Choosing the Observational Likelihood in State-Space Stock Assessment Models

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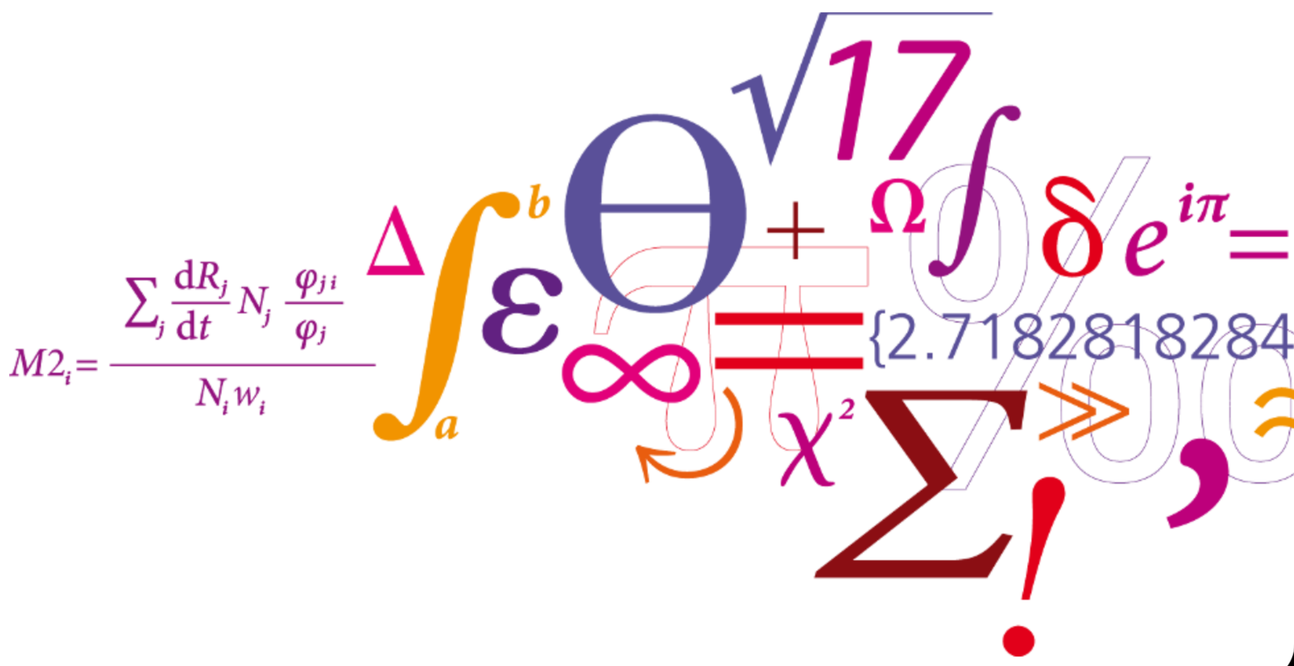
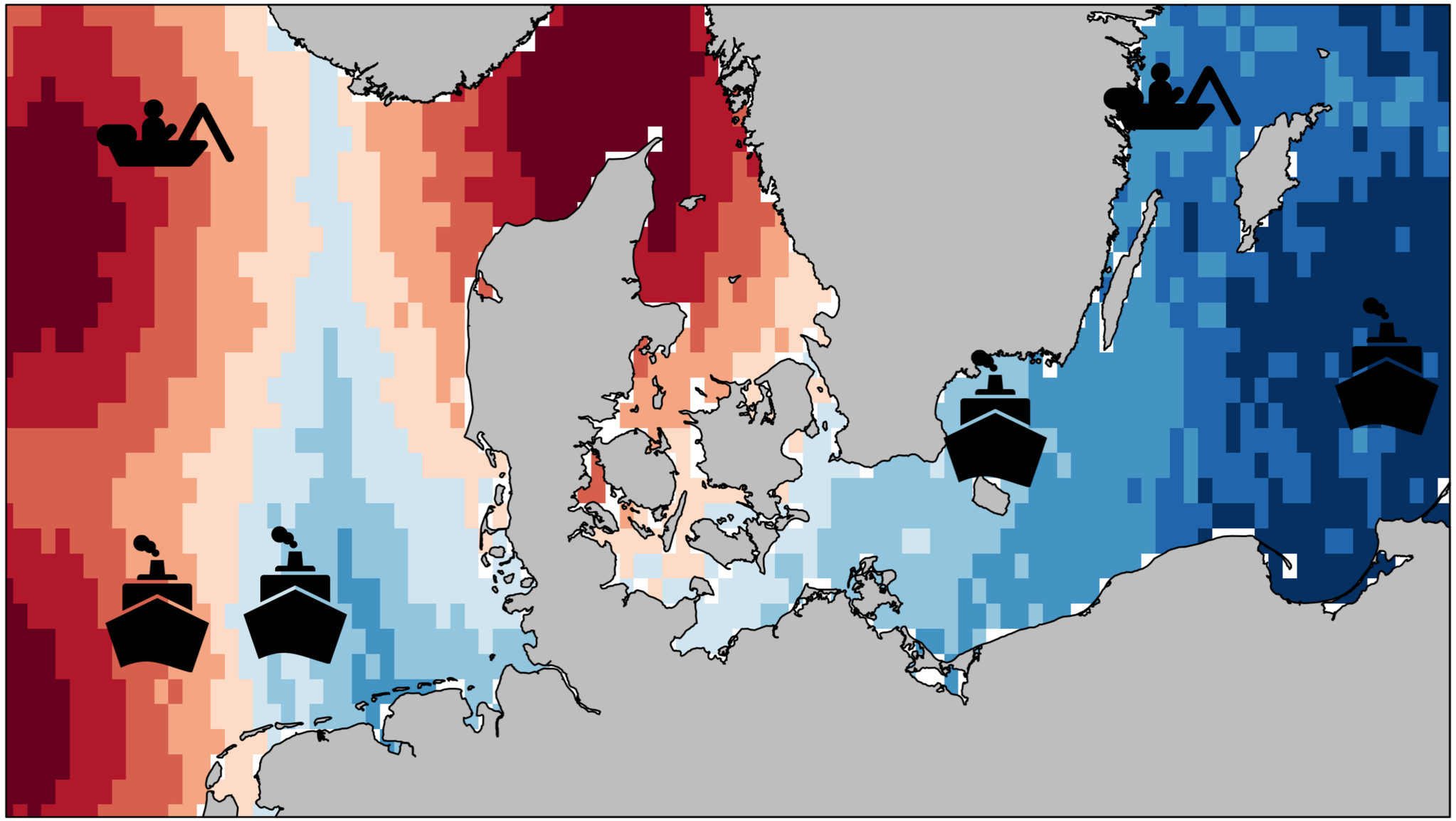


