

# WHY I LIKE ENVIRONMENTAL ECONOMICS

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Lecture 1

14.42/14.420

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MIT Department of Economics

# What is Environmental Economics?

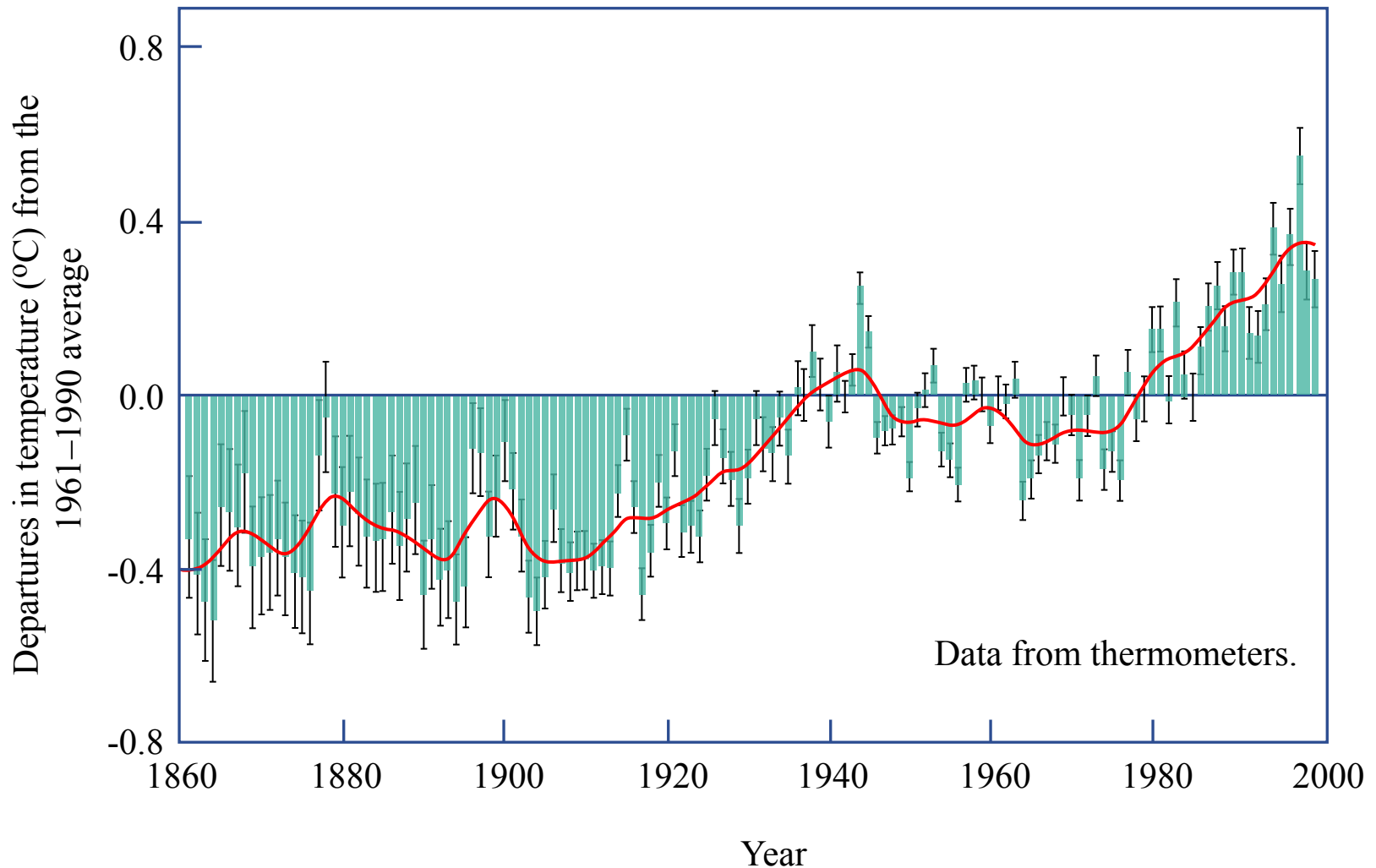
- Economics is the study of the allocation of scarce resources.
- This helps us understand how much money society should spend on environmental quality and how environmental policies should be structured.
  - Why not have zero pollution?
- Specifically, economics helps us to understand:
  - The value of pollution abatement.
  - The costs of pollution abatement.
  - The welfare effects of different policies to control pollution.

