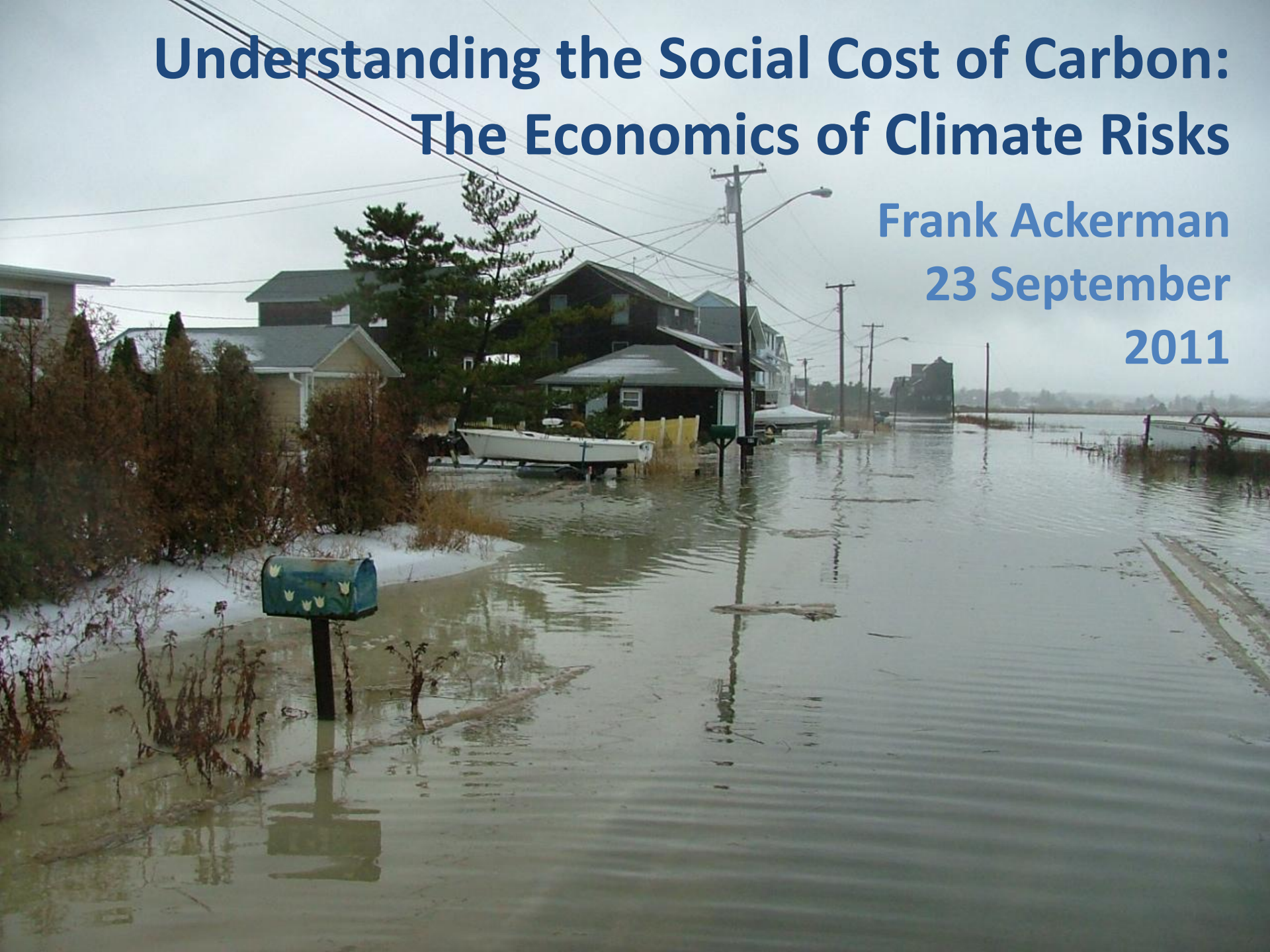


Understanding the Social Cost of Carbon: The Economics of Climate Risks

Frank Ackerman
23 September
2011



America's "social cost of carbon" (SCC)

APPENDIX 15A. SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866

Interagency Working Group on Social Cost of Carbon, United States Government

With participation by

Council of Economic Advisers
Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Energy
Department of Transportation
Environmental Protection Agency
National Economic Council
Office of Energy and Climate Change
Office of Management and Budget
Office of Science and Technology Policy
Department of the Treasury

(No office, no address, no website, no publicity, no named authors)

