BauchModel_8

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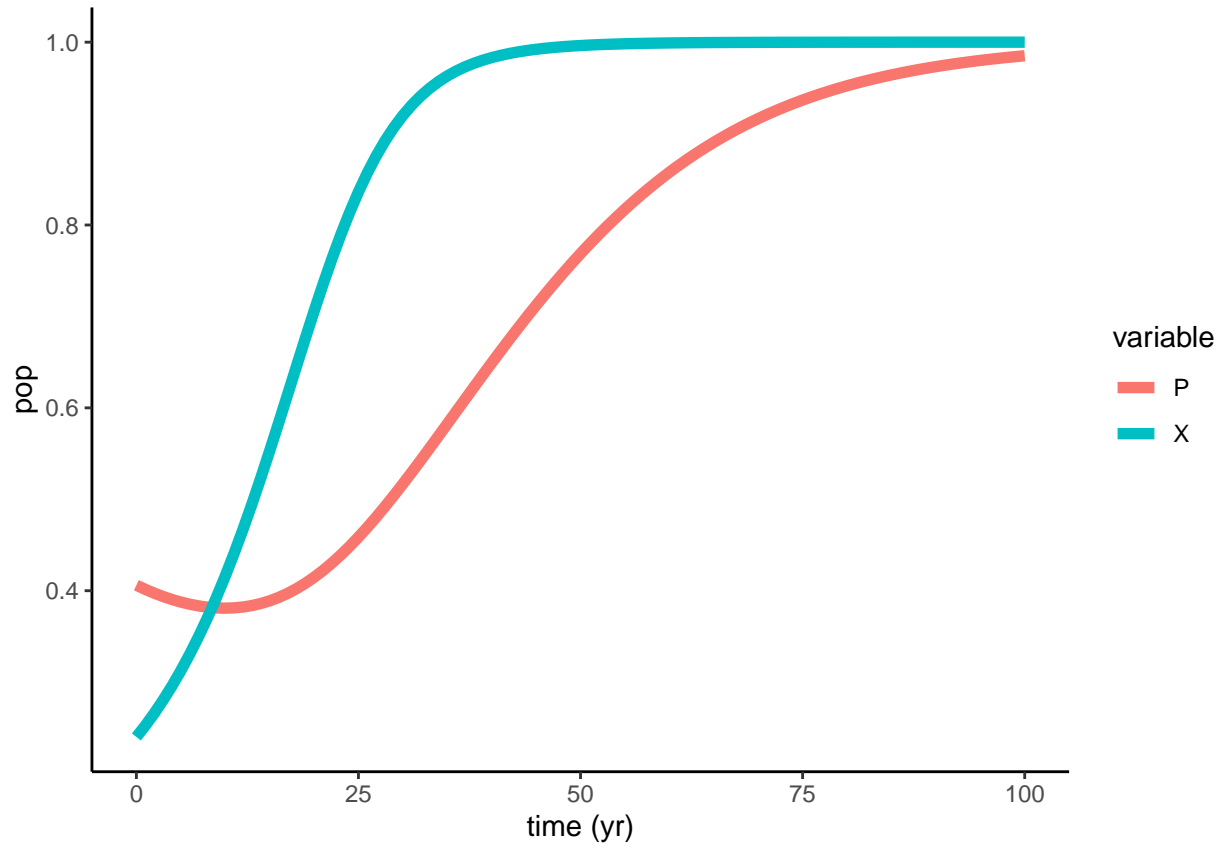

Figure 1: Original Bauch Model

See derivation in notes but this is the new equations (still unsure about interaction terms):

$\frac{dP_1}{dt} = r_1 P_1 (1 - P_1) - \frac{h_1 * P_1 (1 - X_1)}{P_1 + s_1} - e_1 P_1 + i_1 P_2$

$\frac{dP_2}{dt} = r_2 P_2 (1 - P_2) - \frac{h_2 * P_2 (1 - X_2)}{P_2 + s_2} - e_2 P_2 + i_2 P_1$

$\frac{dX_1}{dt} = k_1 X_1 (1 - X_1)[\frac{1}{P_1 + c_1} - w_1 + d_1 (2X_1 - 1)] - prop_1 X_1 (2X_2 - 1)^2 + prop_1 (1 - X_1)(2X_2 - 1)^2$

$\frac{dX_2}{dt} = k_2 x_2 (1 - X_2)[\frac{1}{P_2 + c_2} - w_2 + d_2 (2X_2 - 1)] - prop_2 X_2 (2X_1 - 1)^2 + prop_2 (1 - X_2)(2X_1 - 1)^2$

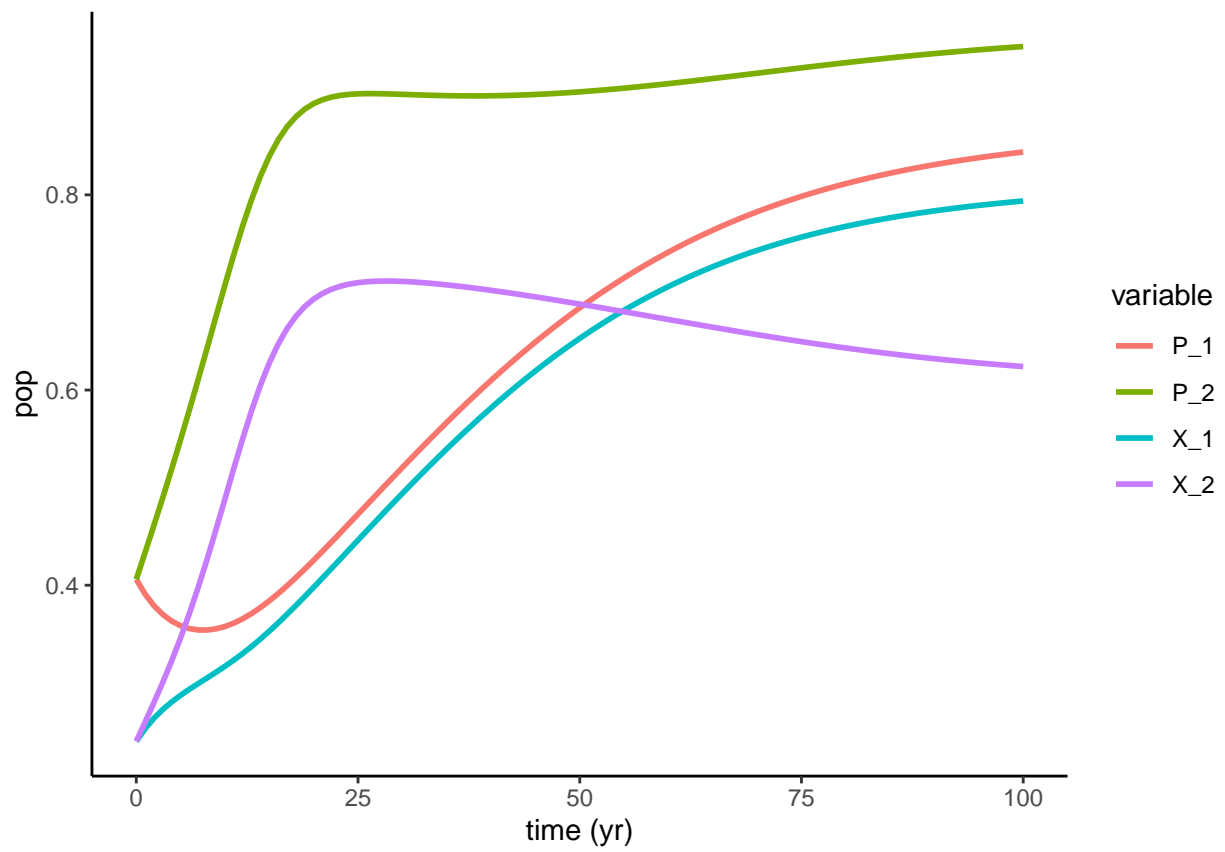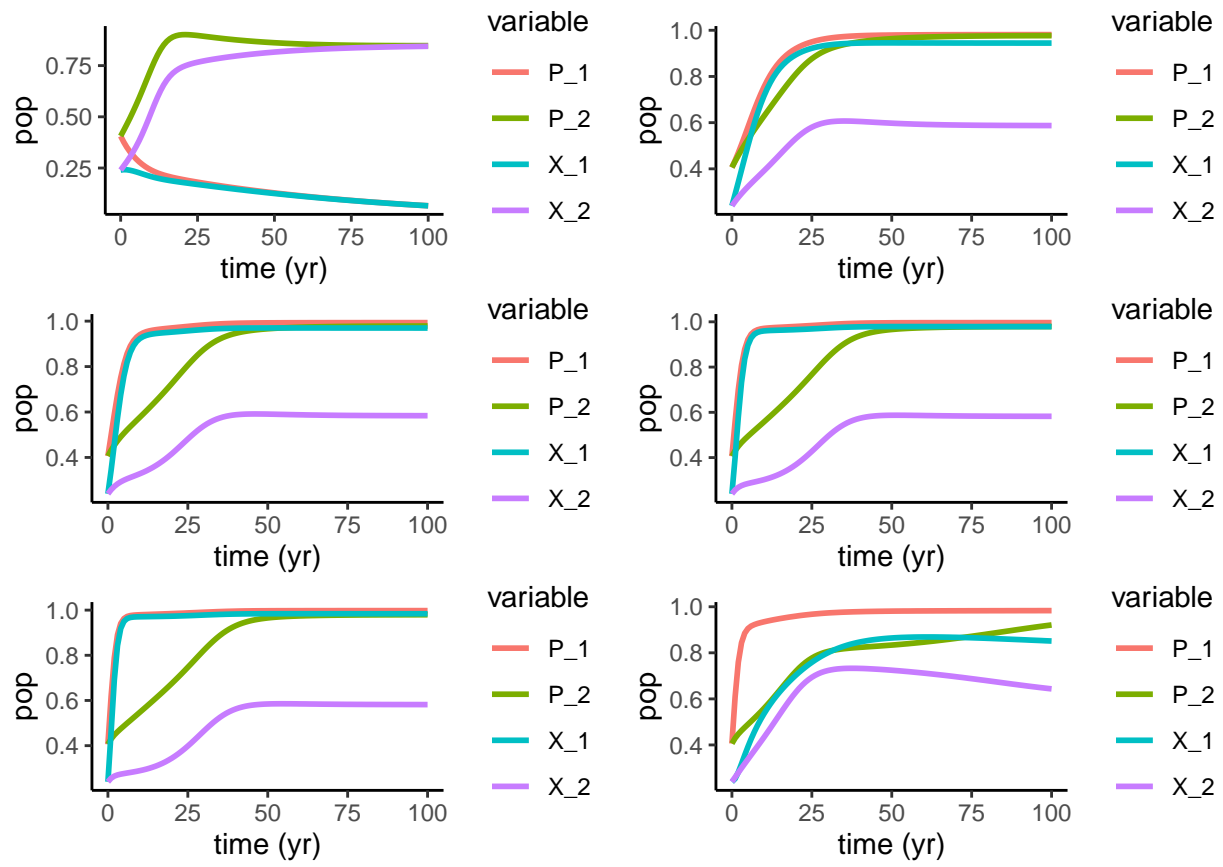Figure 2: New Model with default paramters
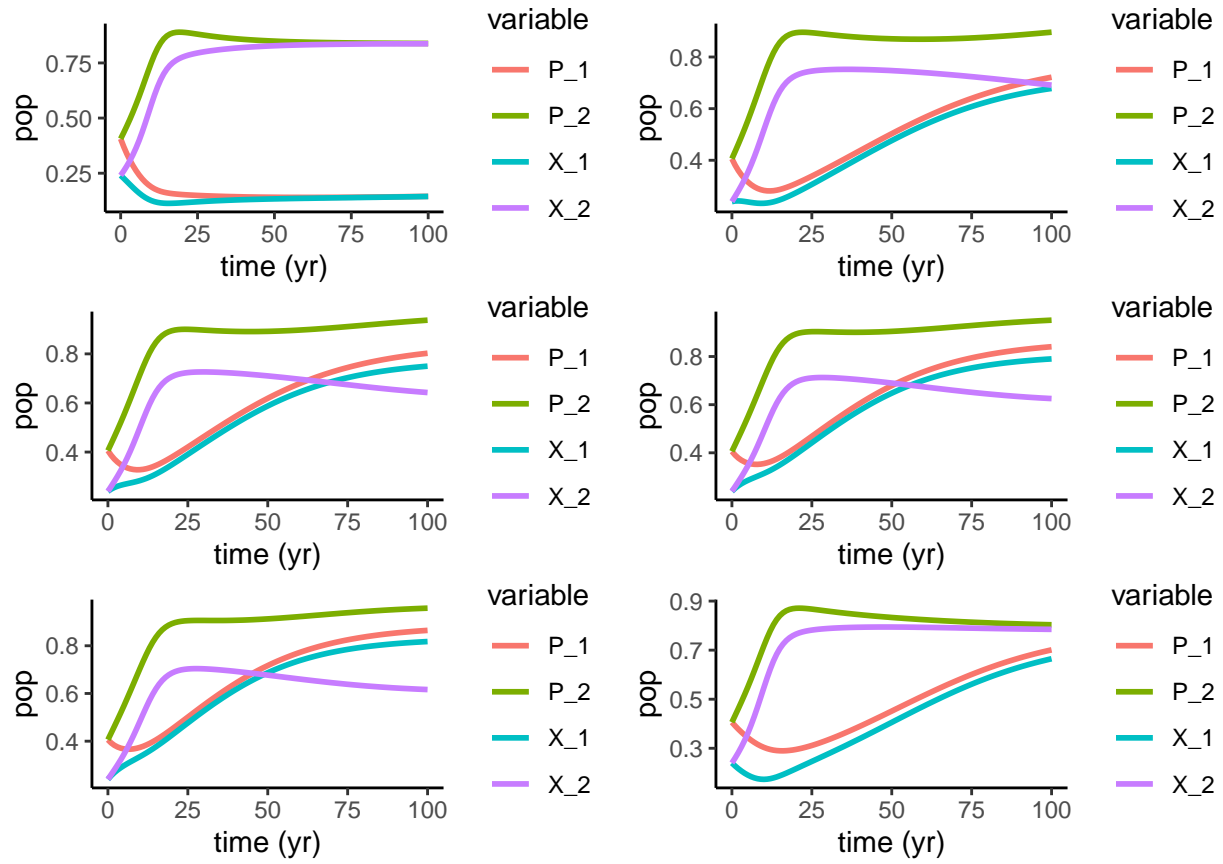
Figure 3: R - Net growth/fecundity, range 0 to 1

