Climate Damage Risks and Decision-Making

Steven Rose

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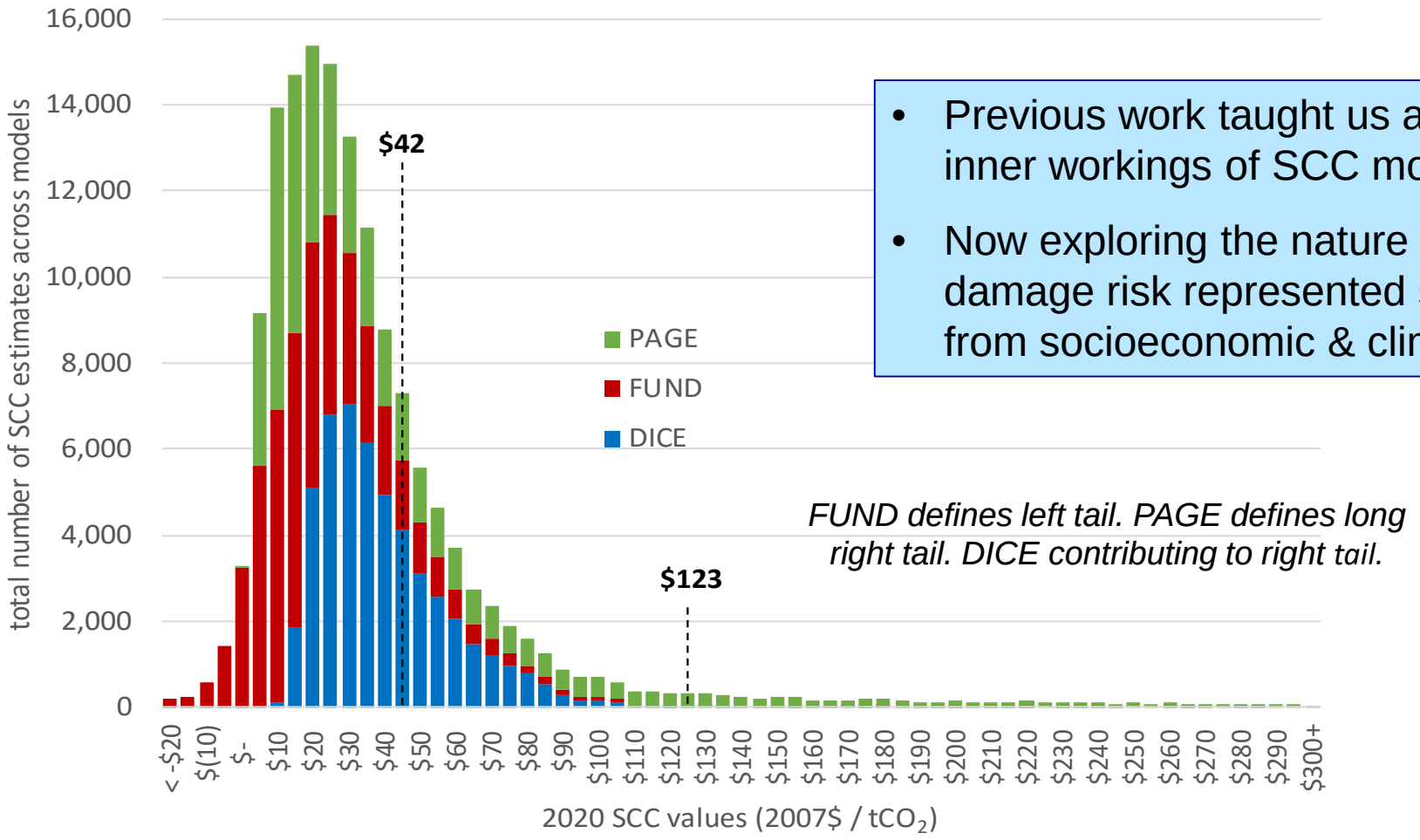
The Importance of Understanding Climate Damage Risks

