

Neoclassical economics and the climate crisis

www.patreon.com/profstevekeen

www.profstevekeen.com

www.isrs.org.uk

A tale of two planets?

- 2°C “will stress human societies and destroy many natural ecosystems such as rainforests and coral reefs”
- 3°C “the stability of human civilisation will be seriously imperilled...”
- 4°C “a full-scale global collapse of human societies is probable...”
- 5°C “will leave most of the globe biologically uninhabitable, with humans reduced to a precarious existence in small refuges...”
- 6°C: “a runaway warming process that could render the biosphere completely extinct and forever destroy the capacity of this planet to support life...”
- “global annual economic losses for additional temperature increases of $\sim 2^\circ\text{C}$ are between 0.2 and 2.0% of income.”
- “the best guess of the impact of a 3-degree warming by 2090 *would reduce the growth of per capita incomes from, say, 1.5 percent per year to 1.485 percent per year.*”
- “The parameter used in the model was a ... 0.227 percent loss in global income per degrees Celsius squared ... This leads to a damage of ... 7.9 percent of global income at a global temperature rise of 6°C .”

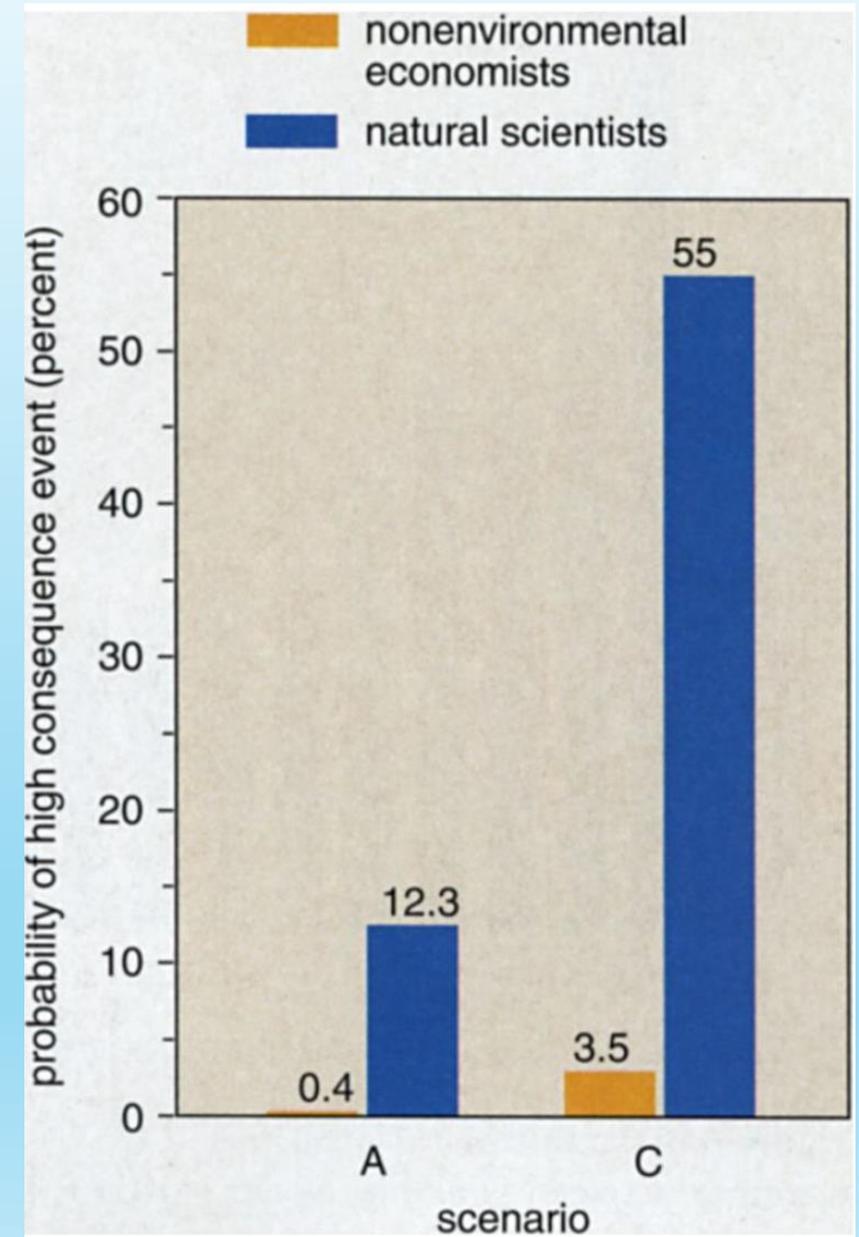
A tale of two planets?

- Left column: [Mark Lynas \(2020\) *Our Final Warning: Six Degrees of Climate Emergency*](#), p. ix
- Right column:
 - *IPCC 2014 Economic Impacts* chapter (Chapter 10; lead co-author Richard Tol);
 - Nordhaus 1991 paper “Expert Opinion on Climate Change”; and
 - Nordhaus 2018 paper “Projections and Uncertainties about Climate Change in an Era of Minimal Climate Policies”, *American Economic Review: Economic Policy*
- Basis of Lynas’s conclusions:
 - Compilation of paleontological research on climate over the last 250 million years
- Basis of conclusions of economists:
 1. “Textbook economics” ideological belief that markets can cope with anything
 2. Confusing temperature distribution today with raising overall global temperature
 3. Assuming activities undertaken indoors are immune from climate change
 4. Made-up “data” ***bordering on fraud...***
 5. Distort or ignore scientific literature
 6. Minimizing expected impact of climate change every step of the way...