The number: **\$21** per ton of CO₂

- The \$21 estimate is an average of 15 results
 - 5 emission scenarios, 3 models; constant 3% discount rate
- Emission scenarios from EMF-22
 - Roughly comparable to IPCC's B2 emissions
- Model averages
 - PAGE: \$30
 - DICE: \$28
 - FUND: \$6
- FUND estimates big net benefit in agriculture
 - Based on very old research, now out of date
 - Also contains a serious software bug (divide-by-zero error)

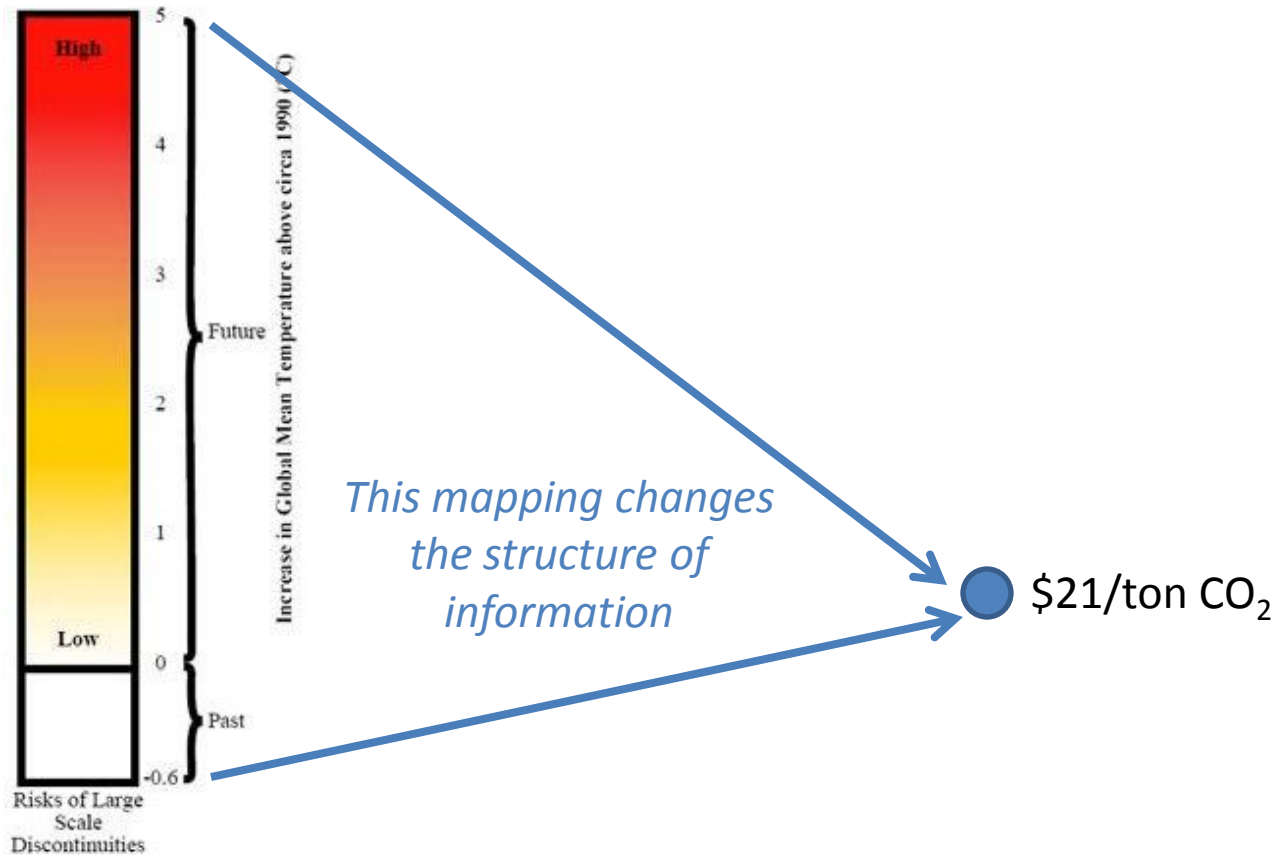
Climate science vs. economics

- Climate change in science
 - Immediate response is needed
 - Business as usual threatens lives, communities
- Climate change in economics
 - Cost-benefit analysis is needed
 - Important to ensure we don't spend too much
- Both cannot be correct!
 - A major effort to refute the science has failed
 - Therefore, a new climate economics is needed

