equations

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LV Model

$$\frac{dE}{dt} = \mu_e \times E \times \frac{\alpha_{e,s} \times S}{(\alpha_{e,s} \times S) + \kappa_e} \times (R - E - (\beta_{e,s} \times S)) - (\zeta_{e,2} \times gen \times E) - (\delta_e \times E) \quad (1)$$

$$\frac{dS}{dt} = \mu_s \times S \times \frac{\alpha_{s,e} \times E}{(\alpha_{s,e} \times E) + \kappa_s} \times (R - S - (\beta_{s,e} \times E)) - (\zeta_{s,1} \times sp \times S) - (\zeta_{s,2} \times gen \times S) - (\delta_s \times S) \quad (2)$$

$$\frac{dgen}{dt} = (\gamma_{s,2} \times \zeta_{s,2} \times gen \times S) + (\gamma_{e,2} \times \zeta_{e,2} \times gen \times E) - (\delta_g \times gen) \quad (3)$$

$$\frac{dsp}{dt} = (\gamma_{s,1} \times \zeta_{s,1} \times sp \times S) - (\delta_p \times sp) \quad (4)$$

Simple predictive inequality

$$S^*_{gen} = \frac{\delta - \gamma_g \zeta_g E}{\gamma_g \zeta_g} \quad (5)$$

$$S^*_{sp} = \frac{\delta}{\gamma_p \zeta_p} \quad (6)$$

$$S^*_{sp} < S^*_{gen} \quad (7)$$

$$\frac{\delta}{\gamma_p \zeta_p} < \frac{\delta - \gamma_g \zeta_g E}{\gamma_g \zeta_g} \quad (8)$$

$$\frac{\gamma_g \zeta_g}{\gamma_p \zeta_p} < 1 - \frac{\gamma_g \zeta_g E}{\delta} \quad (9)$$

Jmut values

Specialist to generalist

$$Jmut_{coop} = I^E_{gen}R + \delta(-1 + \frac{I^S_{gen}}{I^S_{sp}} - \frac{I^E_{gen}}{\mu_e + \kappa_e\mu_e}) \tag{10}$$

$$Jmut_{comp} = I^E_{gen}R + \frac{(\beta_{e,s}\mu_e I^E_{gen} - \mu_e I^S_{gen} + (\mu_e + I^E_{gen})I^S_{sp})\delta}{\mu_e I^S_{sp}} \tag{11}$$

Generalist to specialist

$$Jmut_{coop} = -\delta + \frac{\gamma_{s,1}\zeta_{s,1}((1+\kappa_s)mu_sR\gamma_{e,2}\zeta_{e,2}{}^2 - (1+\kappa_e)\mu_e\zeta s, 2(R\gamma_{e,2}\zeta_{e,2} - \delta) + \gamma_{e,2}\zeta_{e,2}(-\zeta e, 2 + \zeta_{s,2})\delta}{(1+\kappa_s)\mu_s\gamma_{e,2}\zeta_{e,2}{}^2 + (1+\kappa_e)\mu_e\gamma_{s,2}\zeta_{s,2}{}^2} \tag{12}$$

$$Jmut_{comp} = -\delta + \frac{\gamma_{s,1}\zeta_{s,1}(\gamma_{e,2}\zeta_{e,2}(-\zeta_{e,2} + \zeta_{s,2})\delta + \mu_e\zeta_{s,2}(-R\gamma_{e,2}\zeta_{e,2} - \delta) + \gamma_{e,2}\zeta_{e,2}(-\zeta_{e,2} + \zeta_{s,2})\delta)}{\mu_e\zeta_{s,2}(-\beta_{e,s}\gamma_{e,2}\zeta_{e,2} + \gamma_{s,2}\zeta_{s,2}) + \mu_s\zeta_{e,2}(\gamma_{e,2}\zeta_{e,2} - \beta_{s,e}\gamma_{s,2}\zeta_{s,2})} \tag{13}$$