DTU Aqua
National Institute of Aquatic Resources

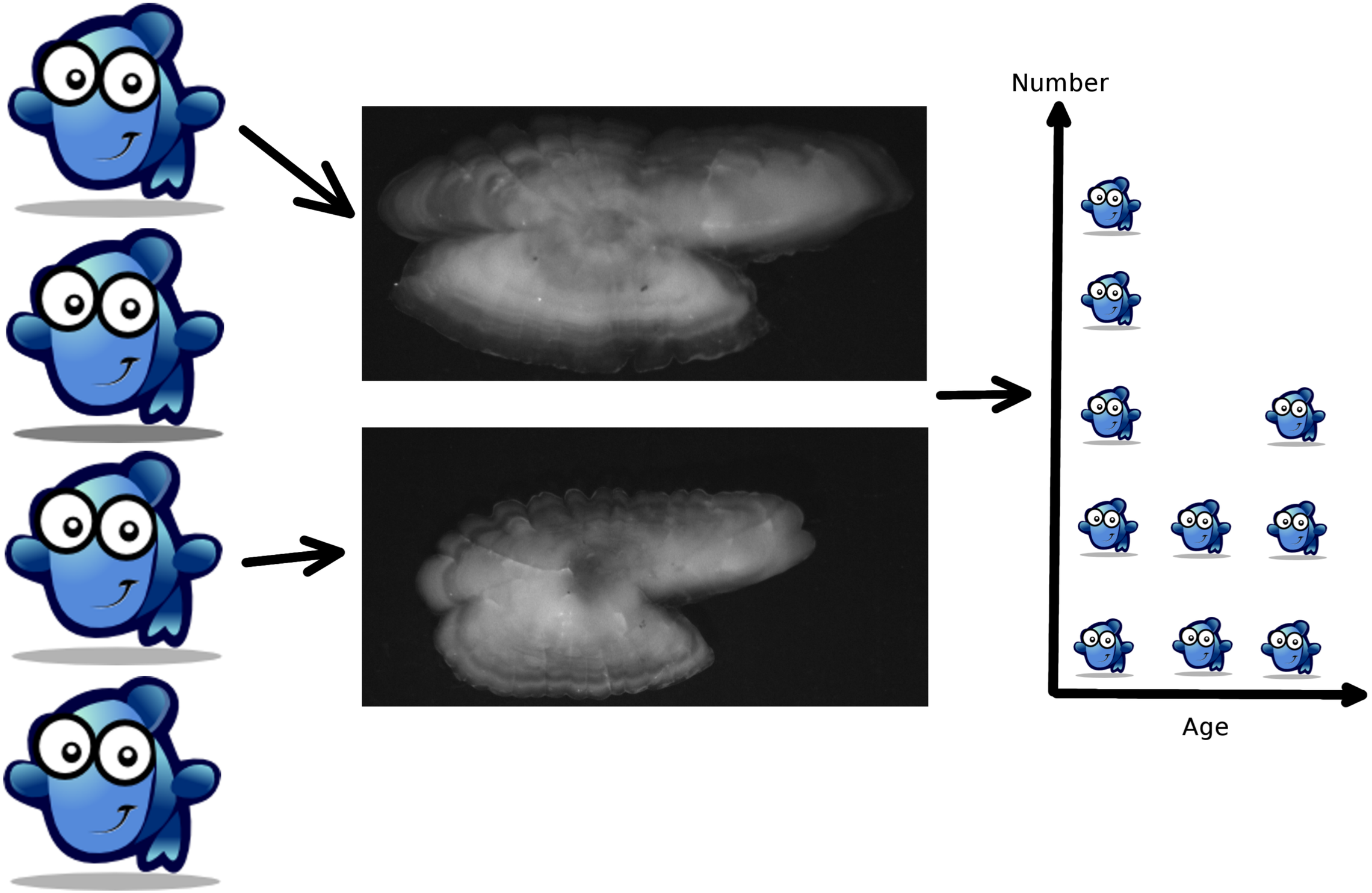
Fishermen Fishing



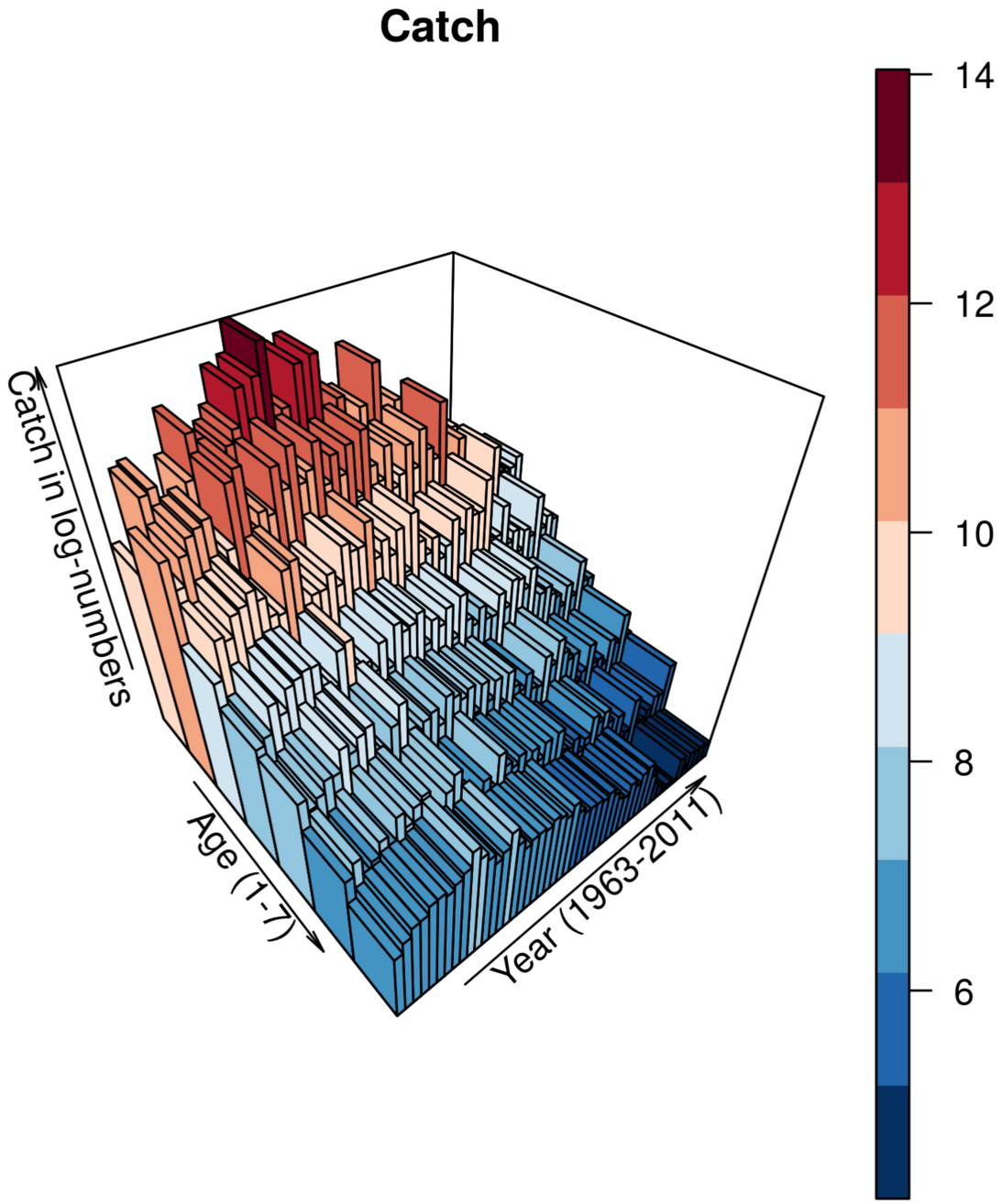
Icons made by Freepik from www.flaticon.com