(1) Economists' beliefs vs scientists' knowledge

- Nordhaus's "Expert Opinion on Climate Change" surveyed 19 "experts"...
 - "experts hold vastly different views about the potential economic impact of climatic change. At one extreme are the **natural scientists, all three of whom** have profound concerns about the economic impacts of greenhouse warming...
 - At the other extreme are the **other subdisciplines of economics** (those whose principal concerns lie outside environmental economics) these **eight respondents** see much less calamitous outcome—about one-30th of the magnitude estimated by the natural scientists"

Figure 4. Difference in academic discipline separated those making high estimates of the economic impacts from global warming from



(1) Economists' beliefs vs scientists' knowledge

- Comments in Nordhaus survey of 19 “experts”—10 economists *including himself & Larry Summers(!)* 3 climate & atmospheric scientists, & 6 others—from economists
- “another respondent held that **the degree of adaptability of human economies is so high** that for most of the scenarios **the impact of global warming would be “essentially zero”.**”
- “An economist explains that in his view energy and brain power are the only limits to growth in the long run, and with sufficient quantities of these it is possible to adapt or develop new technologies **so as to prevent any significant economic costs.**”
- One respondent suggested whimsically that it was hardly surprising, given that the economists know little about the intricate web of natural ecosystems, whereas natural scientists know equally little about **the incredible adaptability of human societies...**
 - The economists also believed that the “technology fairy” will help:
 - “What is missing most is an understanding of the role of technology”
 - Technology will develop to adjust to and accommodate many of the climatic changes and even provide approaches to counter warming effects”

(1) Economists' beliefs vs scientists' knowledge

- One scientist refused to play Nordhaus's "guess GDP impact of x°C warming" game: "*I marvel that economists are willing to make quantitative estimates of economic consequences of climate change where the only measures available are estimates of global surface average increases in temperature.*"
 - As [one] who has spent his career worrying about the vagaries of the dynamics of the atmosphere, *I marvel that they can translate a single global number, an extremely poor surrogate for a description of the climatic conditions, into quantitative estimates of impacts of global economic conditions.*"
- Nordhaus ignored this, & reported the average predictions of 10 economists (including himself! And Larry Summers!...), just 2 climate scientists, & 6 others, as the "expert opinion" "Figure 2. Estimates ... varied widely ... a 3-degree-Celsius rise, experts predicted a loss ranging from 0 to 21 percent ... Ranges for ... a more rapid warming of 6 degrees by 2090, were ... to 0.8 to 62% percent..."

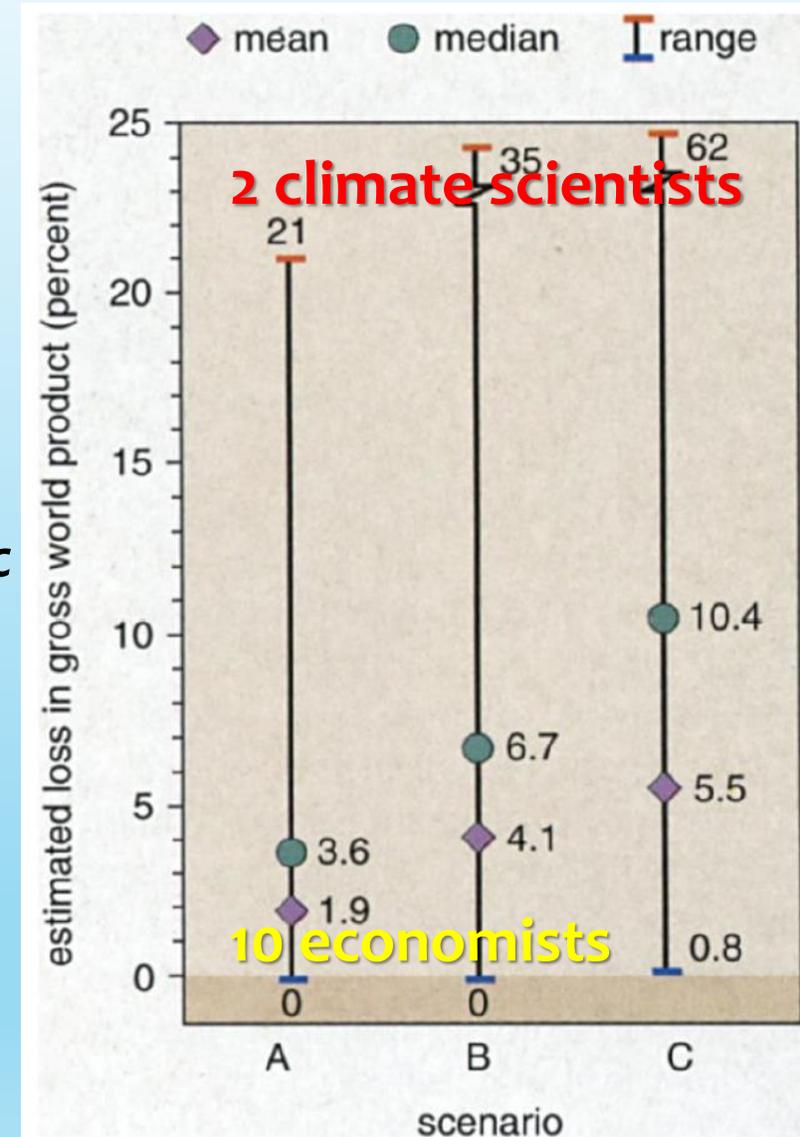


Figure 2. Estimates of the impact on global out-

(2) Climate variation today confused with climate change from huge increase in retained solar energy

- “First, it must be recognised that **human societies thrive in a wide variety of climatic zones**. For the bulk of economic activity, **non-climate variables** like labour skills, access to markets, or technology **swamp climatic considerations in determining economic efficiency**.” (Nordhaus 1991, p. 930)
 - “An alternative approach... is based on direct estimates of the welfare impacts, using observed variations (across space within a single country) in prices and expenditures to discern the effect of climate.
 - Mendelsohn assumes **that the observed variation of economic activity with climate over space holds over time as well**” (Tol 2009)