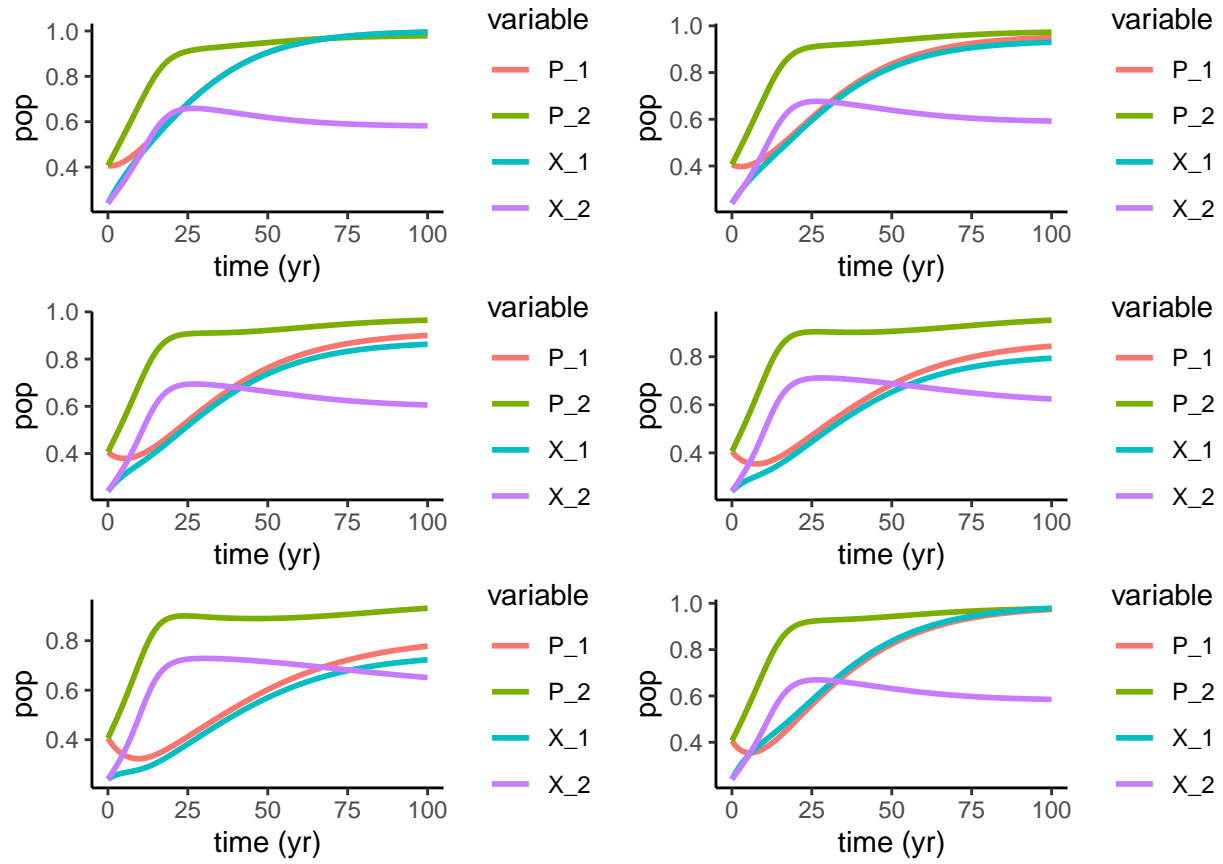Figure 4: S - supply and demand, range 0.1 to 1

Figure 5: h - Harvesting efficiency, range 0 to 0.1. Note, default is .075
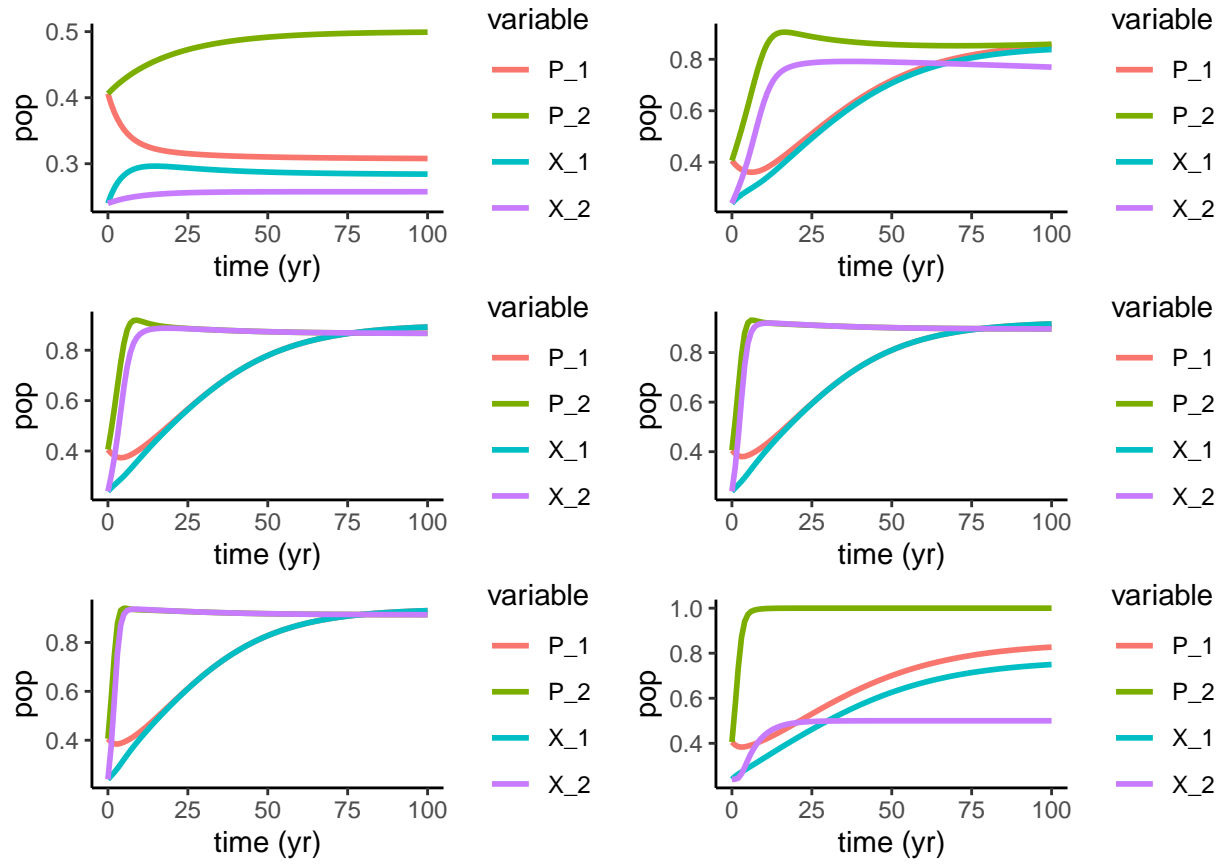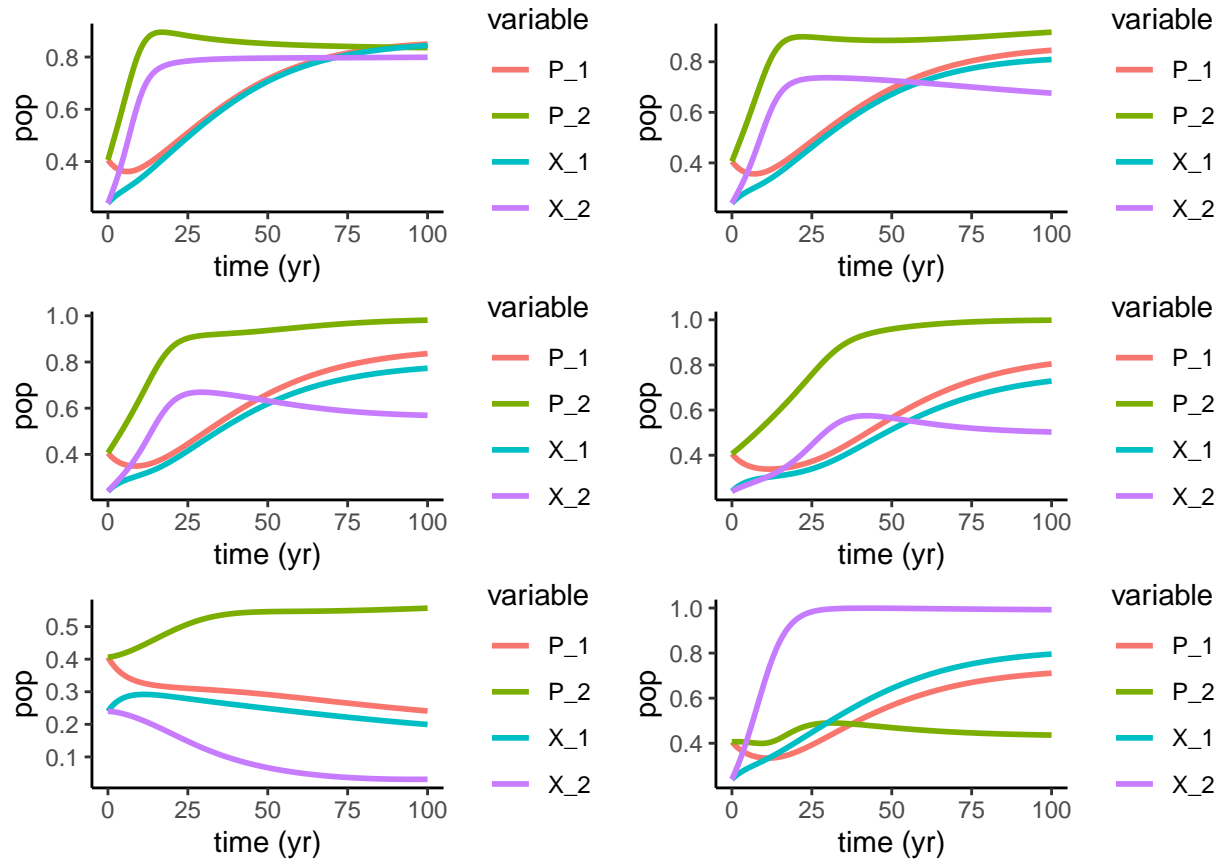
Figure 6: K - Social learning rate 0 to 1
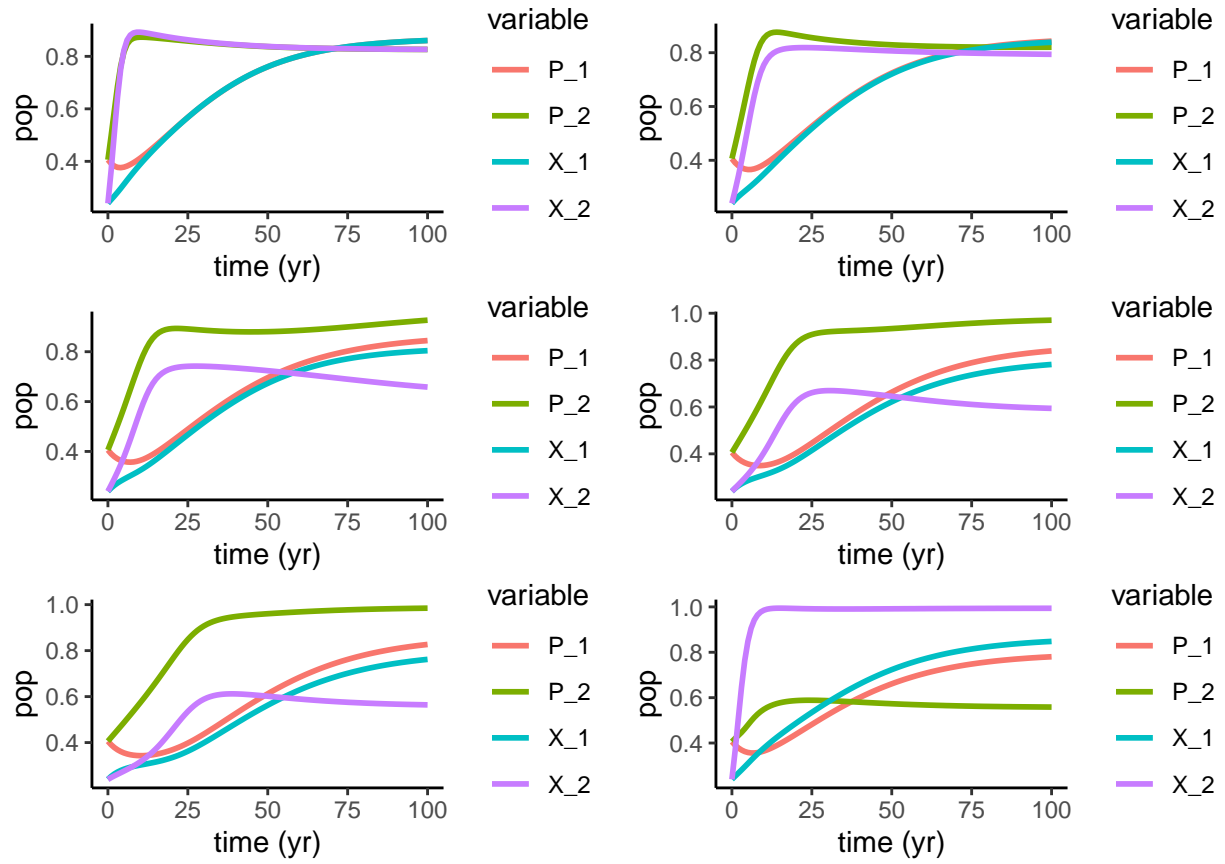
Figure 7: w - conservation costs
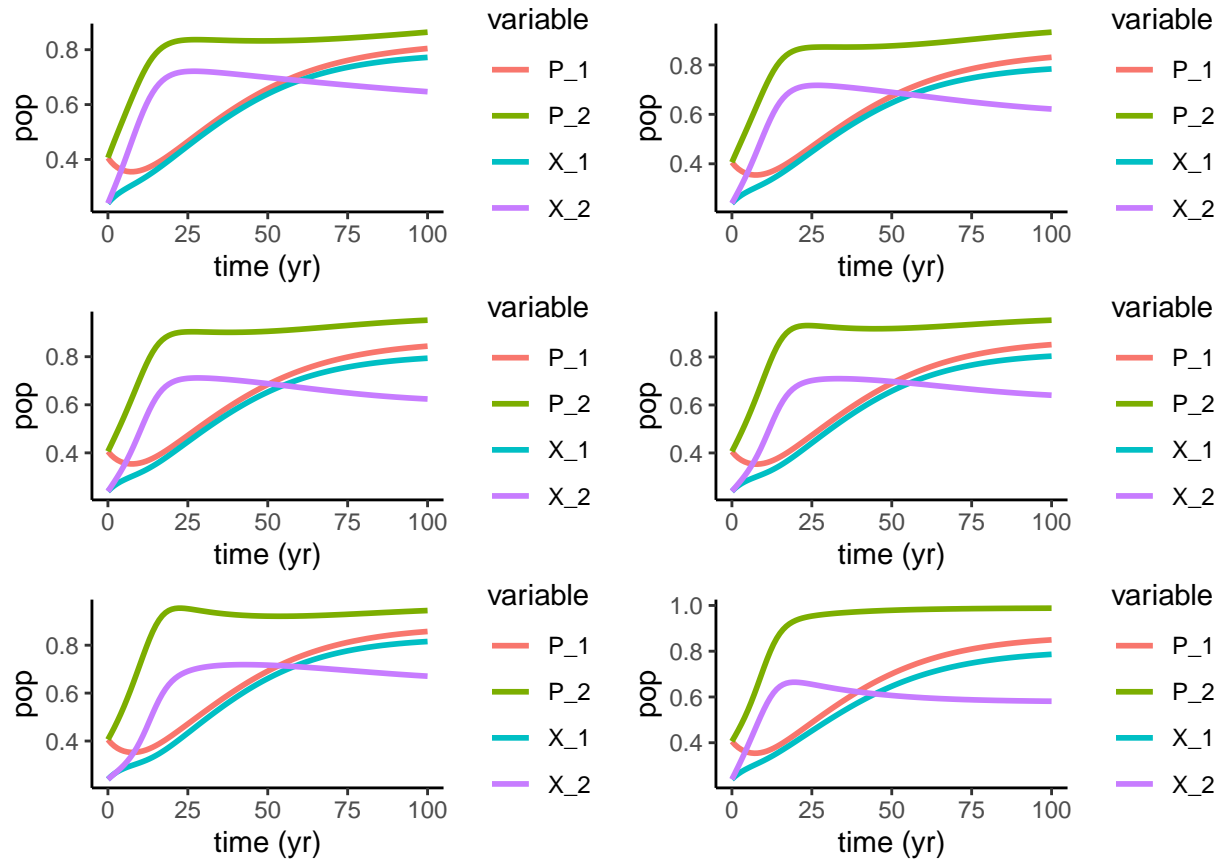
Figure 8: c - rarity valuation param
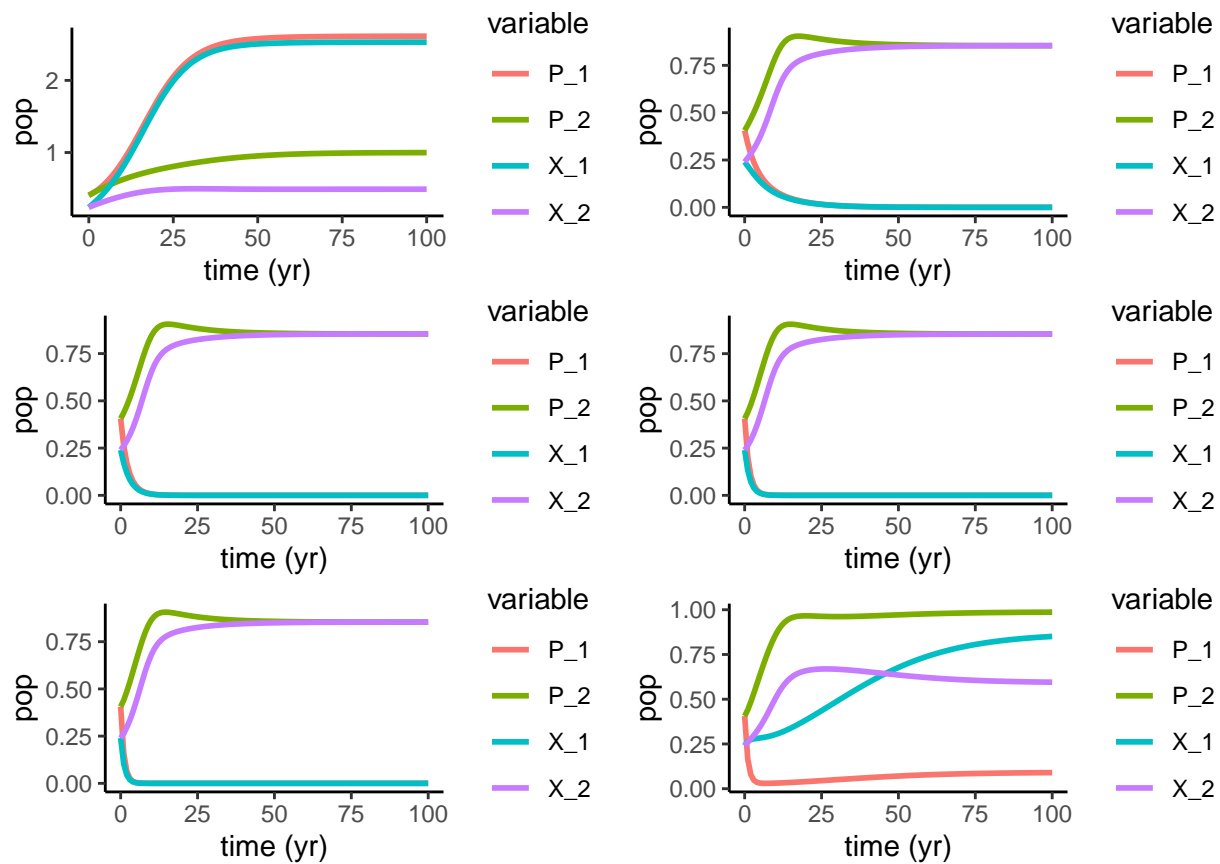
Figure 9: d - social norm strength