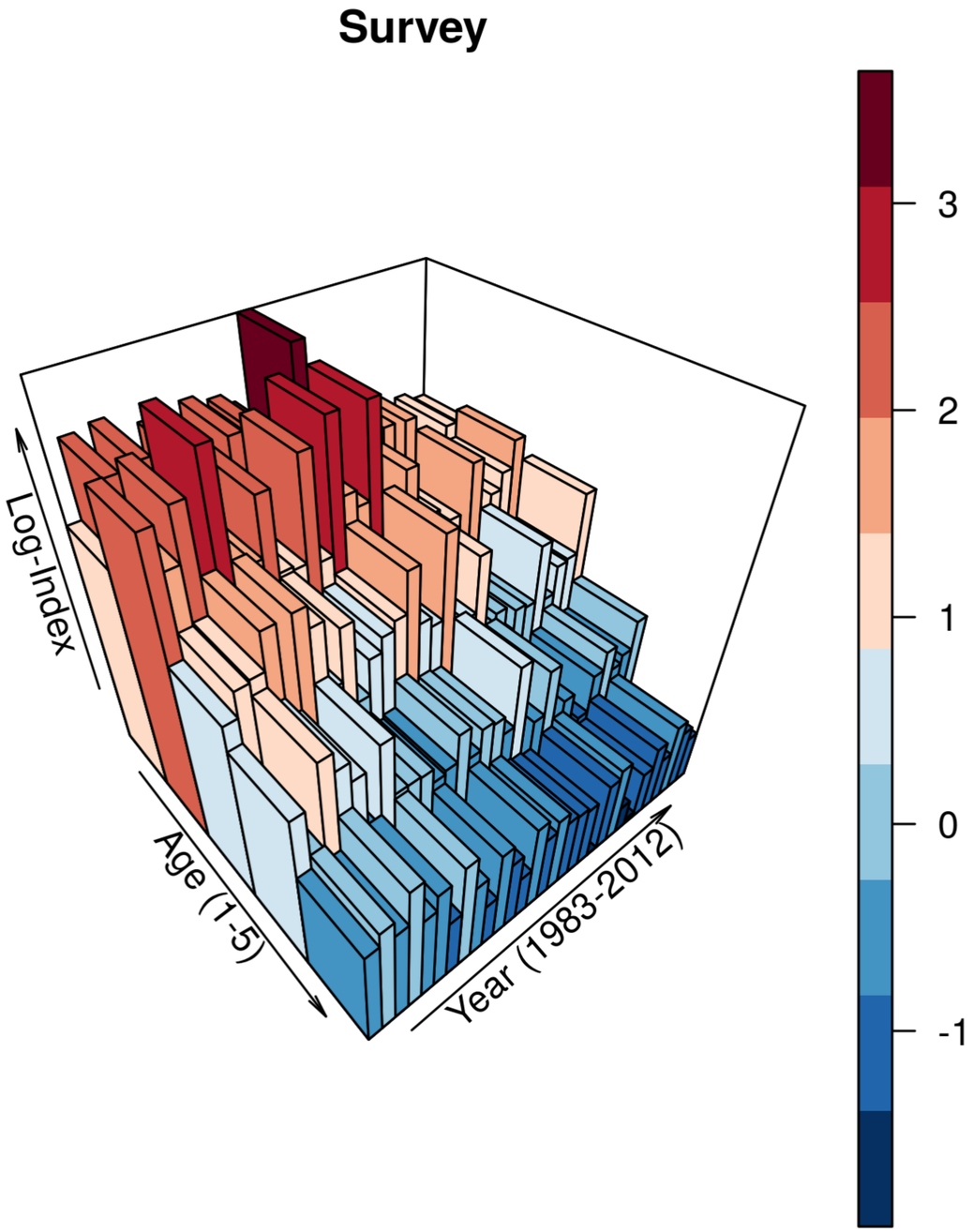
Weigh and Measure

Subsample to get ages



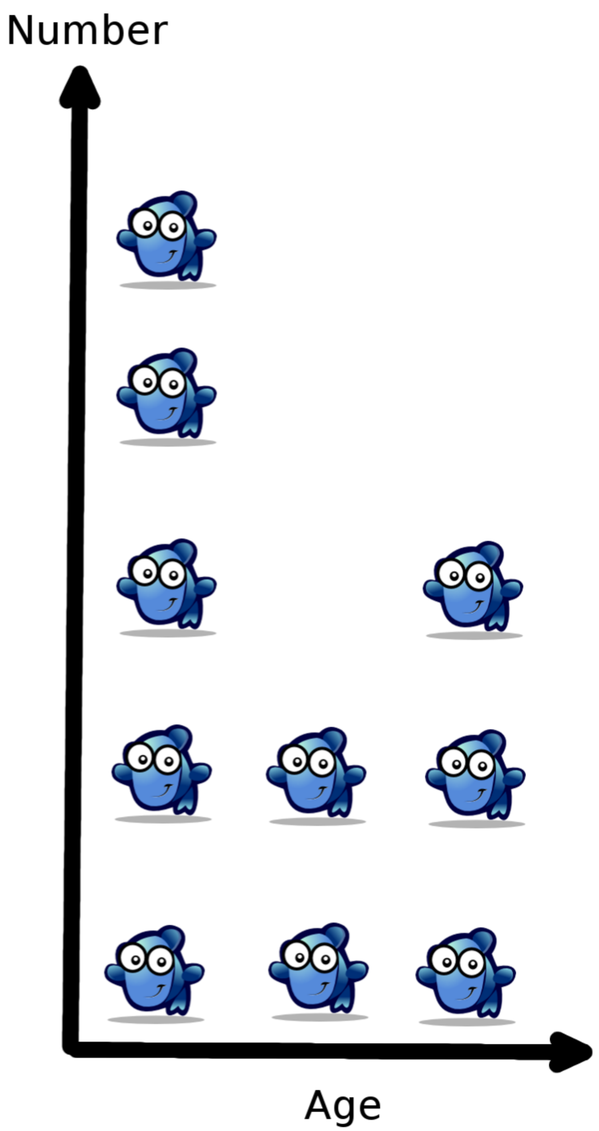
North Sea Cod



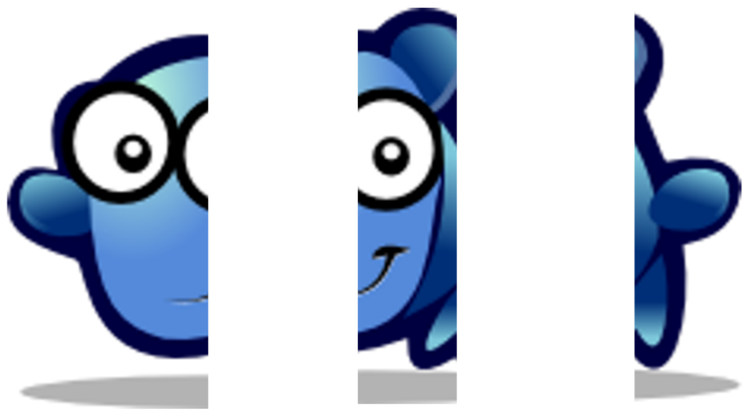


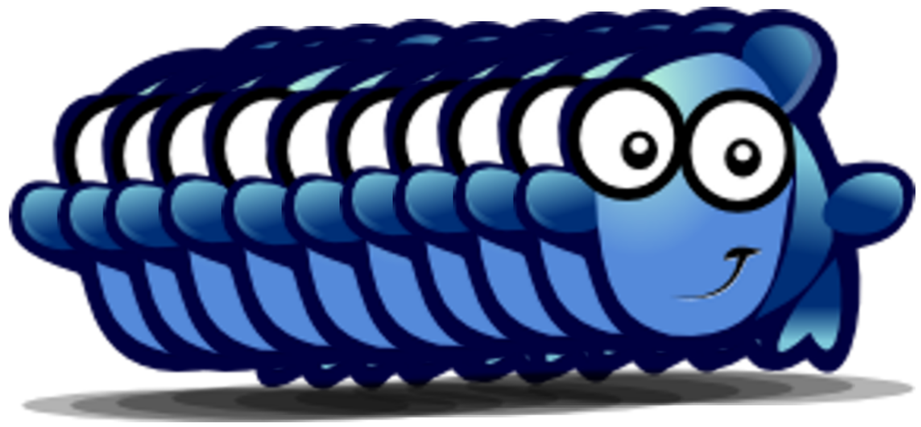
Numbers or proportions

Numers-at-age



Proportions-at-age +
Total numbers/weight



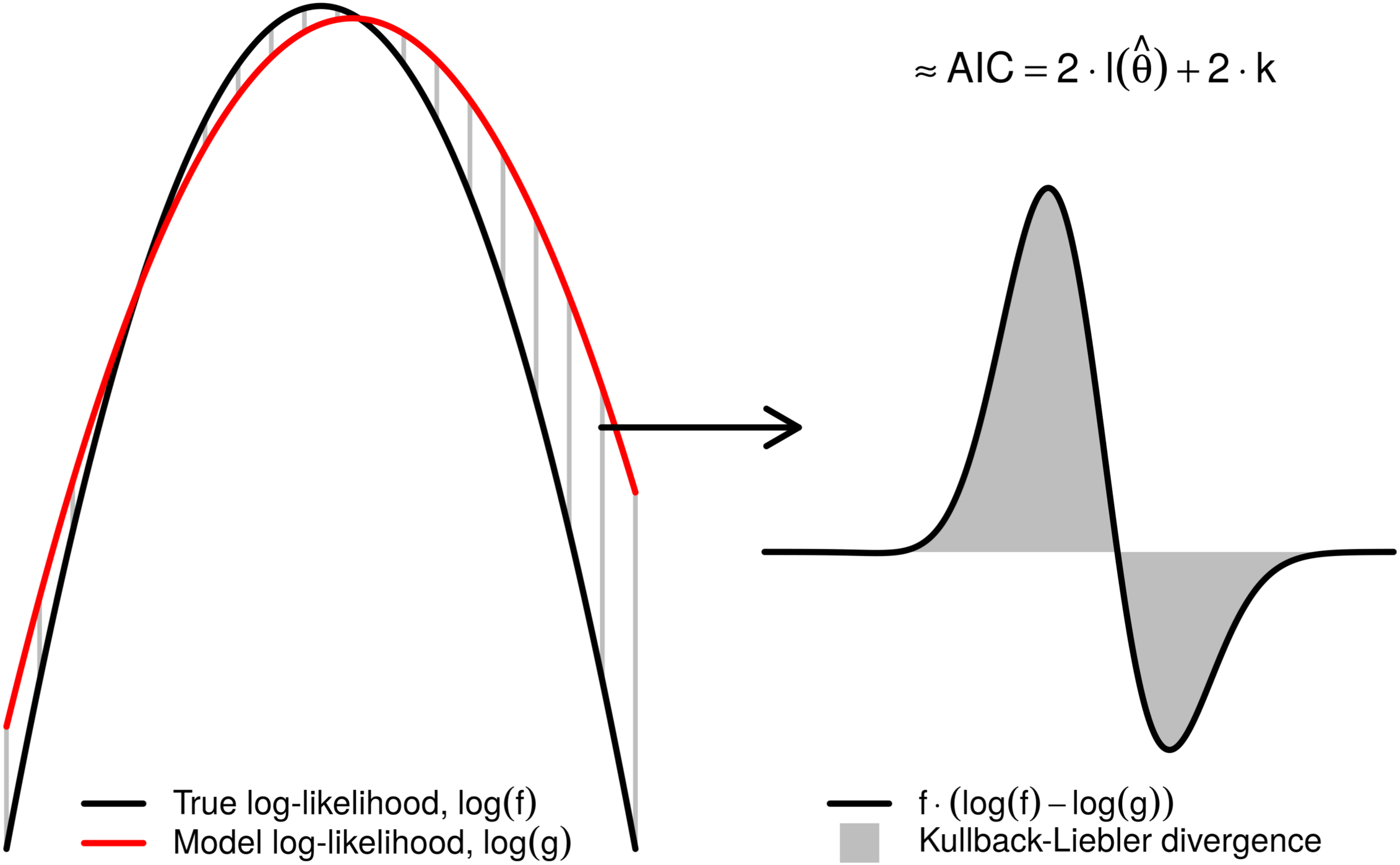


Observational models

- Multivariate log-normal
- Logistic normal (with log-normal total weight)
- Dirichlet (with log-normal total weight)
- (Also implemented 10 other)

