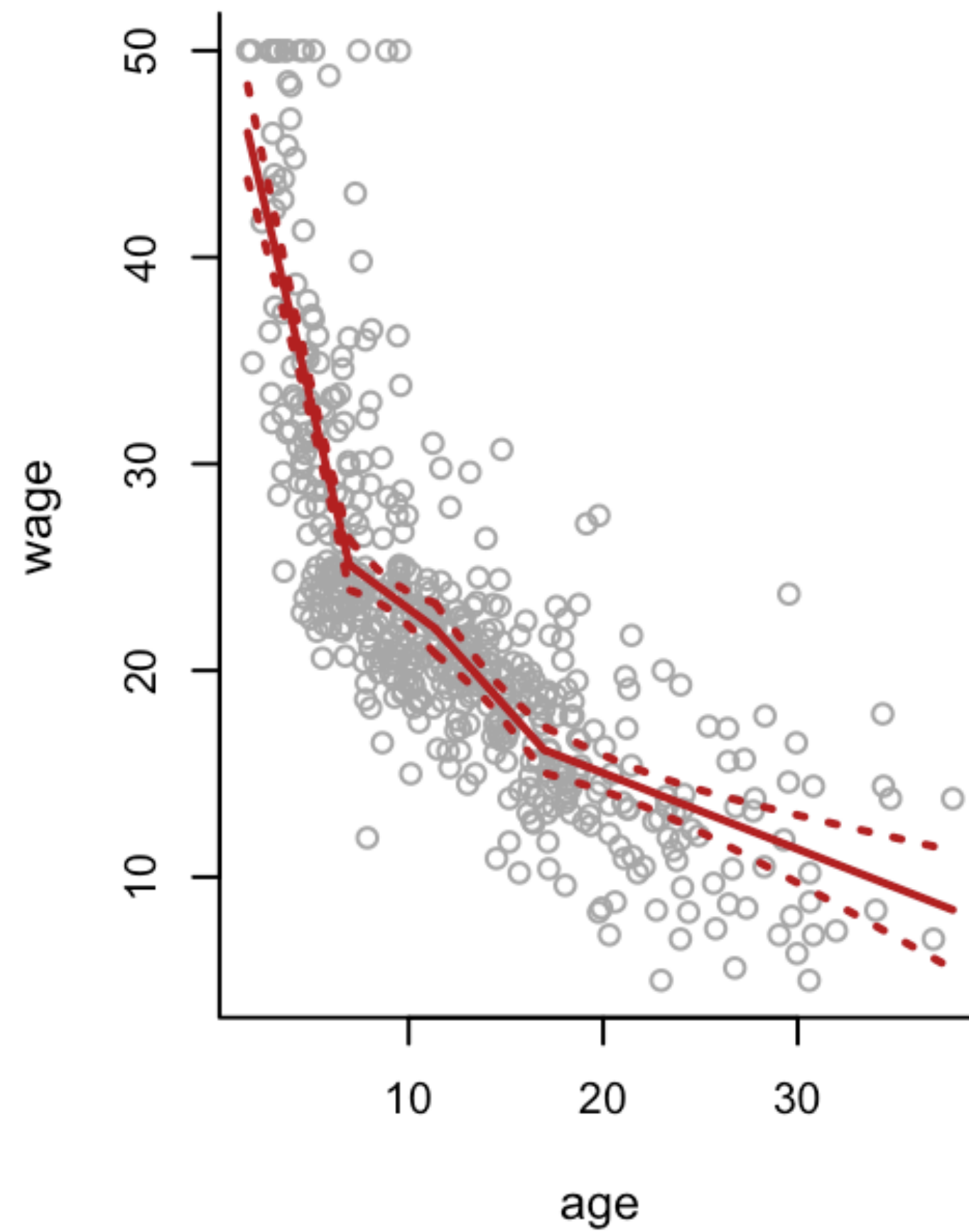


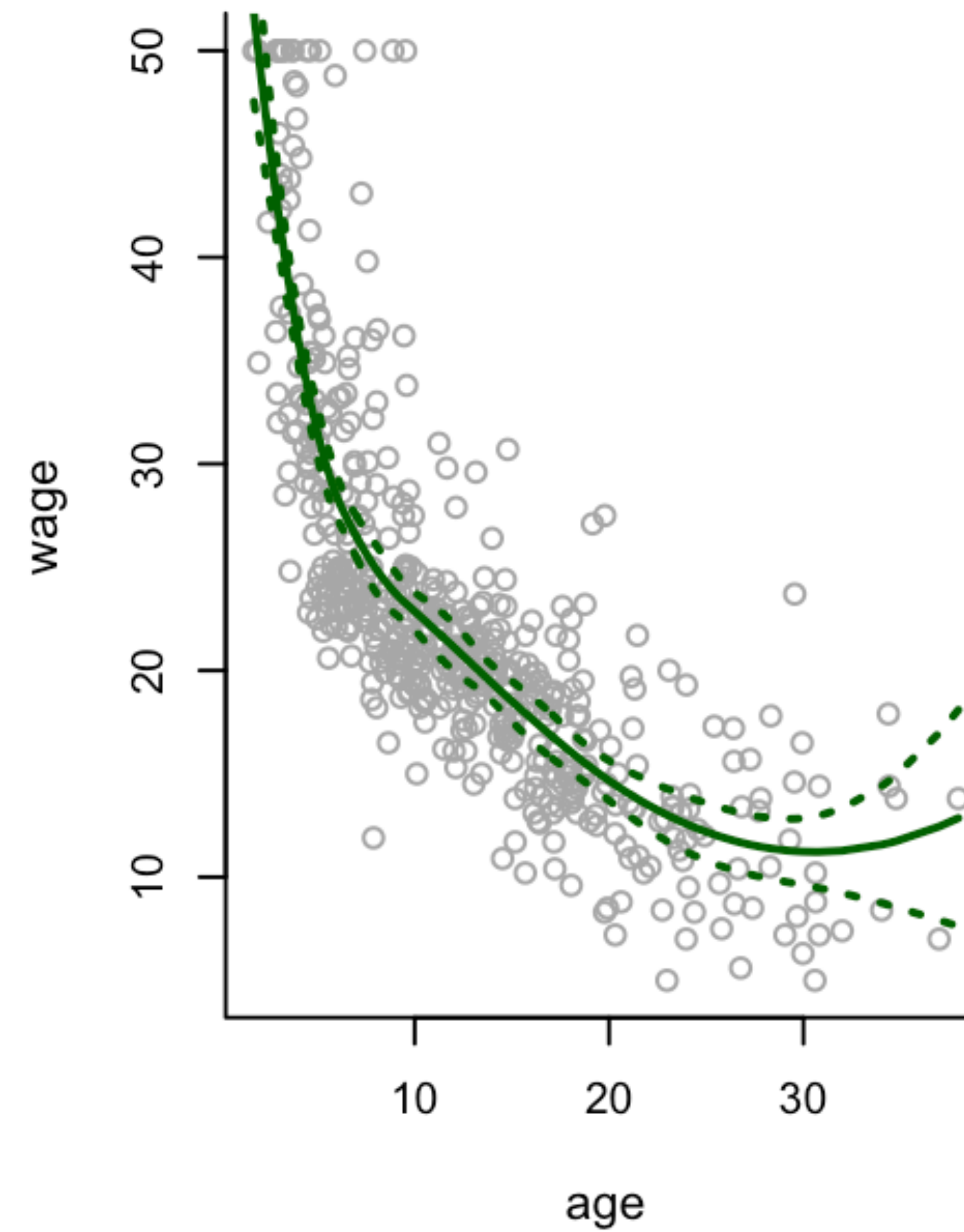
# Regression Splines

Example: Wage (ISLR2)