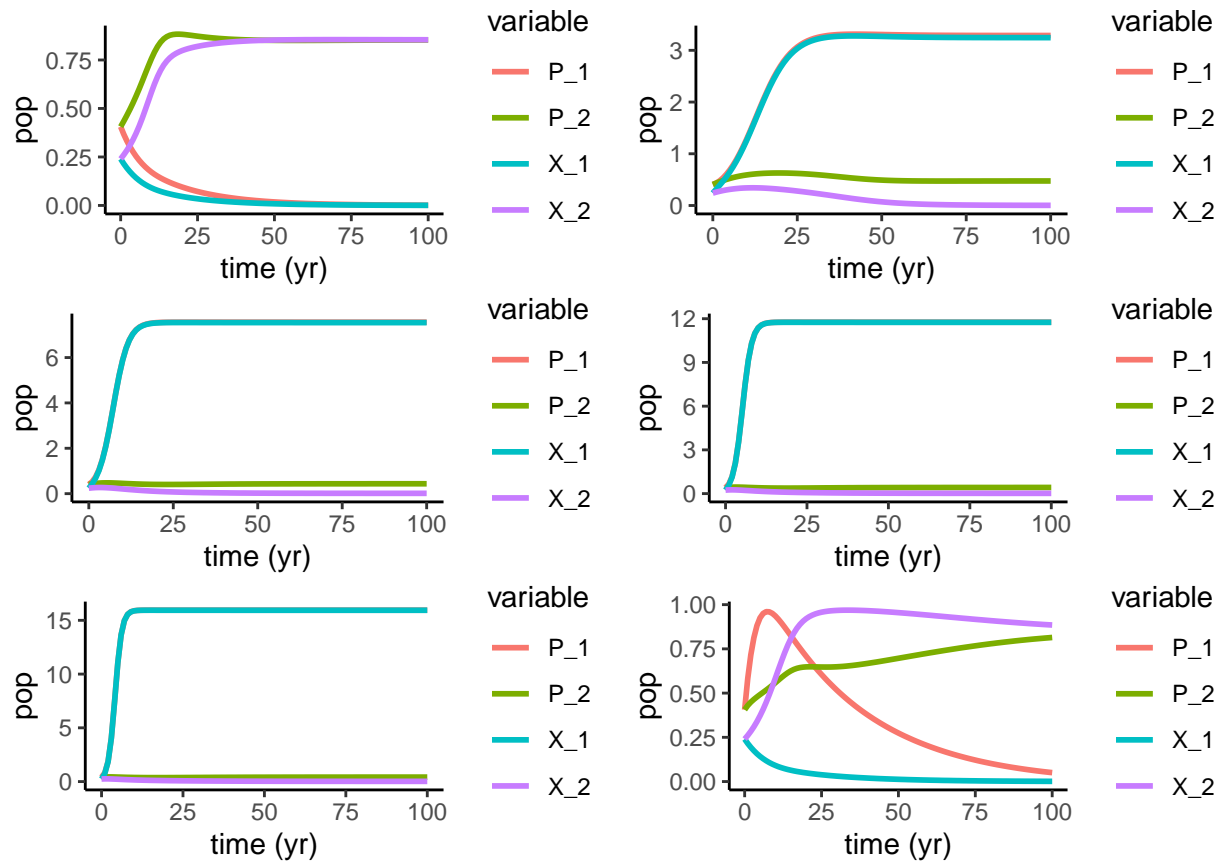Figure 10: e - fish emigration

Changes graph 2

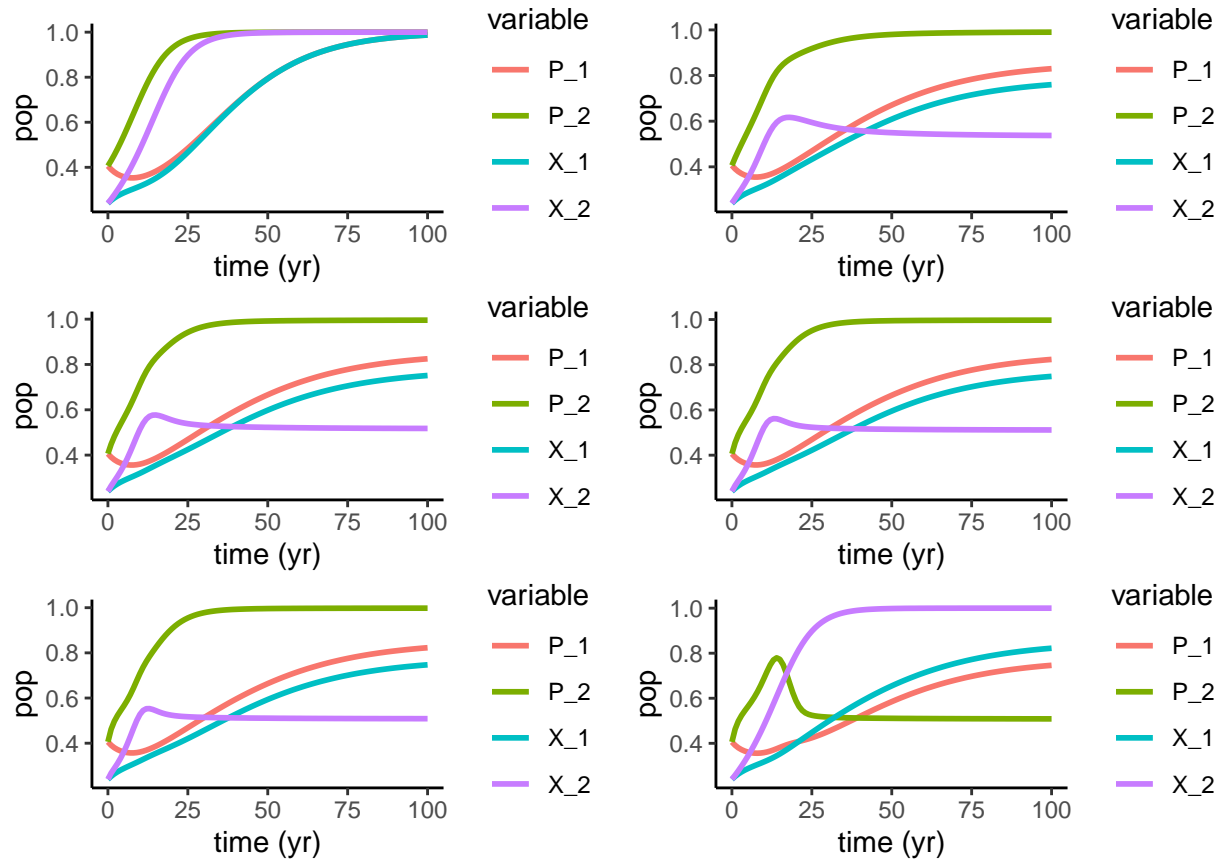Figure 11: i - fish immigration

Changes graph 2
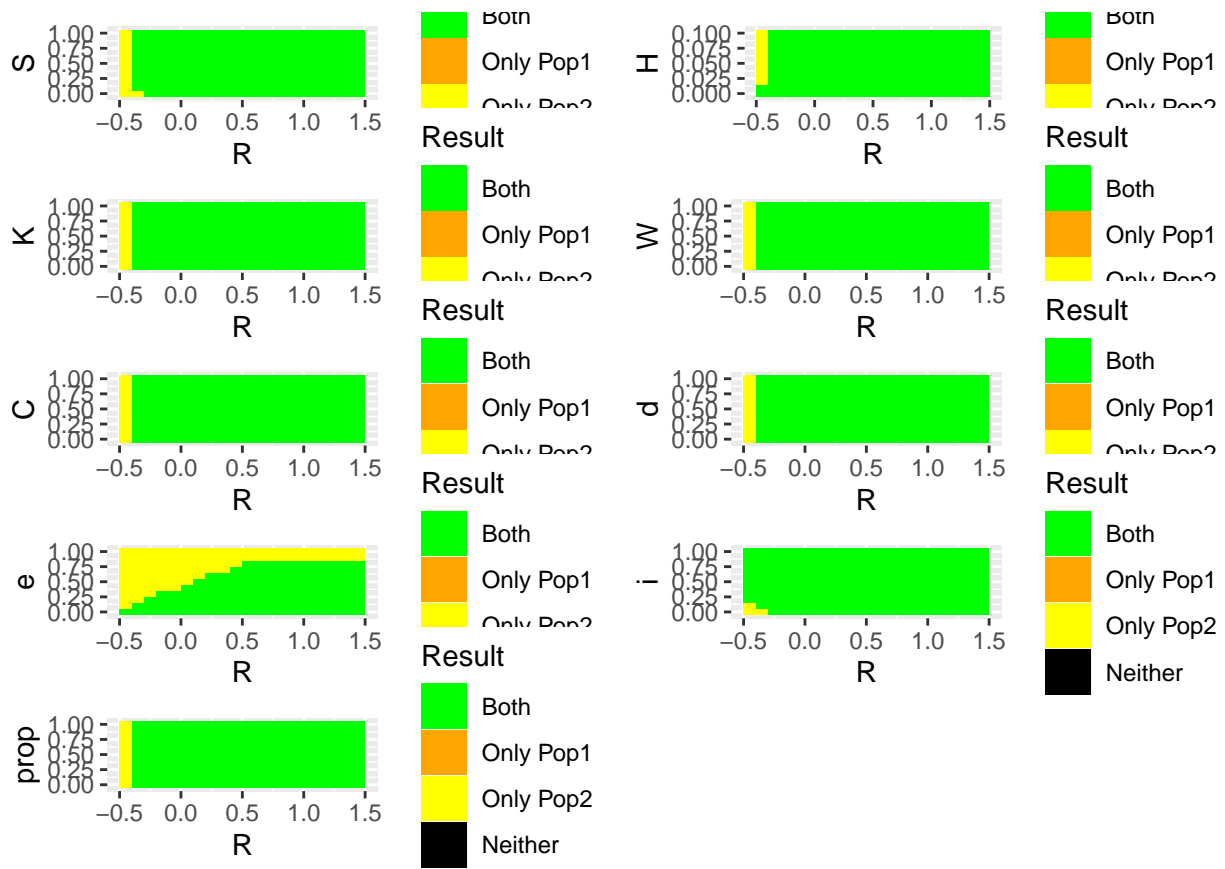
Figure 12: prop - Population influence on the other