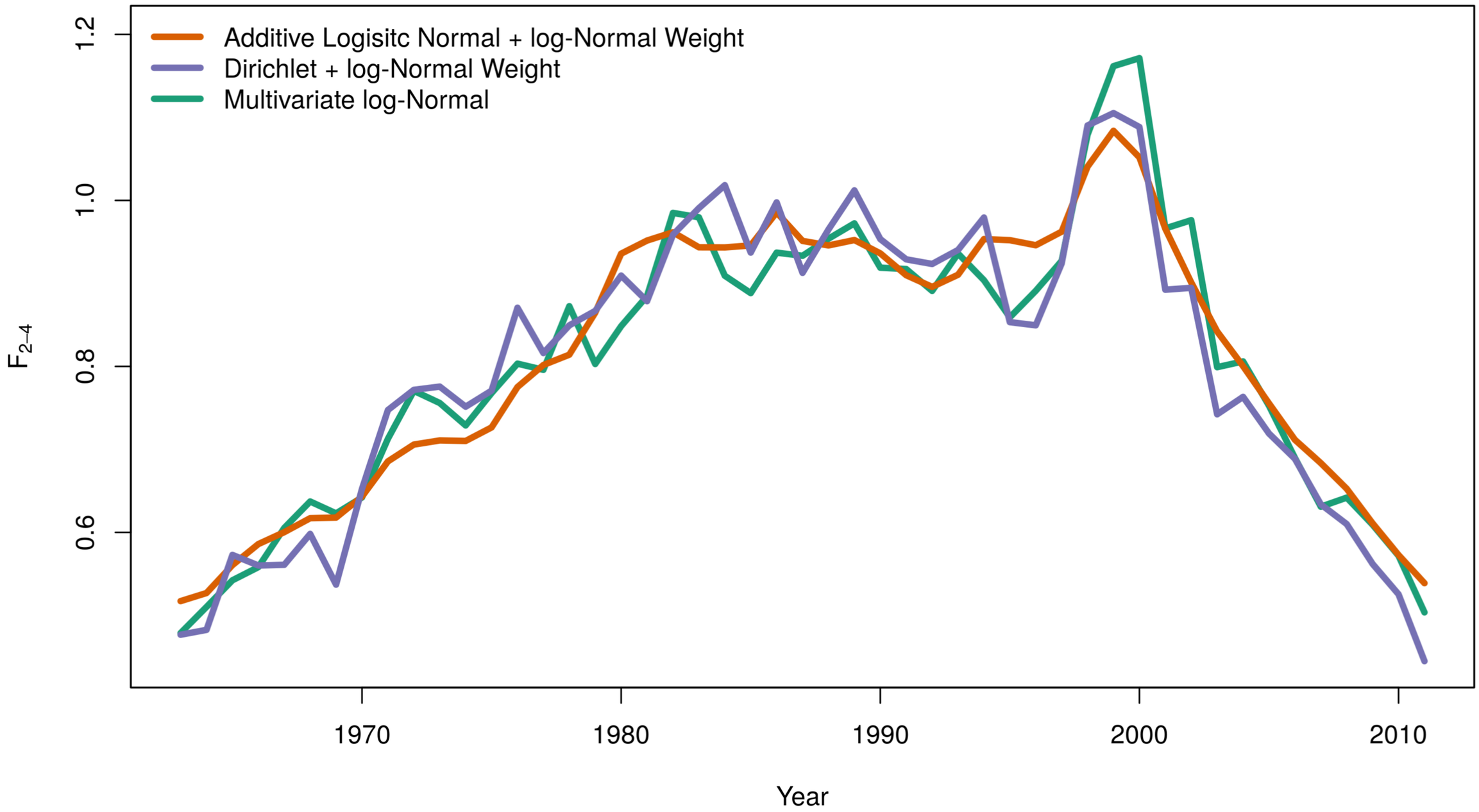
Closest to the truth

$$\approx \mathrm{AIC} = 2 \cdot \mathrm{l}(\hat{\theta}) + 2 \cdot \mathrm{k}$$

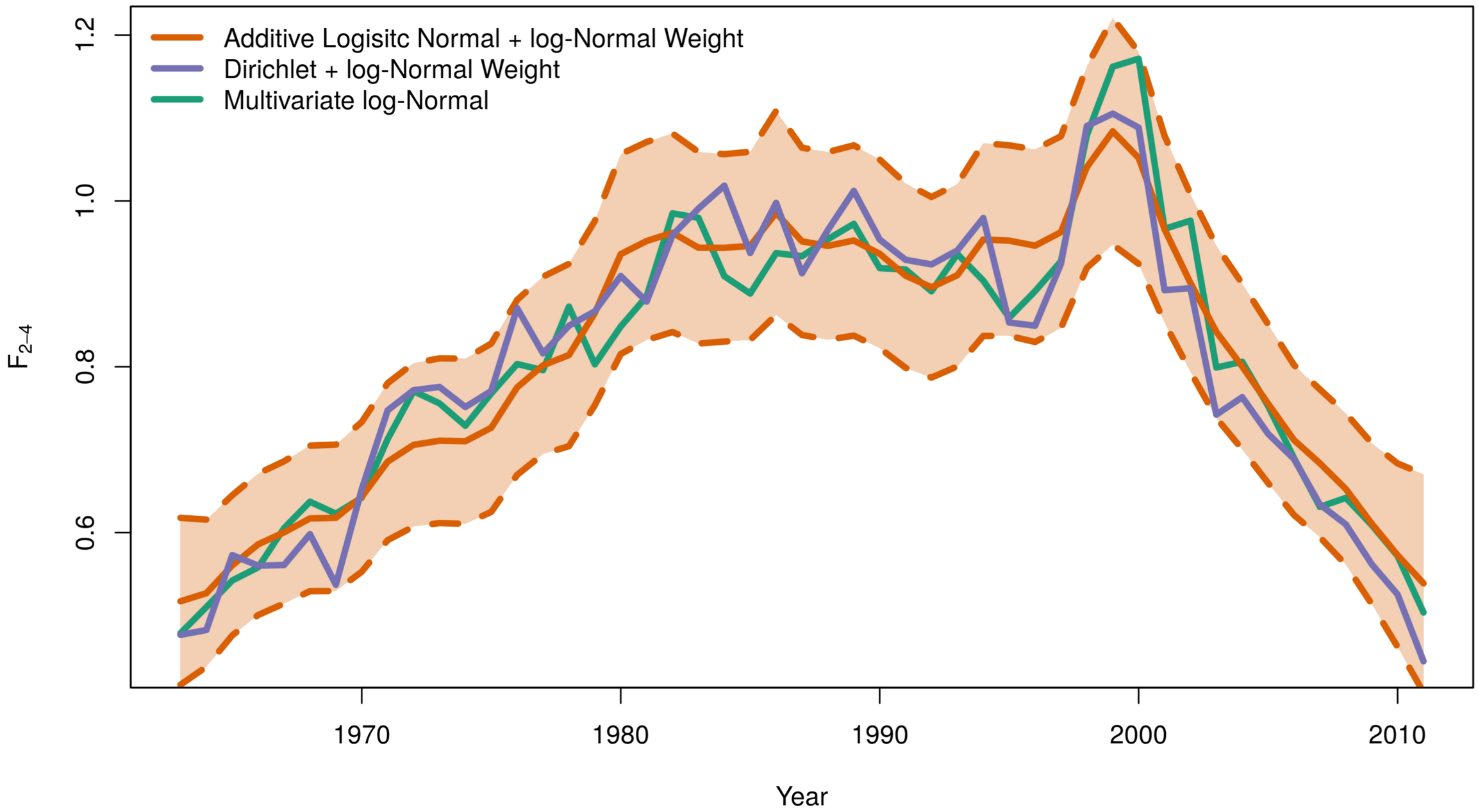


Results - AICs

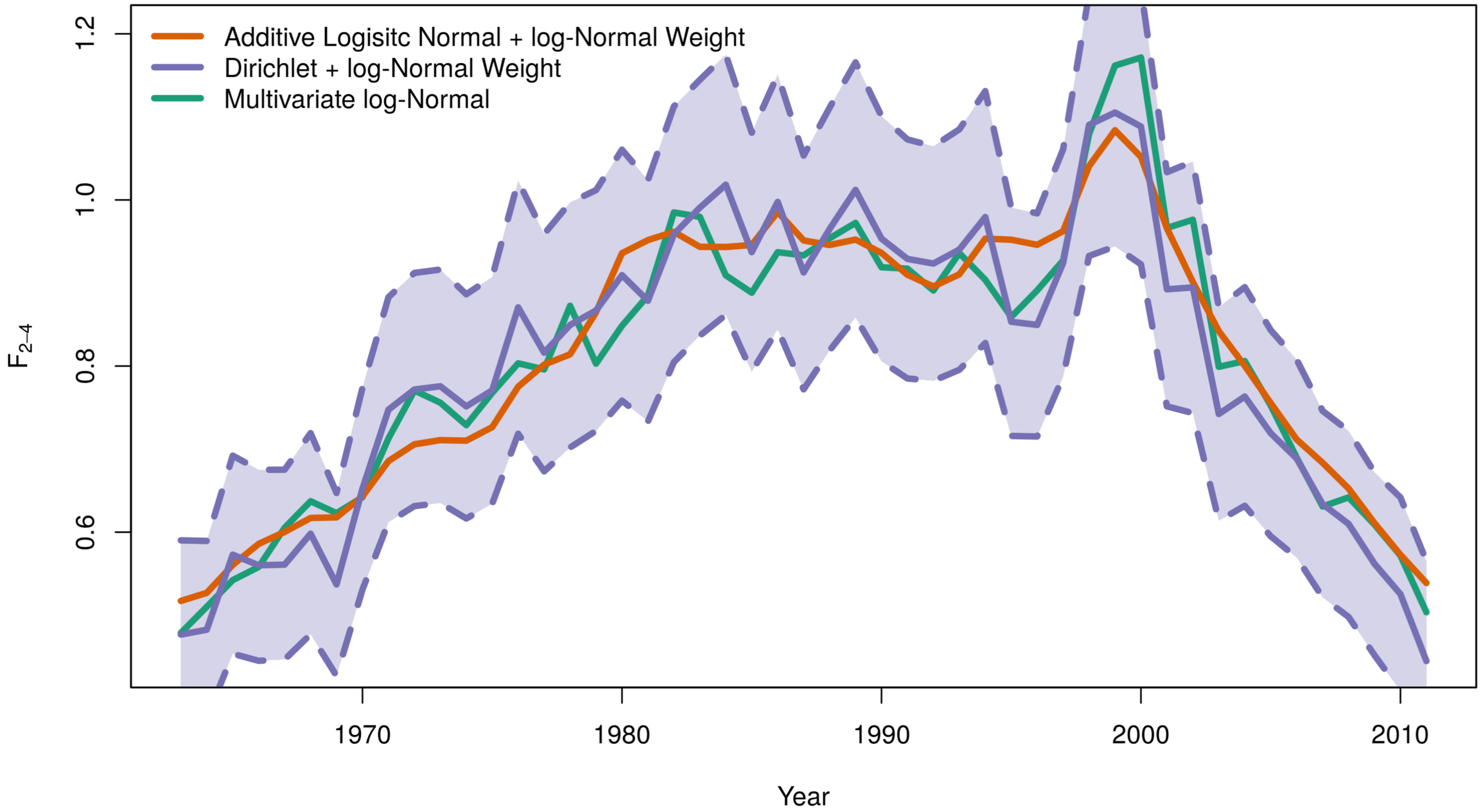
