POLS/CSSS 503:

Advanced Quantitative Political Methodology

POLS 503 Course Goals

Agenda for this week

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How do we intrepret our models?

- $$\log(\text{income}) = \alpha + \beta_1 \text{age} + \varepsilon$$

or

$$\text{wealth} = \alpha + \beta_2 \text{age} + \beta_3 \text{age}^2 + \varepsilon$$

- $$\text{deficit} = \alpha + \beta_4 \text{ideology} + \beta_5 \text{power} + \beta_6 (\text{ideology} \times \text{power}) + \varepsilon$$

- $$\text{budget}_t = \alpha + \beta_7 \text{budget}_{t-1} + \beta_8 \text{partisan}_t + \varepsilon_t$$

- $$\text{spend} = \alpha + \beta_9 \text{compete} + \varepsilon$$

and

$$\text{compete} = \eta + \beta_{10} \text{spend} + \nu$$

- $$\Pr(\text{war}) = (1 - \exp(-\alpha - \beta_{11} \text{distance}))^{-1}$$

How do we intrepret our models?

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The *Challenger* launch decision

The *Challenger* launch decision

The *Challenger* launch decision

Yes	70		
		Yes	53
Yes	57	**Yes**	79
Yes	63		
Yes	70	**Yes**	58

The *Challenger* launch decision

Yes	53	**Yes**	70
Yes	57		
Yes	58		
Yes	63		
		Yes	79
Yes	70		

The *Challenger* launch decision

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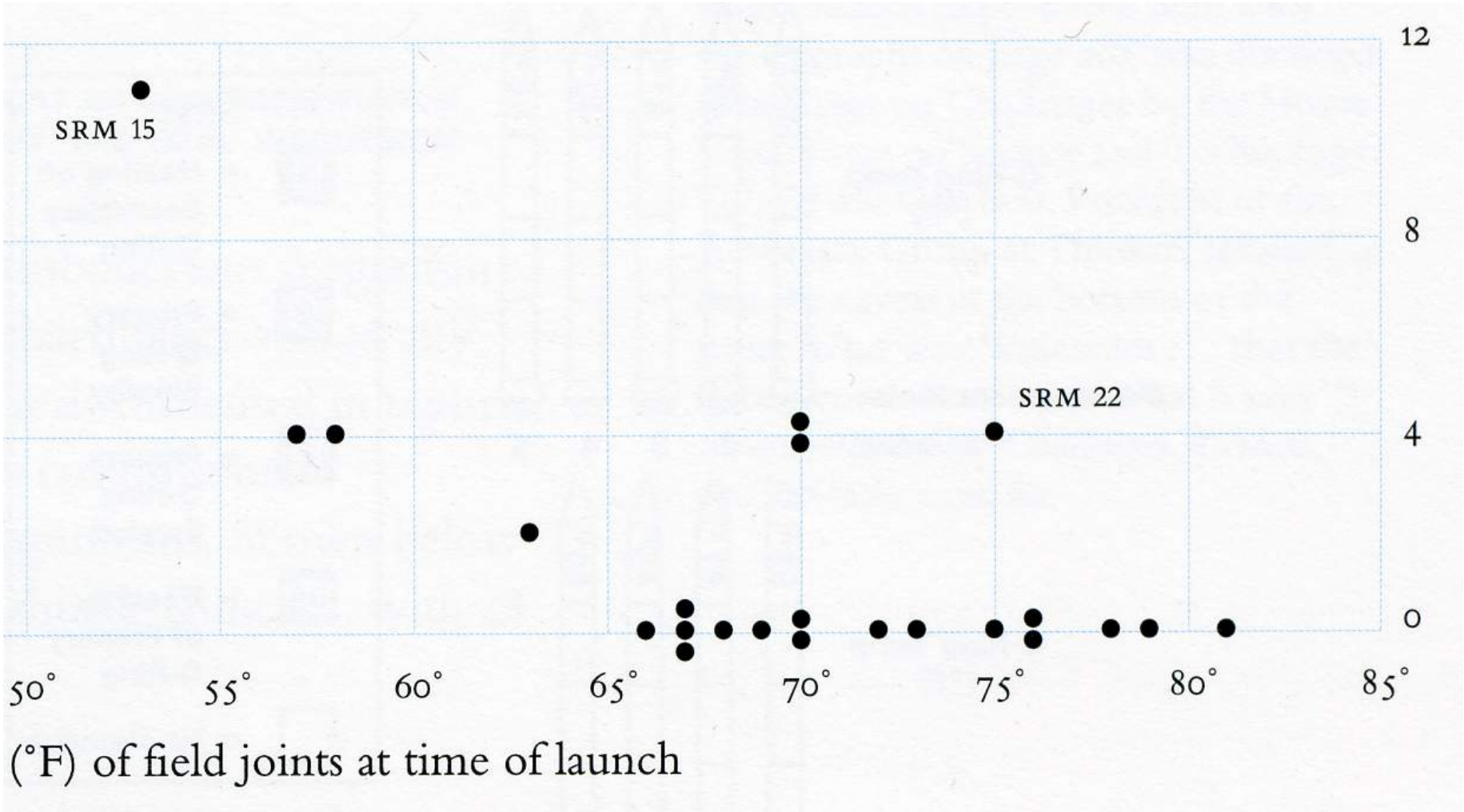
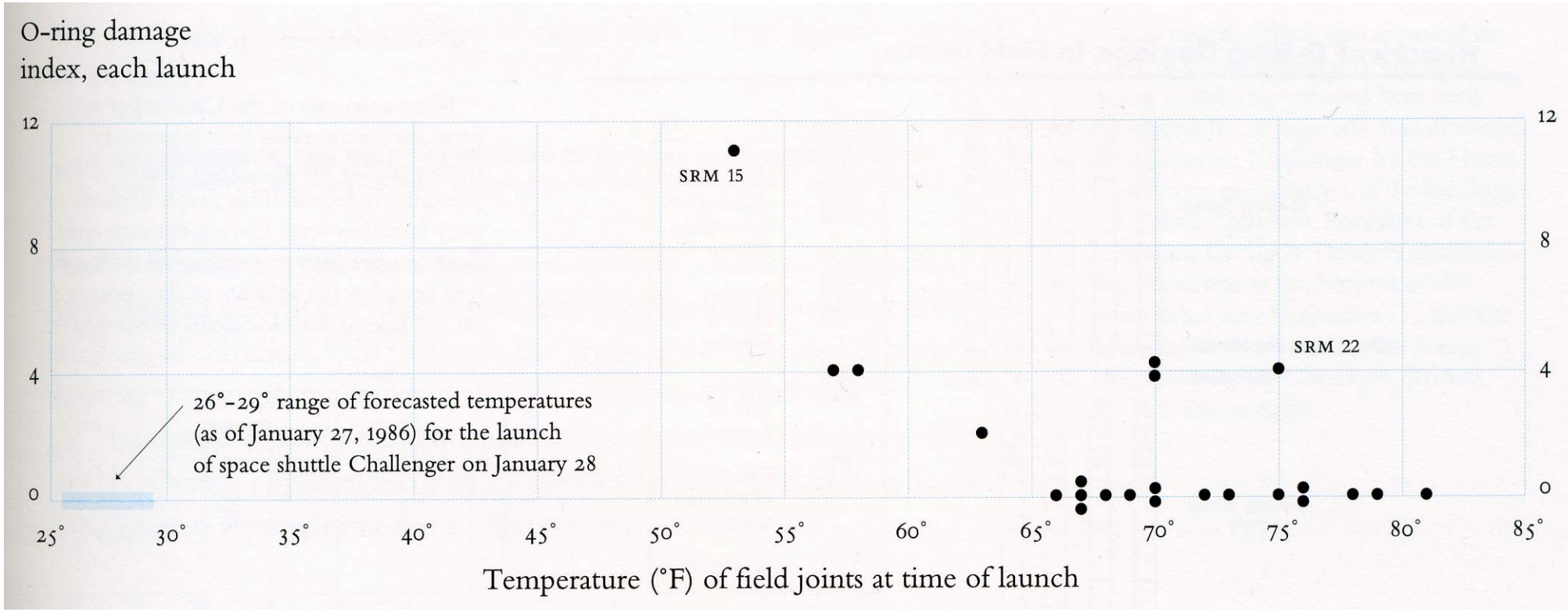
The *Challenger* launch decision