# Example: Using Economics to Reframe Climate Change

- Trends
- Damages
- Abatement Costs

# Variation in Global Surface Temperatures

## Global



# Expected impact on global climate

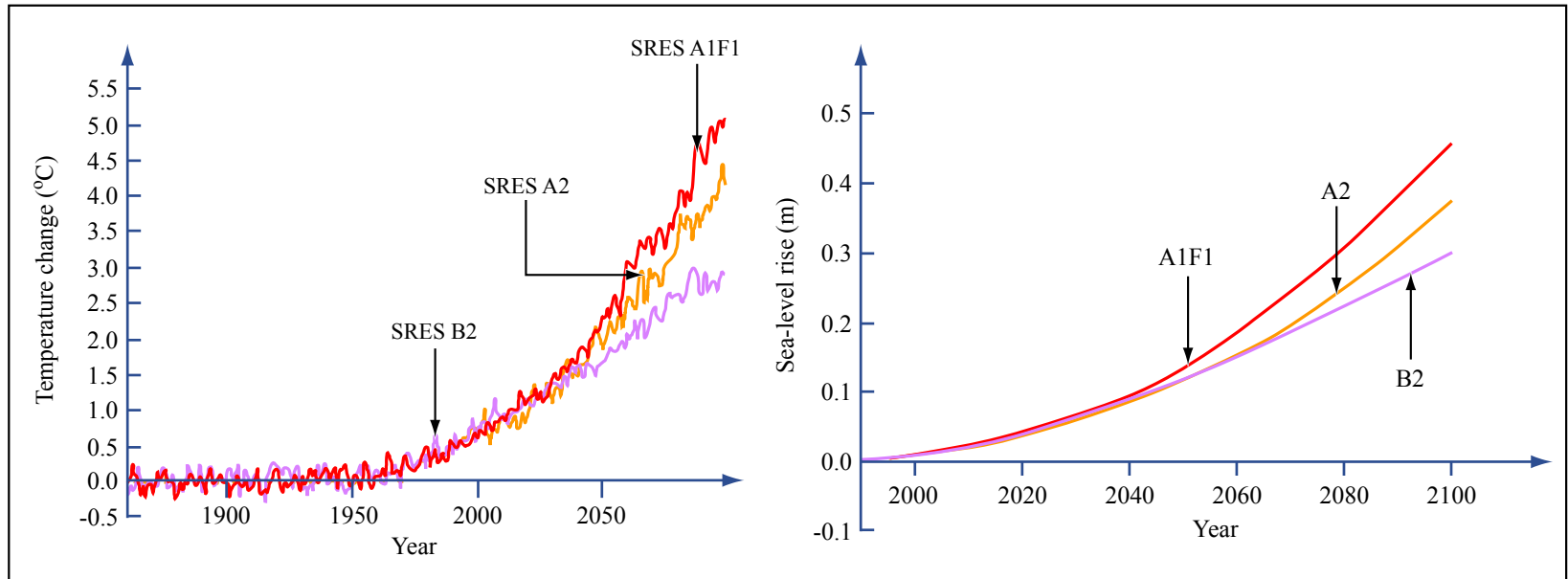


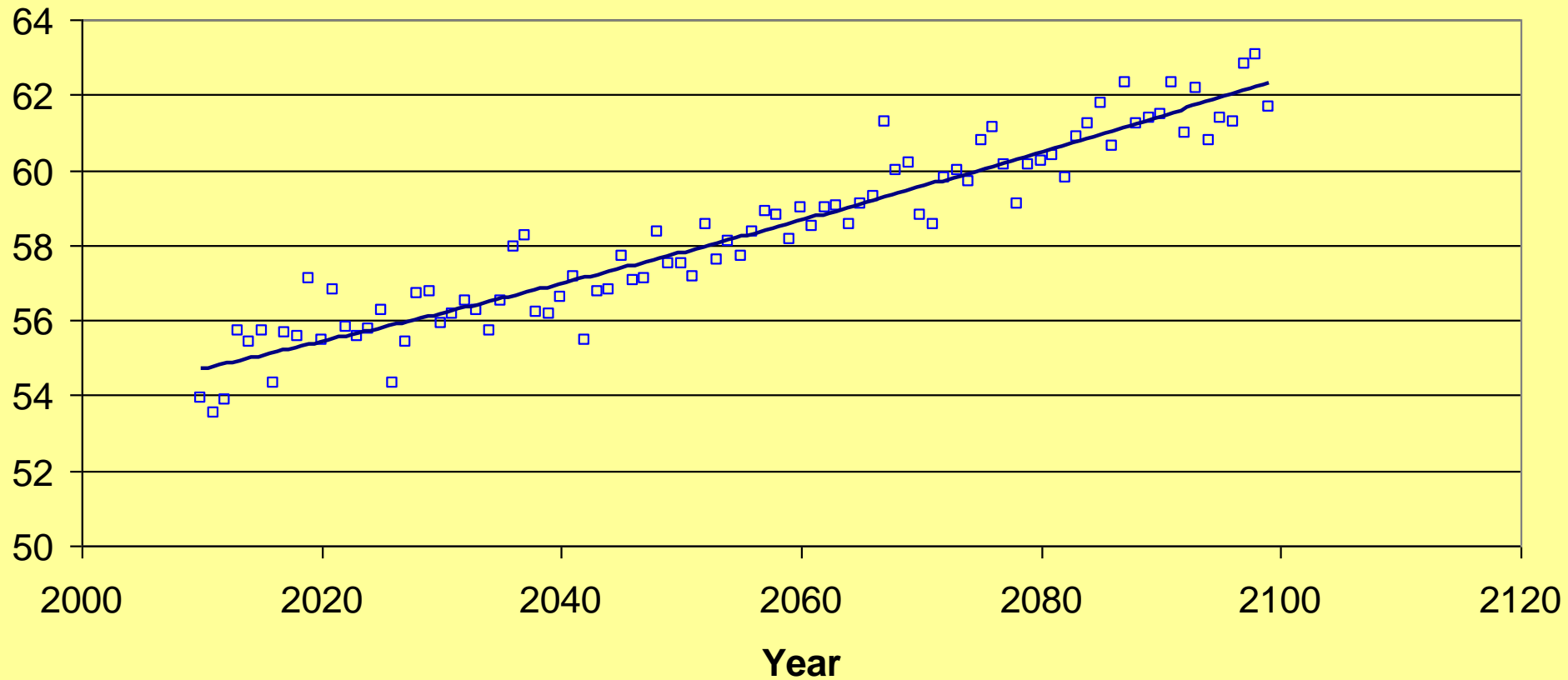
Image by MIT OpenCourseWare.

