

U.S. Social Cost of Carbon

Gernot Wagner



CLIMATE SHOCK

Gernot Wagner
Martin Weitzman

* Forthcoming
late 2014/
early 2015,
Princeton
University
Press

\$40

Large differences in Social Cost estimates

All > -\$15, given \$500 billion in global fossil fuel subsidies

Study	Value (\$/tCO ₂)
Stern (2007)	\$85/tCO ₂
Nordhaus (2008)	\$12/tCO ₂
UK Government Economic Service (2002)	\$30/tCO ₂
Obama Administration (2009)	\$21/tCO ₂
Obama Administration (2013) for year 2020	\$43/tCO ₂ ; \$129/tCO ₂ 95%
Reference values	Value (\$/tCO ₂)
EU emissions trading price (today)	\$7/tCO ₂
RRGI auction price	\$3/tCO ₂
British Columbia carbon tax (current)	\$30/tCO ₂
Sweden carbon tax	\$150/tCO ₂ but with exemptions
Australia carbon tax	\$23/tCO ₂ , but for only 300 sources; to equal EU ETS price in 2015! New government wants to repeal.

Social Cost used in >20 U.S. federal rules since 2010

Each regulatory use provides opportunity for public comments

e.g.

- Energy Conservation Standards for Standby Mode and Off Mode for Microwave Ovens, 77 Fed. Reg. 8526 (Feb. 14, 2012)
- Energy Conservation Standards for Residential Dishwashers, 77 Fed. Reg. 31,964 (May 30, 2012)
- Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 75 Fed. Reg. 74,152 (Nov. 30, 2010)

...

- Proposed Carbon Pollution Standards for New Power Plants (Nov. 20, 2013)
- Upcoming Carbon Pollution Standards for Existing Power Plants

Office of Management and Budget
initiated additional comment period

~\$40 revised November 2013 Social Cost of CO₂

Small correction to May 2013 revision; e.g. \$37 down from \$38. All in 2007 US\$.

Discount Rate	5.0%	3.0%	2.5%	3.0%
Year	Avg	Avg	Avg	95th
2010	11	32	51	89
2015	11	37	57	109
2020	12	43	64	128
2025	14	47	69	143
2030	16	52	75	159
2035	19	56	80	175
2040	21	61	86	191
2045	24	66	92	206
2050	26	71	97	220

Significant increase over 2010 figures:
\$37 up from \$24

2013 Social Cost up due to new model versions

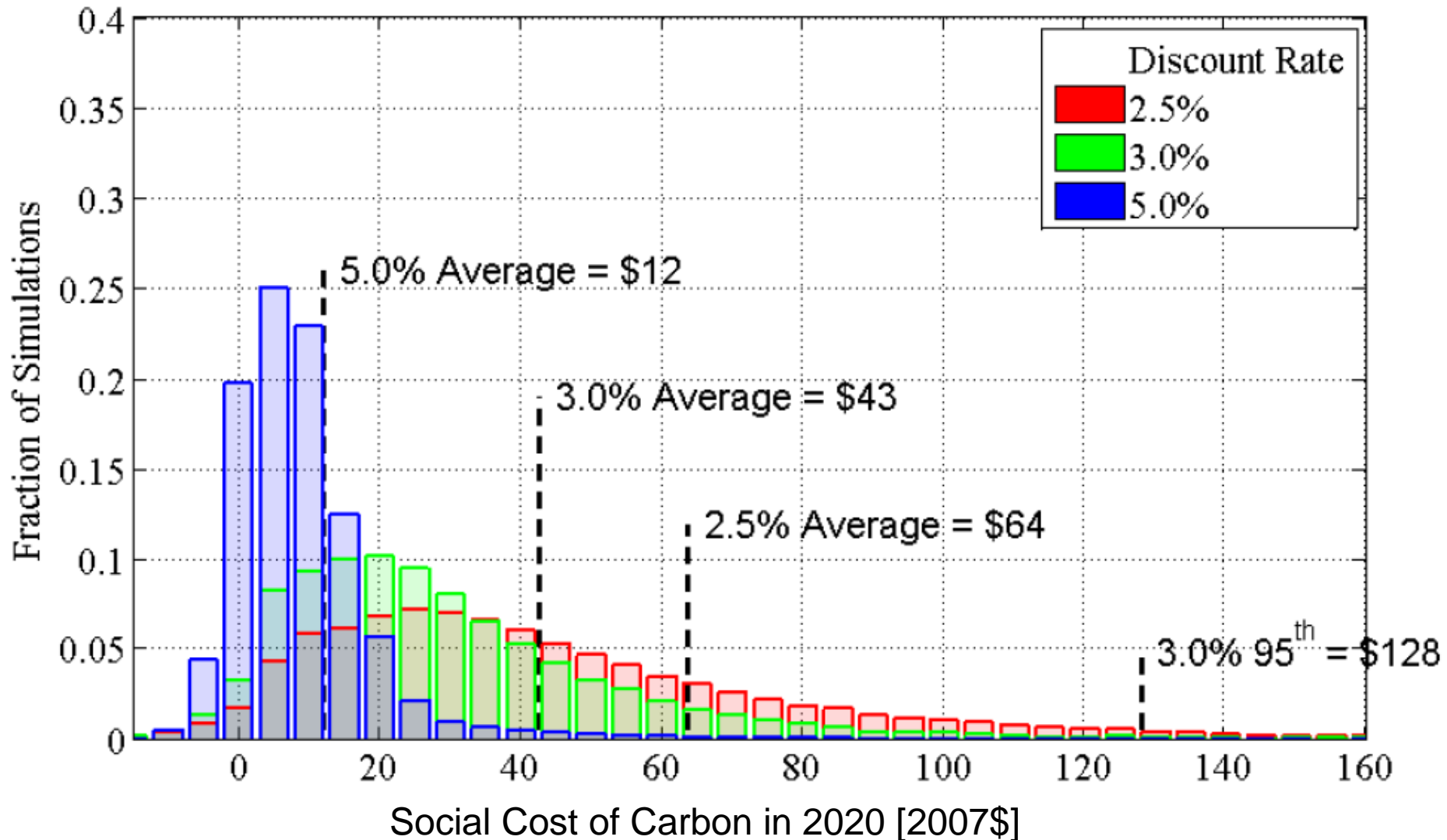
Core assumptions all remained unchanged from 2010 Interagency Working Group