The *Challenger* launch decision

The *Challenger* launch decision



The *Challenger* launch decision

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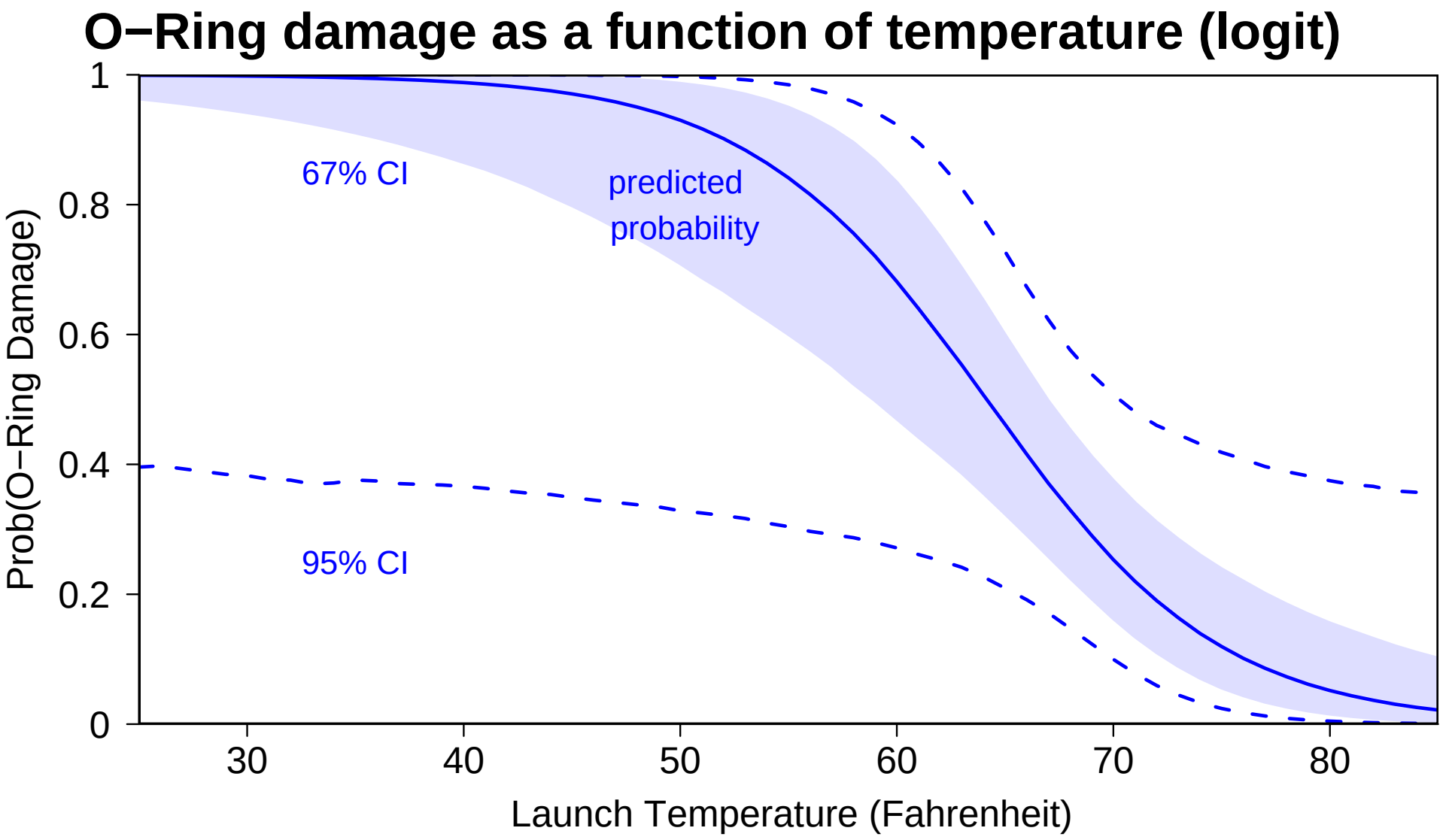
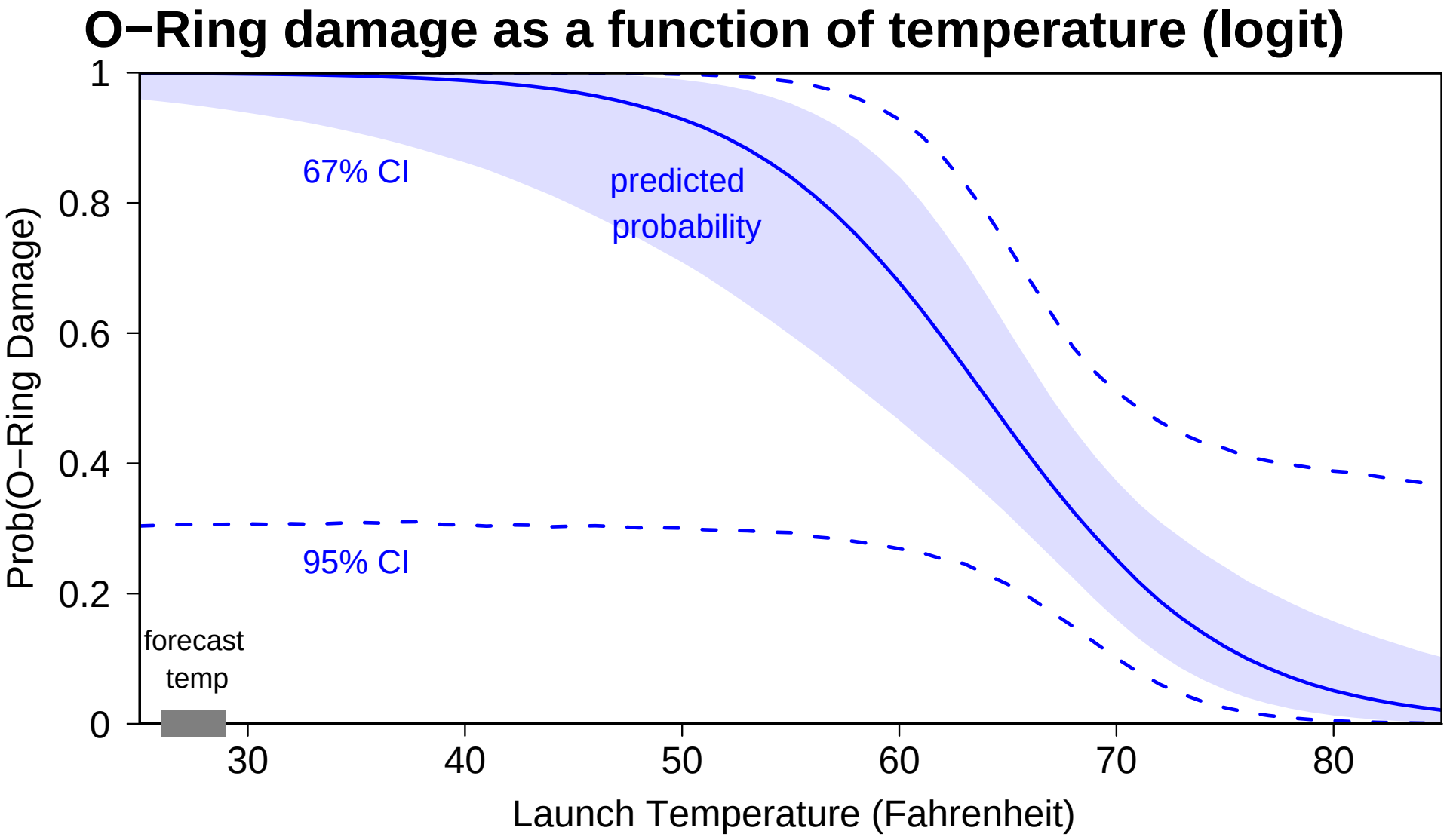
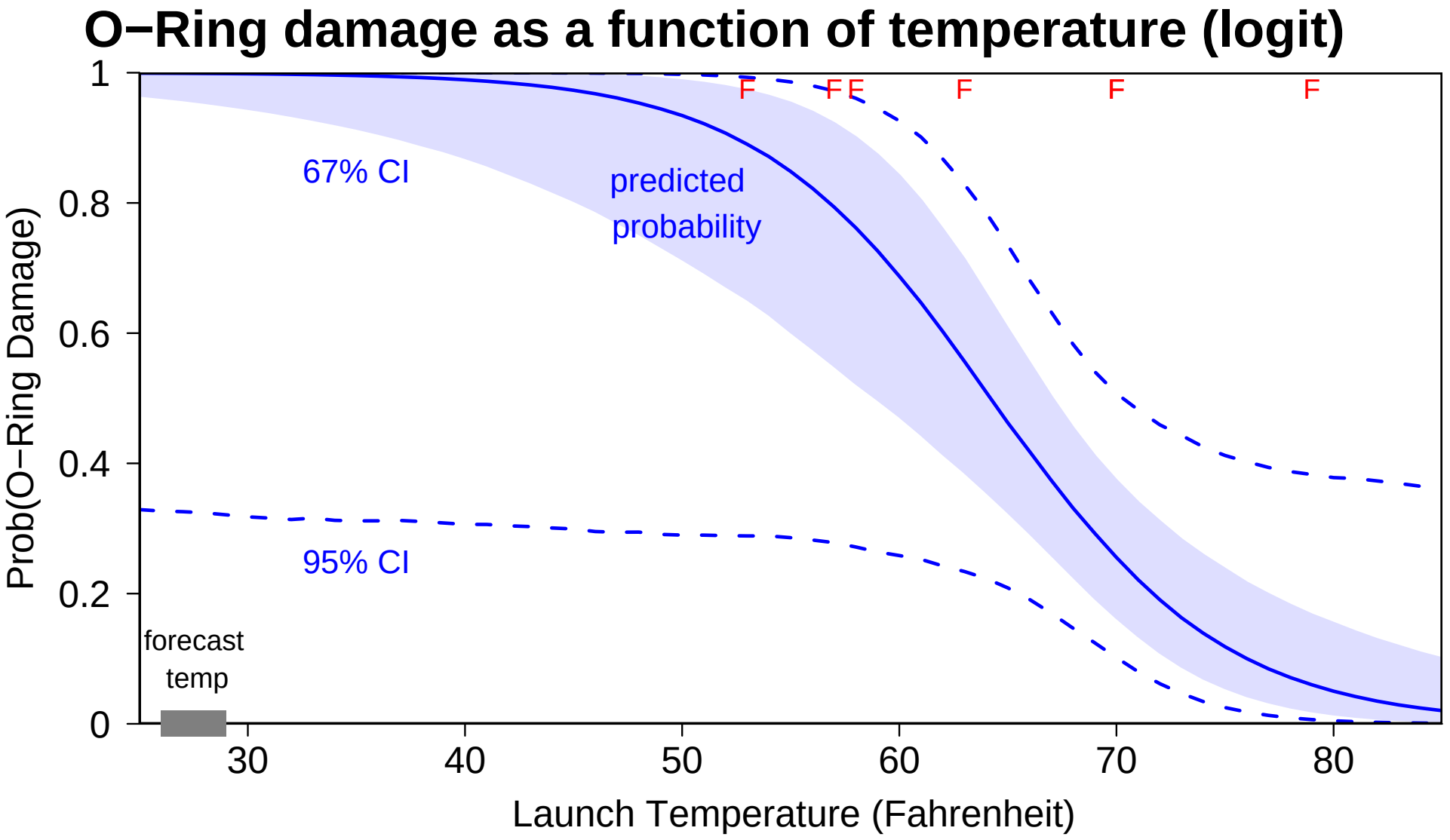