Mapping science to economics: 1

*Scientific assessment
of damages*

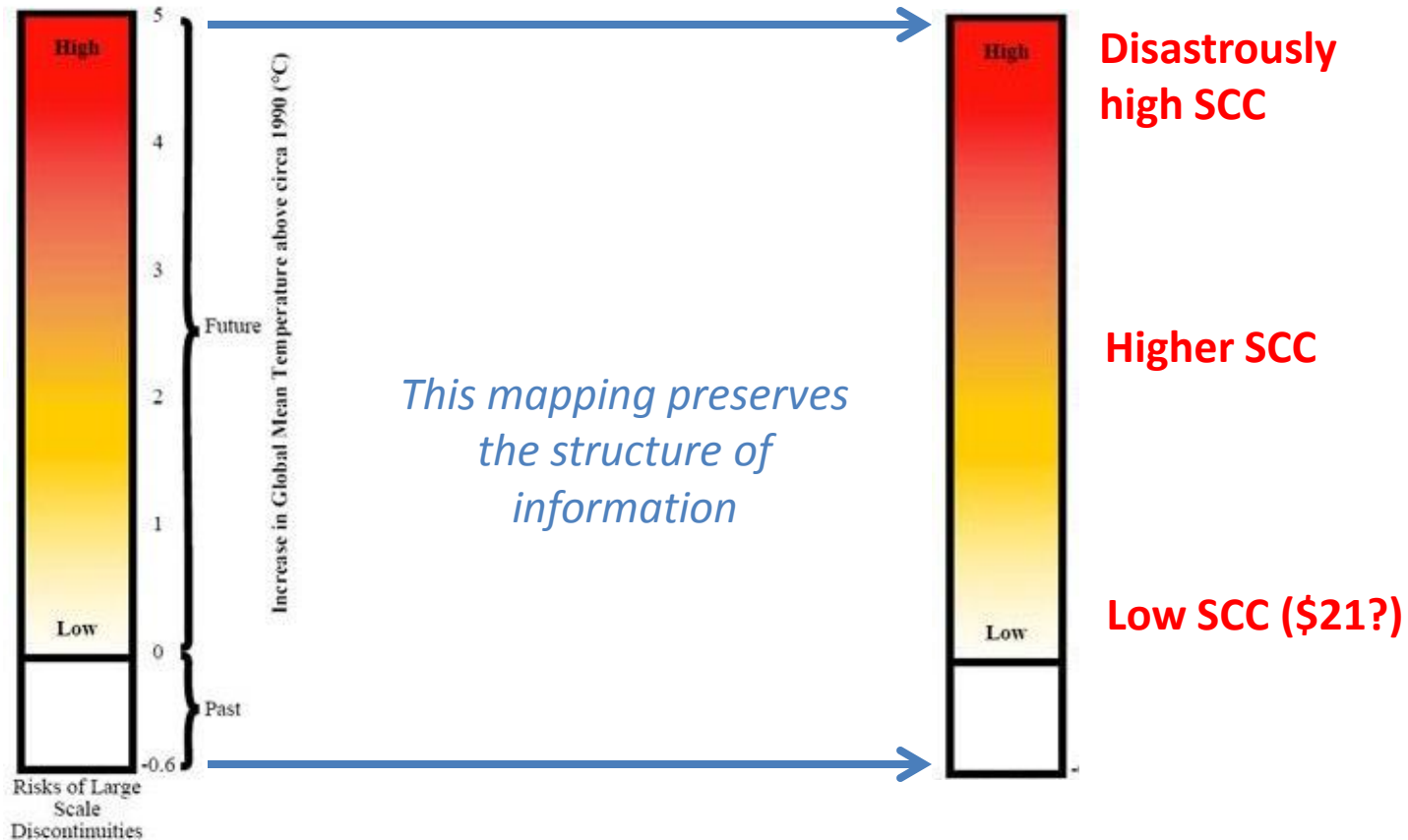
*Economic assessment
of damages*



Mapping science to economics: 2

*Scientific assessment
of damages*

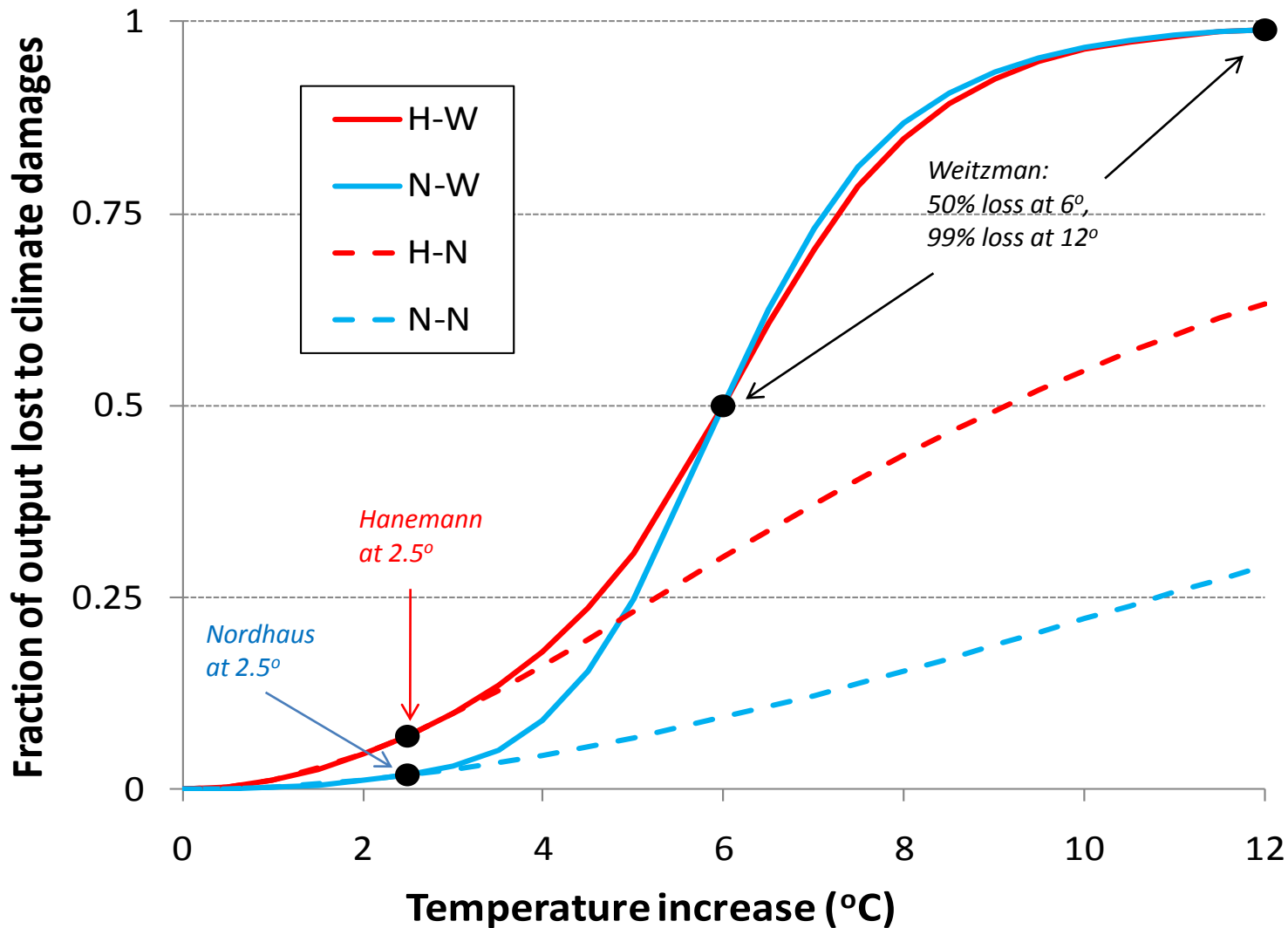