- **Change in global surface temperature**

- **Change in global mean sea level**

Source: Hadley Centre (UK) Model 3 – A1F1

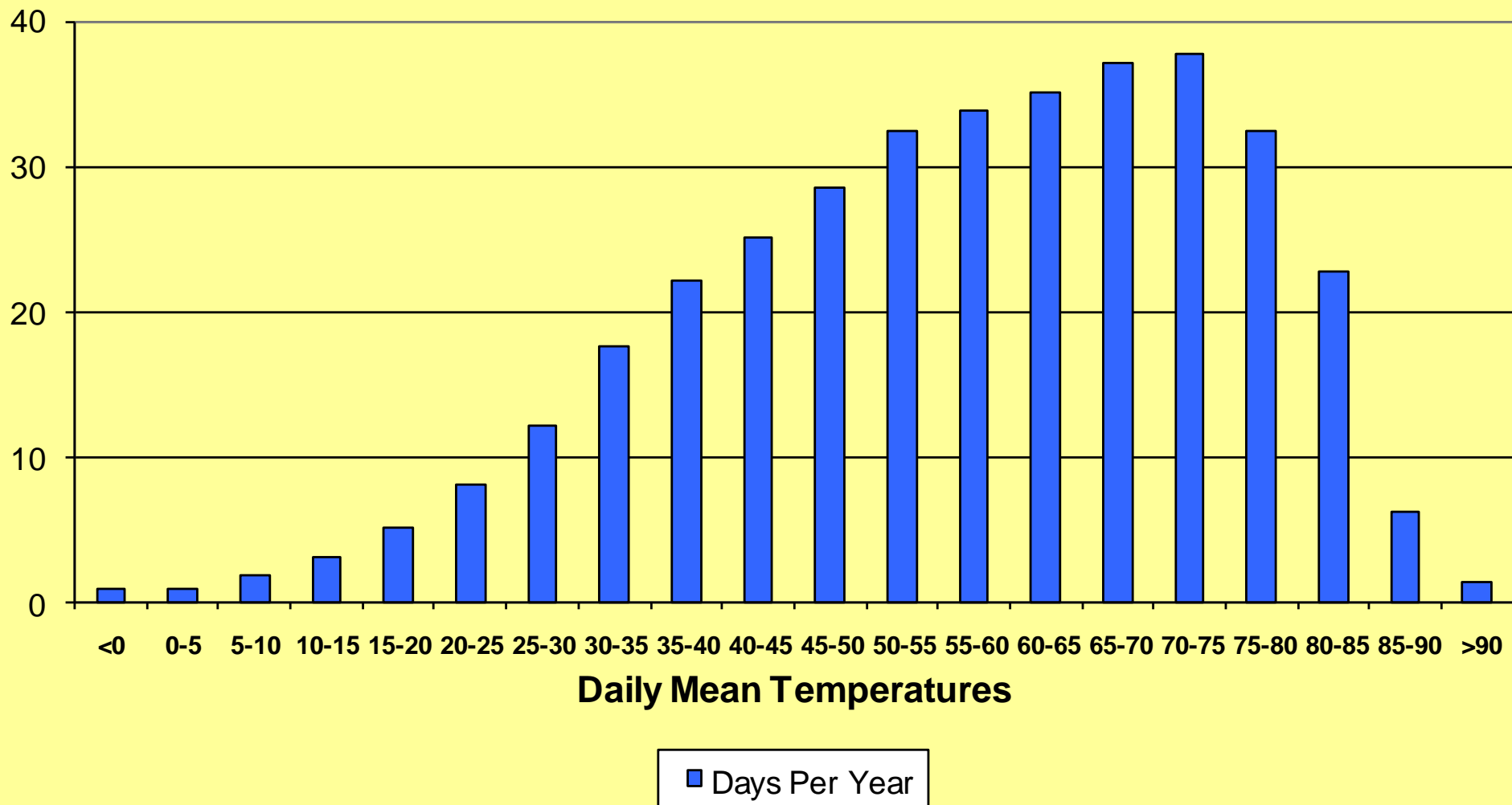
# Expected impact on U.S. climate



□ Average Daily Mean Temperature (Annual)  
— Poly. (Average Daily Mean Temperature (Annual))

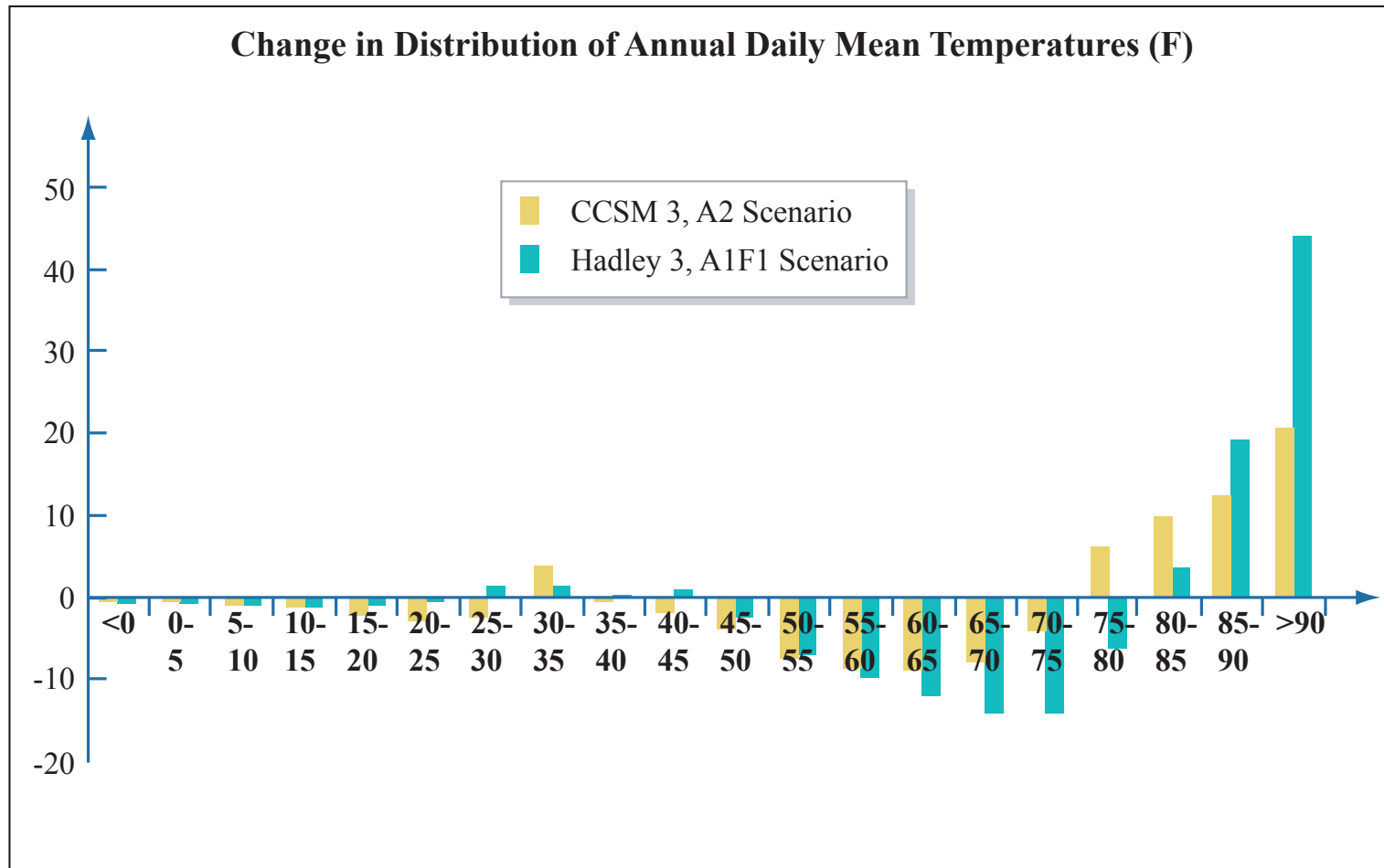
**Source: Author's Calculations From National Center for Atmospheric Research, Community Climate System Model (CCSM) 3 A2**