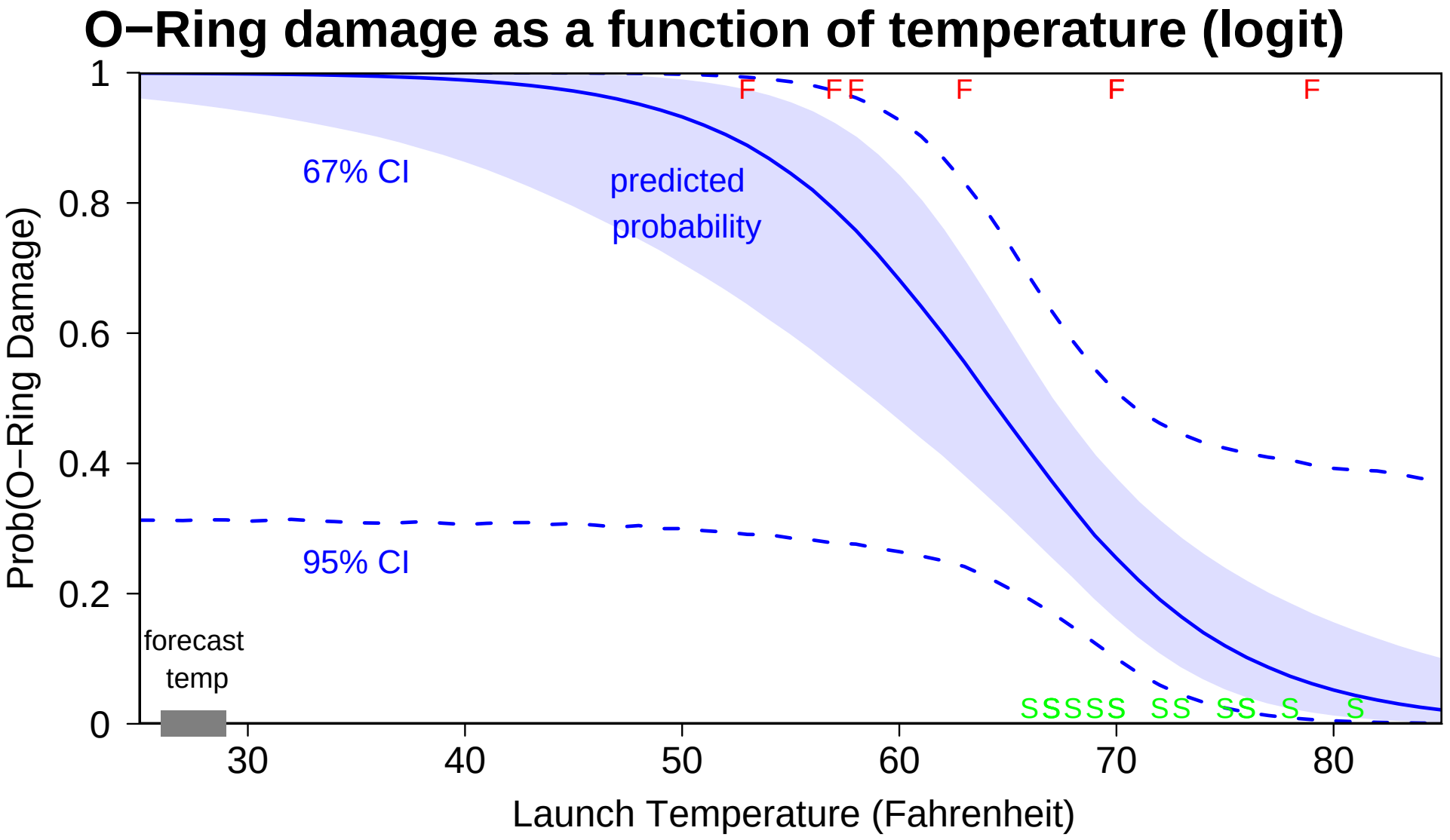
A picture clearly shows non-linear model predictions *and* uncertainty