- **Climate change is a risk management problem**
  - Significant unavoidable uncertainty given the relevant geographic and temporal scope
- **"Damages," i.e., monetary representations of impacts, are important information**
  - Reflects actual preferences and behavior
  - Allows for aggregation of potential impacts
  - Allows for consideration of trade-offs
  - Facilitates prioritization of responses
- **Certainly not without issues** (e.g., who's preferences, market uncertainty, distributional effects)
- **Monetary characterizations of damages uncertainty and risk are needed**, e.g.,
  - Federal and state use of the social costs of CO_2 and other greenhouse gases
  - Informing global climate objectives and emissions pathways
  - Prioritizing adaptation responses
- **Critical research area** that begins with assessing current knowledge for informed decisions today

Representations of Damage Risk Underlie Social Cost of Carbon Outcomes

Histogram of the 150,000 USG SCC estimates for 2020 with a 3% discount rate



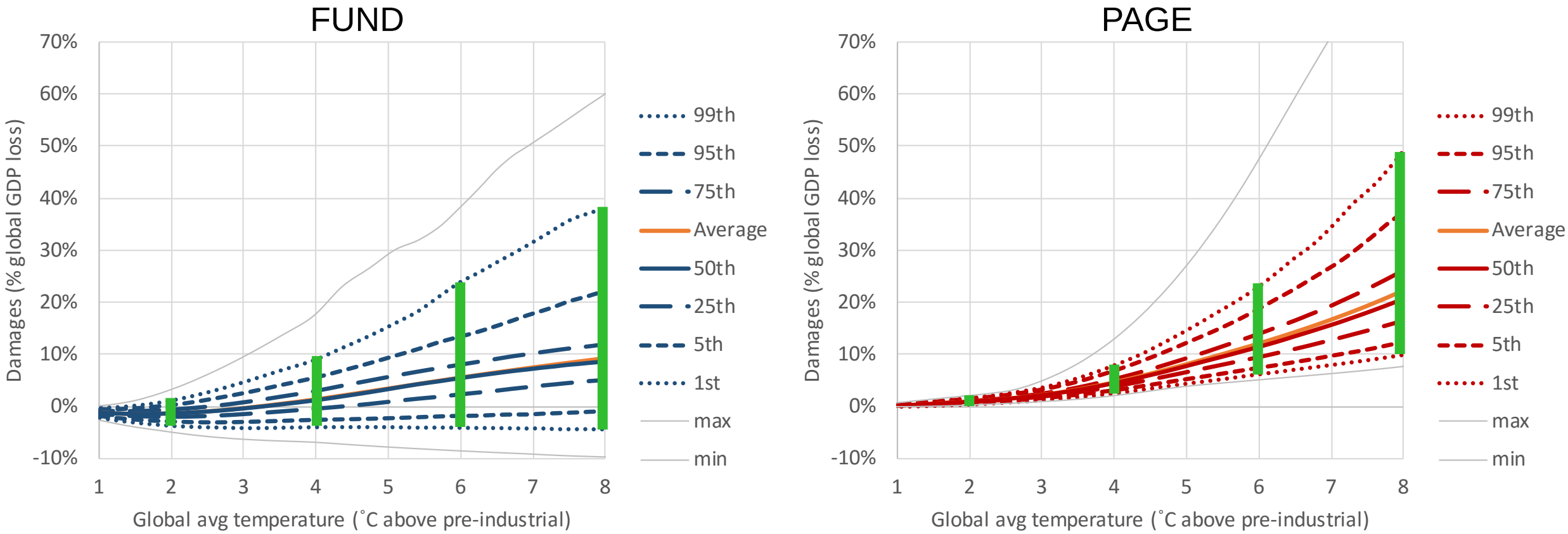
- Previous work taught us about the inner workings of SCC models
- Now exploring the nature of the damage risk represented separate from socioeconomic & climate drivers

FUND defines left tail. PAGE defines long right tail. DICE contributing to right tail.

