

Motivated Rejection of (Climate) Science: Causes, Tools, and Effects

Stephan Lewandowsky

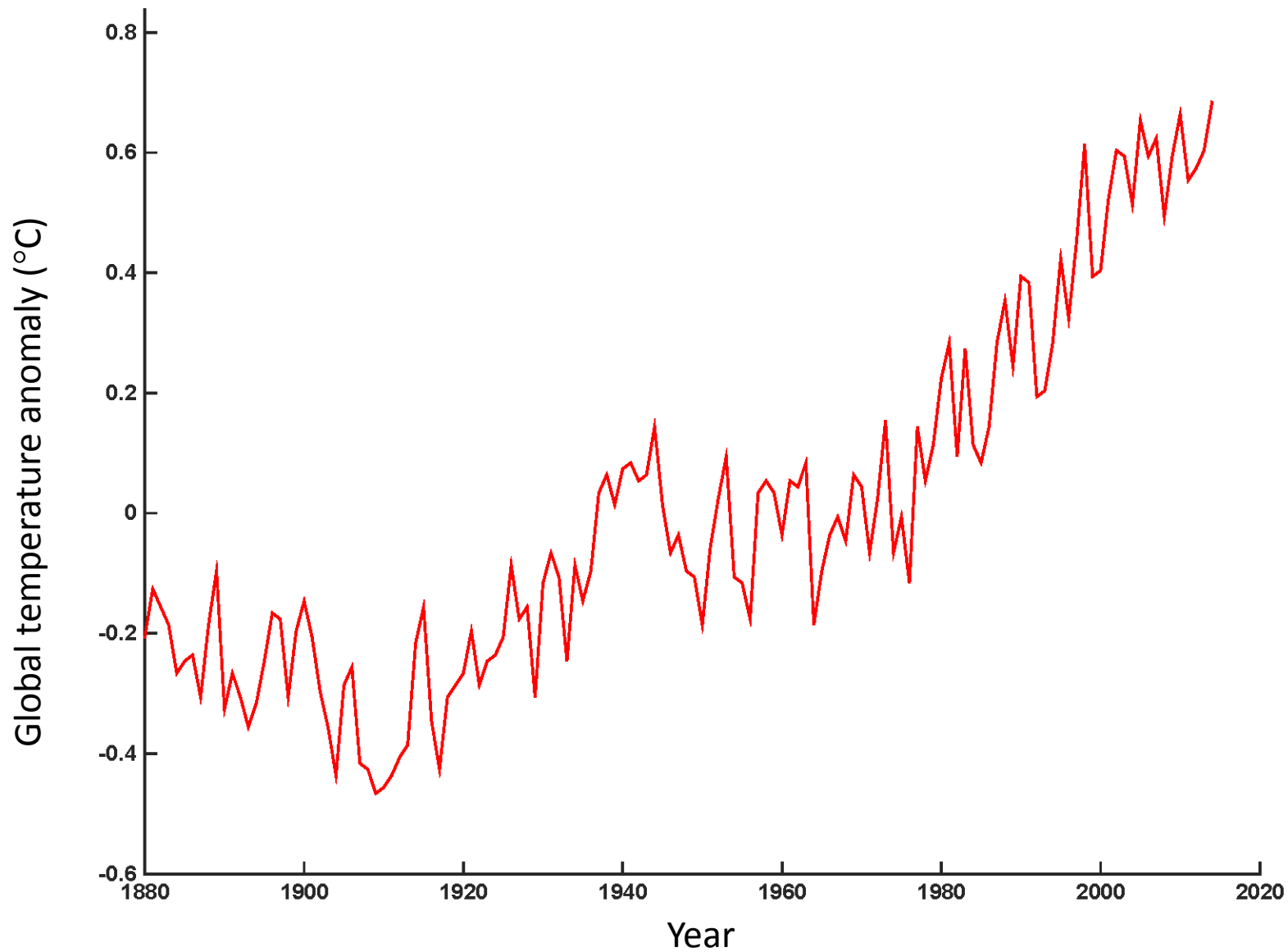


School of Experimental Psychology and Cabot Institute
University of Western Australia