## Distribution of Annual Daily Mean Temperatures (F), 1968-2002



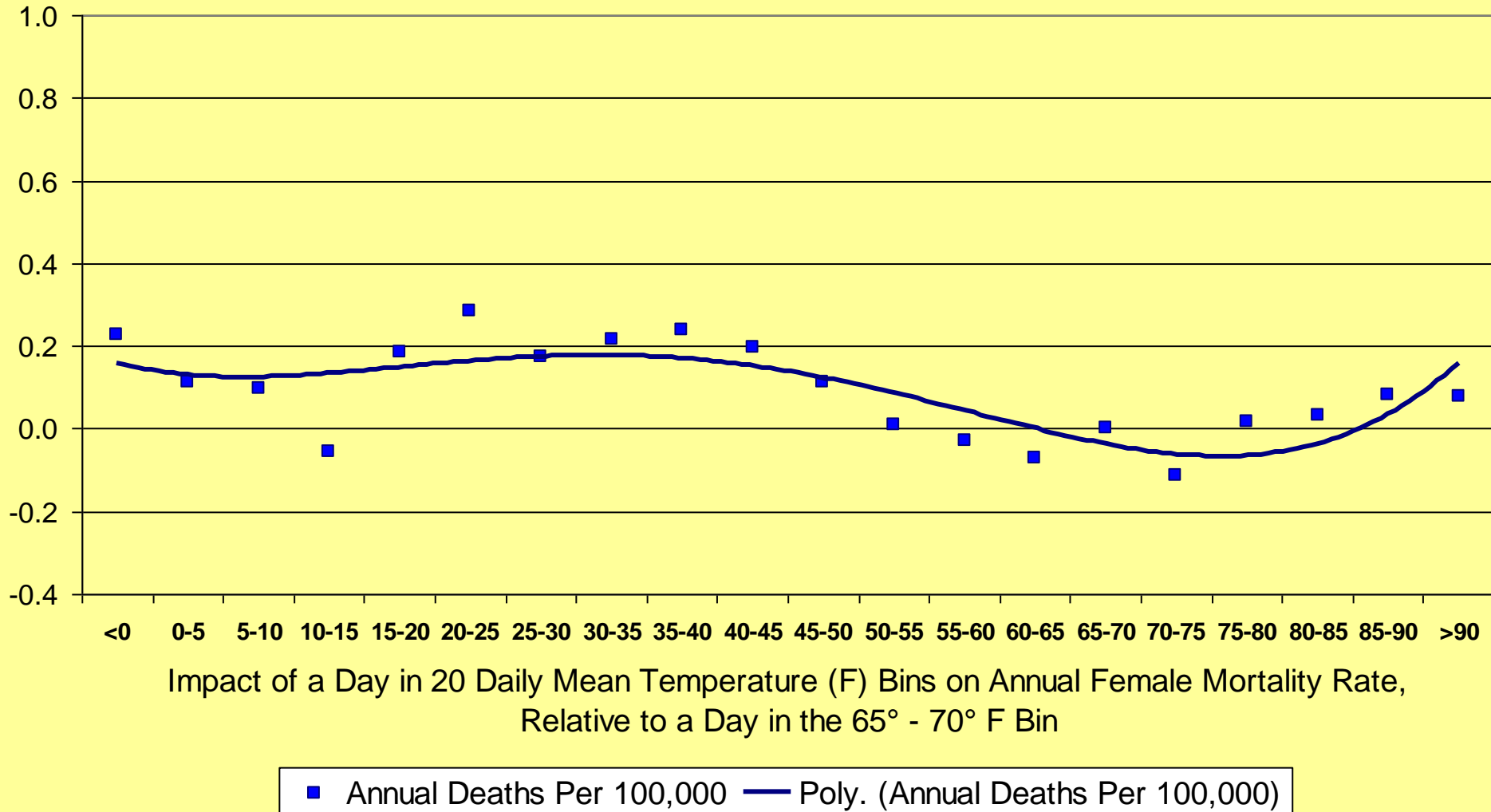
Note: Population-weighted average over all counties