• **WTF?...**

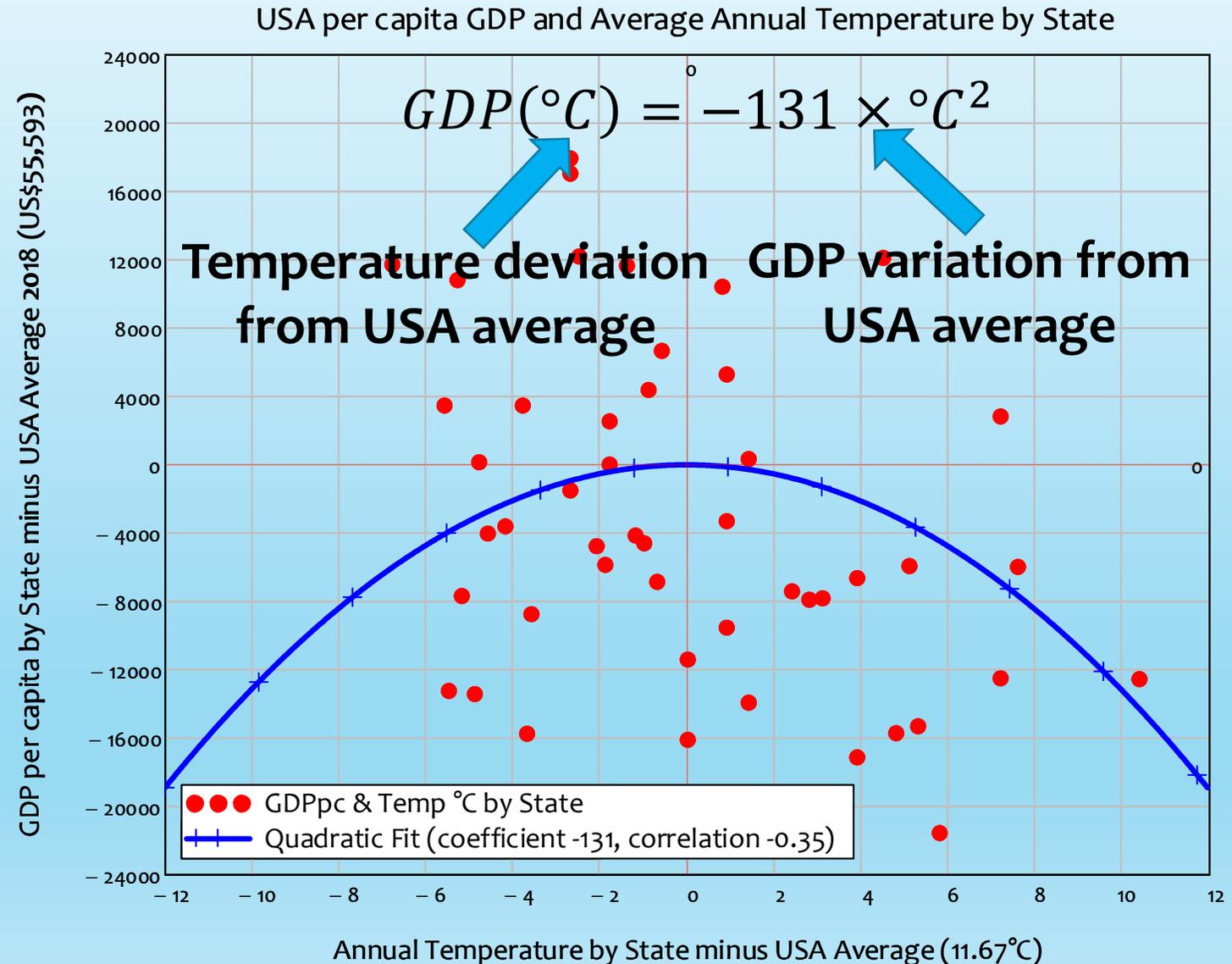
- This is mistaking climate:GDP variations today, **with no change in total energy in the biosphere...**
- **for the impact of climate change as the energy level of the biosphere increases dramatically because of the additional solar radiation retained via increased CO₂...**

(2) Climate variation today confused with climate change from huge increase in retained solar energy

- They took data on average temperature and GDP by region in the USA like this:

State	Celcius	GDP2018pc
Alabama	17	40279
Arizona	18.9	43096
Arkansas	15.6	38467
California	16.2	67698
Colorado	7.9	59057
Connecticut	9.2	67784
Delaware	12.5	66023

- A weak, nonlinear relationship
- Mild temperature State → slightly higher GDP than hot or cold temperature state
- Fitted a parabola to it—like this
- **Then “assumed” climate change would have the same effect!**



(2) Climate variation today confused with climate change from huge increase in retained solar energy

- Tol 2009: “Mendelsohn assumes that **the observed variation of economic activity with climate over space holds over time as well**”
- This *fantasy* generates ludicrously small estimates of the impact of climate change

<i>°C increase over pre-industrial global average temperature</i>	<i>2°C</i>	<i>4°C</i>	<i>6°C</i>	<i>8°C</i>	<i>10°C</i>	<i>12°C</i>
Nordhaus’s <i>actual</i> 2011 “Damage Function” forecasts	-1.00%	-4.00%	-8.0%	-13.0%	-19.0%	-26.0%
Parabola, fitted to today’s USA temperature:GDP distribution	-0.24%	-2.13%	-5.9%	-11.6%	-19.1%	-28.6%
<i>Lynas’s paleontologically based predictions</i>	<i>Possible to almost certain collapse of civilization</i>			<i>Probable end of life on Earth</i>		

- Nordhaus’s more recent estimates are *even lower*: “The parameter used in the model was a ... 0.227 percent loss in global income per degrees Celsius squared ... This leads to a **damage of ... 7.9 percent of global income at a global temperature rise of 6°C.**” Nordhaus, W. (2018). "Projections and Uncertainties about Climate Change in an Era of Minimal Climate Policies." *American Economic Journal: Economic Policy*, Vol 10, p. 345

(3) Assume industry unaffected *because it happens indoors!*

87% of economy
assumed to be
 unaffected!

