

What's a GAMM?

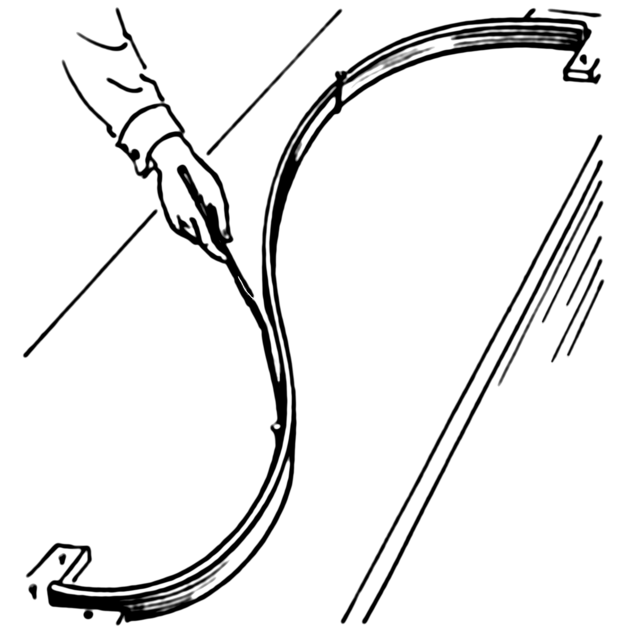
GAMMs are a flexible form of regression model well-matched to the complexities of the archaeological record, including non-normal distributions such as counts or proportions, non-linear functional relationships, and non-independent observations with correlated errors.

Let's break it down:

- *Generalized* – Model data different distributions
- *Additive* – Additive function of smooth functions.
- *Mixed* – Random effects to model network autocorrelation

How do they work?

Penalized splines are the secret sauce that make GAMs so useful. They allow us estimate functional forms directly from the data, while attempting to minimize overfitting by penalized the “wiggliness” of the function.



What can I do with them?
Alot! Let's look at two examples.

Oxford Pots

A dataset of Late Romano-British pottery.