# Changes in Distribution of Daily Temperatures Under Hadley 3 A1FI and CCSM 3, A2



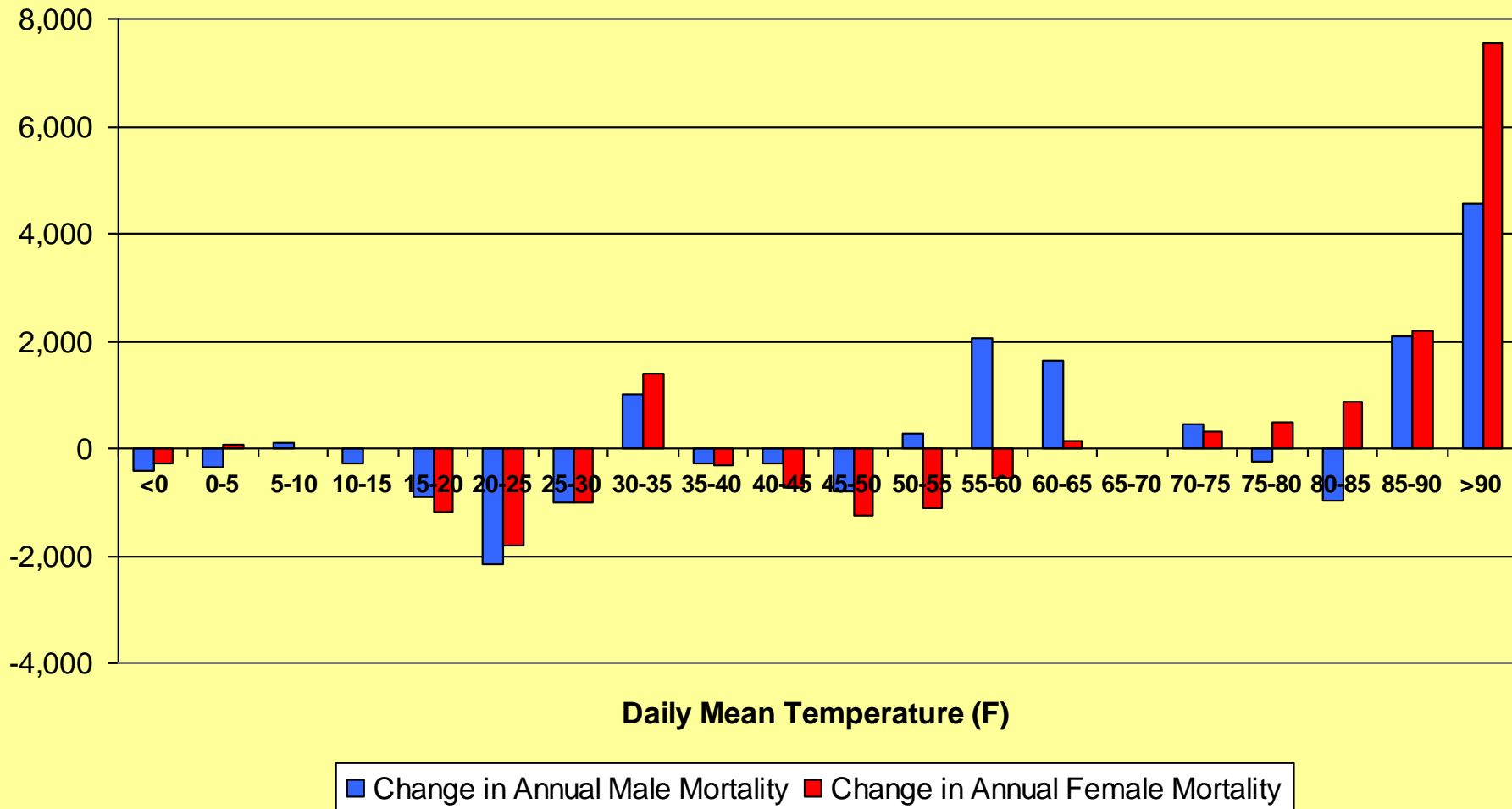


# Estimated Response Function Between Daily Temperature and Mortality: Females

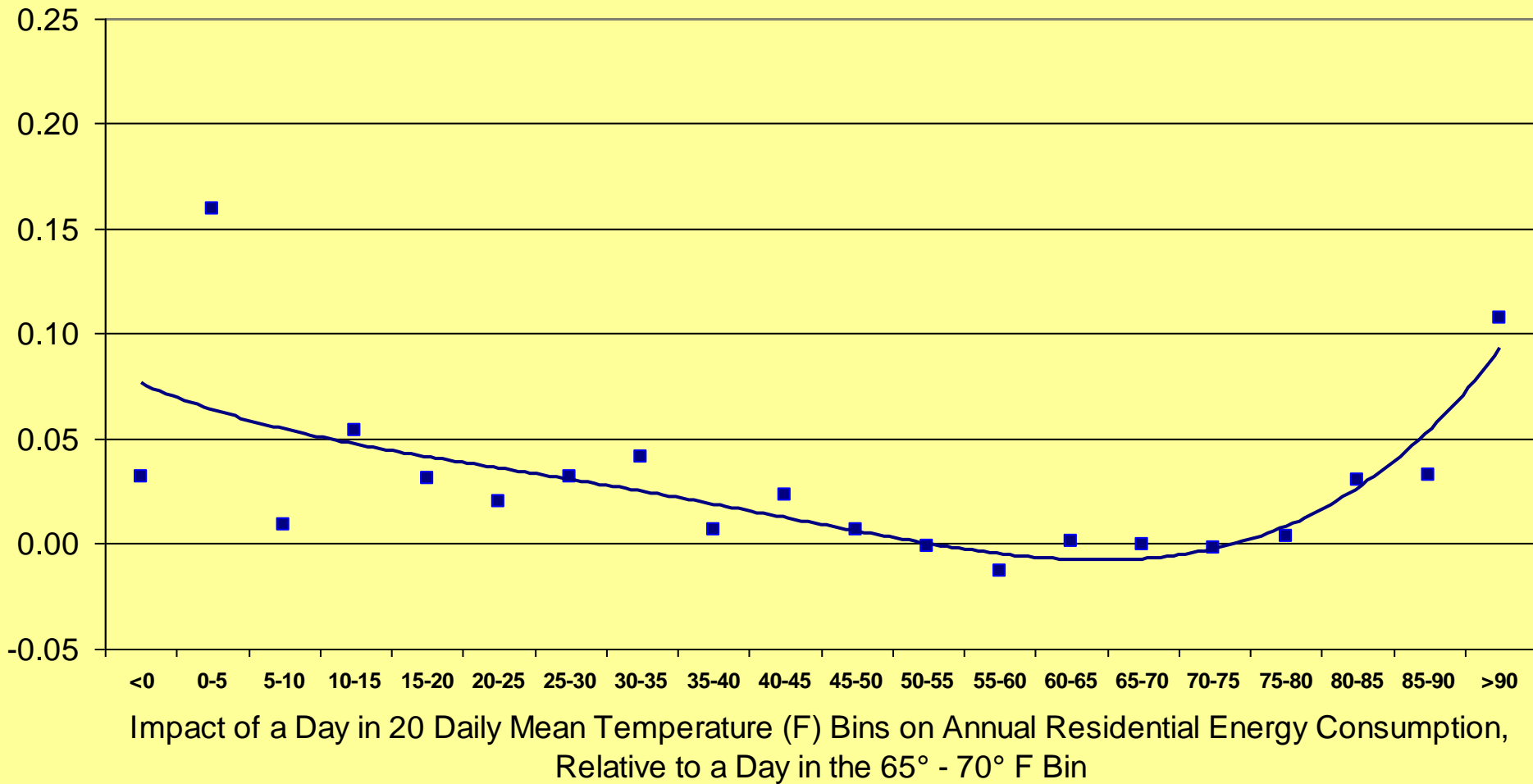