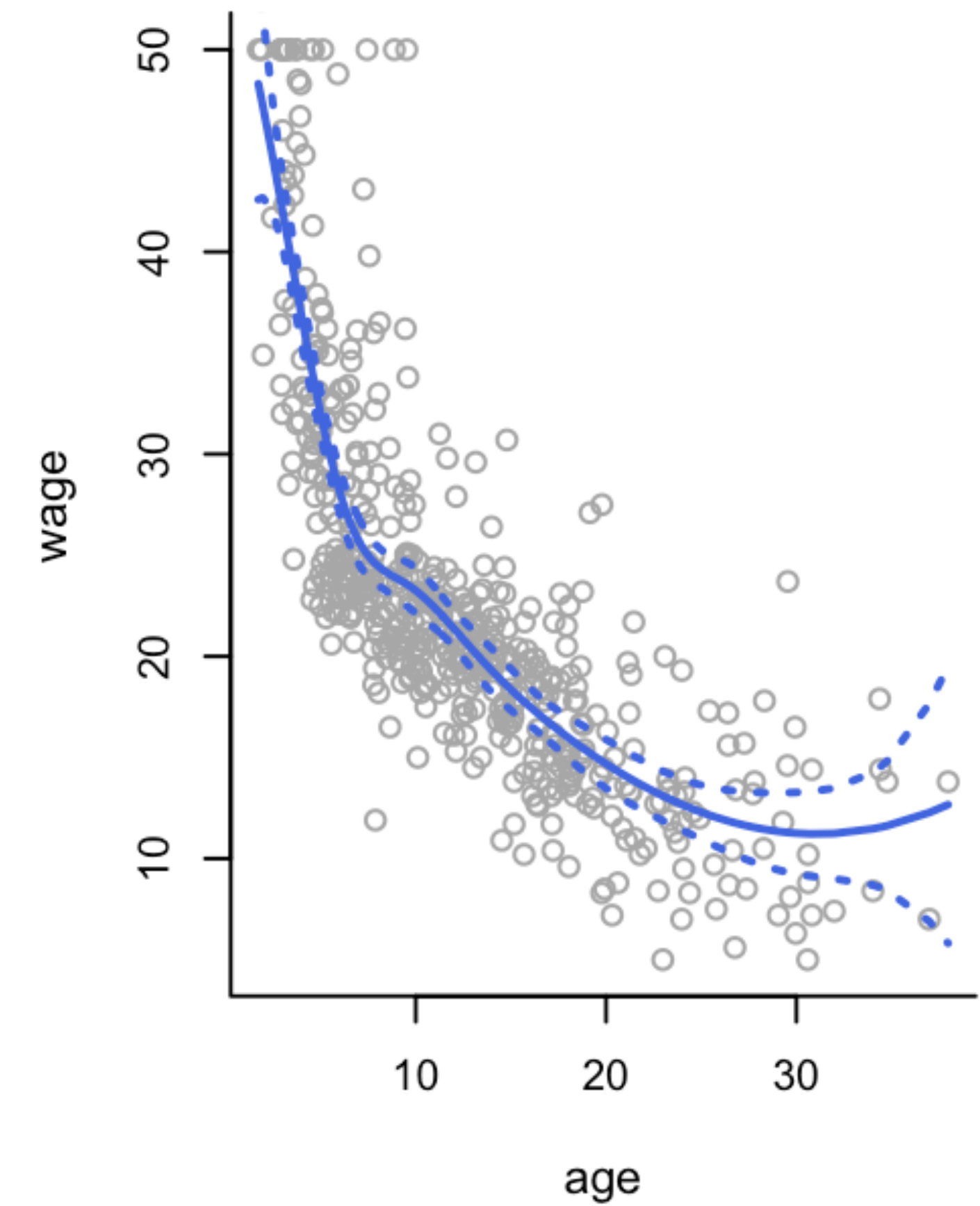
Linear Spline



Quadratic Spline



Cubic Spline



# Regression Splines

## Constraints and Degrees of Freedom

- In the previous example, we started with a cubic piecewise polynomial with 8 unconstrained parameters, so we started with 8 **degrees of freedom** (df)
- We initially imposed one constraint, which restricted one parameter, so we lost a degree of freedom  $8 - 1 = 7$
- With the further two constraints:  $8 - 3 = 5$  df
- In general, a cubic spline with  $K$  knots has  $4 + K$  degrees of freedom. In R we can specify either the number of knots or just the degrees of freedom.

*A degree- $d$  regression spline is a piecewise degree- $d$  polynomial with continuity in derivatives up to degree  $d - 1$  at each knot*