Negligible effect		
Manufacturing and mining		
Other transportation and communication	152.8	5.5
Finance, insurance, and balance real estate	274.8	11.4
Trade and other services	674.6	27.9
Government services	337.0	14.0
Rest of world	50.3	2.1

Skip to 5

- “Table 5 shows a sectoral breakdown of United States national income, where the economy is subdivided by the sectoral sensitivity to greenhouse warming.
- The most sensitive sectors are likely to be those, such as agriculture and forestry, in

Table 5
Breakdown of economic activity by vulnerability to climatic change, U.S. 1981

Sector	National income	
	Value (billions)	Percentage of total
Transportation and communication	152.8	5.5
Finance, insurance, and balance real estate	274.8	11.4
Trade and other services	674.6	27.9
Government services	337.0	14.0
Rest of world	50.3	2.1

(3) Assume industry unaffected *because it happens indoors!*

- This nonsense is repeated by the IPCC, where mainstream economists like Richard Tol write the economics sections
 - “Economic activities such as agriculture, forestry, fisheries, and mining are exposed to the weather and thus vulnerable to climate change. **Other economic activities, such as manufacturing and services, largely take place in controlled environments and are not really exposed to climate change.**” (IPCC 2014 Report, p. 688)

10

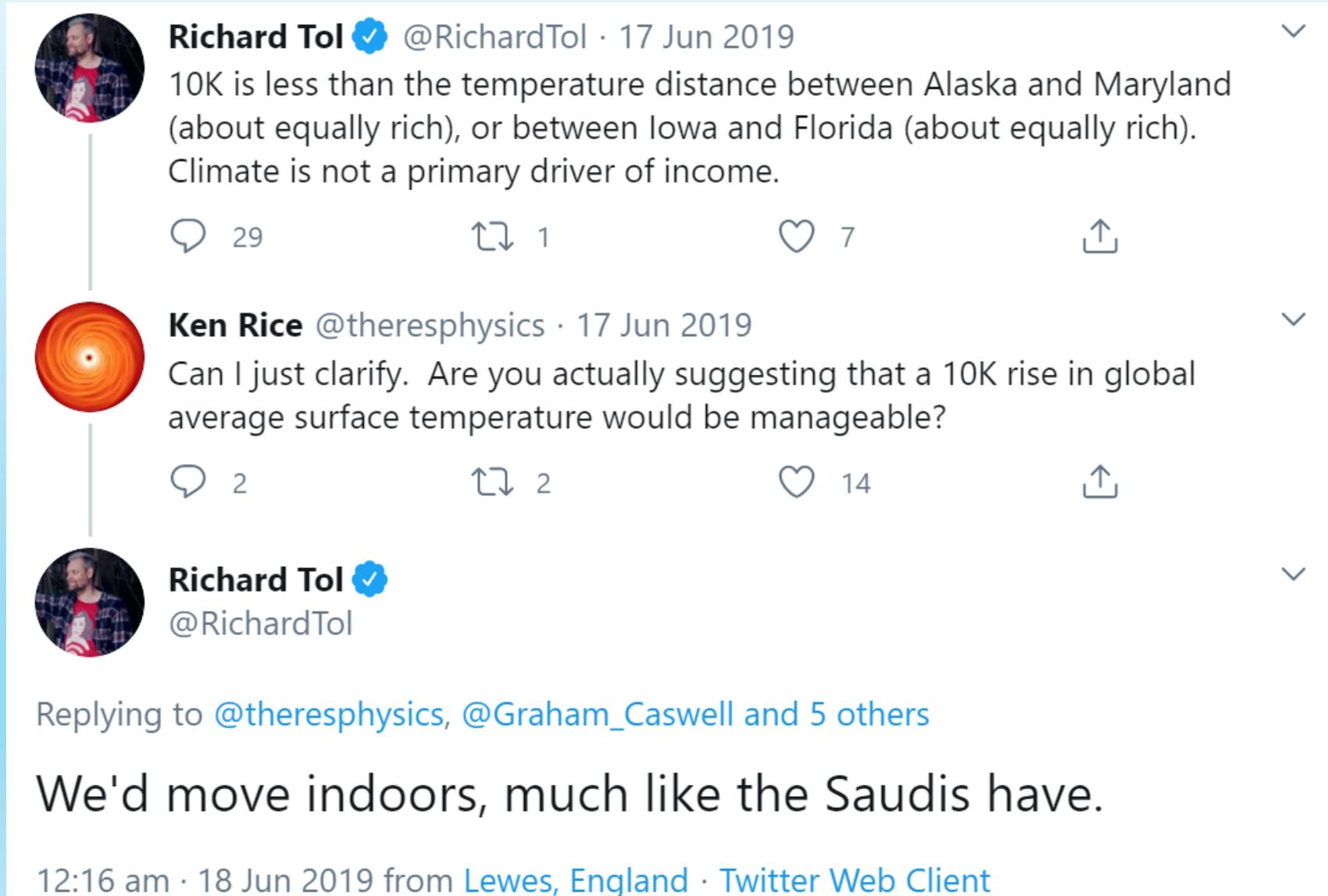
Key Economic Sectors and Services

Coordinating Lead Authors:

Douglas J. Arent (USA), Richard S.J. Tol (UK)

(3) Assume industry unaffected *because it happens indoors!*

- All you need... is Air-conditioning



The image shows a screenshot of a Twitter thread. At the top, a tweet from Richard Tol (@RichardTol) dated 17 Jun 2019 states: "10K is less than the temperature distance between Alaska and Maryland (about equally rich), or between Iowa and Florida (about equally rich). Climate is not a primary driver of income." This tweet has 29 replies, 1 retweet, and 7 likes. Below it is a reply from Ken Rice (@theresphysics) dated 17 Jun 2019 asking: "Can I just clarify. Are you actually suggesting that a 10K rise in global average surface temperature would be manageable?" This reply has 2 replies, 2 retweets, and 14 likes. At the bottom, another tweet from Richard Tol (@RichardTol) is shown, replying to @theresphysics, @Graham_Caswell and 5 others. The text of this tweet reads: "We'd move indoors, much like the Saudis have." The tweet is timestamped 12:16 am · 18 Jun 2019 from Lewes, England · Twitter Web Client.