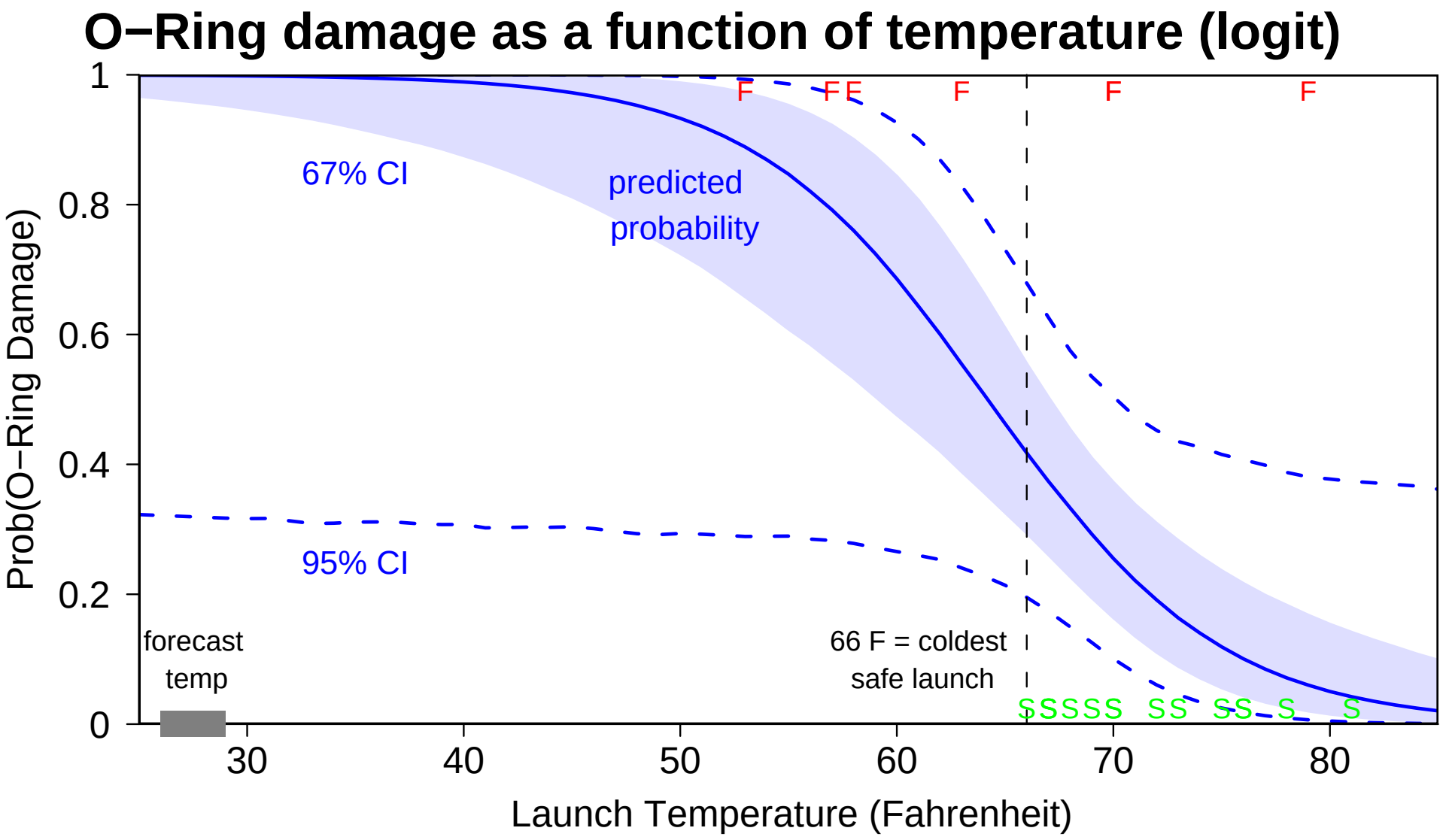
And gives a more precise sense of how foolhardy launching at 29 F is.



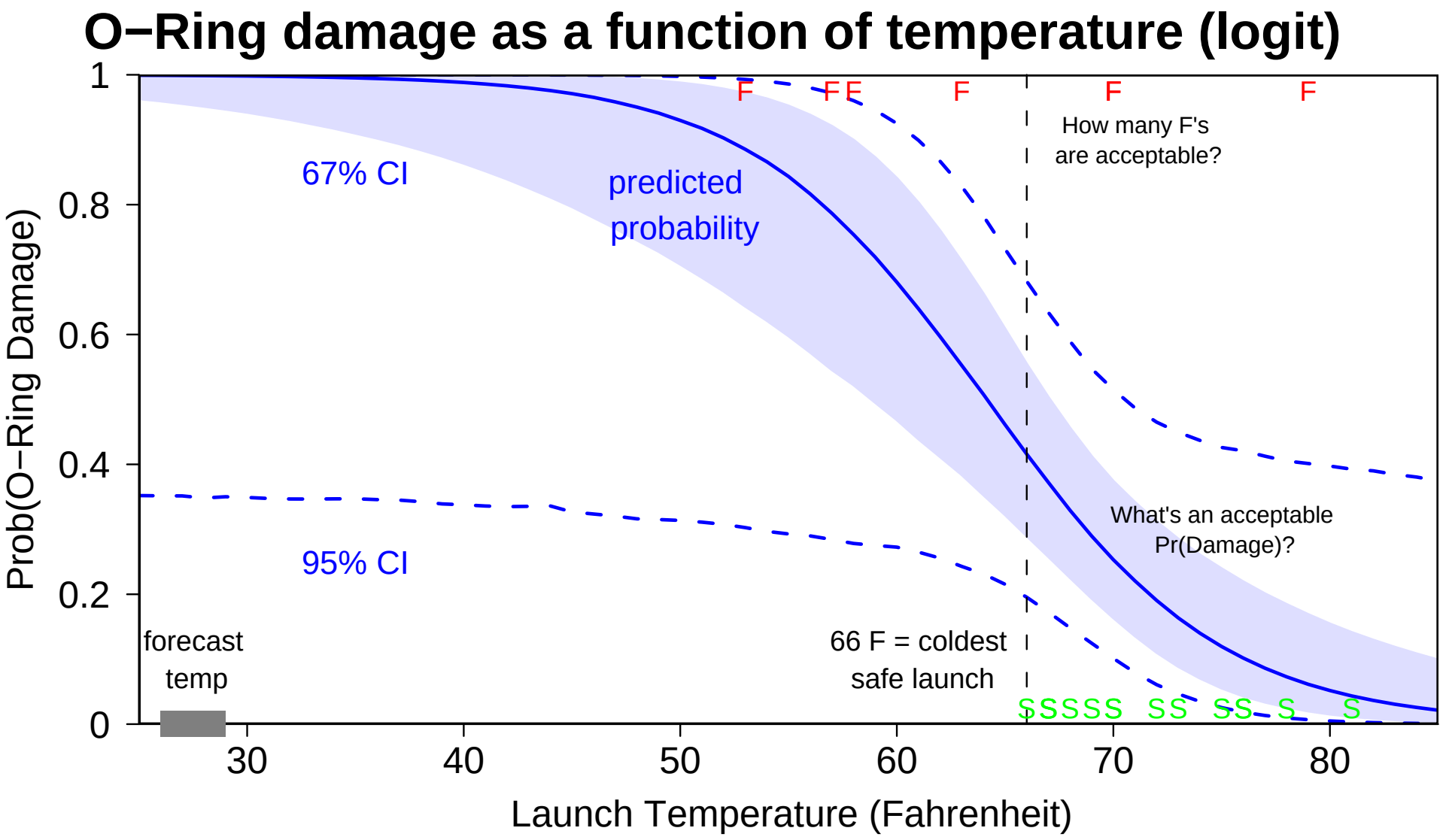
It's also good to show the data giving rise to the model.