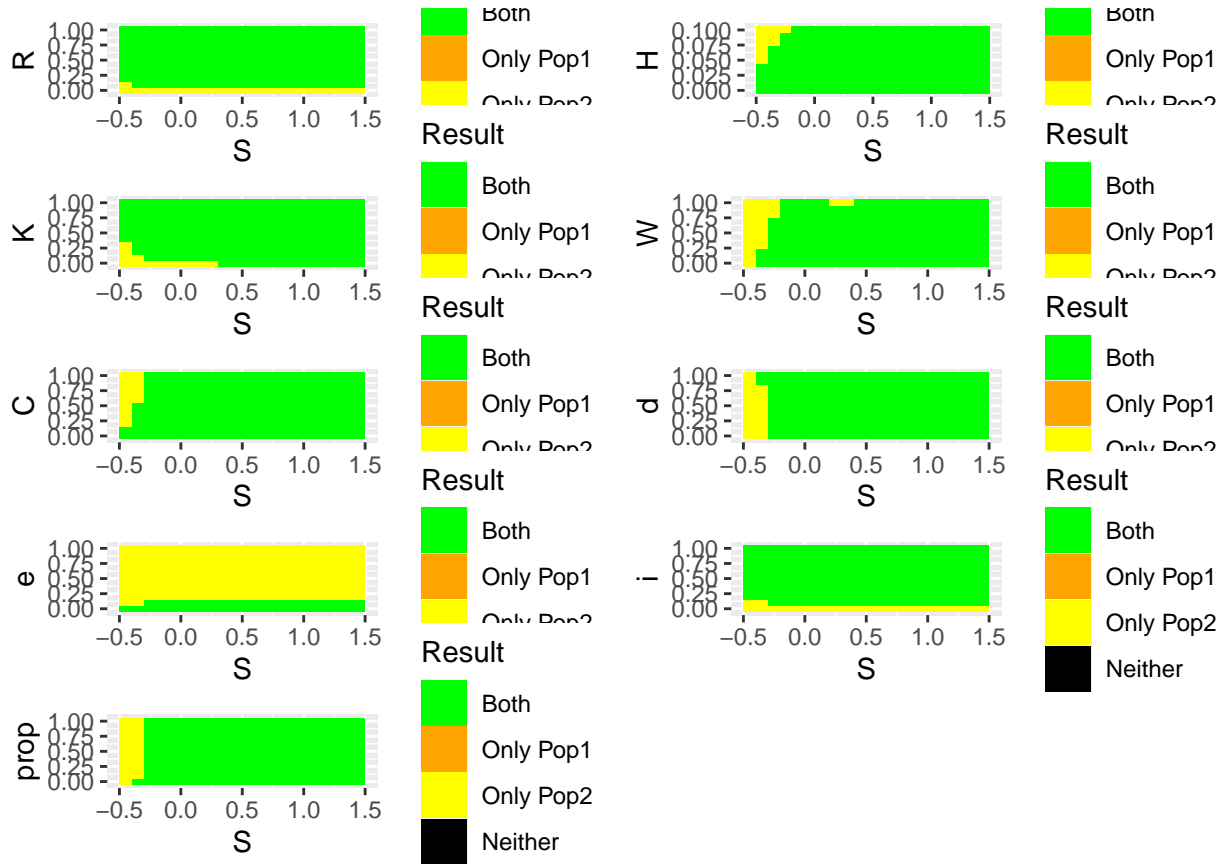
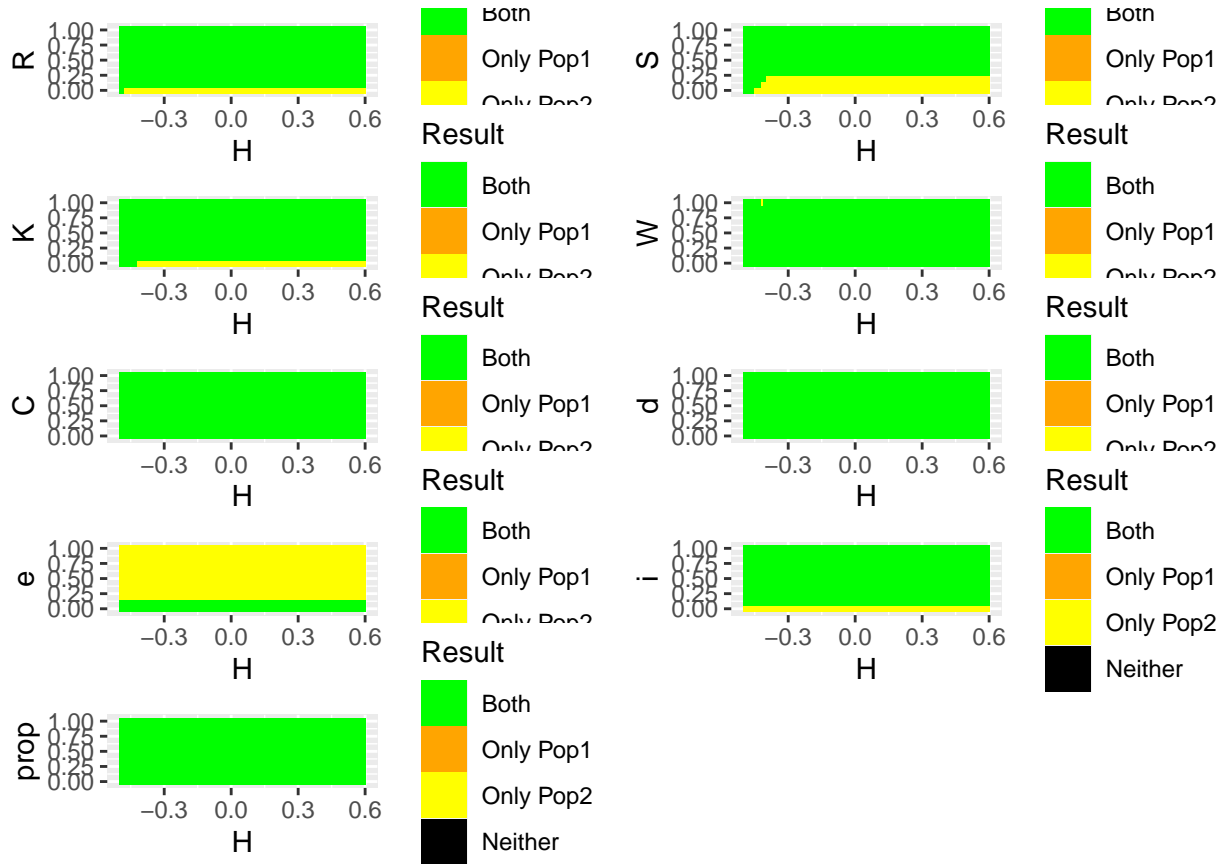Figure 13: R parameter planes

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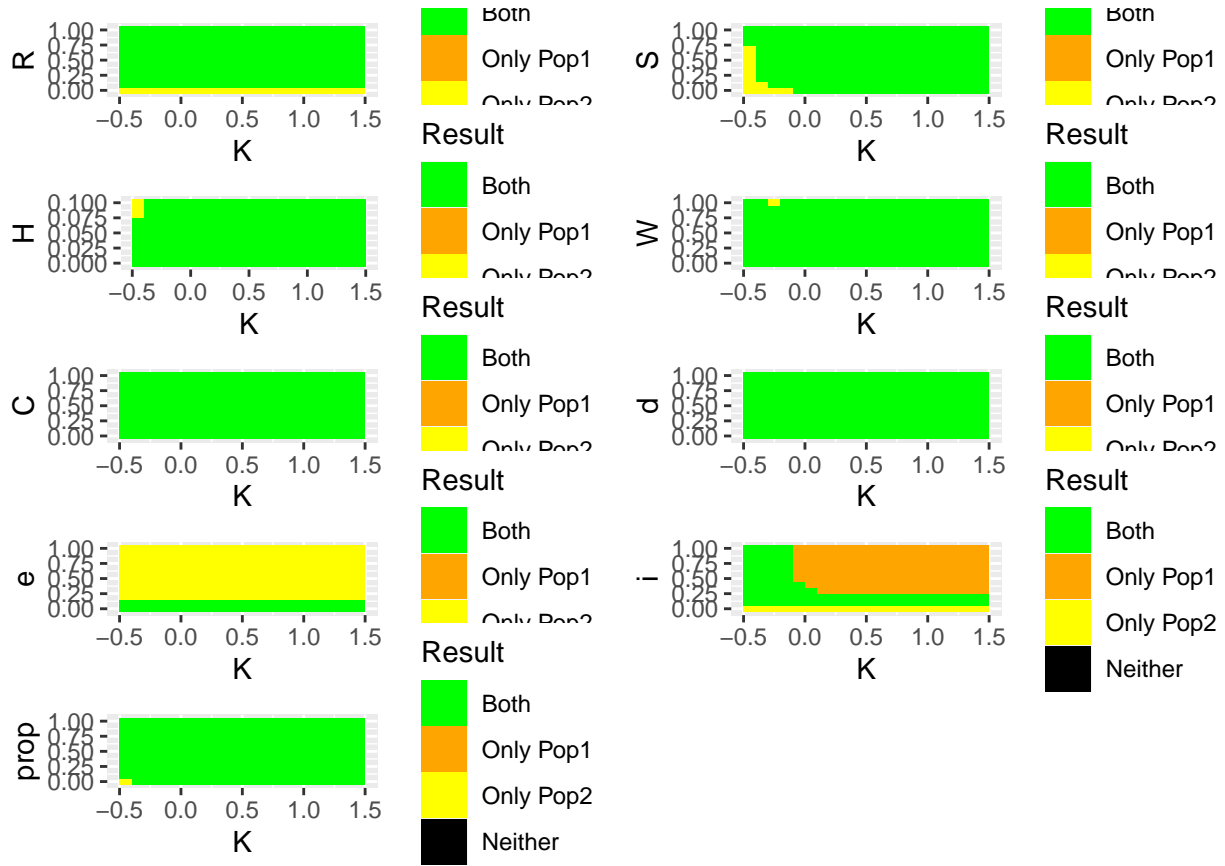Figure 14: S parameter planes

