LECTURE 18: CLIMATE CHANGE POLICY

14.42/14.420

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Today's Class: Climate Change

- "The biggest market failure the world has ever seen."
  - Sir Nicholas Stern (2008)

The Stern Report

- Commissioned by the British government
- 700-page report released in October 2006.
- Sir Nicholas Stern
  - Chair of the Center for Climate Change Economics and Policy at Leeds University and LSE
- Reviews the science and economics of climate change and makes policy recommendations.
- Perhaps the most public discussion of the issue by an economist.
- Also the most controversial.

Stern's Argument

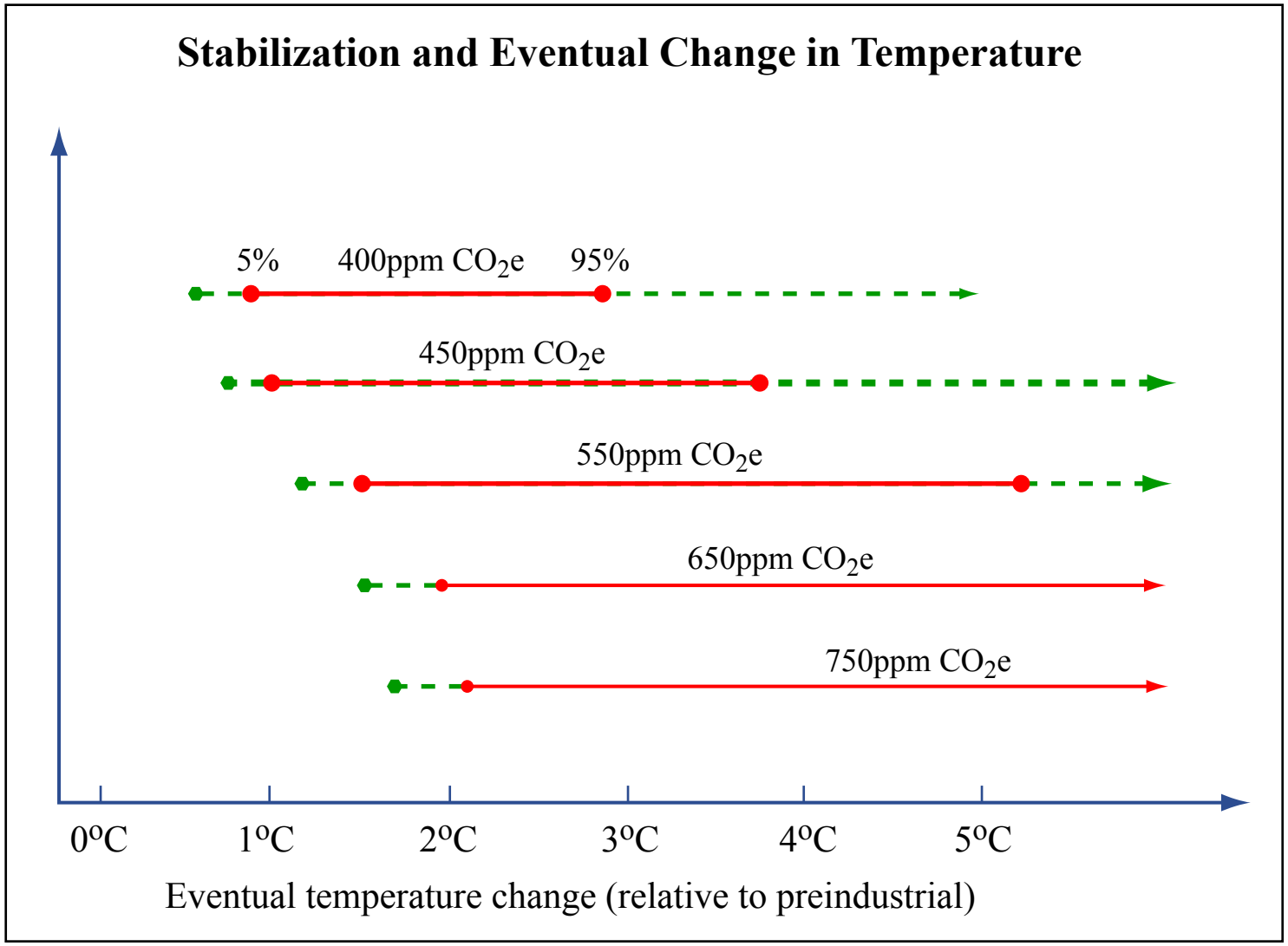


Image by MIT OpenCourseWare.