**Note: Population-weighted sum of age-specific response functions**

# Predicted change in annual female and male mortality

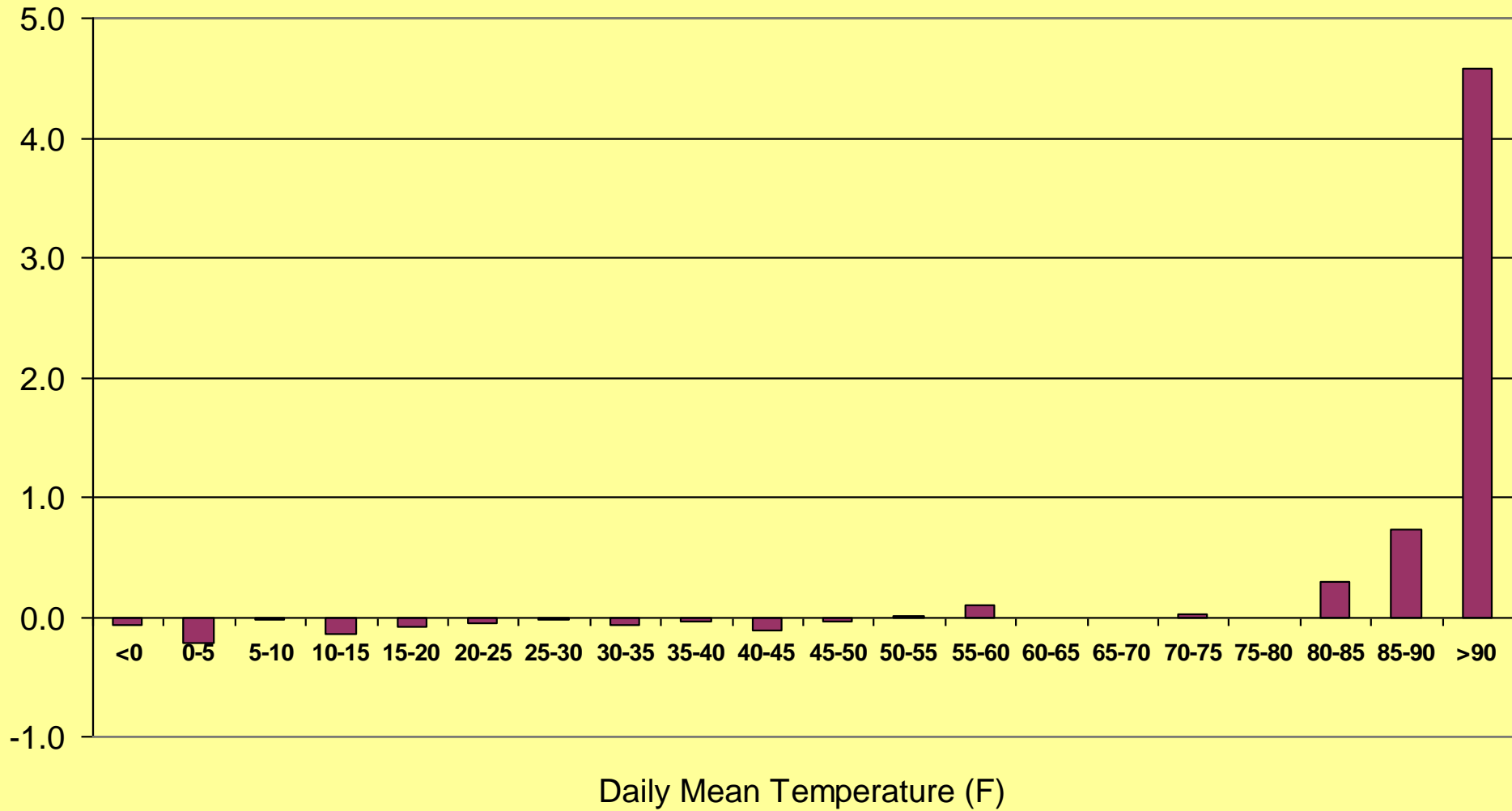


# Estimated Response Function Between Daily Temperature and Residential Energy Consumption



■ Quadrillions of BTUs — Poly. (Quadrillions of BTUs)