Source: Rose et al (in review). Developed from USG data available at https://www.whitehouse.gov/omb/oira/social-cost-of-carbon.

Implied Global Damage Uncertainty

Distributions of implied global damage functions derived from EPRI probabilistic modeling of damage components in isolation

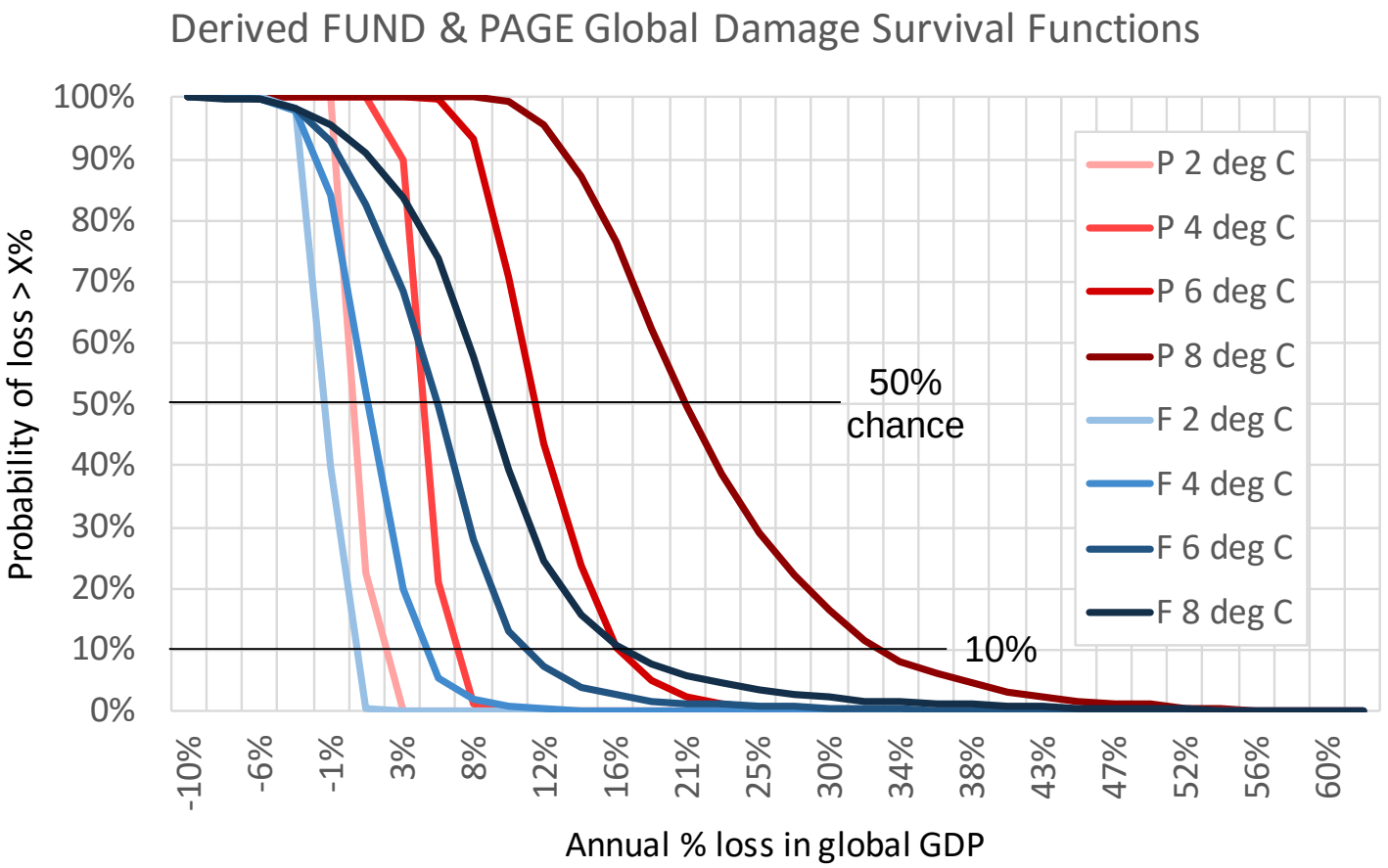


PAGE portrays significantly higher average damages than FUND, with less uncertainty but higher risk of damages