Fishing mortality



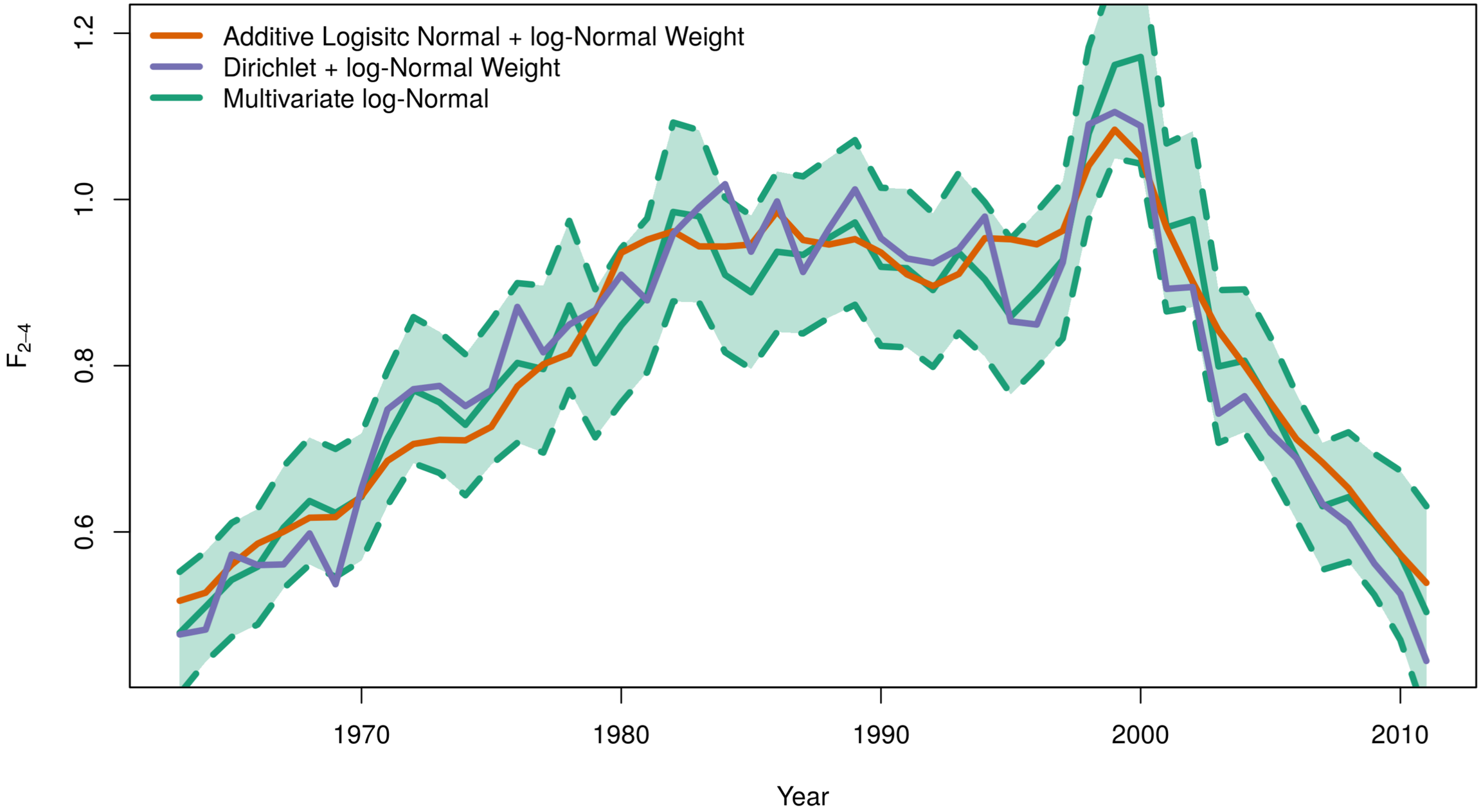
Fishing mortality



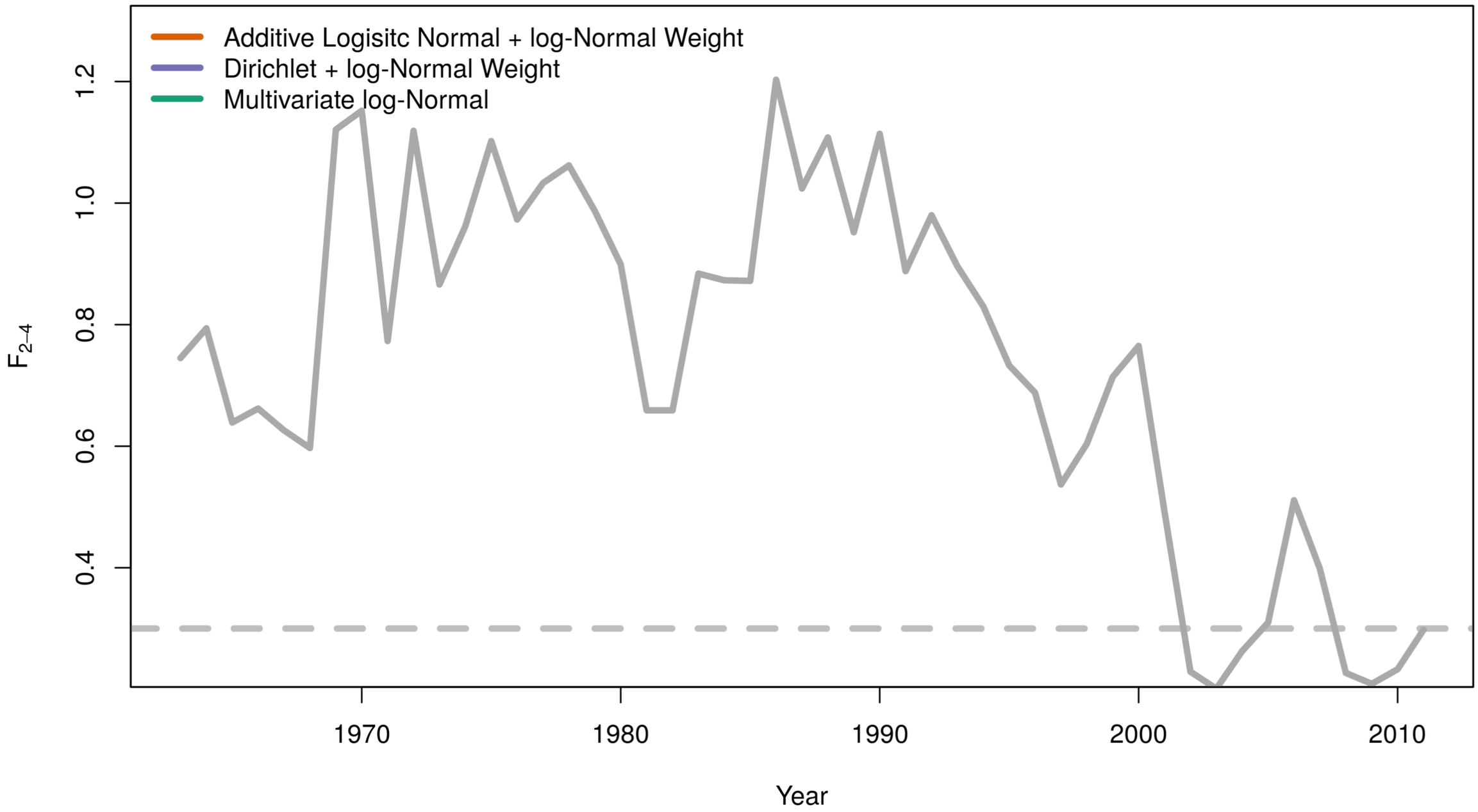
Fishing mortality



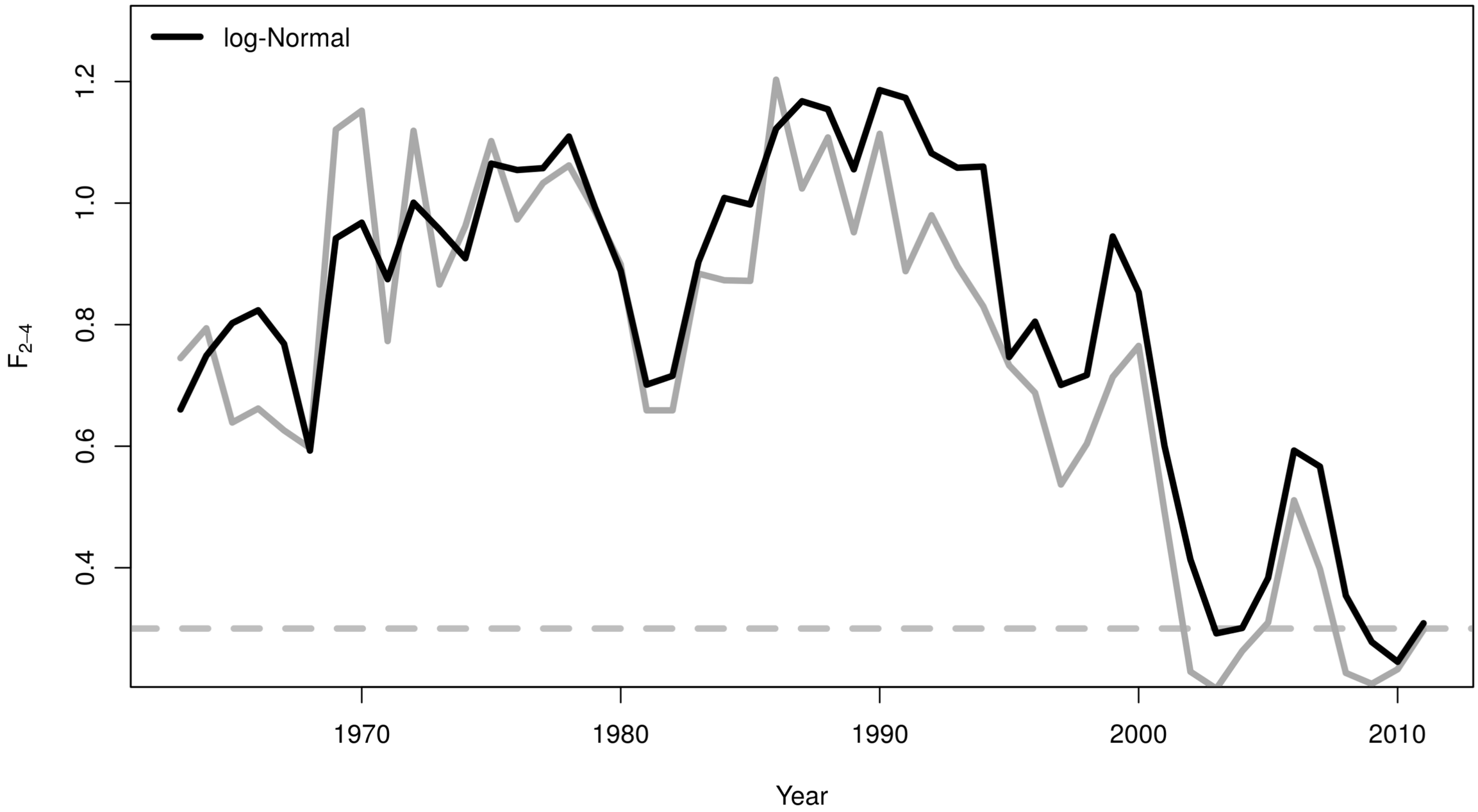
Fishing mortality



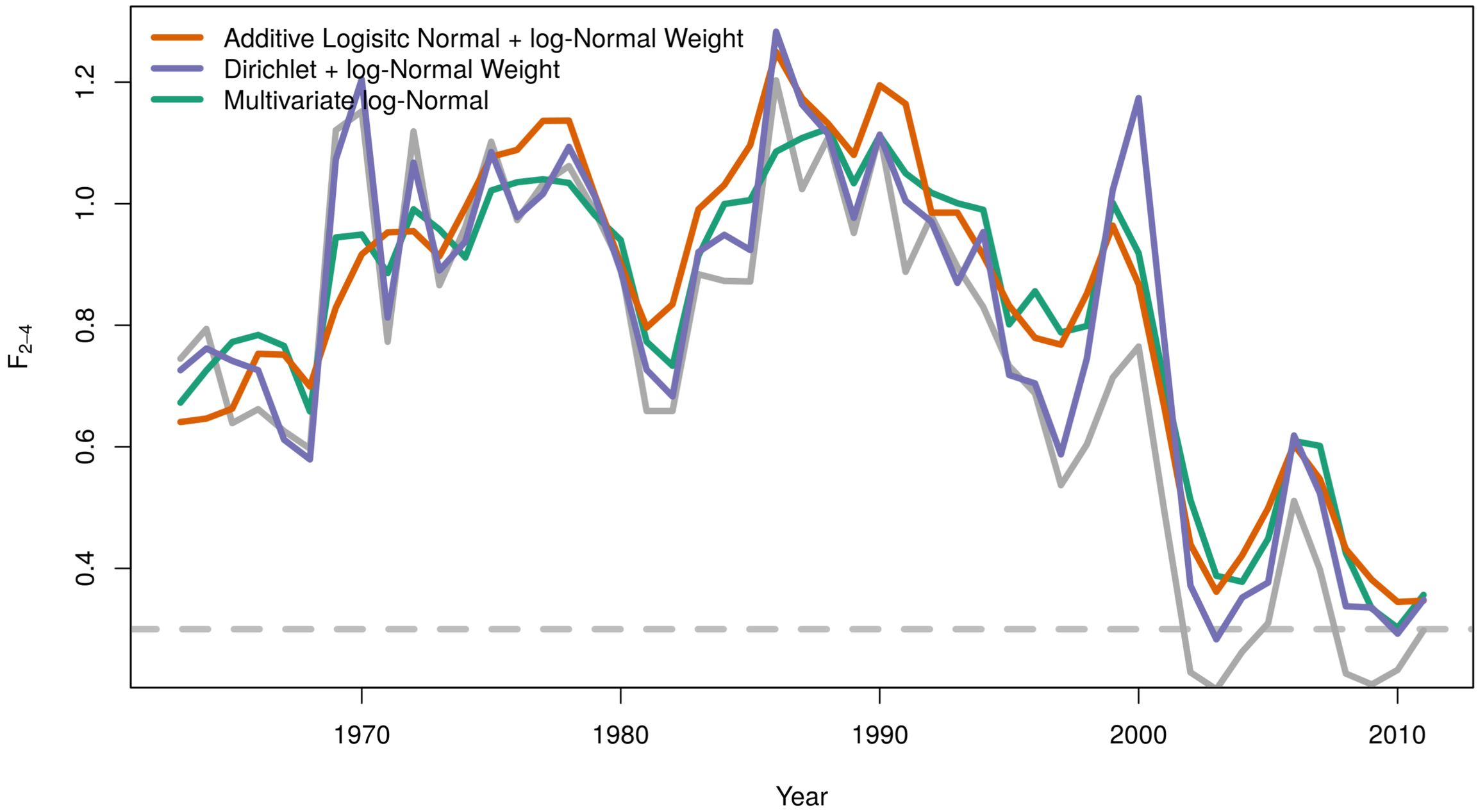