Remembering that the Failures are only meaningful compared to Successes

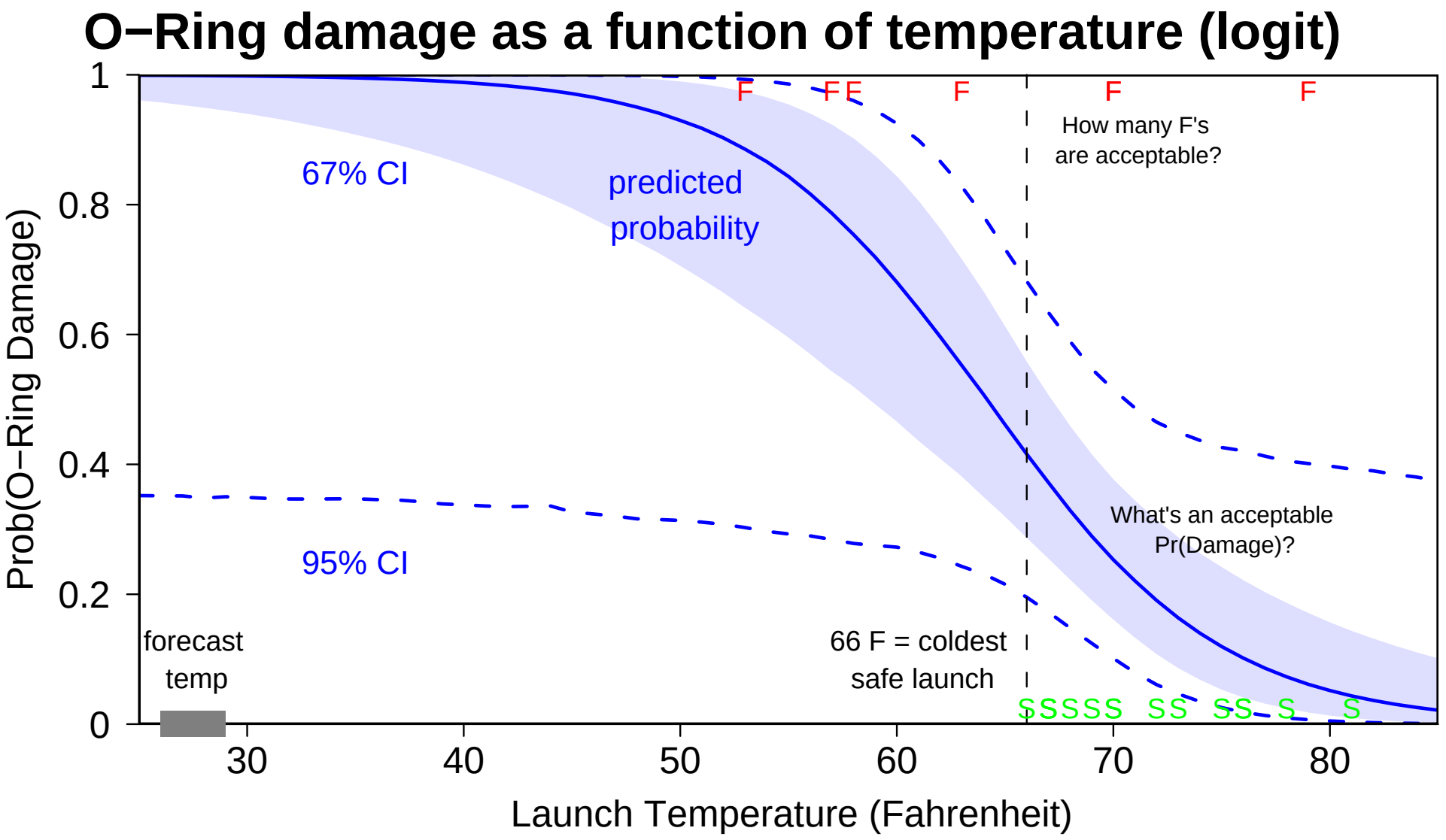


Looking just at the data tempts us to say that launches under 66 F are virtually guaranteed O-ring failures. This inference is based on an unstated model.



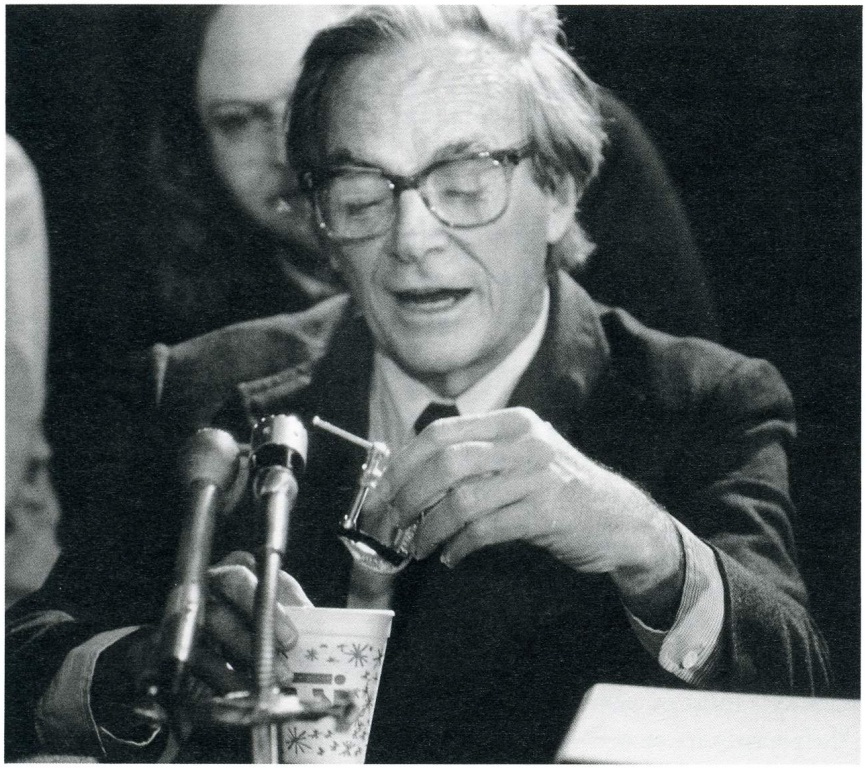
But the estimated logit model should give us pause.

There is a significant risk of failure across the board.



What is an acceptable risk of O-ring failure?

Was the shuttle safe at any temperature?



Going further

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Going further

Why R?

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Why R?

Why R?