Richard Tol ✓ @RichardTol · 17 Jun 2019

10K is less than the temperature distance between Alaska and Maryland (about equally rich), or between Iowa and Florida (about equally rich). Climate is not a primary driver of income.

29 1 7

Ken Rice @theresphysics · 17 Jun 2019

Can I just clarify. Are you actually suggesting that a 10K rise in global average surface temperature would be manageable?

2 2 14

Richard Tol ✓ @RichardTol

Replying to @theresphysics, @Graham_Caswell and 5 others

We'd move indoors, much like the Saudis have.

12:16 am · 18 Jun 2019 from Lewes, England · Twitter Web Client

(4) Made-up “data”

- Nordhaus’s 1991 “87% unaffected” paper had “Farms” as “potentially severely impacted” and “Energy” as “Moderate Potential Impact” ...

Table 5

Breakdown of economic activity by vulnerability to climatic change, U.S. 1981

Sector	National income	
	Value (billions)	Percentage of total
Total national income	2415.1	100.0
Potentially severely impacted		
Forestry, fisheries, other	7.7	0.3
Moderate potential impact		
Construction	109.1	4.5
Water transportation	6.3	0.3
Energy and utilities		
Water and sanitary	5.7	0.2
Real estate		
Land-rent component	51.2	2.1
Hotels, lodging, recreation	25.4	1.1
Negligible effect		
Manufacturing and mining	627.4	26.0
Other transportation and communication	132.6	5.5
Finance, insurance, and balance real estate	274.8	11.4
Trade and other services	674.6	27.9
Government services	337.0	14.0
Rest of world	50.3	2.1

Sources and notes: Data are based on the United States National Accounts, *Survey of Current Business*, July 1984.

(4) Made-up “data”

- He concluded that with doubling of CO₂ (or about a 3°C temperature rise):
- Damages to farming were between “-10.6 to +9.7” billion 1981 US dollars
- Damages to electricity demand were “-1.65 billion”...
- Source for both figures was EPA (1998)
- EPA (1988). U.S. Environmental Protection Agency, *The Potential Effects of Global Climate Change on the United States, Draft Report to Congress.*

Table 6

Impact estimates for different sectors, for doubling of CO₂, U.S. (positive number indicates gain; negative number loss)

Sectors	Billions (1981 \$)
Severely impacted sectors	
Farms	
Forestry, fisheries, other	Small + or -
Moderately impacted sectors	
Construction	+
Water transportation	?
Energy and utilities	
Energy (electric, gas, oil)	
Non-electric space heating	1.16
Water and sanitary	-?
Real estate	
Land-rent component	
Estimate of damage from sea level rise	
Loss of land	-1.55
Protection of sheltered areas	-0.90
Protection of open coasts	-2.84
Hotels, lodging, recreation	?
Total	
Central estimate	
Billions, 1981 level of national income	-6.23
Percentage of national income	-0.26

(4) Made-up “data”

- This is the [final 1989 report to Congress](#):
- Report does say that farms could experience anything from **losses** of \$10.6 billion to **gains** of \$9.7 billion in 1982 dollars
 - precisely the figures Nordhaus reproduces **unaltered** (in 1981 US dollars) in his 1988 paper...



The Potential Effects Of Global Climate Change On The United States



(4) Made-up “data”

- Figures are in Table 6-4 of the Final Report, p. 104

Table 6-4. Aggregate Economic Effects of GISS and GFDL Doubled CO₂ Climate Change on U.S. Agriculture with and without the Direct Effects of CO₂ on Crop Yields

Run	Economic effects (billions of 1982 dollars)		
	Consumer	Producer	Total
GISS Analysis 4 ^a : without CO ₂	-7.3	1.5	-5.9
GISS Analysis 4: with CO ₂	9.4	1.3	
GFDL Analysis 4: without CO ₂	-37.5	3.9	-33.6
GFDL Analysis 4: with CO ₂	-10.3	0.6	

^aAnalysis 4 includes the crop yield and irrigation water supply and demand consequences of climate change throughout the United States.

Source: Adams et al. (Volume C).

(4) Made-up “data”

- So presumably the \$1.65 billion damage figure for “Electricity demand” is there too?
- Annual costs in the range of \$33-73 billion (in 1986 dollars) by 2055
- 20 to 50 times the figure Nordhaus used!
- Did he use lower of “4-6% increase in electricity costs” : 4% times \$45.9 billion=\$1.84 & discount that?
- Who knows? But **as usual**, he trivialized the dangers of climate change

Table 10-1. The Potential National Impacts of Climate Change on Electric Utilities

	2010		2055			
	Base	Increase	Lower GNP		Higher GNP	
			Base	Increase	Base	Increase
Peak demand (GW)	774	20-44	1,355	181	1,780	238-357
New capacity requirements (GW) ^a						
Peaking	50	13-33	176	118	254	182-286
Baseload	226	11-22	1,011	67	1,423	74-98
Total	276	24-55	1,187	185	1,677	227-384
Annual sales (bkWh)	3,847	39-67	6,732	281	8,848	370-555
Annual generation ^b (bkWh)						
Oil/gas	287	(12)-(29)	221	2	308	27-51
Coal	2,798	54-103	6,242	305	8,295	381-560
Other	1,092	1-(1)	846	(2)	1,003	(7)-0
Total	4,177	43-72	7,309	305	9,607	401-611
Cumulative capital costs ^c	669	25-48	1,765	172	2,650	222-228

^aIncludes reserve margin requirements; does not include "firm scheduled" capacity.