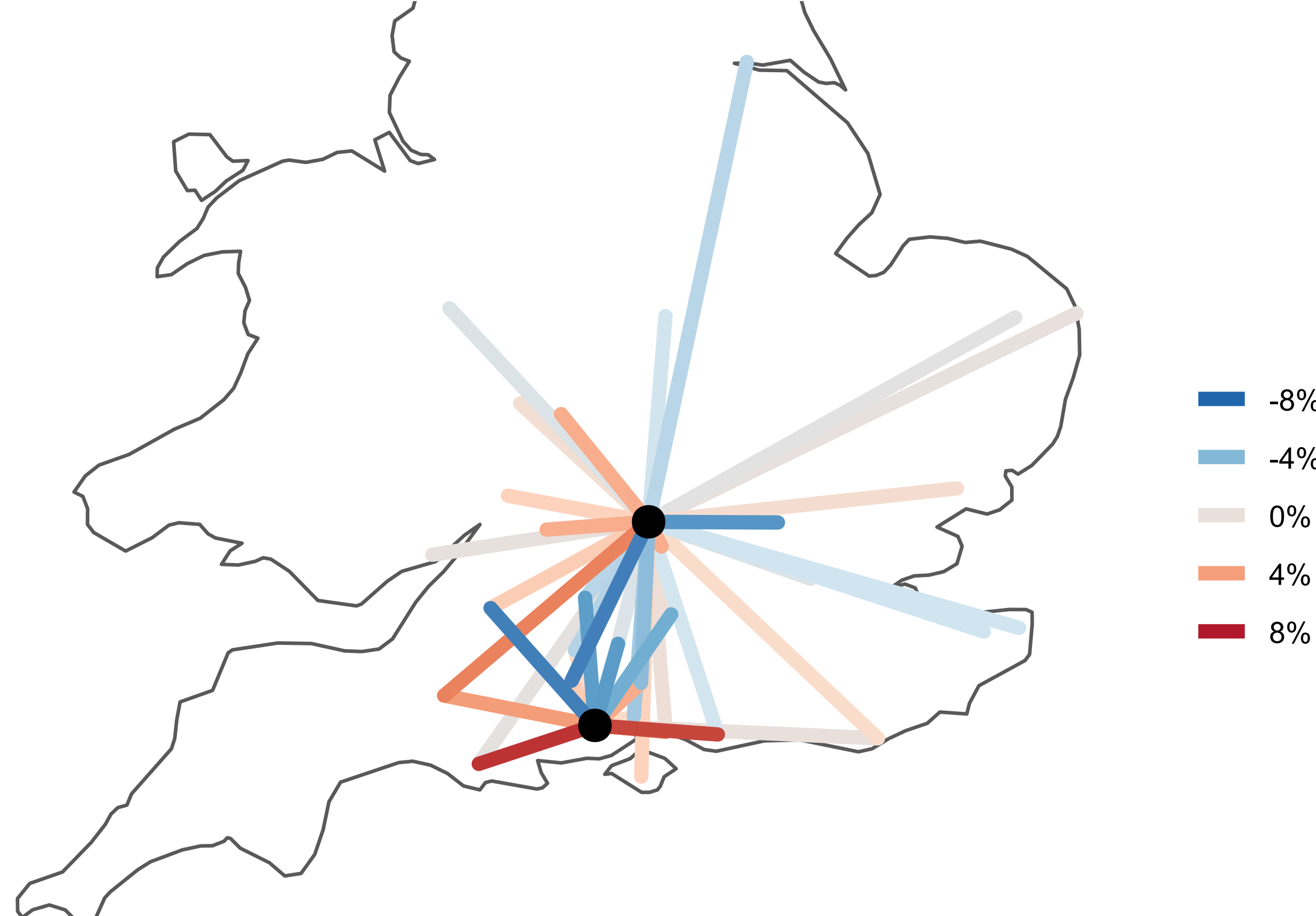
Ceramic distribution in Roman Britain

Percentages of late Romano-British pottery produced in Oxford and New Forest



Residuals from a distance-only interaction model

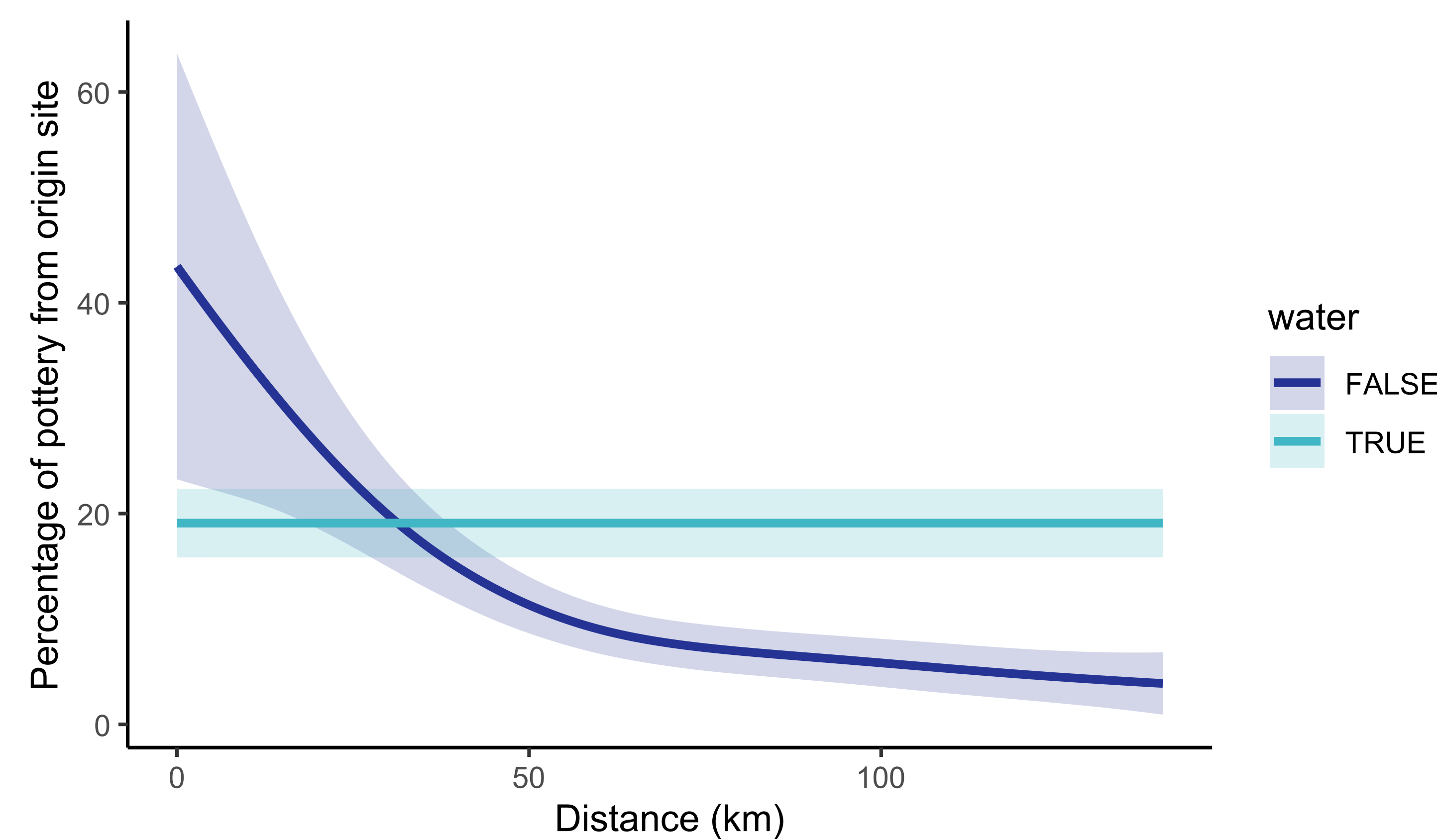
Red ties are stronger than expected, blue ties weaker