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Introduction to R

Introduction to R

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Introduction to R

Entering code

Data types

Some special values

Data structures

Vectors in R

Vectors in R

Vectors in R

Matrices in R

Matrices in R

Matrices in R

Matrices in R

Dataframes in R

Loading data

Benefits and dangers of `attach()`

Missing data

Missing data

Mathematical Operations

Example 1: US Economic growth

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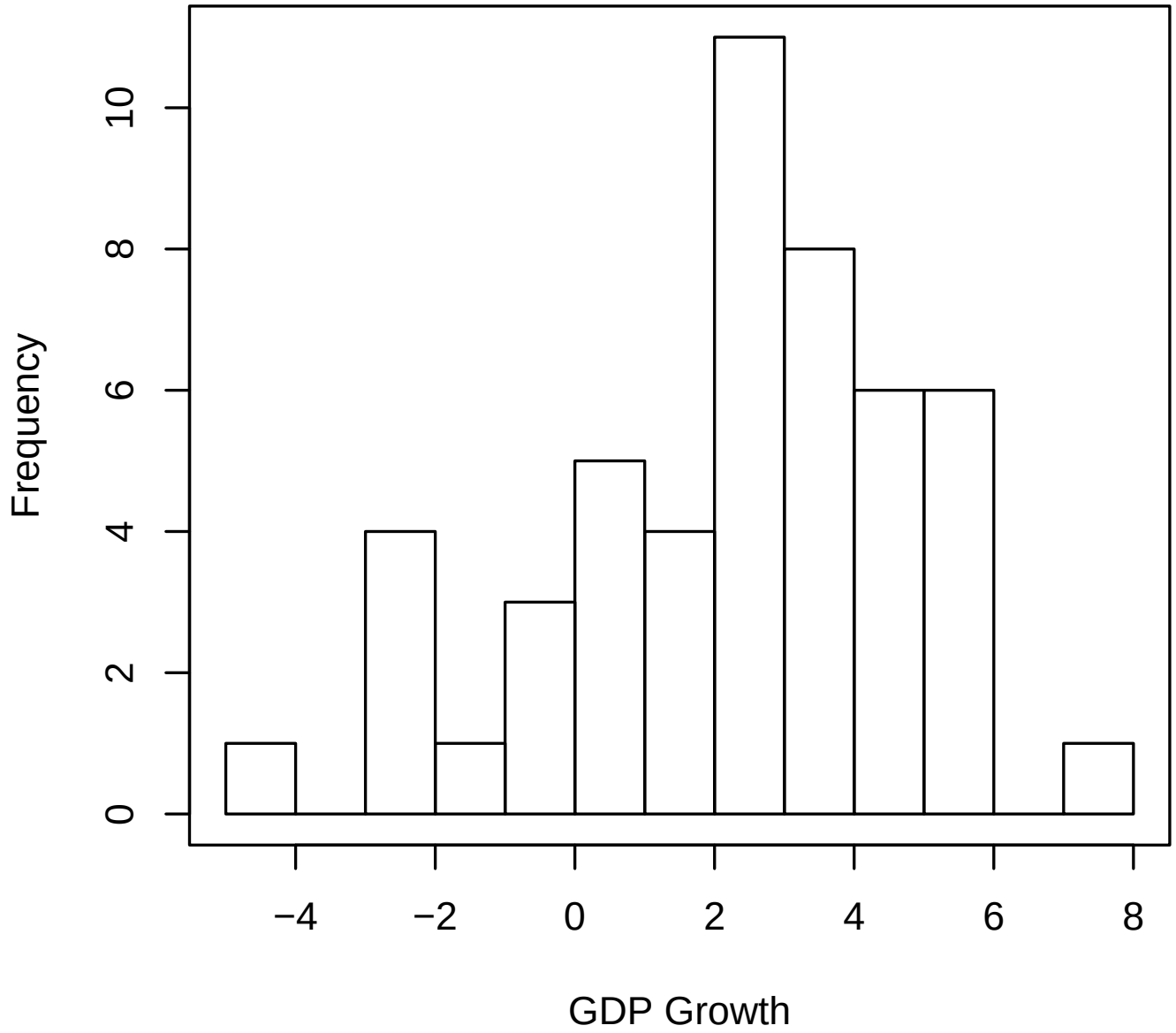
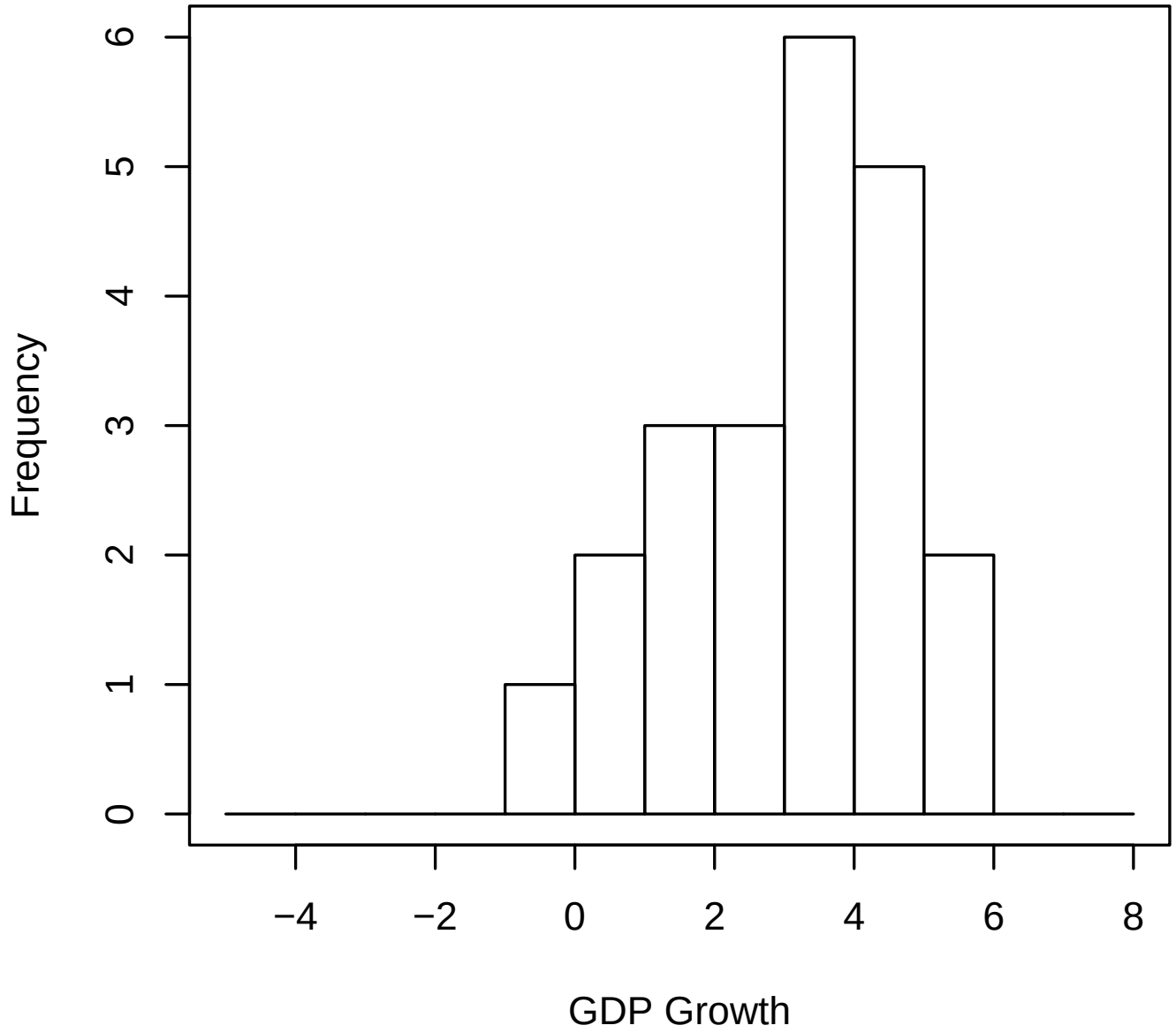
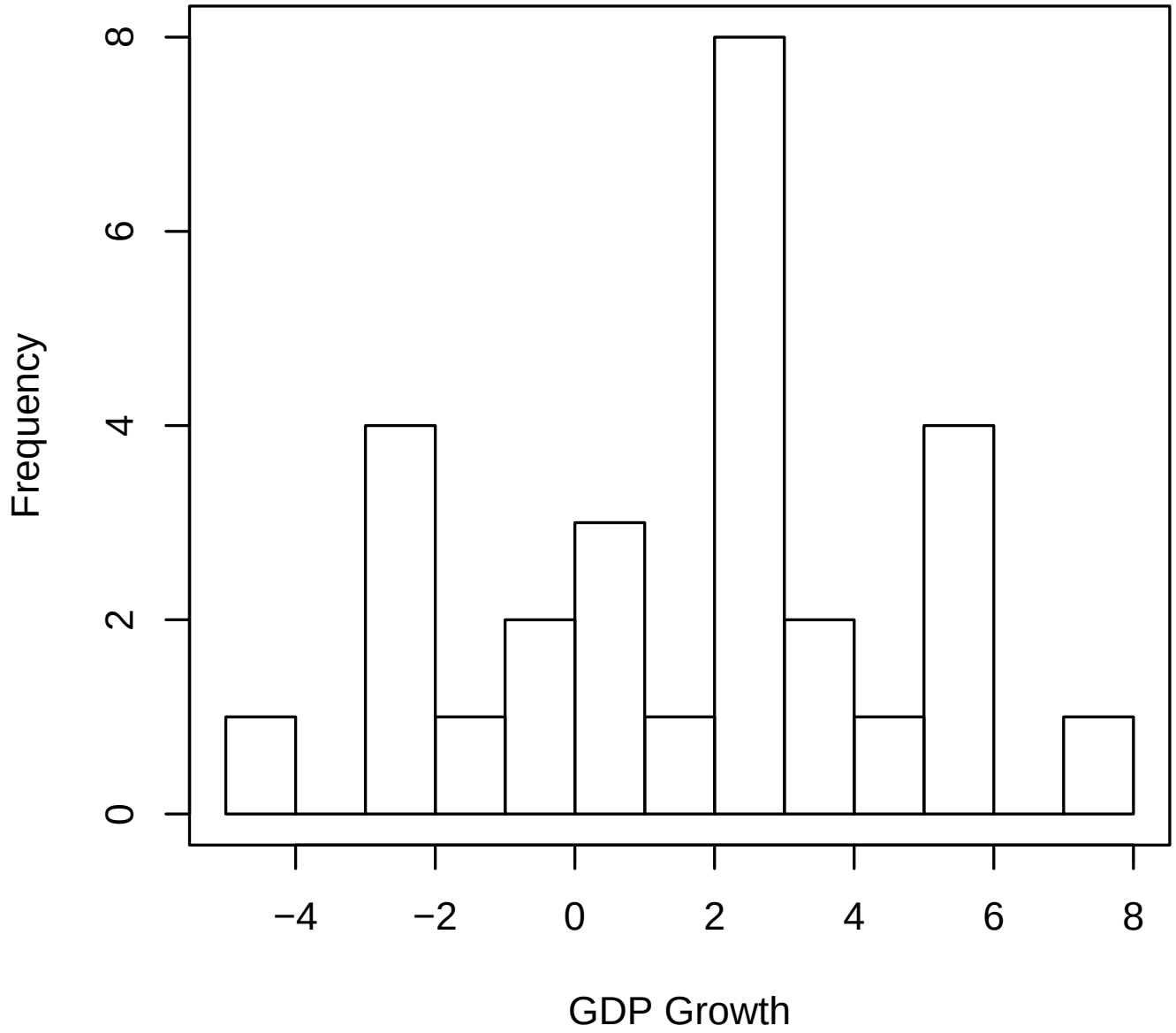
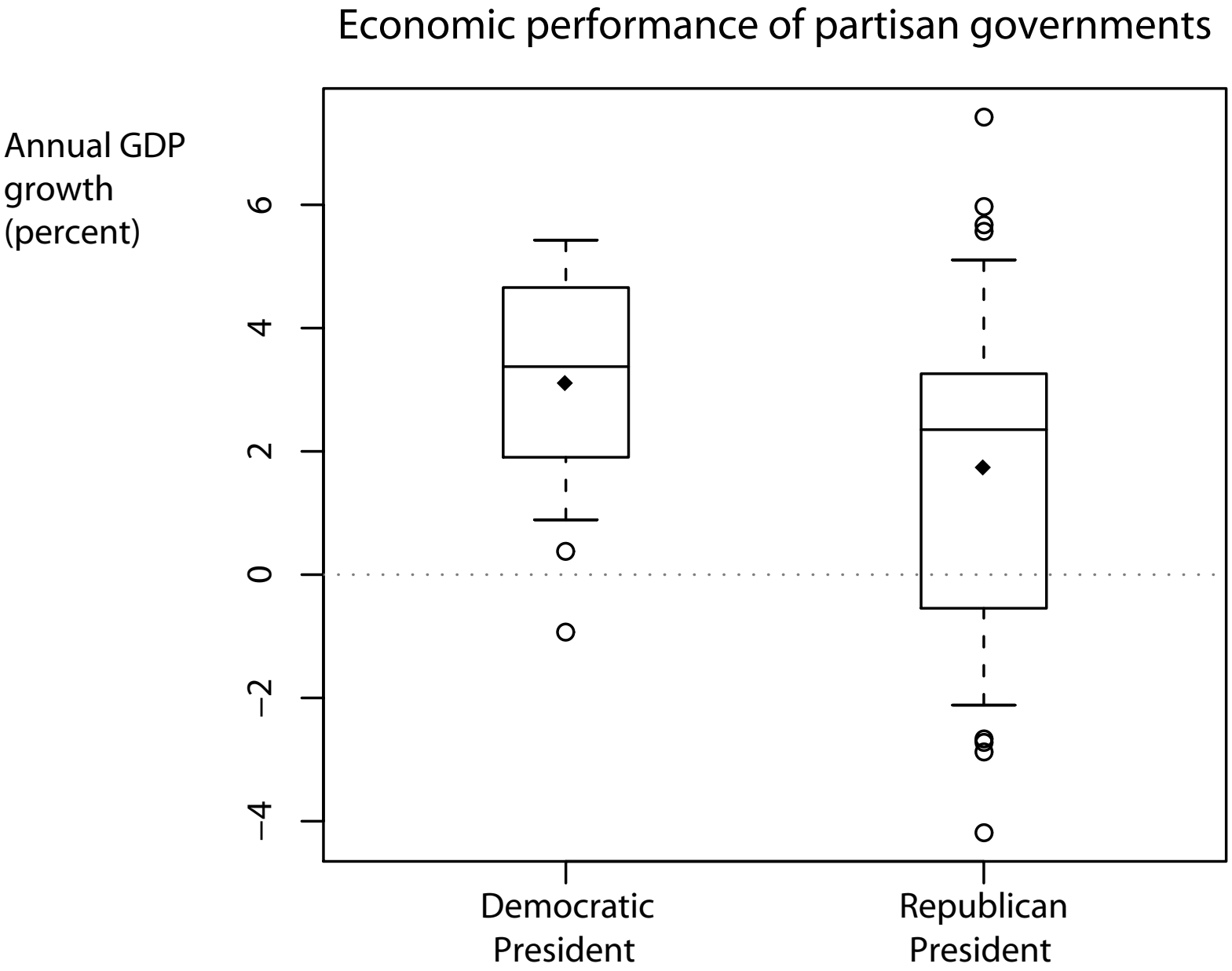