Figure 15: h parameter planes

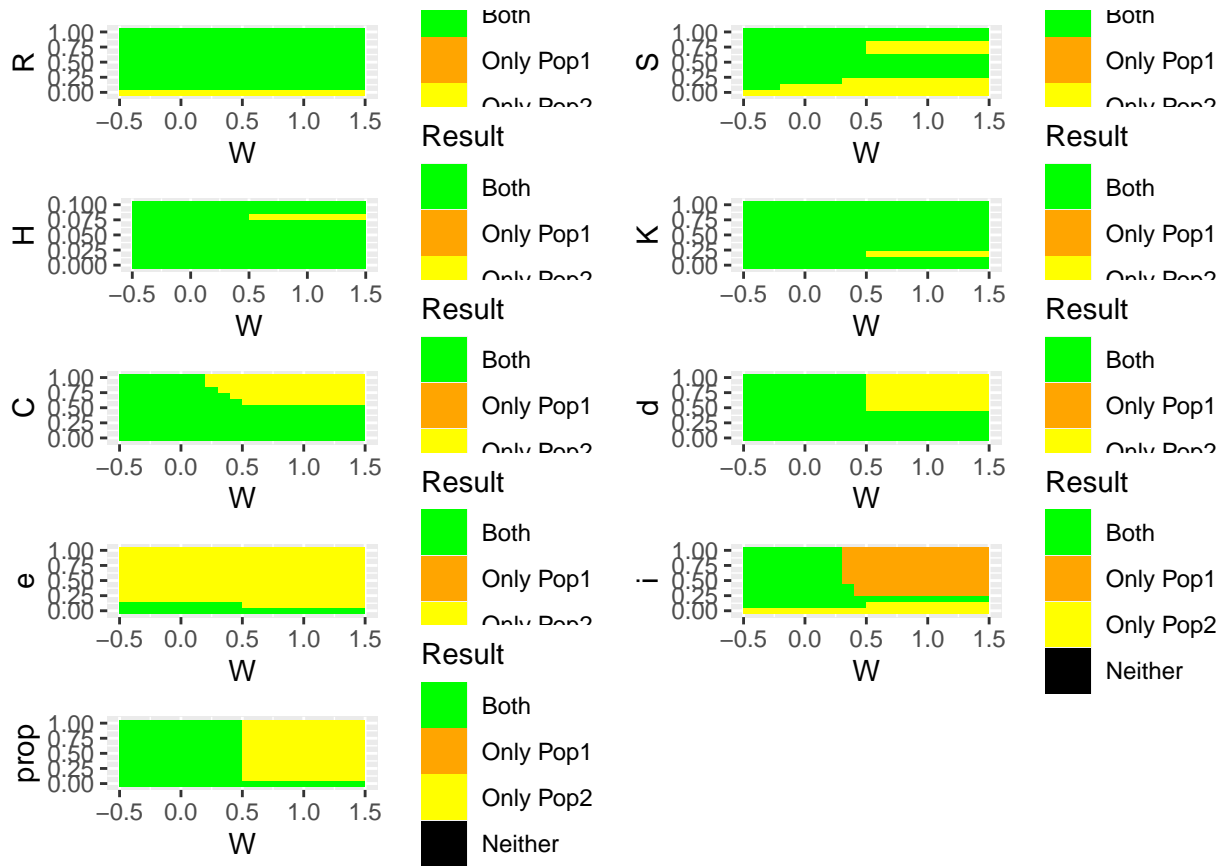Figure 16: K parameter planes ranging from 0-1

Figure 17: w parameter planes

W vs e changes a little

```
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 89.1011, R2 = 5.68706e-12
##
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 92.5957, R2 = 3.58423e-10
##
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 83.0607, R2 = 2.117e-10
##
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 67.387, R2 = 4.86616e-09
##
```
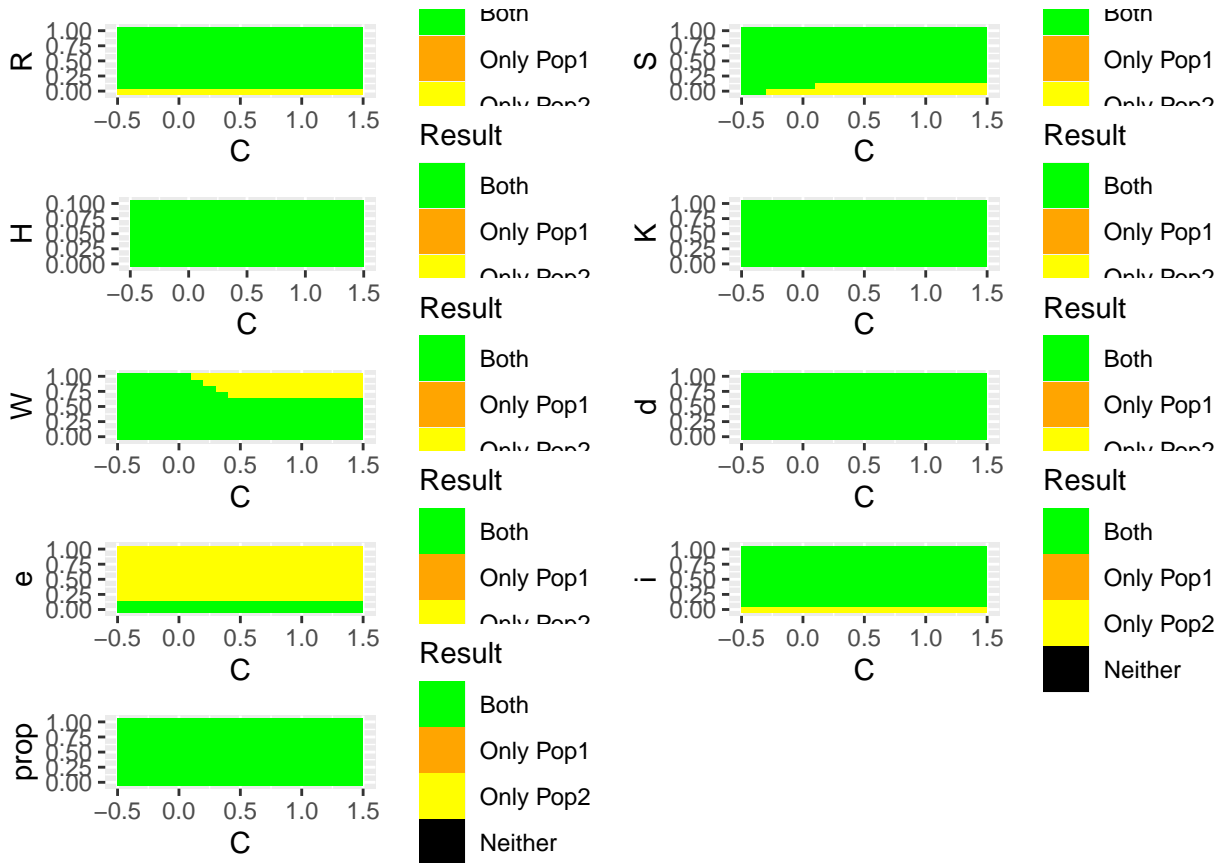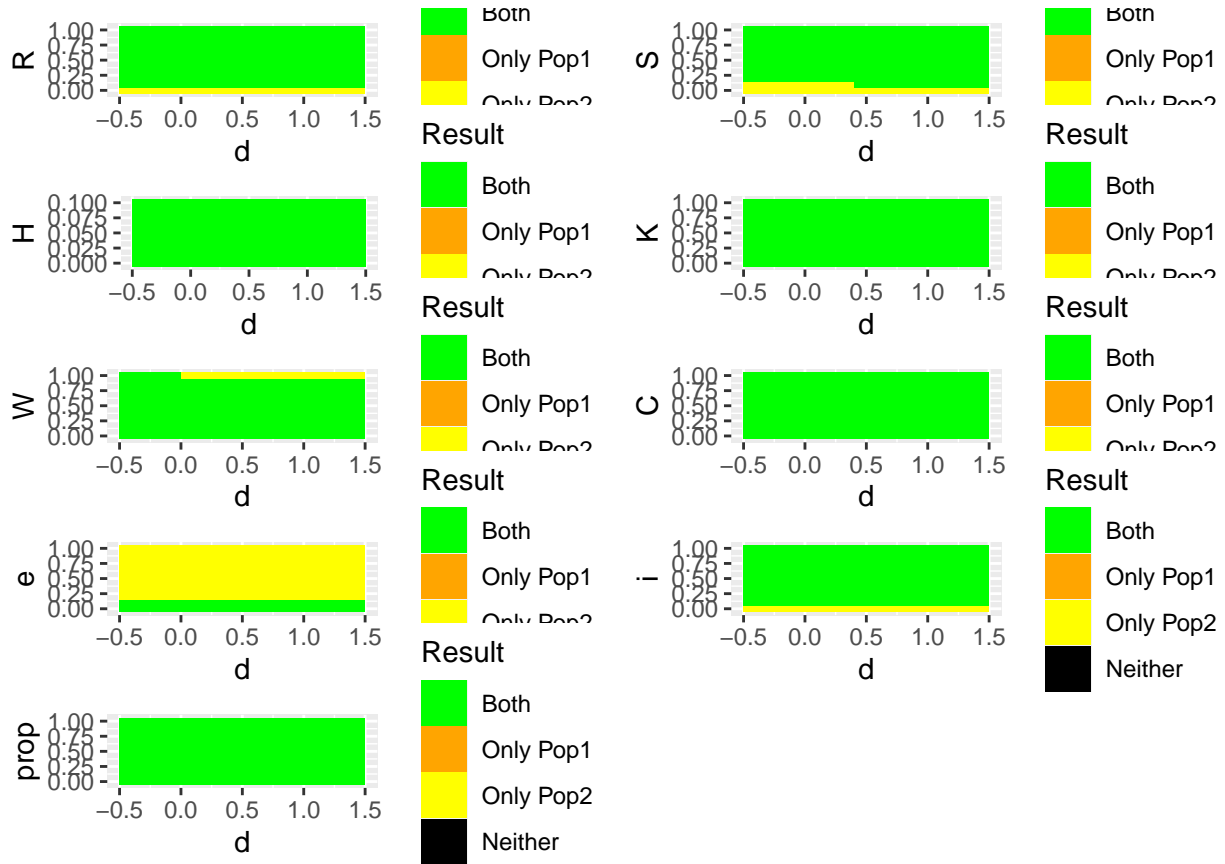

Figure 18: c parameter planes

Figure 19: d parameter planes

```
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 89.1011, R2 = 5.68706e-12
##
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 92.5957, R2 = 3.58423e-10
##
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##
## DLSODA-  At T (=R1) and step size H (=R2), the
##       corrector convergence failed repeatedly
##       or with ABS(H) = HMIN
## In above message, R1 = 67.387, R2 = 4.86616e-09
##
```
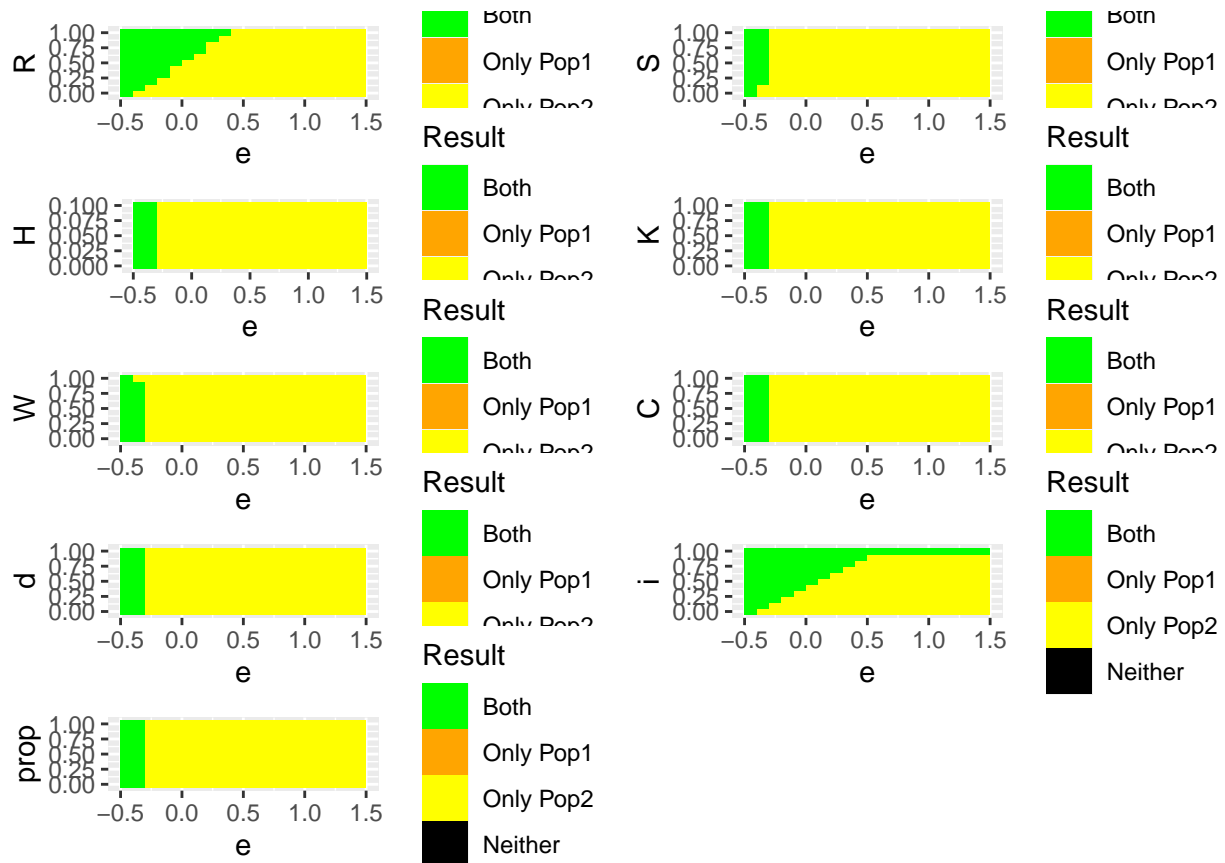