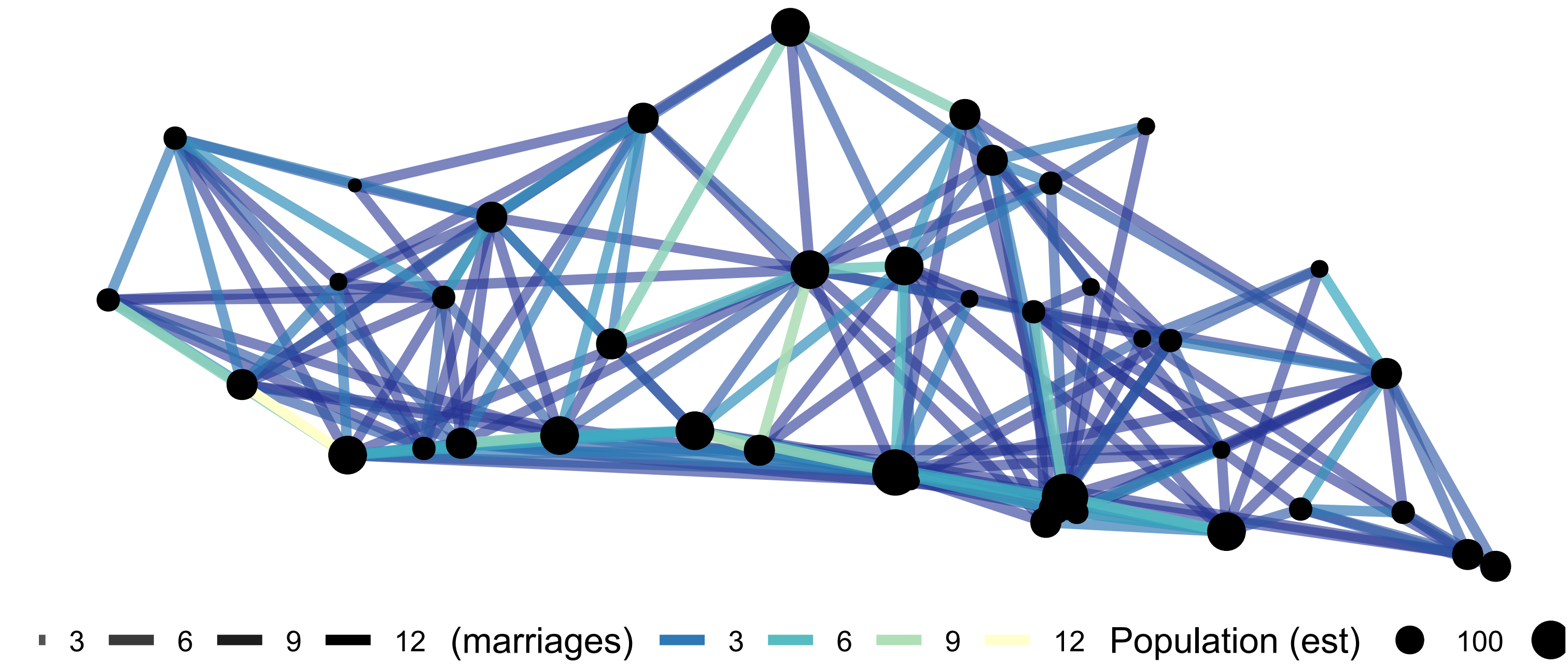
```
m1 <- gam(similarity ~ s(distance, by = water) + water + from,
  method = 'REML', # algorithm to estimate the GAM
  select = TRUE, # allow some variables to be selected
  family = betar(), # beta distribution between 0 and 1
  data = pots_dat)
```