^bIncludes transmission and distribution losses.

^c"Base" values include regional capital expenditures for utility-related equipment in addition to new generating capacity (e.g., new transmission facilities).

^dIn billions of 1986 dollars.

Abbreviations: GW = gigawatts; bkWh = billion kilowatthours.

Source: Linder and Inglis (Volume H).

(5) Distort or ignore scientific literature

- Nordhaus justifies using a simple parabola for the damages from climate change:
 - “The current version assumes that damages are a quadratic function of temperature change and **does not include** sharp thresholds or **tipping points**,
 - but this is **consistent with the survey by Lenton et al. (2008).**”
 - (Nordhaus & Sztorc 2013, p. 11)
- Lenton et al.’s actual conclusion:
 - “**Society may be lulled into a false sense of security by smooth projections of global change.**
 - Our synthesis of present knowledge suggests that **a variety of tipping elements could reach their critical point within this century** under anthropogenic climate change.” (Lenton 2008, p. 1792)

(6) Minimize expected impact every step of the way

- Damages in Nordhaus's DICE model affect **flow** of output (GDP) but not **stock** of industry itself (factories that produce output)

aggregated to the world total. The regional and global production functions are assumed to be constant-returns-to-scale Cobb-Douglas production functions in capital, labor, and Hicks-neutral technological change. Global output is shown in Equation (4): **Damages reduce GDP...**

$$(4) \quad Q(t) = [1 - \Lambda(t)] A(t) K(t)^\gamma L(t)^{1-\gamma} / [1 + \Omega(t)]$$


But Assumes capital, technology & population are unaffected by climate change

In this specification, $Q(t)$ is output net of damages and abatement, $A(t)$ is total factor productivity (of the Hicks-neutral variety), and $K(t)$ is capital stock and services. The additional variables in the production function are $\Omega(t)$ and $\Lambda(t)$, which represent climate damages and abatement costs, shown in Equations (5) and

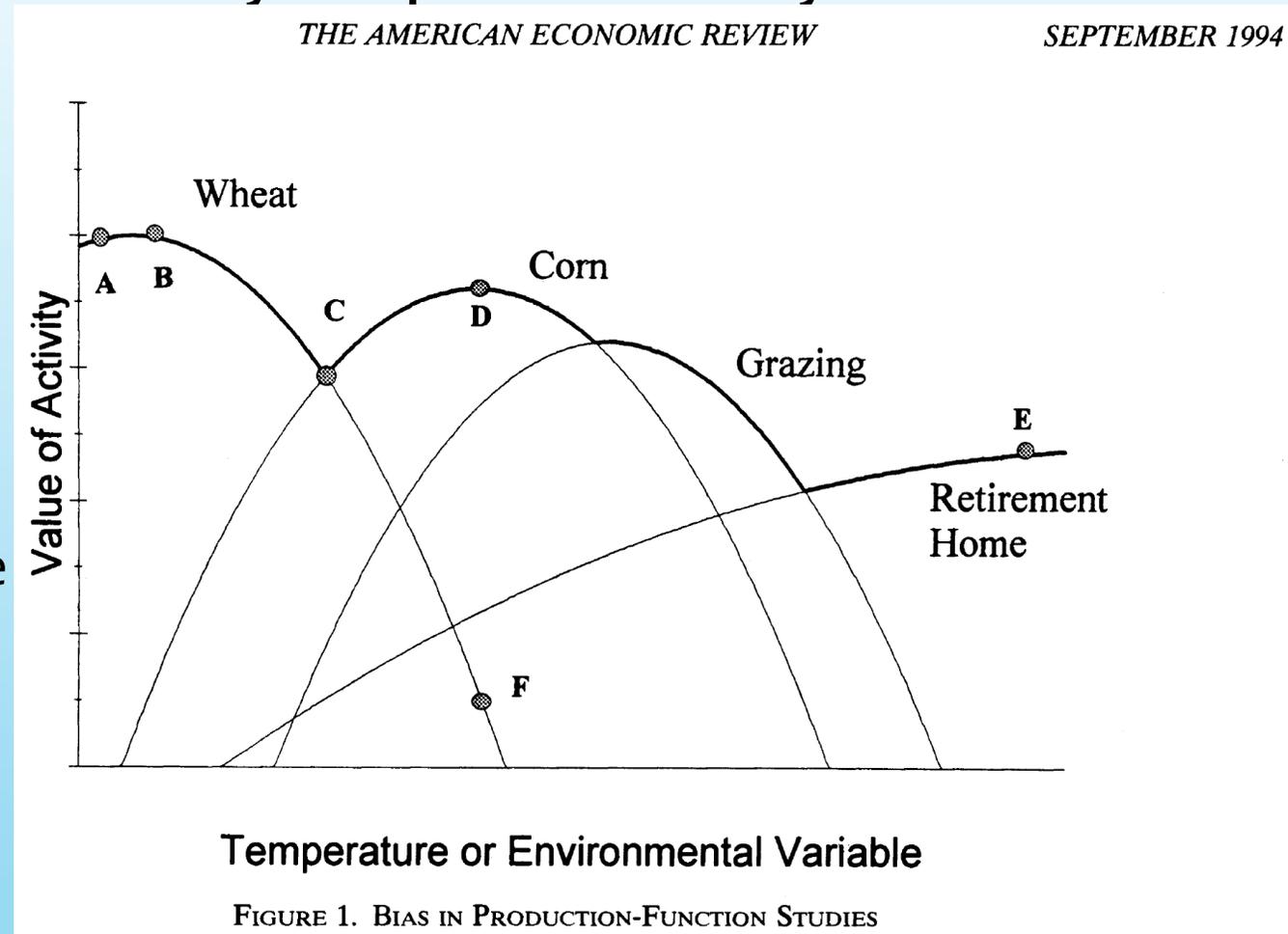
(6) Minimize expected impact every step of the way

- High discount rate for future damages generally a “red herring”
 - Real crimes of economists are their trivial undiscounted damage estimates...
- But in attacking Stern for using a low discount rate, Nordhaus said:
 - “It would be useful to determine how robust our prescriptions are to alternative formulations of the preference structures.
 - These would include preferences where ... *large parts of the population lose interest in economic goods and turn to ascetic pursuits,*
 - or where rich nations use higher productivity to *develop fiendish new weapons*
 - **or where people come to love the altered landscape of the warmer world.**
 - *Perhaps we need to consider a model with uncertainty about preferences **along with uncertainty about extinction...***” (Nordhaus 2007, p. 693)
 - **“love the altered landscape of the warmer world”**
 - **How are you “loving” 2020 so far?**

Skip to “Why???”