IAM	Version used in 2010 Interagency Analysis	New Version	Key changes relevant to interagency SCC
DICE	2007	2010	Updated calibration of the carbon cycle model and explicit representation of sea level rise (SLR) and associated damages.
FUND	3.5 (2009)	3.8 (2012)	Updated damage functions for space heating, SLR, agricultural impacts, changes to transient response of temperature to buildup of GHG concentrations, and inclusion of indirect climate effects of methane.
PAGE	2002	2009	Explicit representation of SLR damages, revisions to damage function to ensure damages do not exceed 100% of GDP, change in regional scaling of damages, revised treatment of potential abrupt damages, and updated adaptation assumptions.

Update includes damages from sea level rise

Large distribution of Social Cost estimates

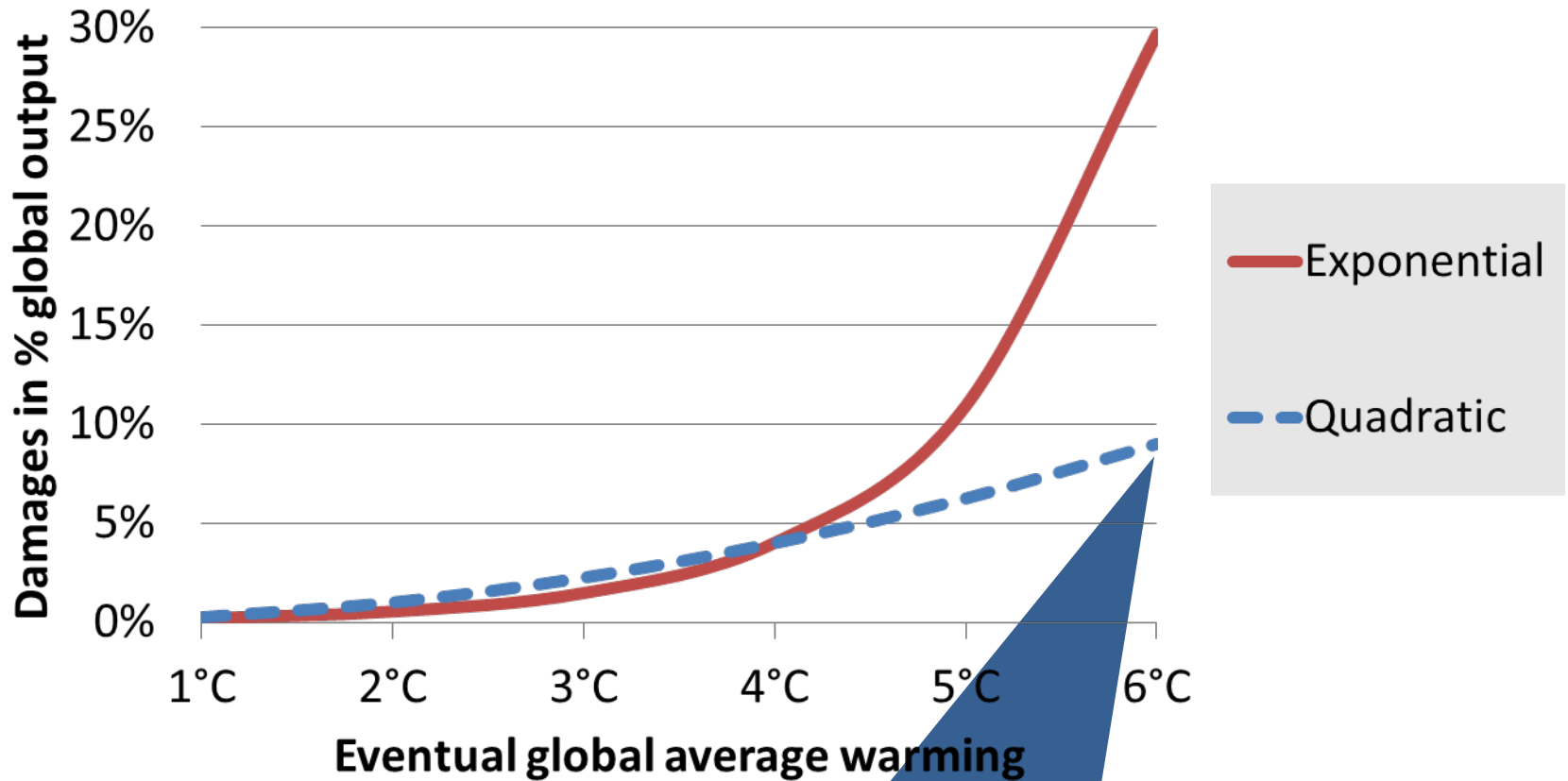
Social Cost of Carbon in 2020 (in 2007 US\$)