*Economic assessment
of damages*



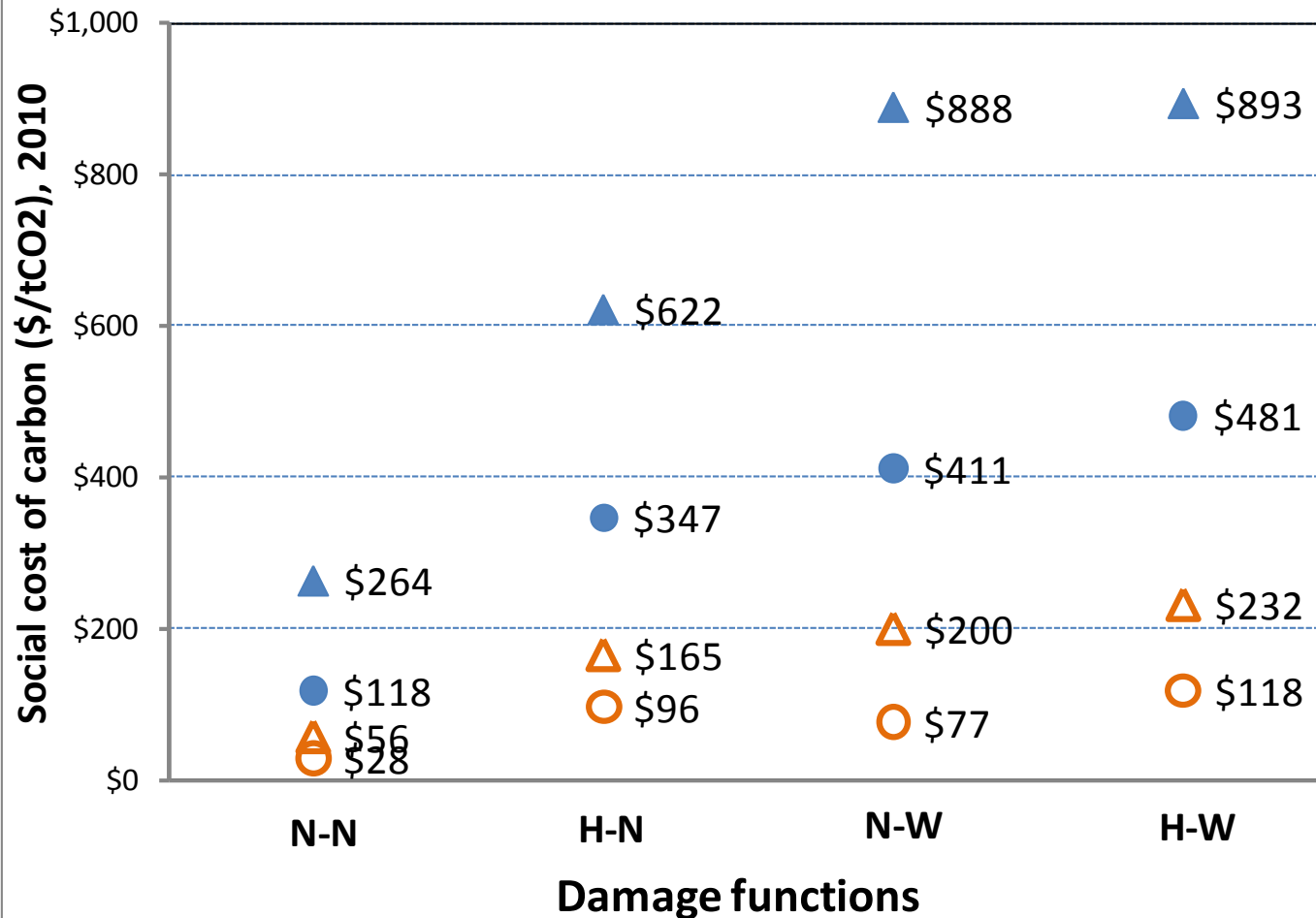
Our re-analysis of SCC

- Use DICE model, as modified by Working Group for US analysis of SCC
- Explore effects of four variations
 1. Median vs. 95th percentile climate sensitivity (3.0 vs. 7.1)
 2. Discount rate: 3.0% vs. 1.5% (close to Stern Review rate)
 3. Low-temperature damages:
 - DICE default (low) vs. Hanemann estimate (4 x DICE)
 4. High-temperature damages:
 - DICE default (low) vs. Weitzman estimate (disaster at 12°C)