Preliminary

Implied Global Damage Risks

Derived global survival functions by level of warming (above pre-industrial)



	2˚C	4˚C	6˚C	8˚C
50% chance of GDP loss > X				
FUND	(2%)	1%	5%	9%
PAGE	0.5%	4%	11%	21%
10% chance of GDP loss > X				
FUND	0%	4%	11%	16%
PAGE	2%	6.5%	16%	33%
Probability of net benefits				
FUND	60%	16%	7%	5%
PAGE	0%	0%	0%	0%

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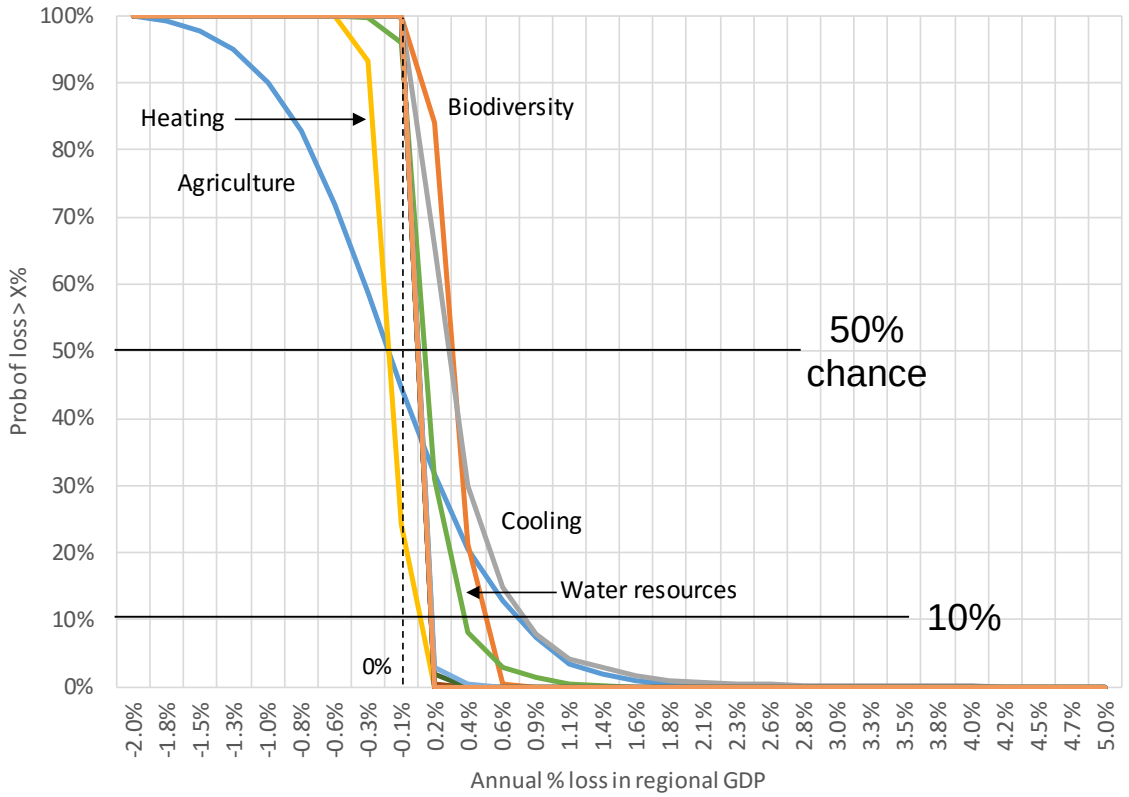
Implied U.S. Damage Risks by Category