Figure 20: e parameter planes
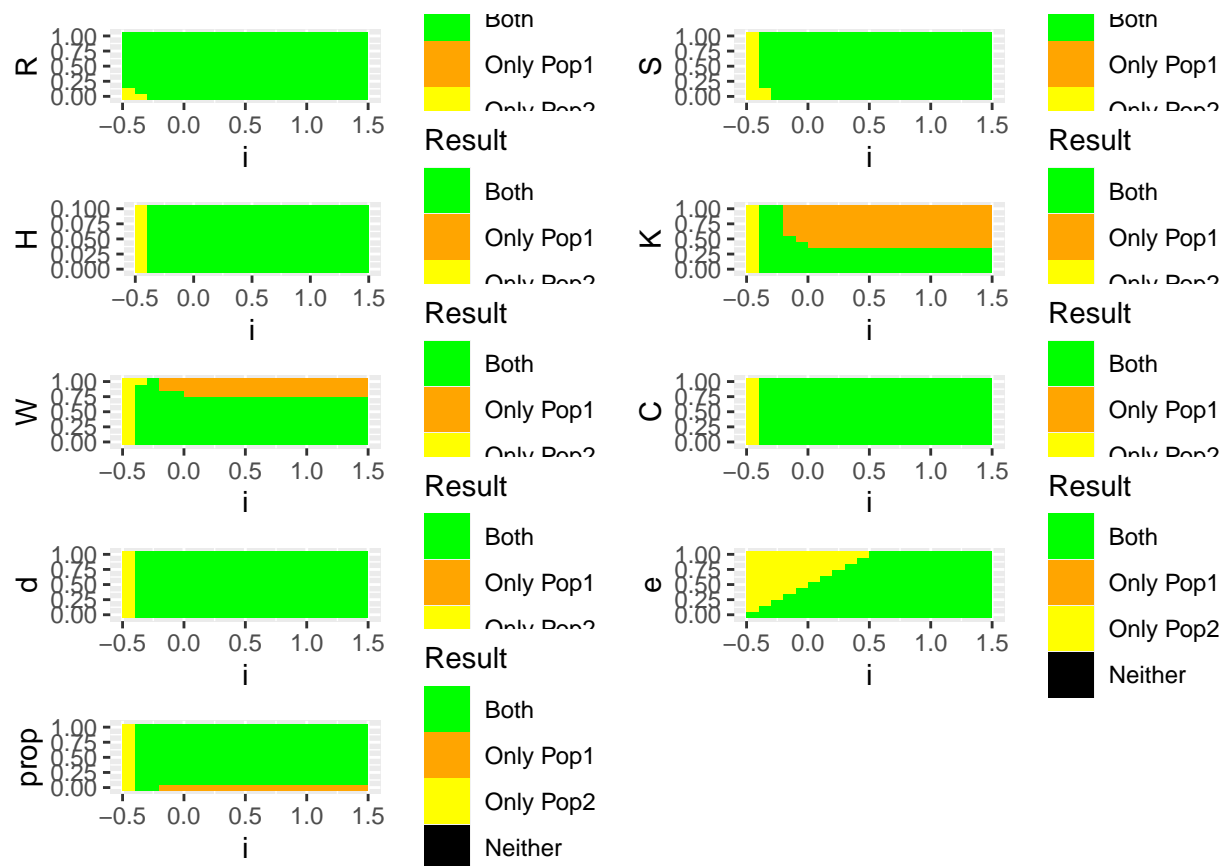
Now there are no more "only pop1" scenarios
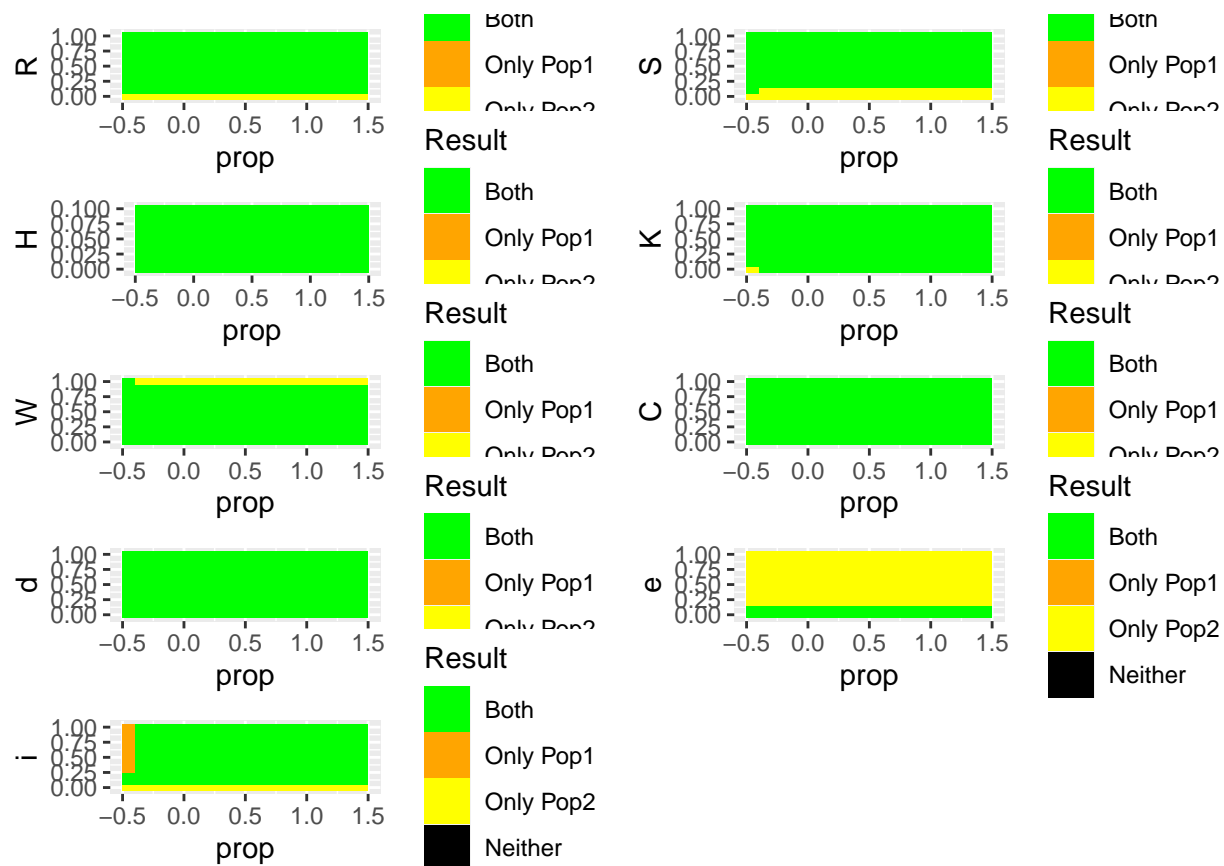
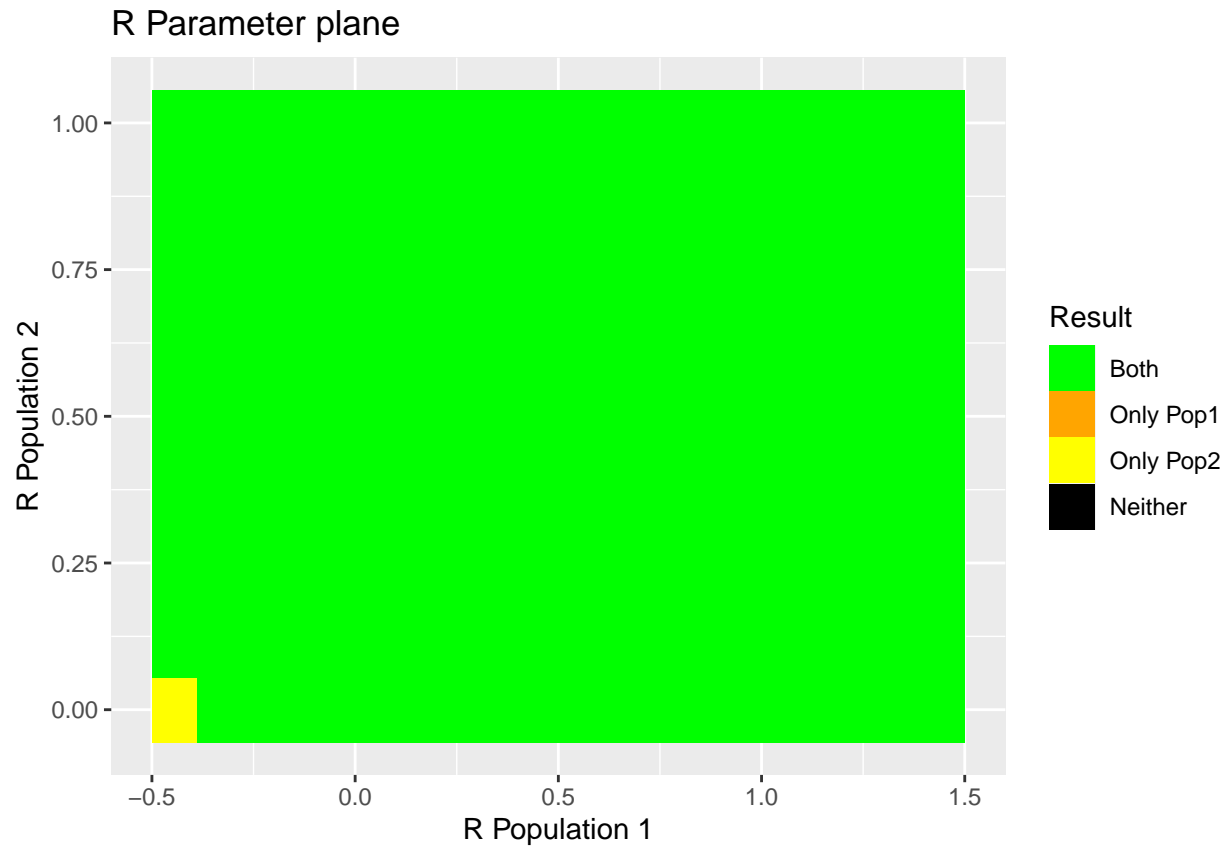Figure 21: i parameter planes