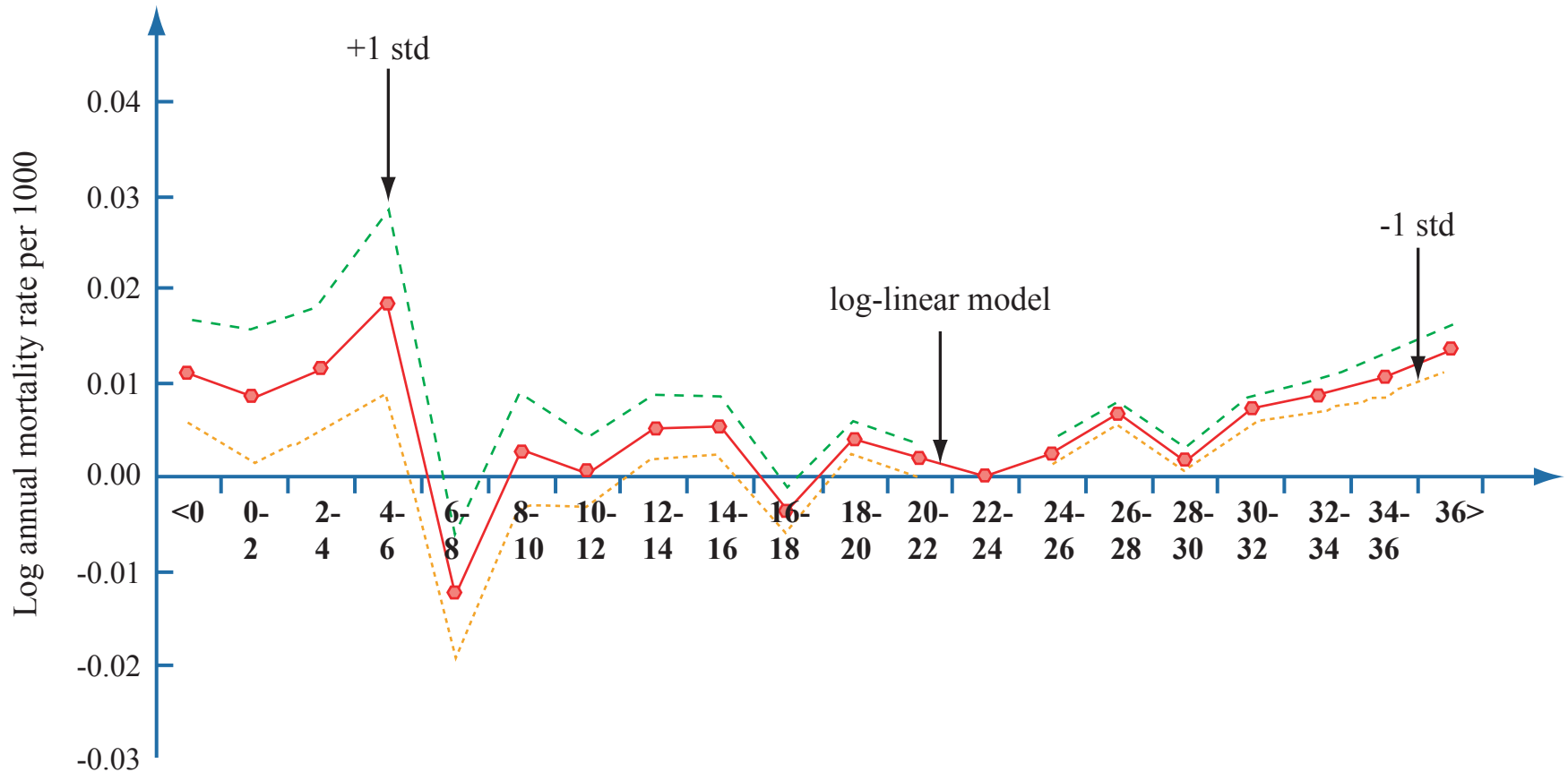
## Predicted change in annual residential energy consumption