Implied U.S. survival functions by damage category for 4˚C warming

FUND



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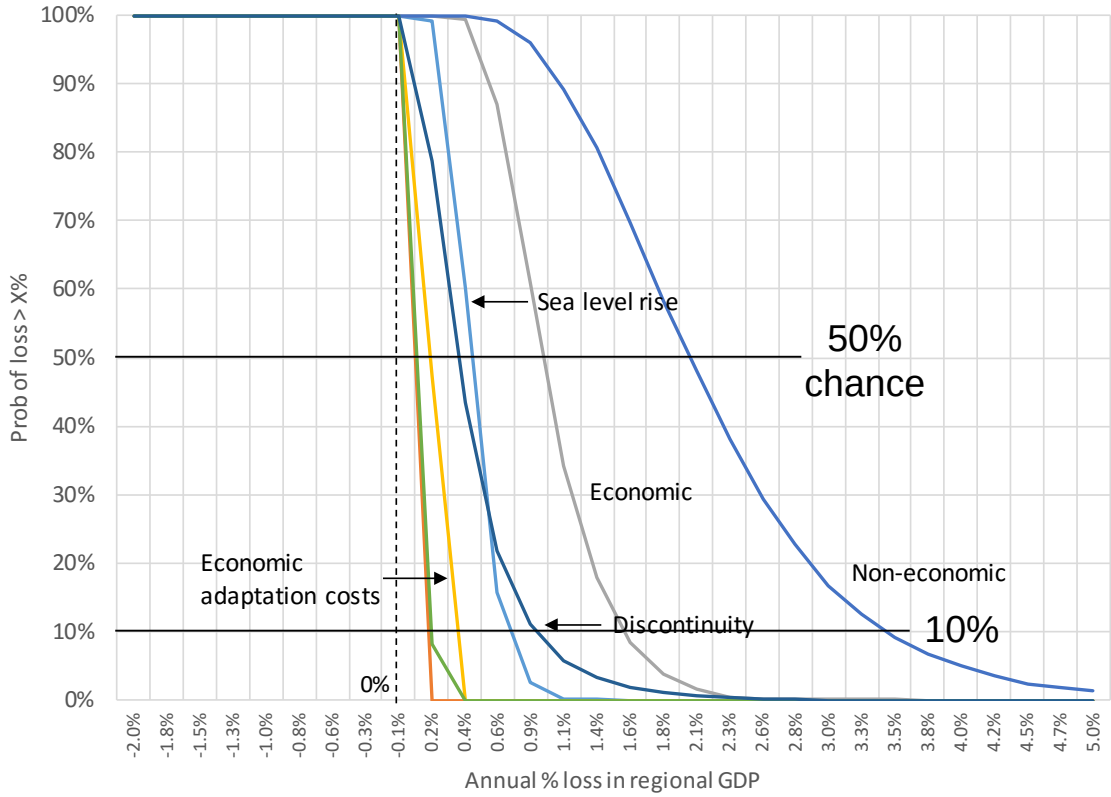

Where do they come from? How do they compare to other characterizations? On-going work.