Estimated distance decay functions

With and without water transport



Chumash Marriages

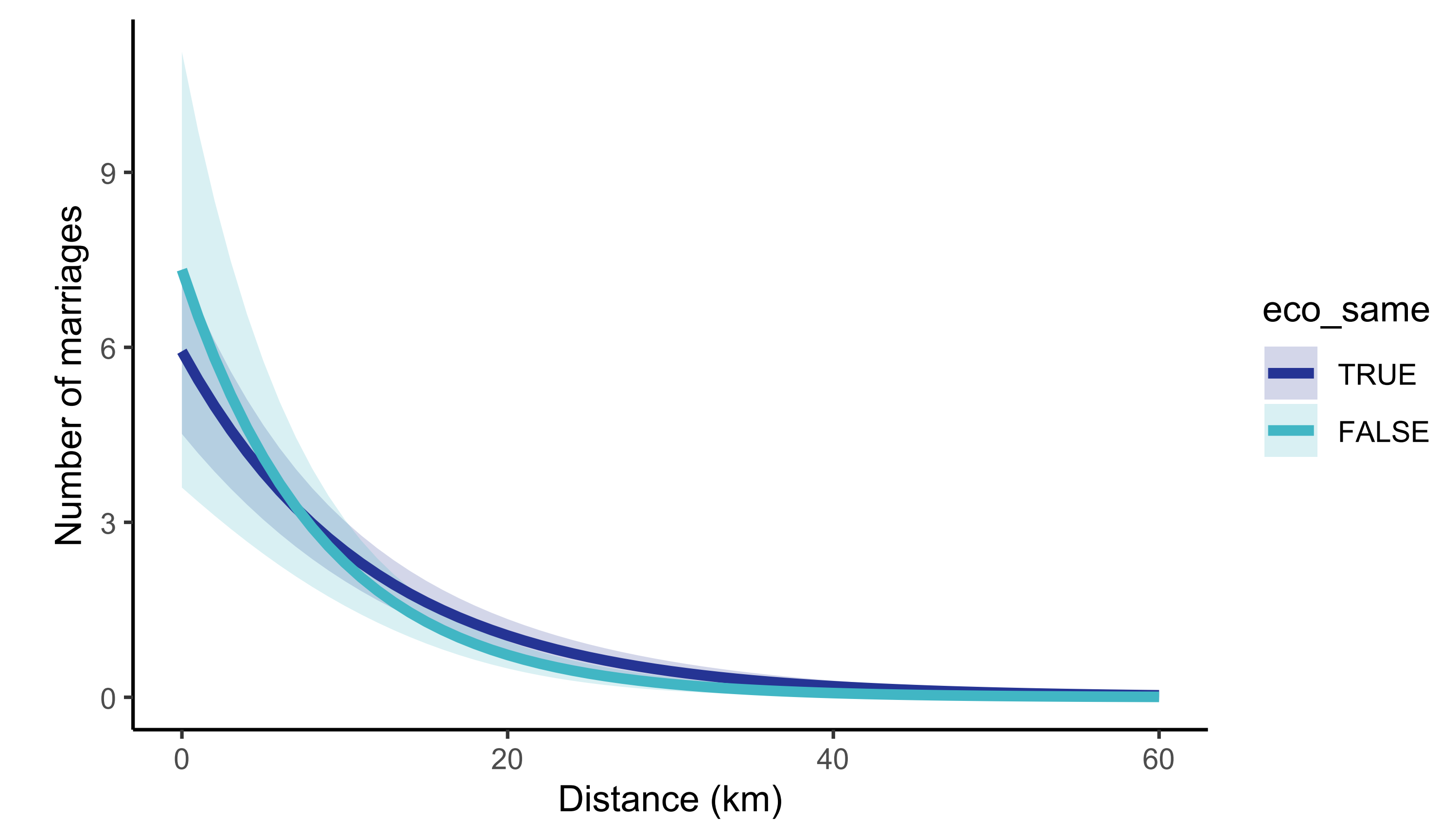


468 marriages

Maximum number of PQL iterations: 20

Estimated distance decay functions

Within and across ecological boundaries



I want to analyze my own data

Moar

Next Steps

Problems: symmetrical vs asymmetrical lots of zeros

Don't like GAMs? Check out: 1. GERGMS 2. AME models 3. BRMS bayesian implementation? The underlying concepts are similar, they only differ in how you estimate them