Stern's Argument (Continued)

- "The bottom-up, disaggregated, less formal, risk-evaluation approach is preferable to aggregate modeling in investigating the case for action."
- 5 degrees C temperature increase: "Alligators near the North Pole."

Likelihood (in Percentage) of Exceeding a Temperature Increase at Equilibrium

Stabilization level (in ppm CO_2e)	2°C	3°C	4°C	5°C	6°C	7°C
450	78	18	3	1	0	0
500	96	44	11	3	1	0
550	99	69	24	7	2	1
650	100	94	58	24	9	4
750	100	99	82	47	22	9

Marginal Abatement Cost Curves

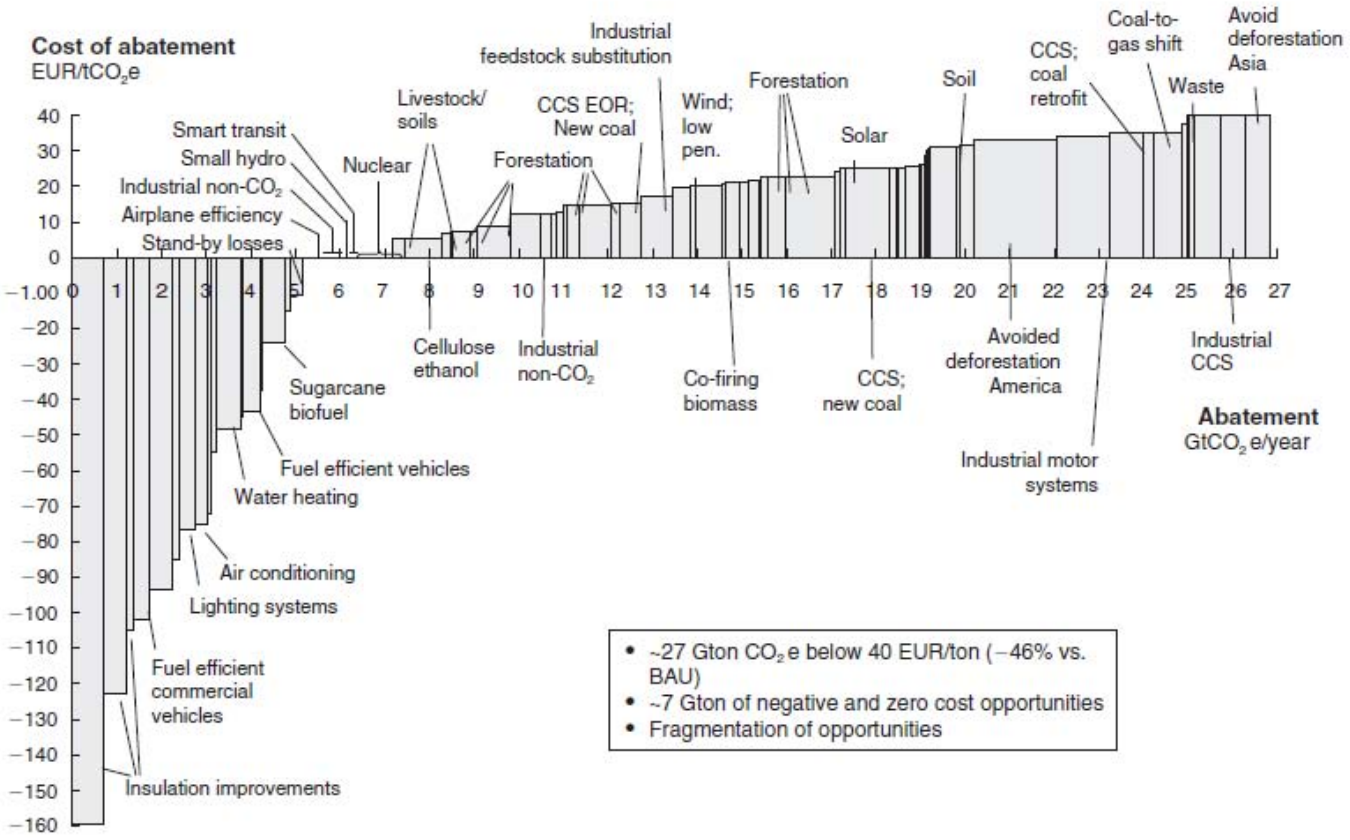


FIGURE 4. MCKINSEY BOTTOM-UP APPROACH TO ABATEMENT COSTS

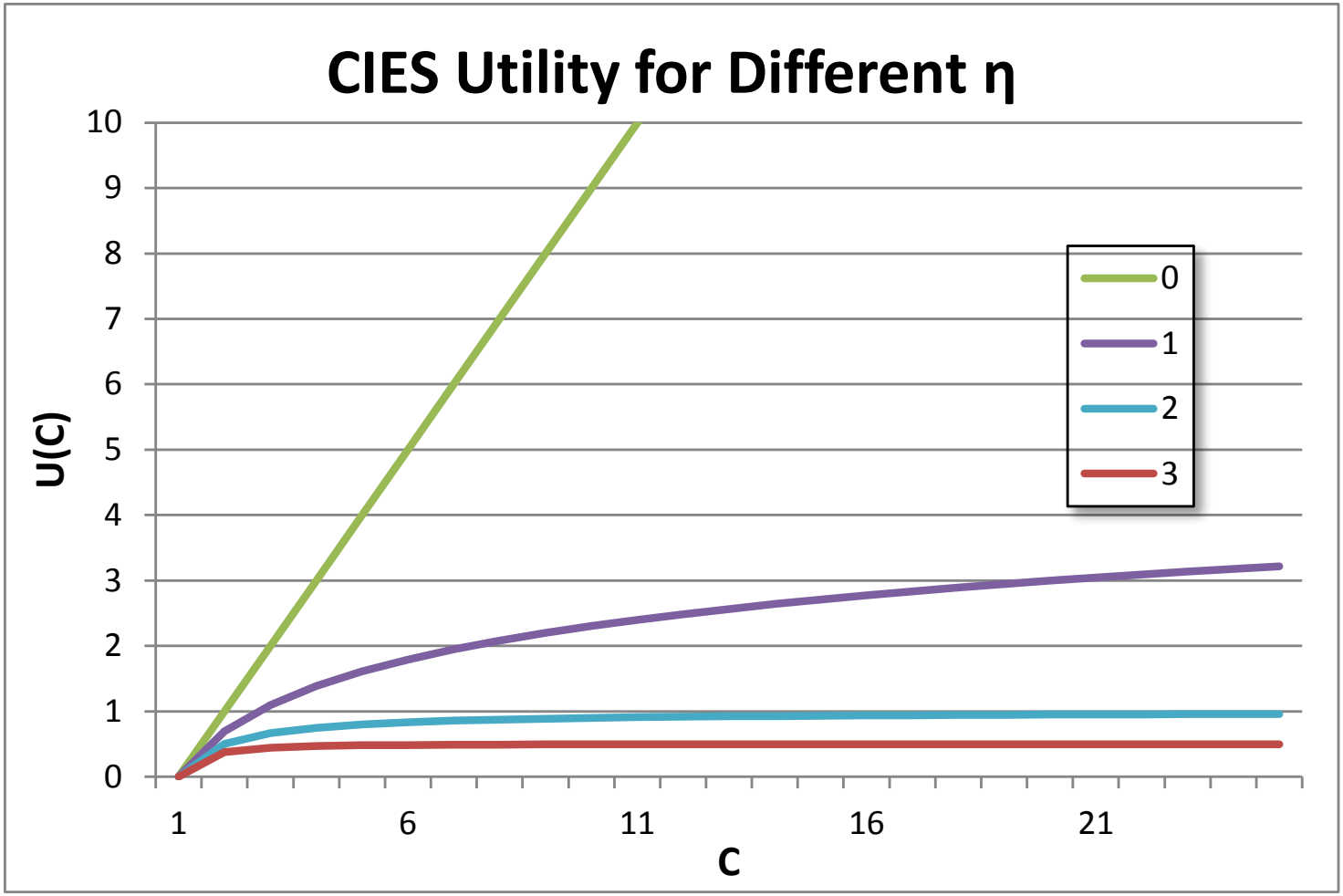
Source: Enkvist et al. 2007, 38.