Histogram of US GDP Growth, 1951−−2000
Frequency
0
2
4
6
8
10
−4
−2
0
2
4
6
8
GDP Growth

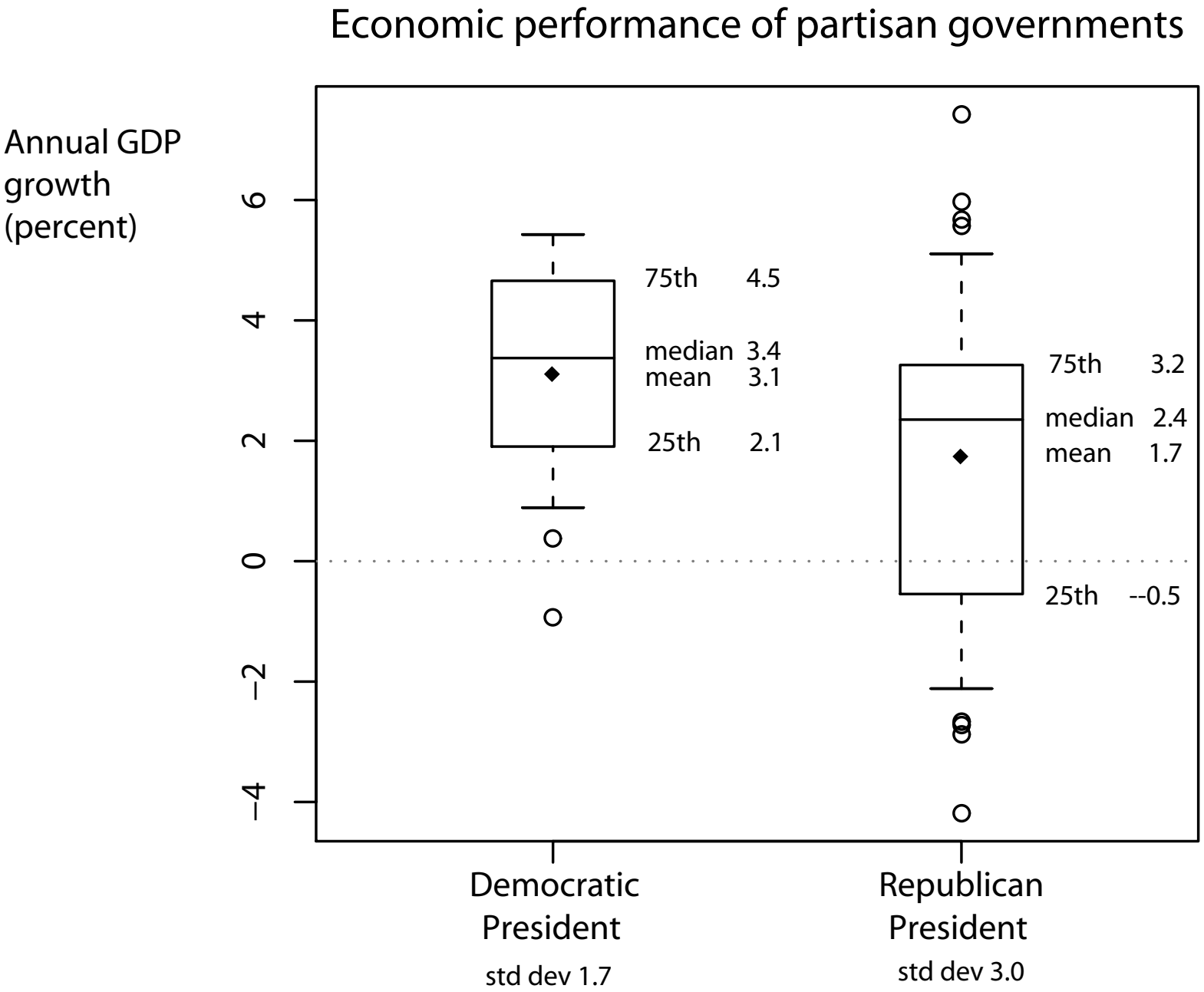

GDP Growth under Democratic Presidents
Frequency
0
1
2
3
4
5
6
−4
−2
0
2
4
6
8
GDP Growth