Haddock Advice 2012



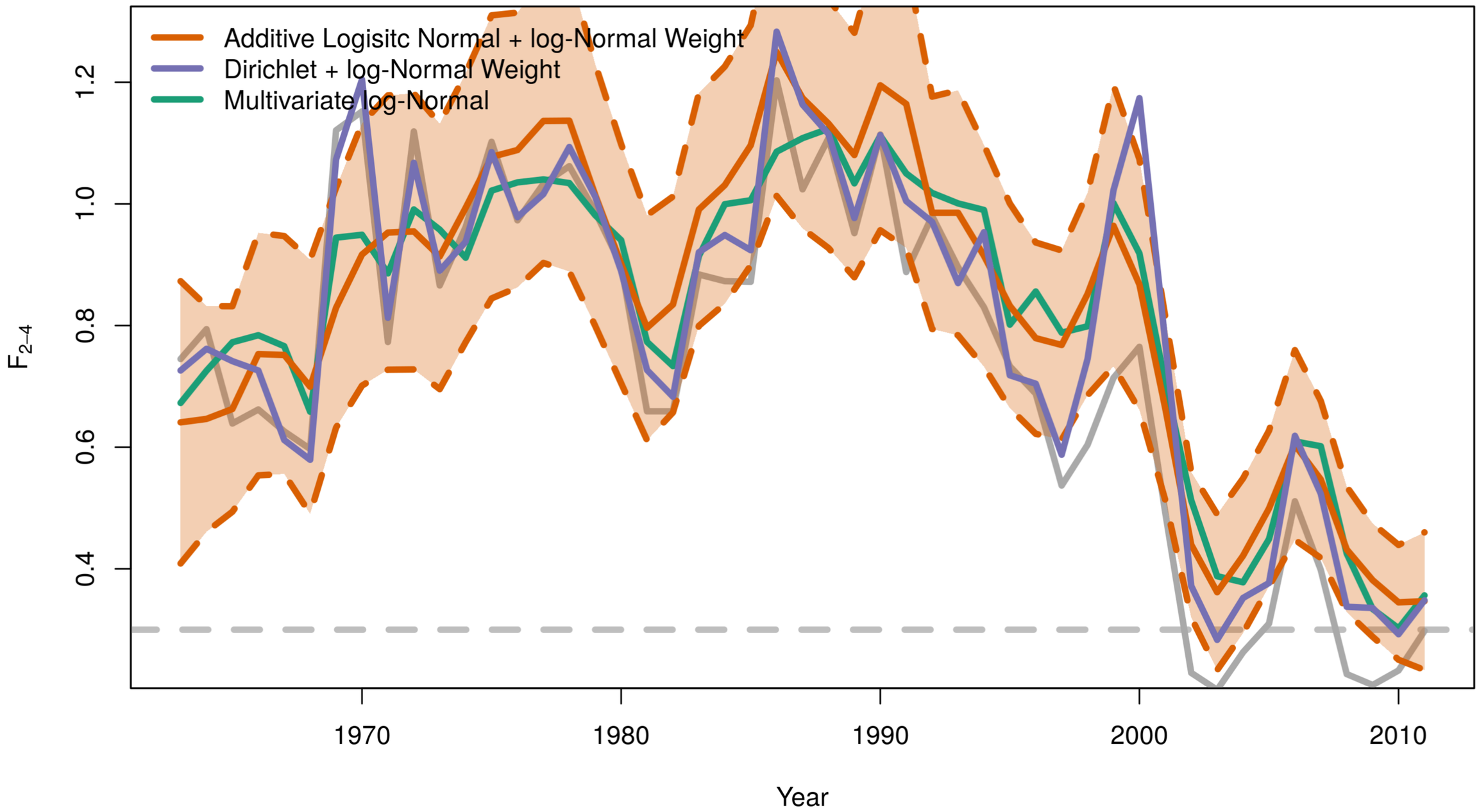
Haddock Advice 2012



Haddock Advice 2012



Haddock Advice 2012

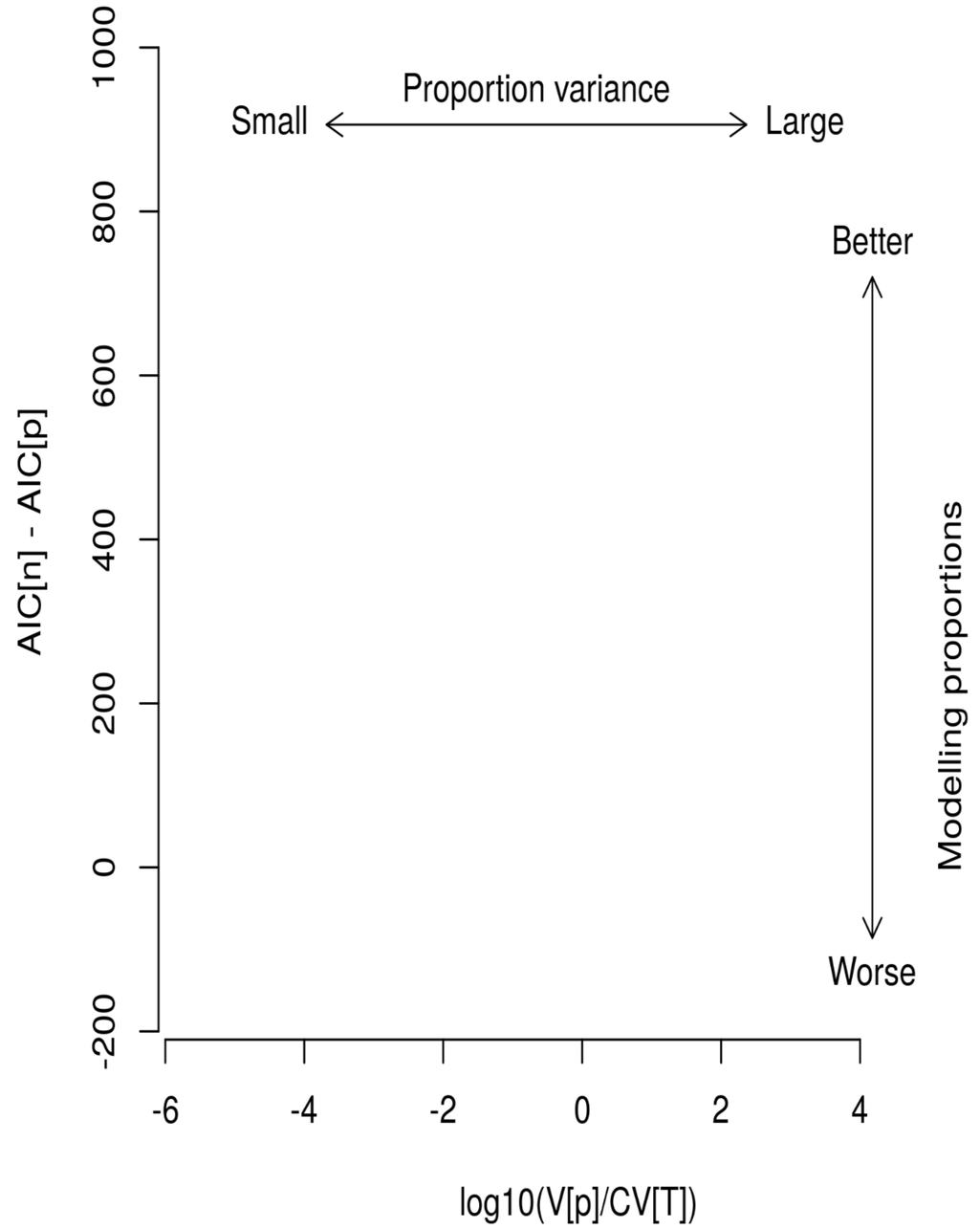


Simulation study

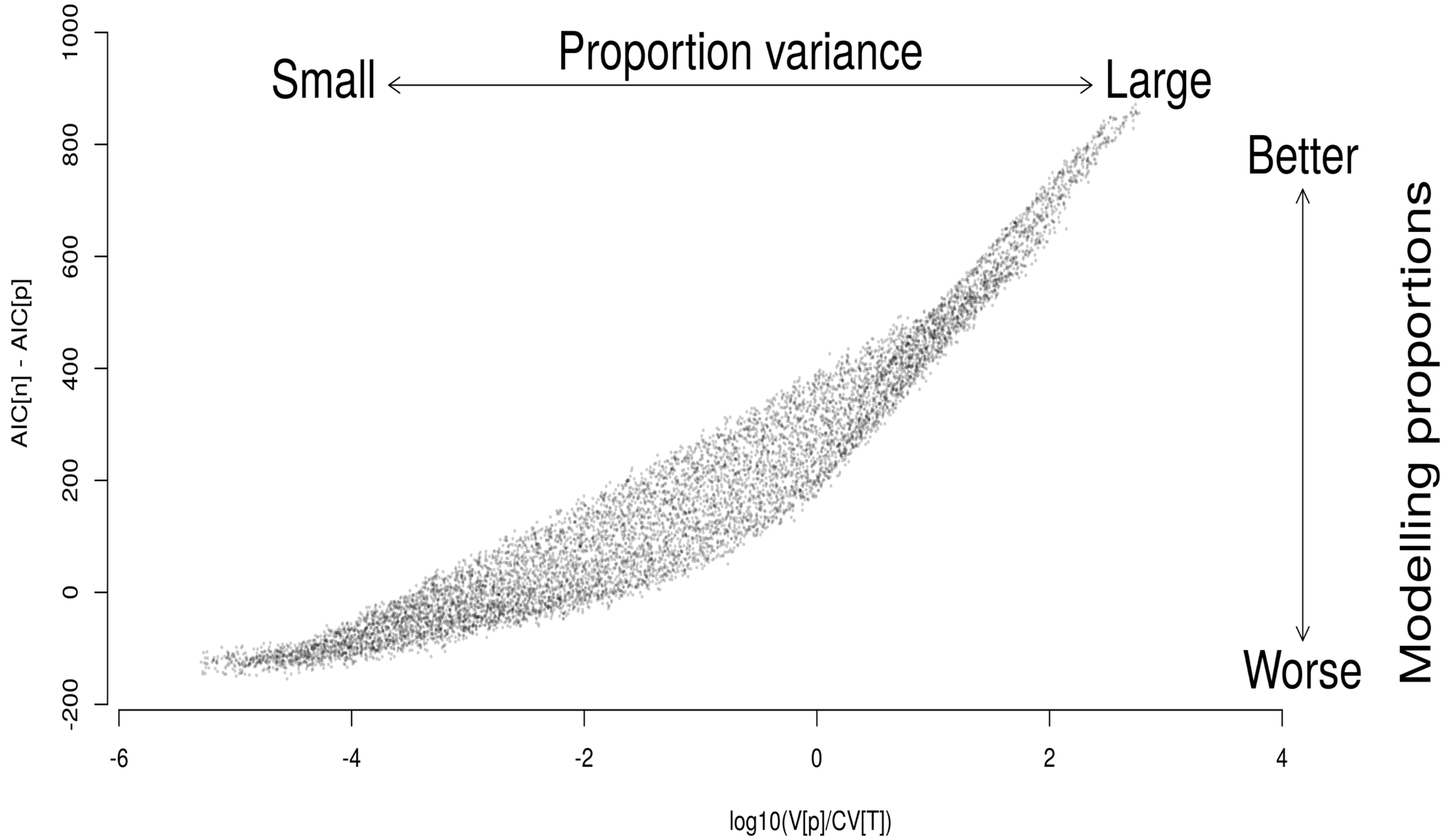
- Ignore process
- Simulate numbers-at-age

  with varying covariance
- Subsample to get estimated proportions

  with varying sample size
- Estimate models



Simulation study



Conclusion

- There is no reason to believe we know the most suitable observational likelihood a priori
- We provide a way to limit the number of candidate models
- Both numbers- and proportions-at-age can be suitable
- The choice will depend on where the variability in data lies
- Easily extends to any observational likelihood (or combination)