(6) Minimize expected impact every step of the way

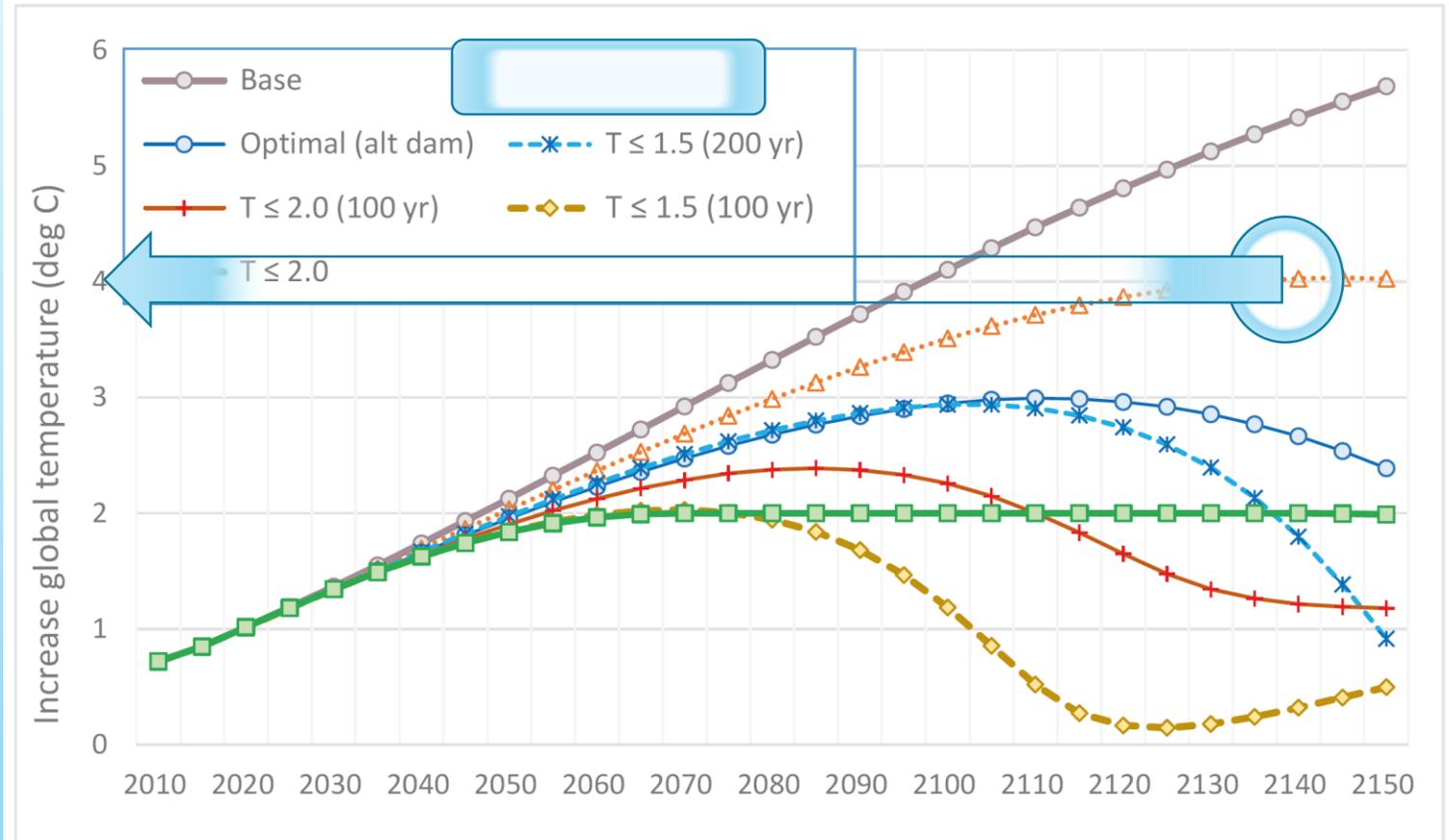
- “We suspect that higher levels of greenhouse gases will hurt the global economy, **but because of the fertilization effect of CO₂ or the attractiveness of warm climates, the greenhouse effect might on balance actually be economically advantageous.**” (Nordhaus 1991)
- “these studies ... tend to overestimate the damage. This bias is sometimes called the “dumb-farmer scenario” to suggest that it **omits a variety of the adaptations that farmers customarily make in response to changing economic and environmental conditions...**” (Mendelsohn & Nordhaus 1994)



Why was work *this bad* given a “Nobel Prize”?