Figure 22: prop parameter planes

R Parameter plane

Figure 23: r population planes

Figure 24: s population planes

H Parameter plane

Figure 25: h population planes

Figure 26: k population planes 0 to 1

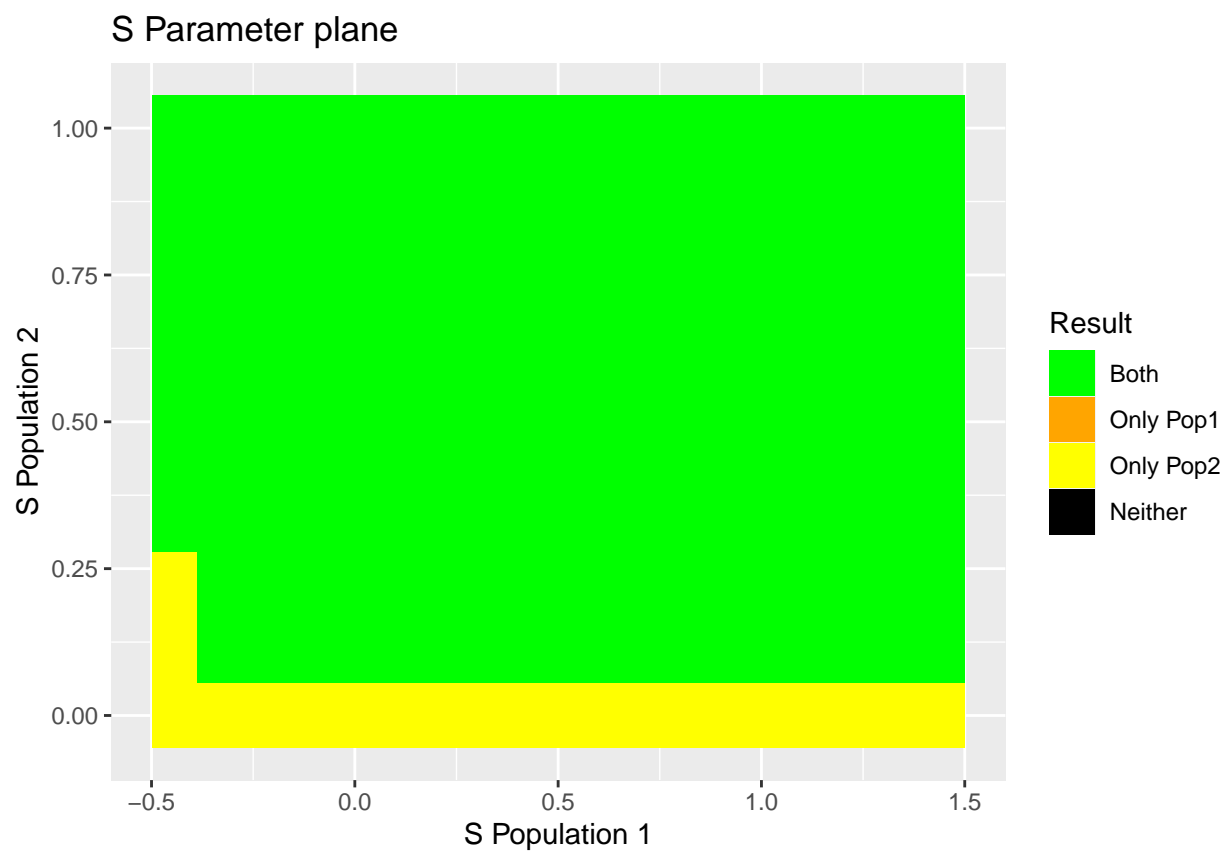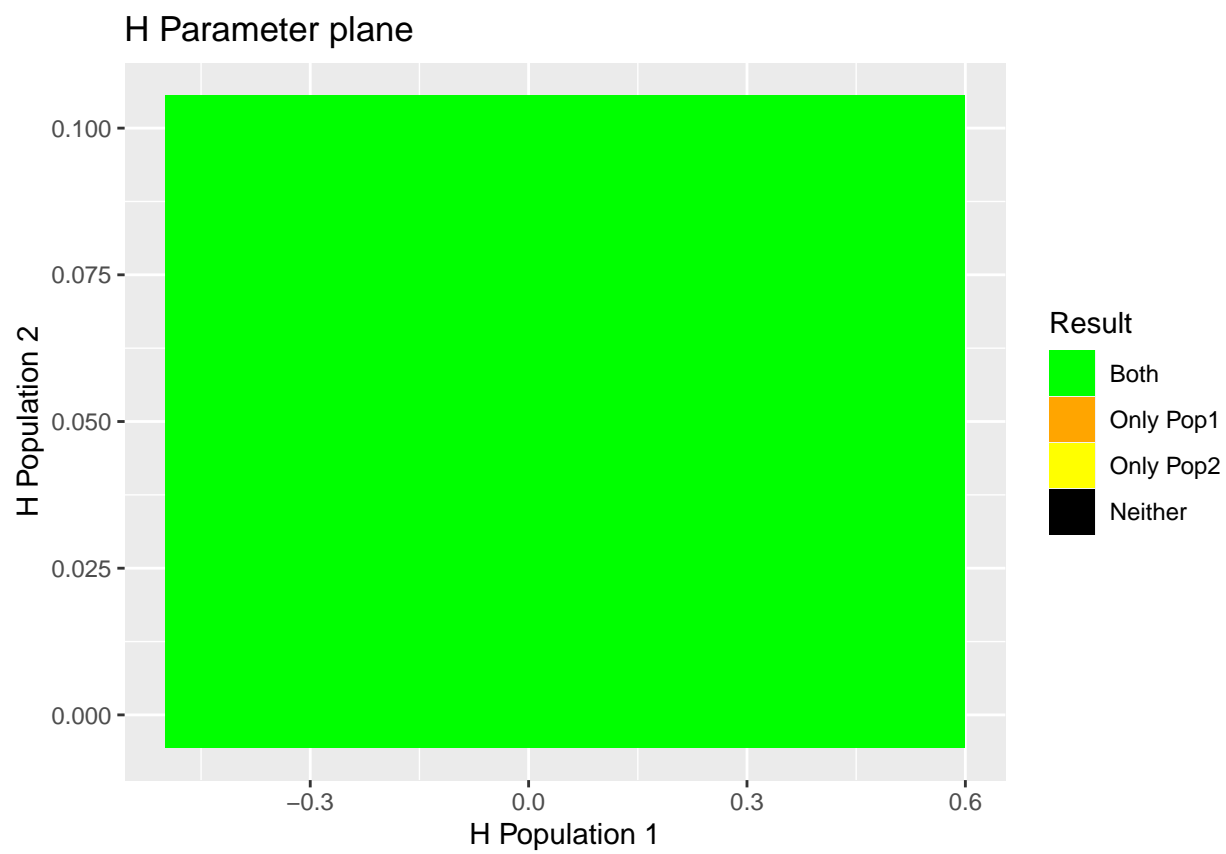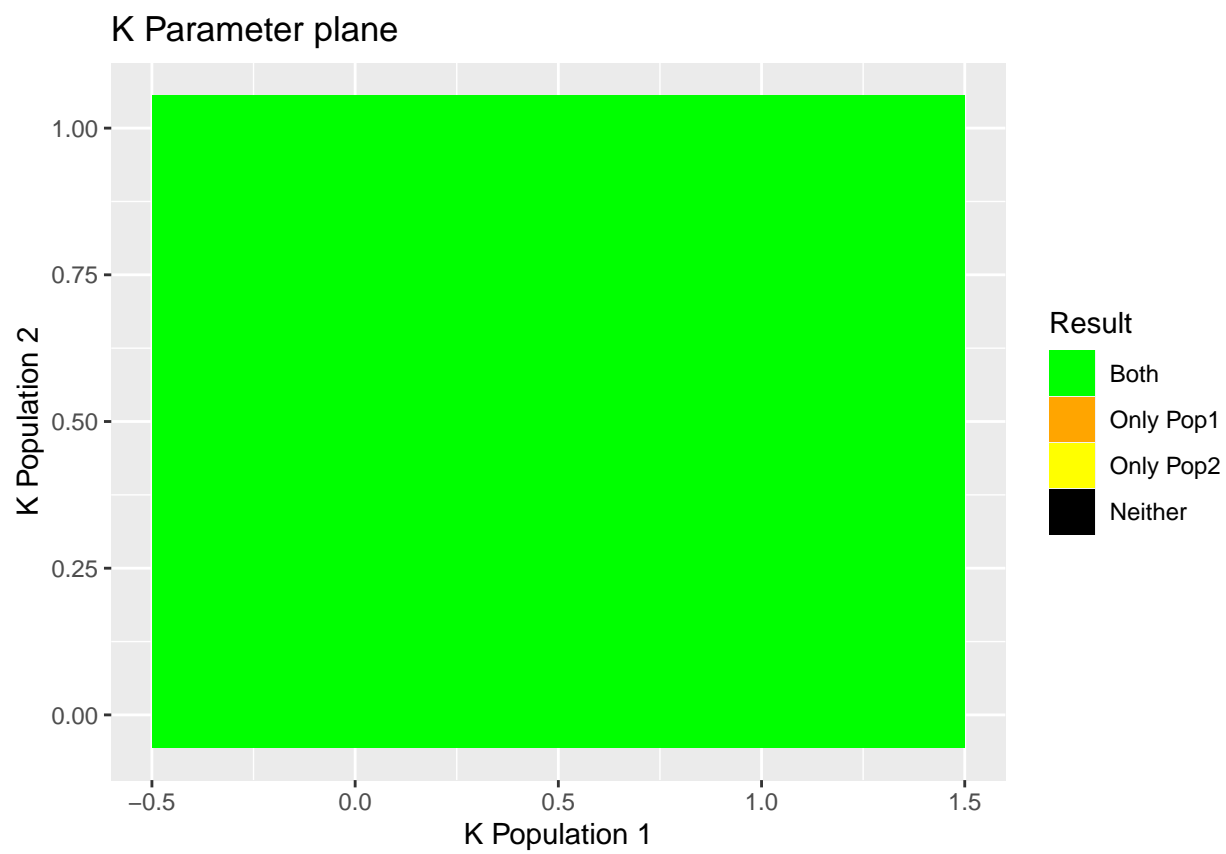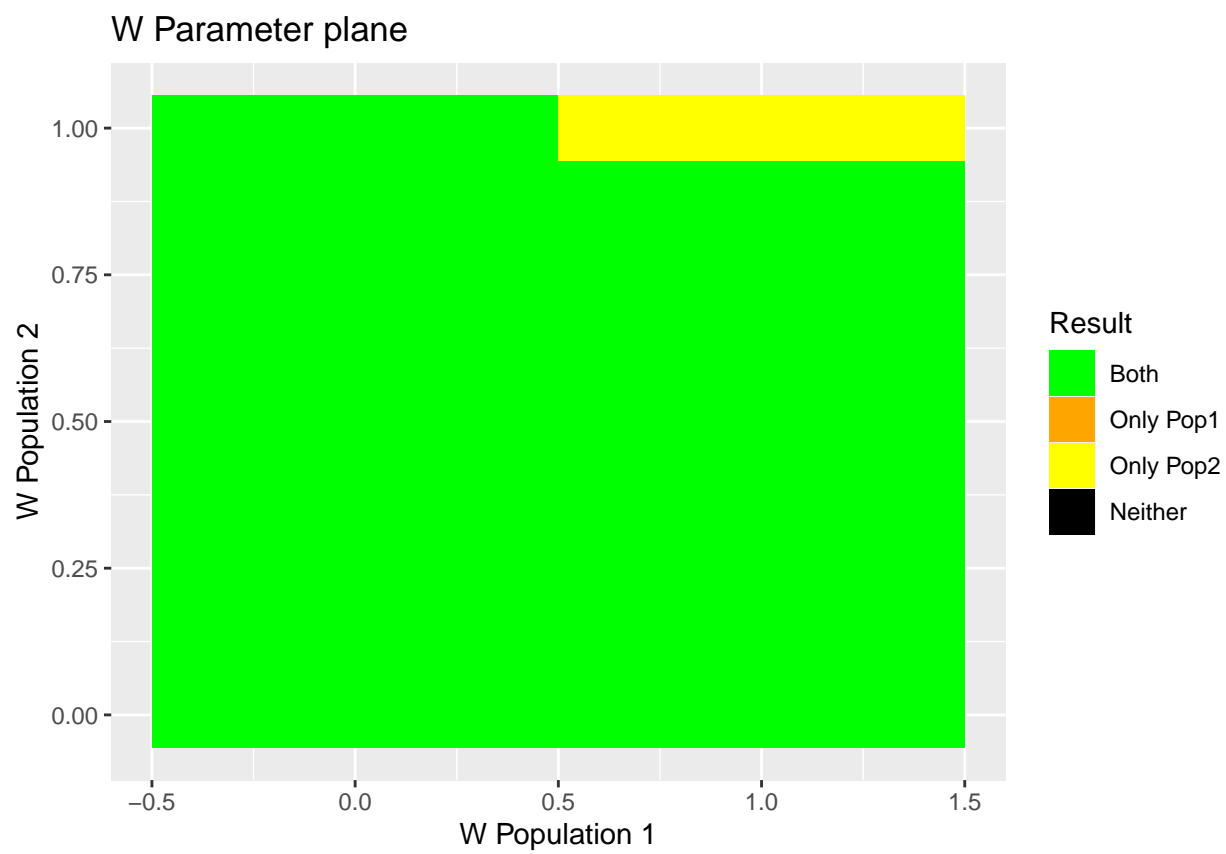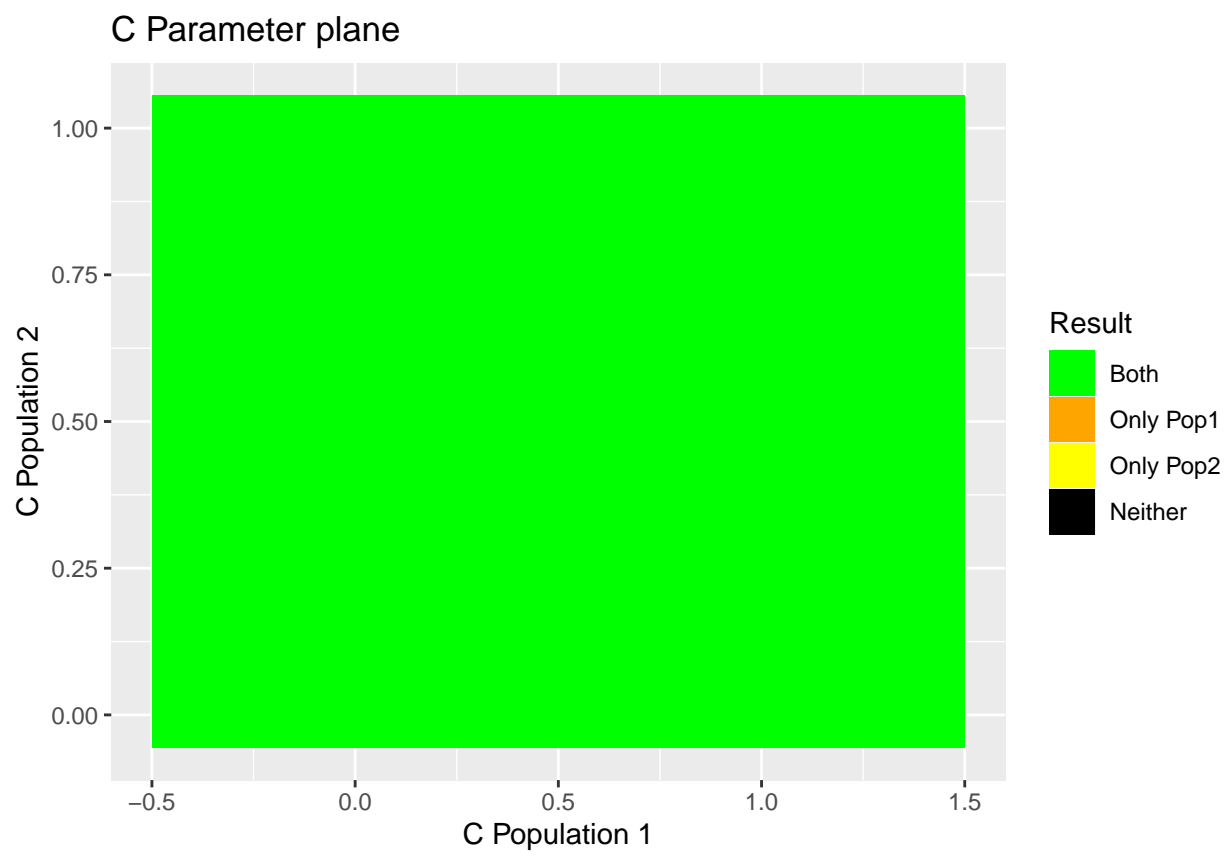Figure 27: w population planes