GDP Growth under Republican Presidents
Frequency
0
2
4
6
8
−4
−2
0
2
4
6
8
GDP Growth

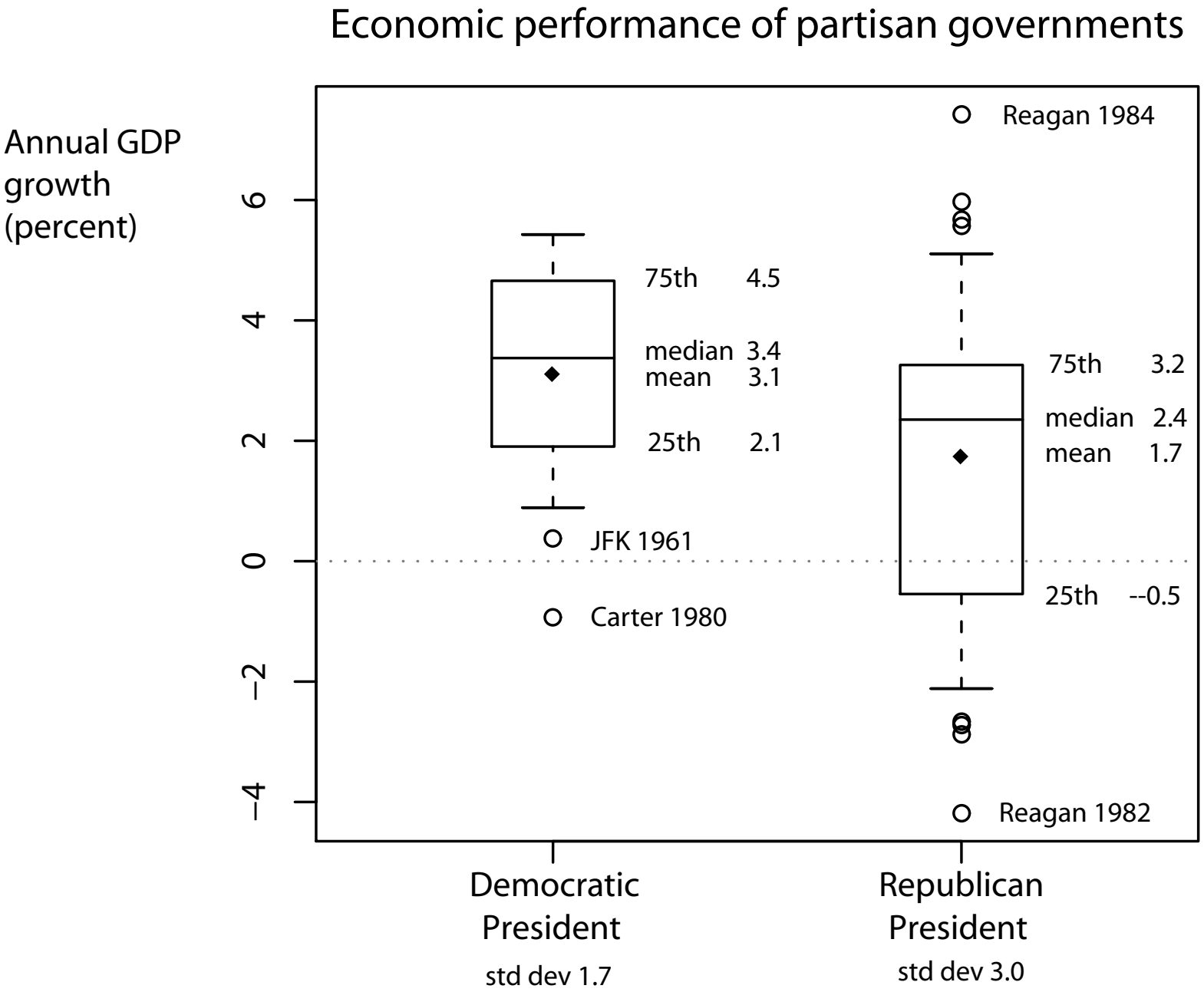
Box plots: Annual US GDP growth, 1951–2000



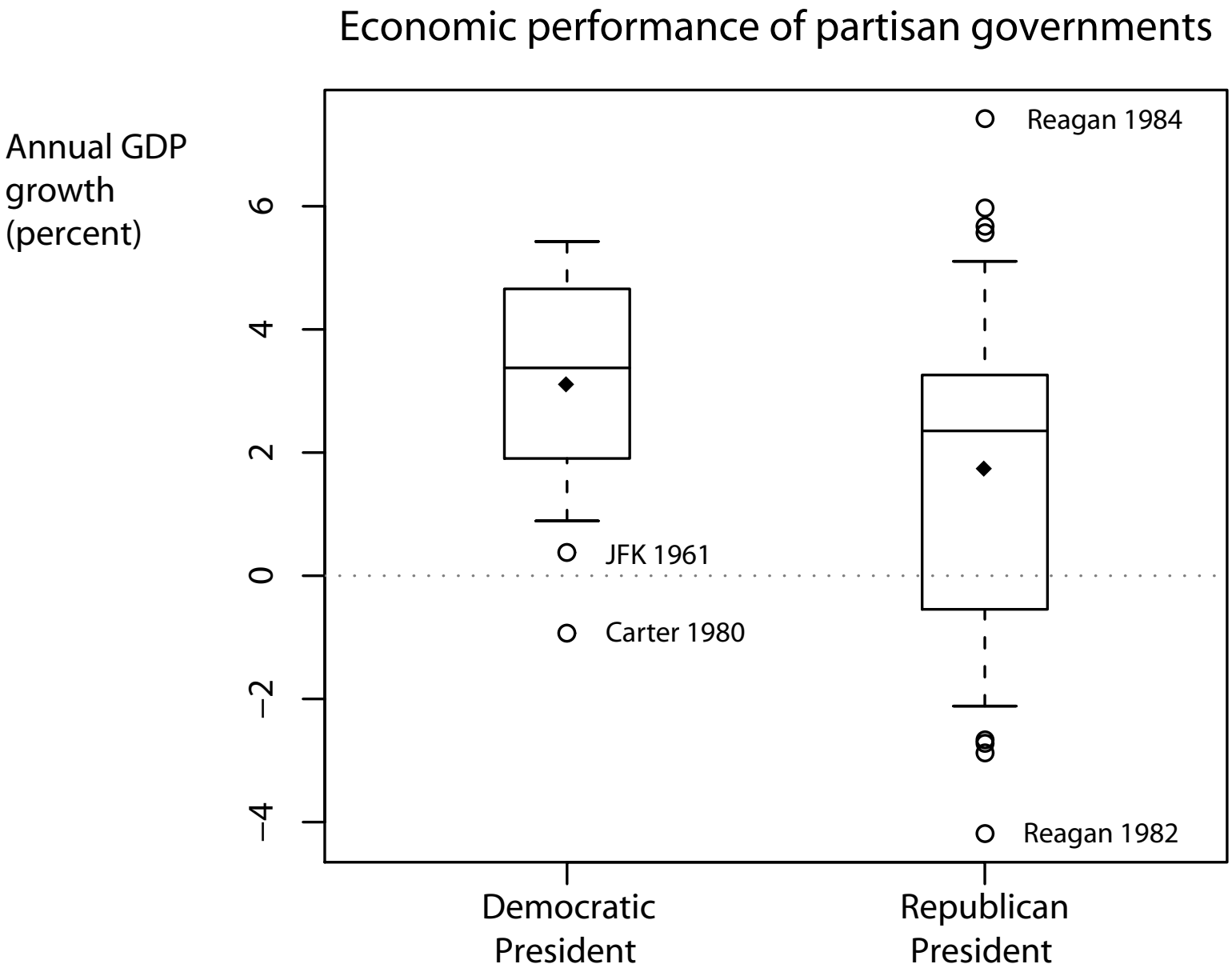
Box plots: Annual US GDP growth, 1951–2000



Box plots: Annual US GDP growth, 1951–2000



Box plots: Annual US GDP growth, 1951–2000



Help!

Installing R on a PC

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Installing R on a Mac

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Editing scripts

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Editing data

Example 2: A simple linear regression

Example 2: A simple linear regression

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Data and Prediction