U\Theta}/\sigma_U^2$ (as in Figure 2 in the main text).

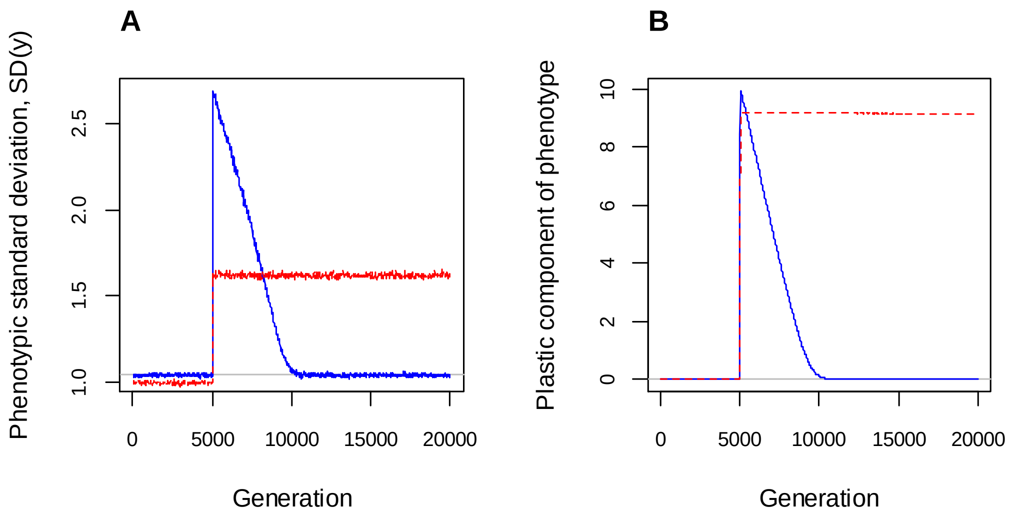

Figure S5. Phenotypic standard deviation, $SD(y)$ (**A**), and the expected plastic component of the phenotype, $\bar{z}_b(\mu_U - u_0)$ (**B**) in the simulations represented in Supporting Figure S4.