Figure 28: c population planes
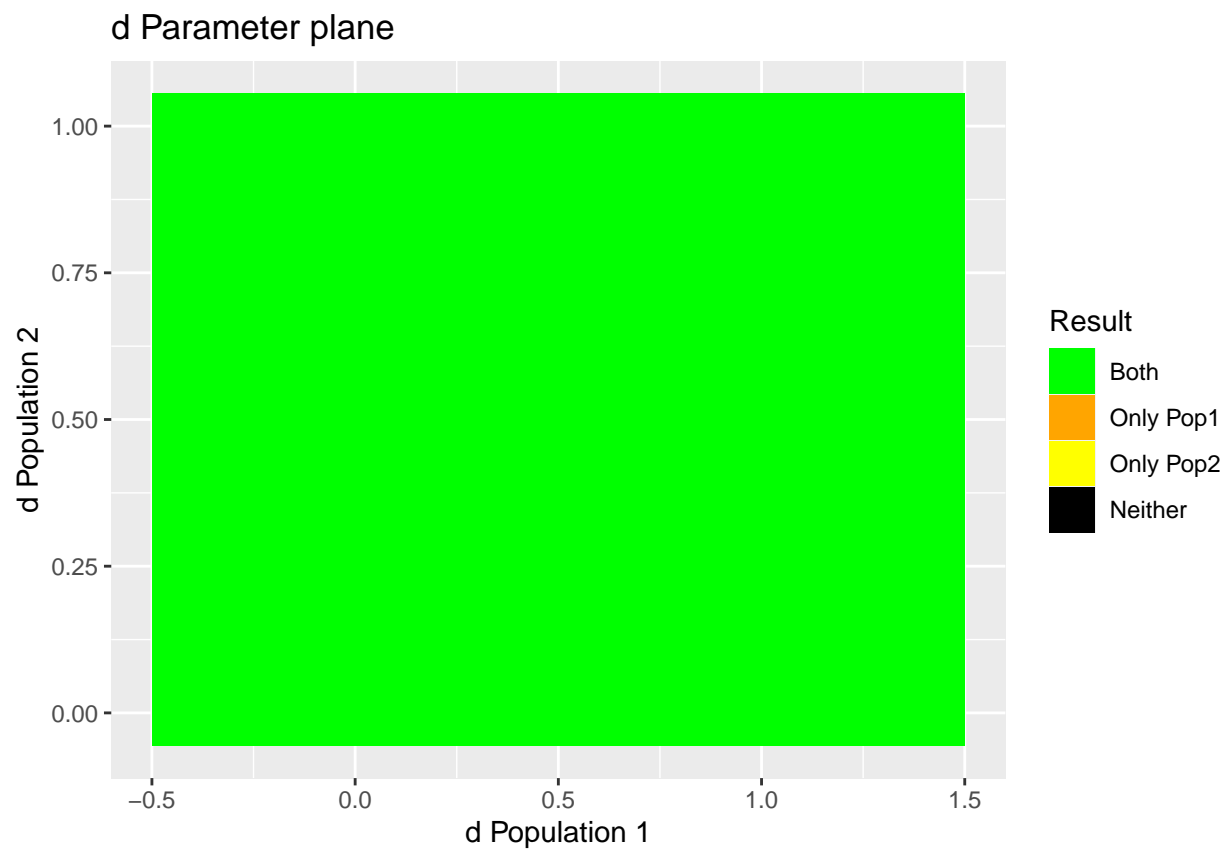
Figure 29: d population planes
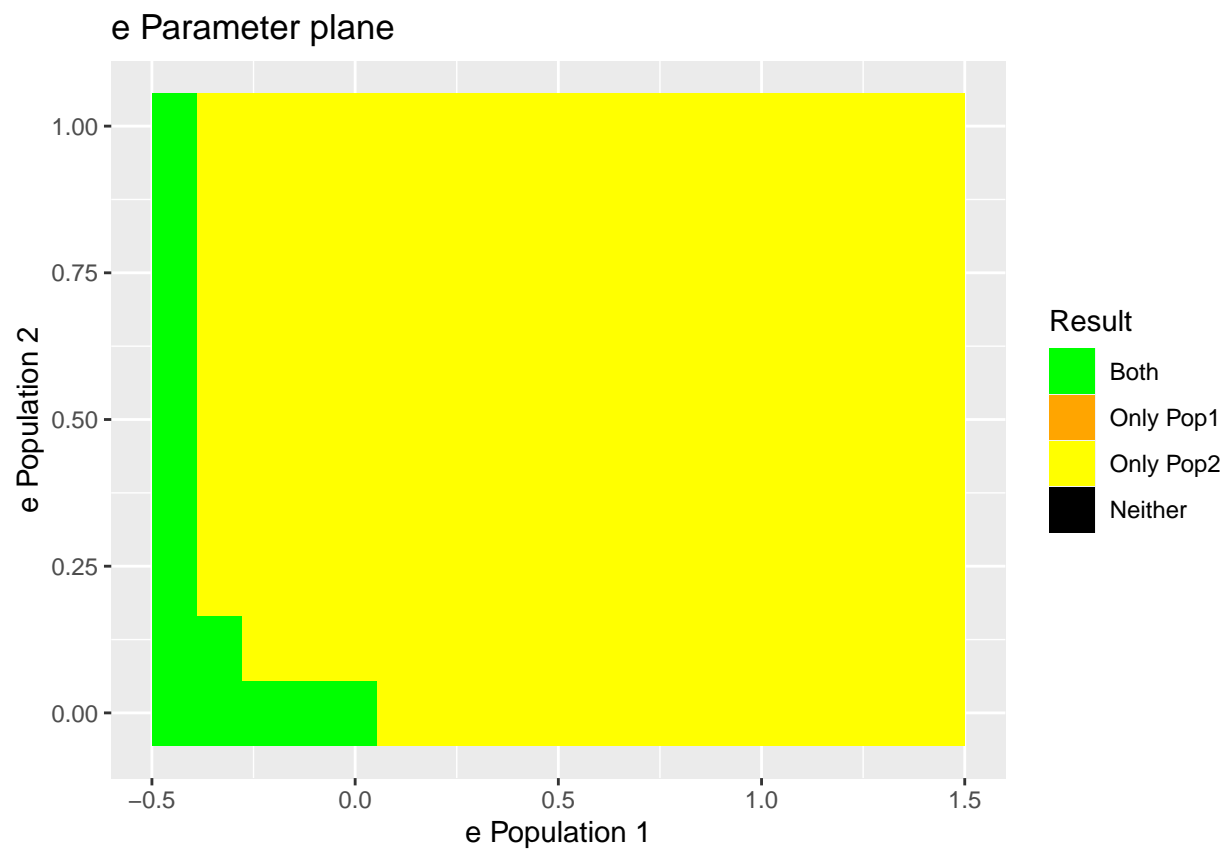
e Parameter plane

Figure 30: e population planes

Why is pop1 the only one that matters?
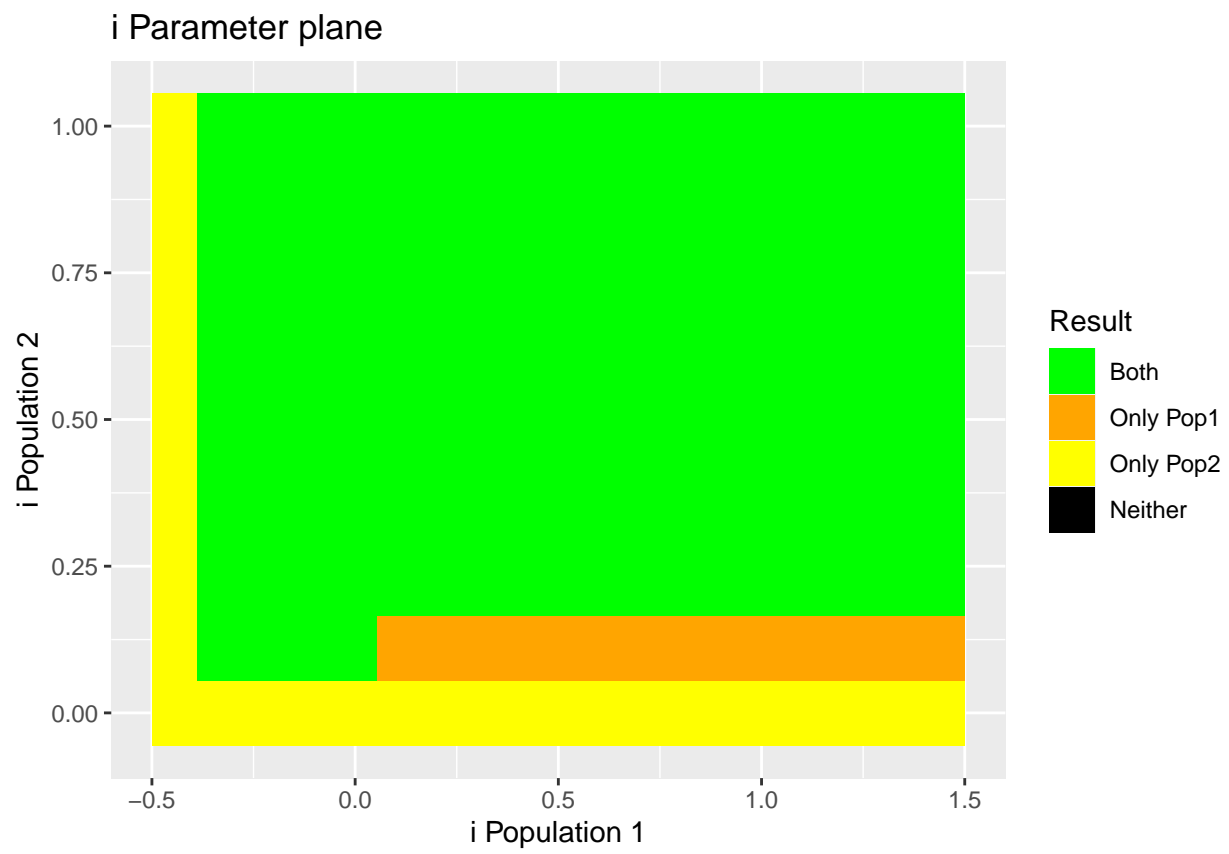
i Parameter plane
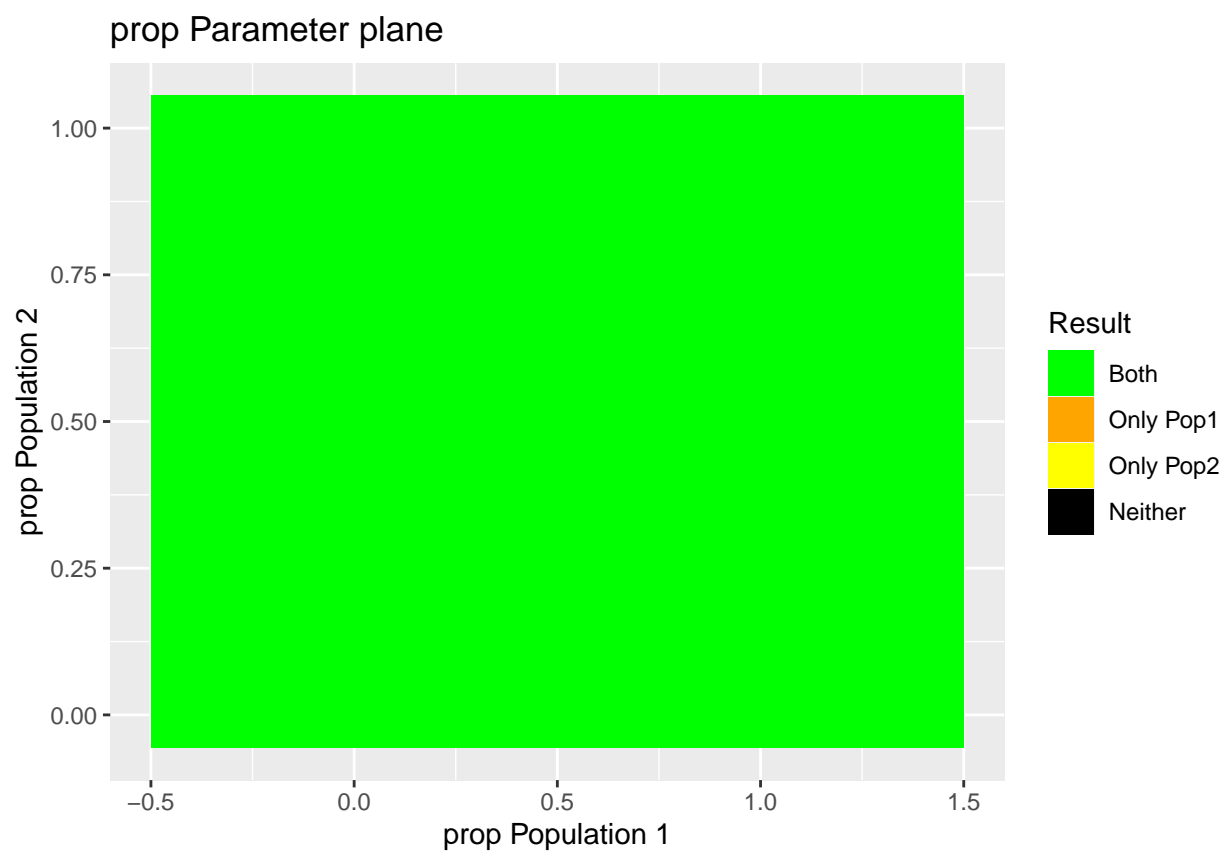

Figure 31: i population planes

Interesting. Why did e not act in a similar way?

Figure 32: prop population planes