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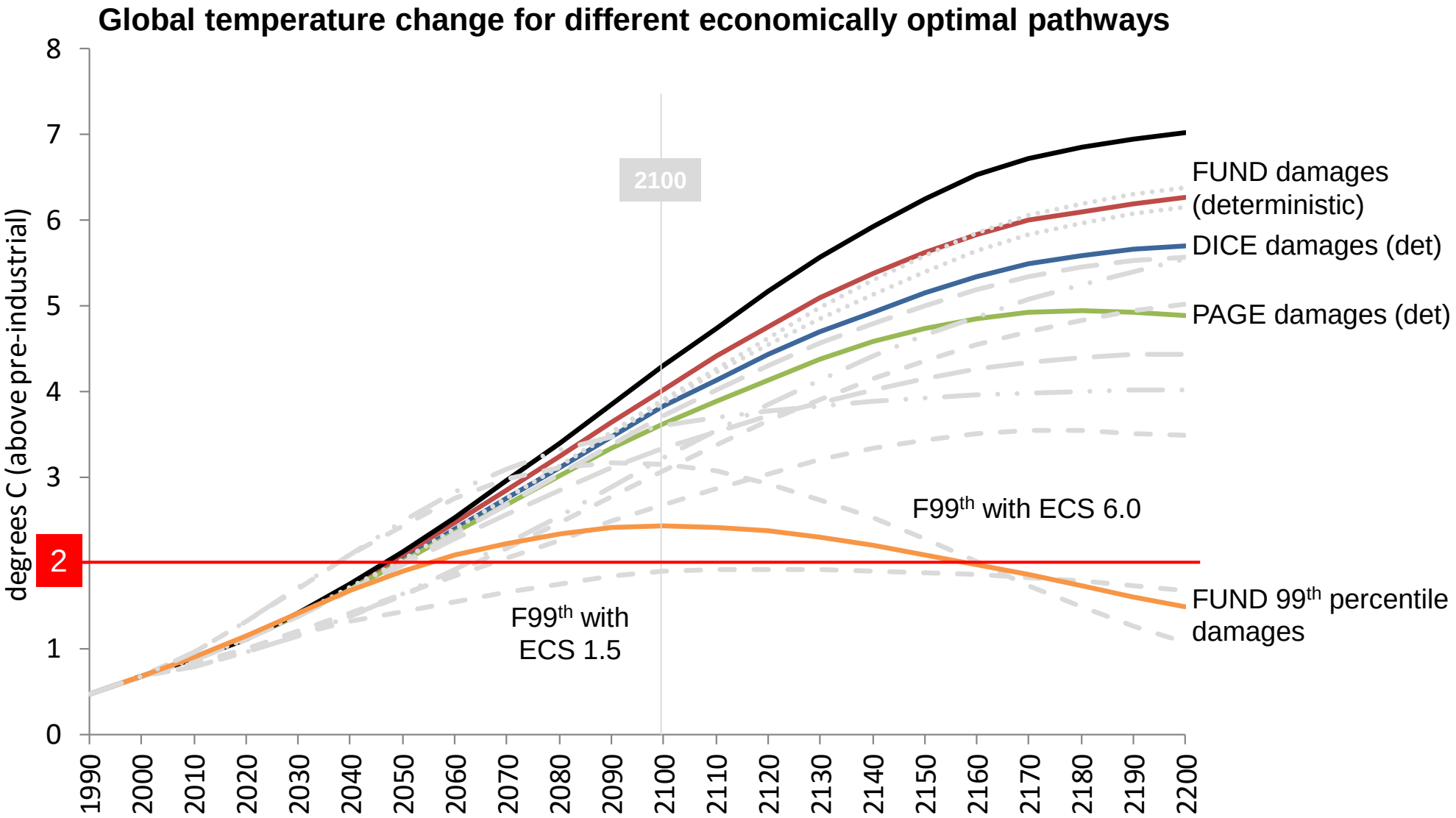
Informing Global Temperature Objectives and Strategy

What Level of Damage Risk is Consistent with a 2˚C Future?



Gray lines represent pathways considering additional uncertainties (e.g., economic growth, climate dynamics, technology)

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Concluding Thoughts

- **Damage risk information needed** – federal, state, city, company, international
- **Understanding & transparency essential** for informed decisions, scientific integrity, research progress
- **Important damage risk issues for decision-makers, and analysts**
  - Understanding the state of the art
    - Communicating what we know and don't
    - Reconciling information from different methods
    - Poorly understood physical processes
  - Transforming knowledge into functions and distributions
  - Expert elicitation opportunities and limits
  - Other uncertainties contributing to risk, e.g., socioeconomics, climate
- **Damage risk perspectives inform mitigation, adaptation, R&D, research**

Thank you!

srose@epri.com