Discount rate and
damage functions
drive (almost) all

Shape of damage function critical for Social Cost

Large divergence for temperatures increases $>5^{\circ}\text{C}$ above pre-industrial



DICE et al assume
~quadratic damage function

Would need to know damage *distribution* at each $\Delta^\circ\text{C}$

Current practice of extrapolating from small $\Delta^\circ\text{C}$ – using quadratic function – inadequate

Final $\Delta^\circ\text{C}$	2 $^\circ\text{C}$	2.5 $^\circ\text{C}$	3 $^\circ\text{C}$	3.5 $^\circ\text{C}$	4 $^\circ\text{C}$	4.5 $^\circ\text{C}$	5 $^\circ\text{C}$	5.5 $^\circ\text{C}$	6 $^\circ\text{C}$
Ave. damages as % of GDP	1%	1.5%	2%	3%	4%	?	??	???	????
Prob >50% damages	???%	???%	???%	???%	???%	???%	???%	???%	???%

Quadratic extrapolation of damages likely underestimate

Critical issues for Social Cost updates

Re-running 3 models with 2010 assumptions routine update, but only first step

- Declining discount rate
- Updated damage functions
- Damages as % of growth vs % of levels
- Additive vs multiplicative damages

- Revisit model selection (DICE, FUND, PAGE; CRED?, ENVISAGE?)
- Update assumptions to IPCC Shared Socioeconomic Pathways

- “IBM-ify” Social Cost calculations

“Good job.
More can and must be done.”

CLIMATE SHOCK

Gernot Wagner
Martin Weitzman

* Forthcoming
late 2014/
early 2015,
Princeton
University
Press

It's not over 'til the fat tail zings

Rapidly increasing probability of extreme final temperatures

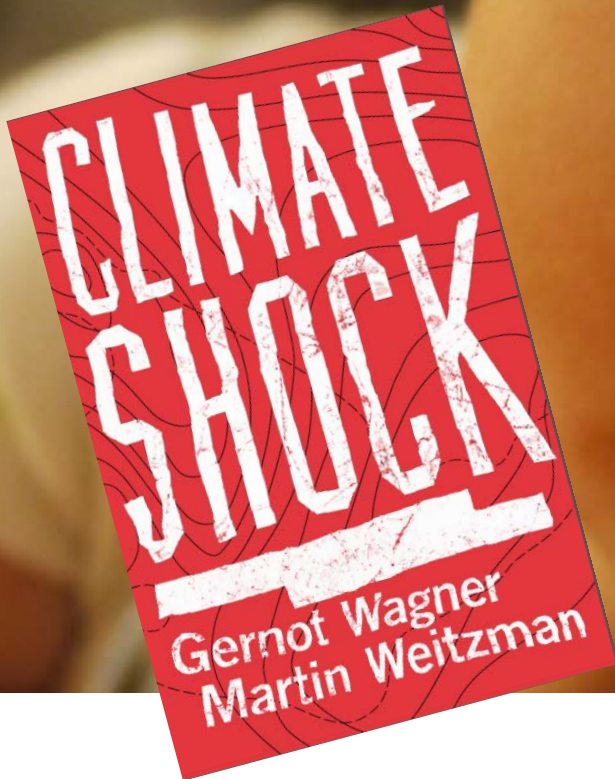
By 2100, per IEA's
"New Policies Scenario"

CO ₂ e (ppm)	400	450	500	550	600	650	700	750	800
Median Δ°C	1.3°C	1.8°C	2.2°C	2.5°C	2.7°C	3.2°C	3.4°C	3.7°C	3.9°C
Prob >6°C	0.04%	0.3%	1.2%	3%	5%	8%	11%	14%	17%

<1.5x

10x

Analysis beyond standard benefit-cost
analysis (and, thus, Social Cost)?



Gernot Wagner
gwagner@edf.org
gwagner.com