Stern's Argument

- Sensitive to two issues:

1. Choice of discount rate
2. How to model risks

Constant Elasticity of Substitution



Setting η

- Stern's "Leaky Bucket" argument: For example, given the current income distribution in the United States, an η of two would imply that a redistribution from the fifth-richest decile to the second-poorest decile would be welfare-improving even if only 7 percent of the transfer reached the recipient
- For a transfer from the richest decile to the second-poorest, virtually any redistribution would be welfare-improving regardless of loss along the way, so long as the recipient received some benefit
- (Atkinson and Brandolini 2007, 14).

Nordhaus (2007): “A Wrinkle Experiment”

- Consider a “wrinkle in the climate system” that will cause damages = 0.1 percent of consumption starting in 2200, forever after.
- How much would we pay now to eliminate that?
- How much would we pay now to buy an insurance contract to eliminate a 10% chance of that?

Weitzman (2007): "Long-Term Discounting"

- Analogy to Stern Review's Question: should we sacrifice C=1% of GDP now to remove damages of B=5% of GDP in 100 years?
- With $\delta=0$, would trade off a fixed fraction of GDP for that same fixed fraction of GDP at *any* future time.
- With $\delta=0.1$ and $\eta=1$, then B/C ratio is 4.5/1.
- But with $\delta=2$ and $\eta=2$, the B/C ratio is 0.1/1 = 1/10.

Weitzman's Bottom Line

- While there may be something to Stern's position about the limited relevance of market-based inferences for putting welfare weights on the utilities of one's great-grandchildren, and there might be some sporadic support for Stern's preferred taste parameters scattered throughout the literature, I ultimately find such an extreme stance on the primacy of $\delta=0$, $\eta=1$ unconvincing when super-strong policy advice is so dependent upon nonconventional assumptions that go so strongly against mainstream economics.
- Journal of Economic Literature, page 709.

Weitzman's Fat Tails

Multiplicative-Quadratic Damages *M(T)* (As Fraction of Output)

G:	400	500	600	700	800	900
Median T	1.5°	2.5°	3.3°	4.0°	4.5°	5.1°
$Prob_P$ [T ≥ 5°C]	1.5%	6.5%	15%	25%	38%	52%
$Prob_N$ [T ≥ 5°C]	10^{-6}	2.0%	14%	29%	42%	51%
$Prob_P$ [T ≥ 10°C]	.20%	.83%	1.9%	3.2%	4.8%	6.6%
$Prob_N$ [T ≥10° C]	10^{-30}	10^{-10}	10^{-5}	.1%	.64%	2.1%

T	2°C	4°C	6°C	8°C	10°C	12°C
M(T)	1%	4%	8%	13%	19%	26%

Takeaways

- The Stern Report takes an unconventional economic approach:
  - Very low discount rate
  - Essentially assumes vertical MD at 550 ppm.
- But this may have informally achieved the formal answer:
  - Risk adjustment gives low discount rate
  - Weitzman's fat tails argument is related to steeply sloped marginal damages.
- Still substantial disagreement among economists about climate policy:
  - What discount rate?
  - How to structure policy, especially given second best political economy?
- But many of the same core concepts hold:
  - Separate efficiency and equity
  - Equate marginal costs and marginal benefits
  - Find intertemporal Pareto optimum for abatement path

Reading for Next Time

- “South Pole Carbon Asset Management: Going for Gold?”
- Again, Thursday’s class will be driven by discussion.
- I will send discussion questions tonight.

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