Four damage functions

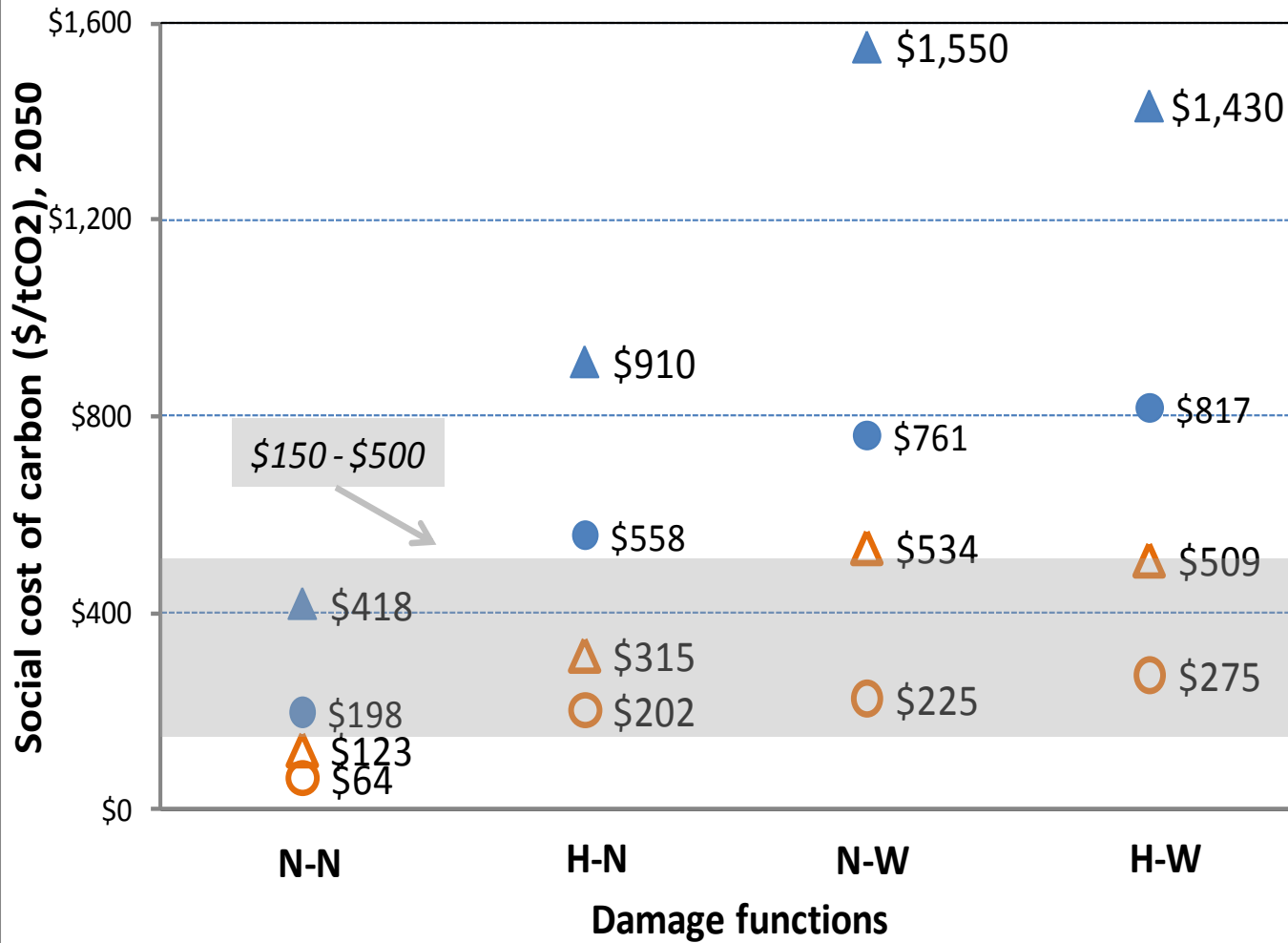


Alternate SCC values, 2010



▲ 1.5%, 95th percentile ● 1.5%, average ▲ 3%, 95th percentile ○ 3%, average

Alternate SCC values, 2050



Marginal cost of maximum feasible abatement scenarios

- ▲ 1.5%, 95th percentile
- 1.5%, average
- ▲ 3%, 95th percentile
- 3%, average

Costs of rapid abatement

- Inter-model comparison project (PIK)
 - Five models: scenarios stabilizing at 400 ppm CO₂ by 2100
 - Marginal cost in 2050: \$150 - \$500 / ton CO₂, average \$260
- International Energy Agency “BLUE Map”
 - Stabilization at 450 ppm CO₂
 - Marginal cost in 2050: \$175 - \$500 / ton
 - Range of estimates reflects technology optimism / pessimism
- UK (DECC) guidance on long-term carbon prices
 - Marginal abatement cost for a 2°C scenario
 - Range of about \$150 - \$500 / ton in 2050

How close to infinity is close enough?

- Under many of our variants, the SCC exceeds the marginal cost of maximum feasible abatement
 - So anything reasonable passes a cost-benefit test
 - Cost-benefit analysis becomes identical to precaution
- Weitzman: under plausible assumptions, the marginal benefit of abatement is infinite
 - Our analysis: under worst-case risks, SCC is so high that it has the same implication as infinite cost
 - Doubling worst-case SCC has no effect on policy
 - Compare to: $2 * \infty = \infty$



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Stockholm Environment

Institute - US Center

Tufts University

Boston

Our study of the SCC:

<http://www.economics-ejournal.org/economics/discussionpapers/2011-40>