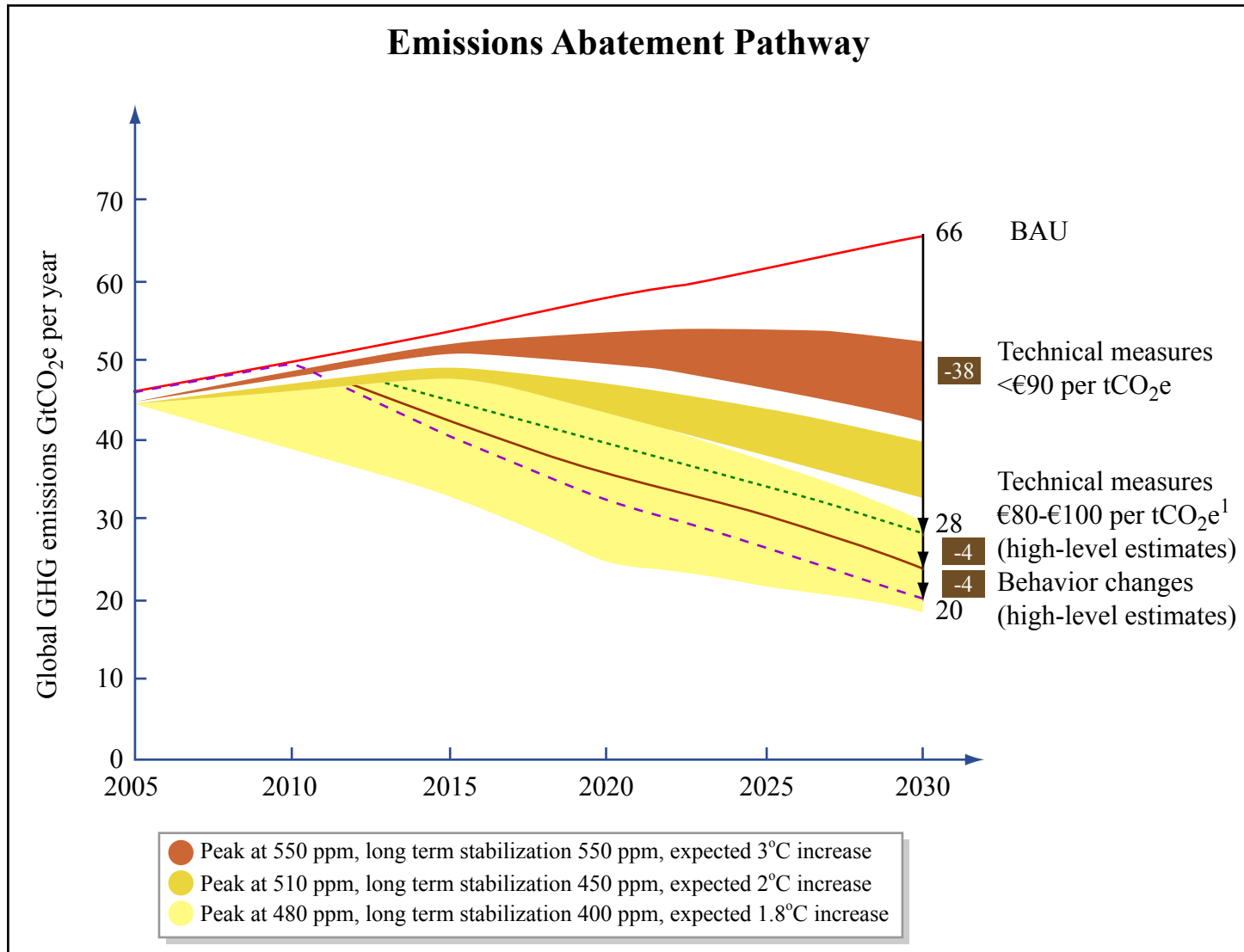
■ Quad BTU

# Results from India (Preliminary)

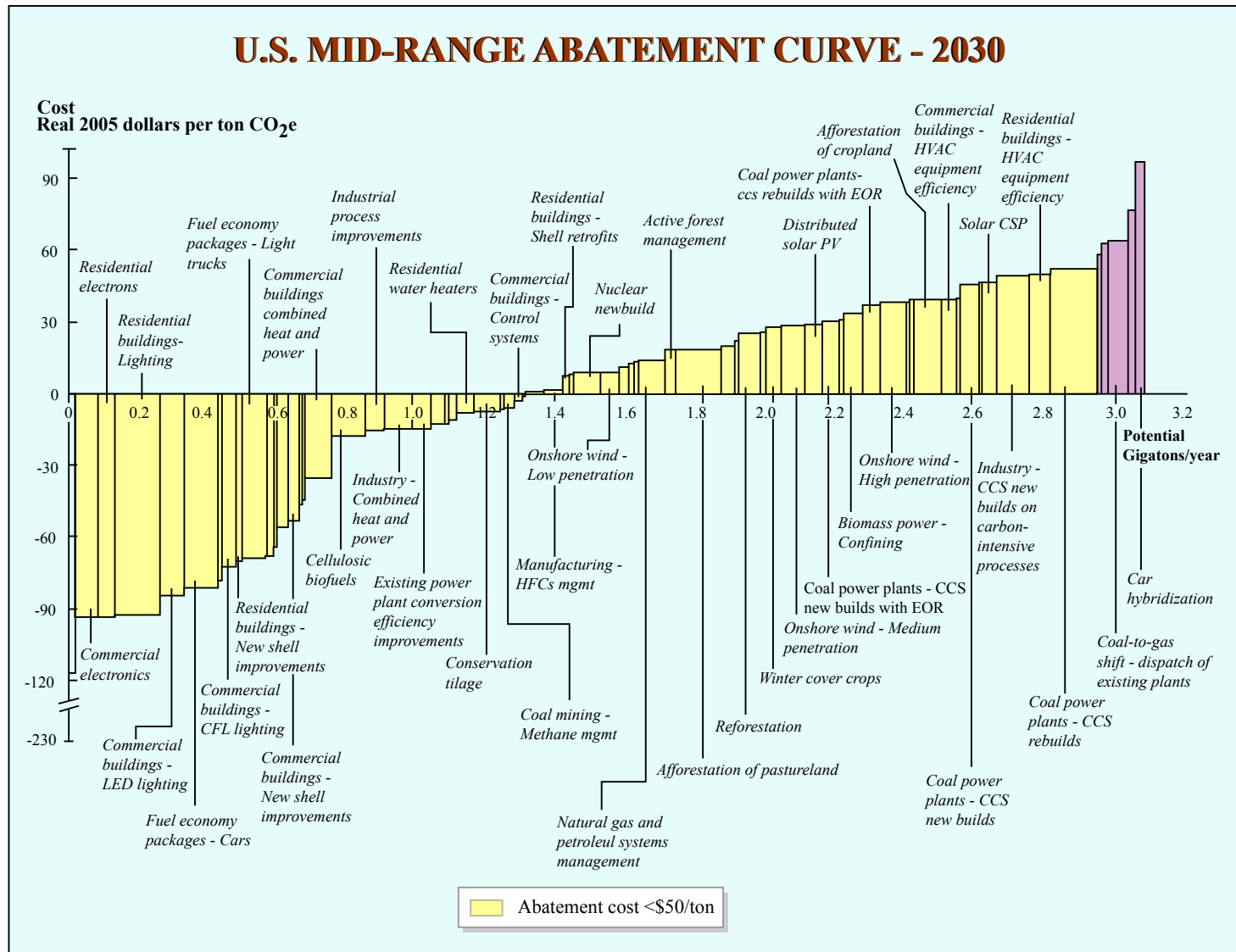
**Estimated Mortality Impact of a Day in 20 Temperature (C) Bins on Log Annual Mortality Rate, Relative to a Day in the 20° - 24°C Bin**



# Carbon Emissions Projections



# Abatement Cost Curves (McKinsey)



# The Economics of Climate Change

- What costs of climate change?
  - What forms of costs?
  - How should we value environmental amenities?
- What costs of greenhouse gas emission abatement?
  - How do we abate emissions? Fuel switching, changes in demand patterns, energy efficiency, sequestration
- Present-future tradeoffs:
  - What discount rate to use?
- Irreversibility/option value
- How to design policy?
  - Taxes? Trading? R&D subsidies? Clean Development Mechanism offsets?
- Equity
- How to decide which policy option?



# Syllabus

## Course Modules:

1. Social Choice and the Role of Government
2. Economic Efficiency and Benefit-Cost Analysis
3. Externalities and Public Goods
4. Optimal Regulation of Pollution
5. Risk and Uncertainty
6. International Trade
7. Environment, Growth, and Development
8. Measuring Benefits
9. Natural Resource Economics
10. Policy Application: Airborne Particulates
11. Policy Application: Climate Change
12. Policy Application: Energy Efficiency

# How I Teach

- Name cards
- Interactive
- Class participation matters
- Goal: prepare you to think about environmental economics in:
  - Econ PhD programs
  - Consulting or industry jobs
  - Policy analysis/think tank jobs
  - Government
- Tools:
  - Theory
  - Stata

# Innovating

- Teaching this class very differently this year
- Different learning modes:
  - In-class participation
  - Business school cases
  - Theory
  - In-class simulations
  - Empirical exercises in problem sets
- New class modules:
  - Energy efficiency
  - Climate change policy
  - Theory of natural resource extraction
  - Environmental issues in developing countries
- Pursue feedback throughout the semester

# Questions for the Class

- Background
  - Why interested in environmental economics?
  - What environmental problems most of interest?
- 
- Background on me.

# Big Questions

- Why did the environmental movement take off in the 1960s?
- Is it really possible to create a market for pollution? How well do these markets work?
- Are pollution taxes better or worse than cap-and-trade programs?
- Is there a “race to the bottom” in environmental regulation?
- How does international trade affect the environment?
- What is the relationship between economic development and environmental quality?
- Are poor countries “under-polluted,” as Pritchett/Summers have claimed?

# Big Questions

- Are we running out of resources?
  - What does “sustainability” mean in economic terms?
  - How do you measure the value of a polar bear?
  - Is there an Energy Efficiency Gap?
- 
- Get ready to answer these questions on Thursday

# Answers to Big Questions

- Get ready to begin answering these questions on Thursday.

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