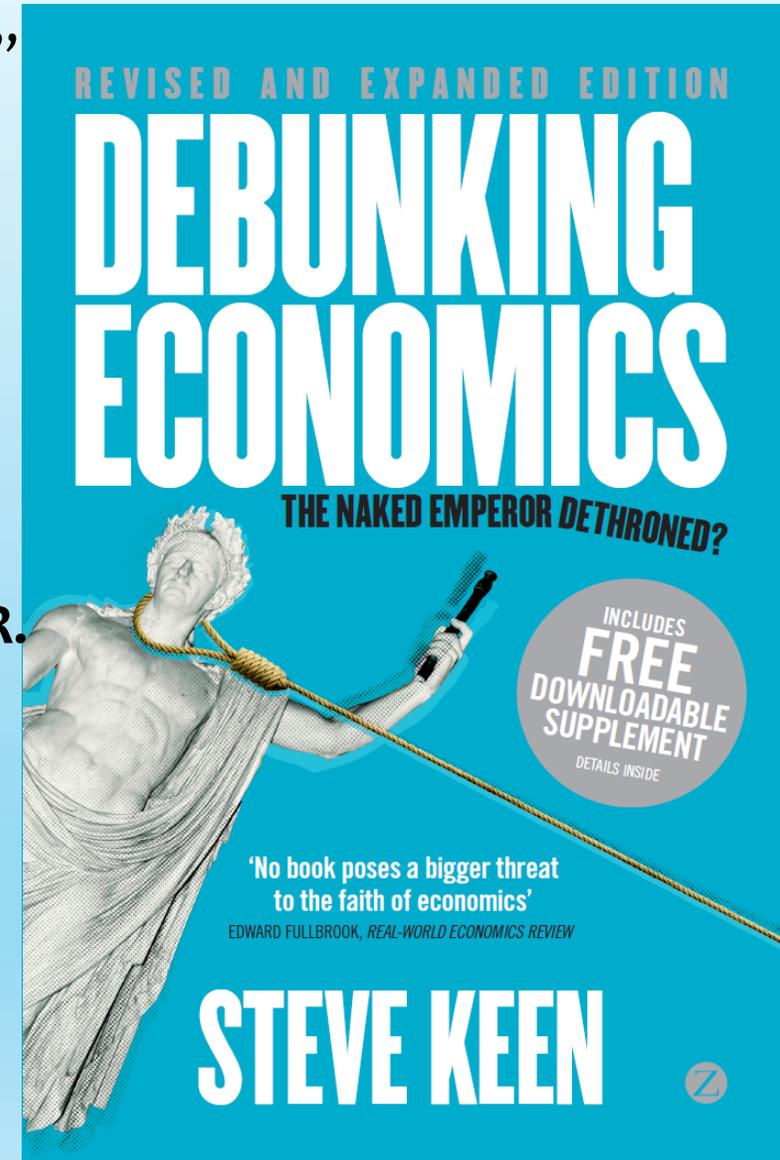
- To “[William D. Nordhaus ‘for integrating climate change into long-run macroeconomic analysis’](#)”
- **His “Nobel Prize” lecture:** *Optimal* time path of global temperature stabilizes at **4°C above pre-industrial levels** in 2140...
- Because it defends the Neoclassical religion!
 - Inherent belief in the superiority of unfettered free market
- Climate change requires controls on markets, **therefore** it can’t be a problem...

Temperature trajectories in different policies



Why was work *this bad* given a “Nobel Prize”?

- Neoclassical economics is an internally flawed model of capitalism
- But believed by its adherents because it “explains everything”
 - It is “scientism”: not mathematics but “mythematics”
 - “Simplifying assumptions”:
 - *“assumes that the observed variation of economic activity with climate over space holds over time as well”*
 - *Assume “manufacturing and services, largely take place in controlled environments and are not really exposed to climate change”*
 - **IT’S. NOT. A. “SIMPLIFYING ASSUMPTION”. WHEN. YOUR. CONCLUSIONS. DEPEND. ON. IT. BEING. TRUE.**
- Why did (Neoclassical economist) referees pass this garbage?
 - *Because Neoclassical economists make assumptions like this all the time.*
 - *Theory falls apart without “let’s assume a can-opener” assumptions...*



Nordhaus & his cronies support inaction on climate change

- Nordhaus & economists in the IPCC are providing ammunition for climate change deniers/trivializers to attack science-based Working Groups and undermine Global Warming policy...

Bjorn Lomborg
@BjornLomborg

Replying to @SamanthaJPower

Dear Samantha. Yes, climate is problem, but nowhere to extinction

[IPCC: Impact *s
ipcc.ch/pdf/ass](https://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4_wg3_chapter10.pdf)

10 Key Economic Sectors and Services

Chapter 10 Sectors and Services

Coordinating Lead Authors:
Douglas J. Arent (USA), Richard S.J. Tol (UK)

Executive Summary

This chapter assesses the implications of climate change on economic activity in key economic sectors and services, on economic welfare, and on economic development.

For most economic sectors, the impact of climate change will be small relative to the impacts of other drivers (medium evidence, high agreement). Changes in population, age, income, technology, relative prices, lifestyle, regulation, governance, and many other aspects of socioeconomic development will have an impact on the supply and demand of economic goods and services that is large relative to the impact of climate change. {10.10}

10:16 am · 19 Oct 2017 · [Twitter Web Client](#)

temperature increase (°C)

Area of the circles represents weights assigned to each study
Source: W. D. Nordhaus and A. Moffat, NBER Working Paper No. 23646

“High Agreement”

Neoclassical economics is an existential threat to humanity

- Capitalism may cease to exist because of Neoclassical economics
 - Economists desire to preserve their “markets can solve all problems” ideology will lead capitalism into an existential crisis
 - Coronavirus is just a first taste of what we face
 - [Limits to Growth](#) gave warnings in 1972—almost 50 years ago.
 - Who trashed the reputation of this excellent systems dynamics work, without understanding it himself? William Nordhaus!
 - For more, see my Patreon site www.patreon.com/profstevekeen (all articles are free access: no paywall):
 - **Playing DICE with Life on Earth: Nordhaus’s Damage Function**
 - **The mythical economic data on climate change (1): Nordhaus’s 1994 survey of “experts”**
 - **Bjorn Lomborg, The Gullible Environmentalist**
 - **An extraordinary Twitter Exchange with Richard Tol**
 - **Climate Change: Extinction or Adaptation?**