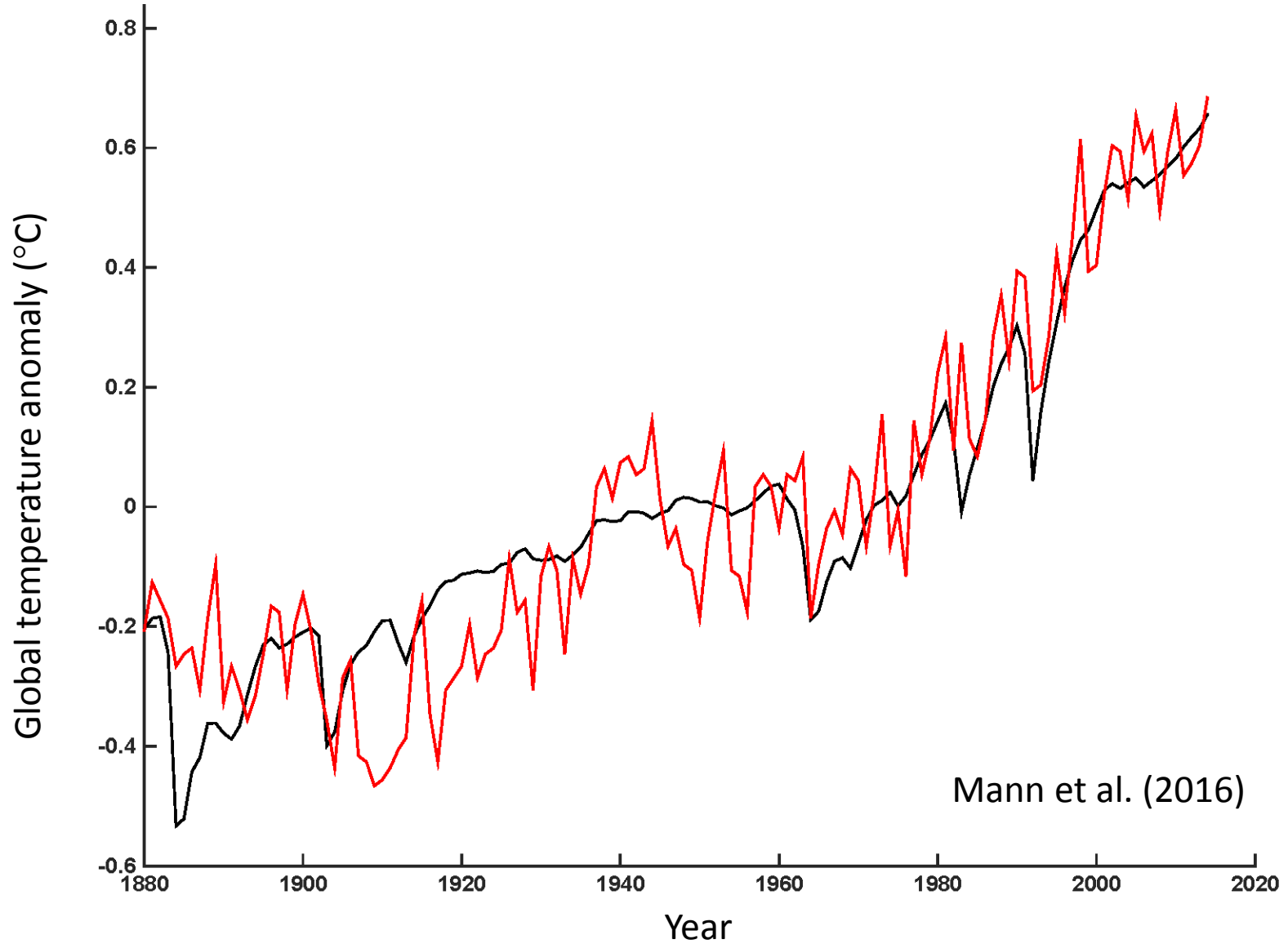
Twitter: @STWorg

www.shapingtomorrowsworld.org

The Problem

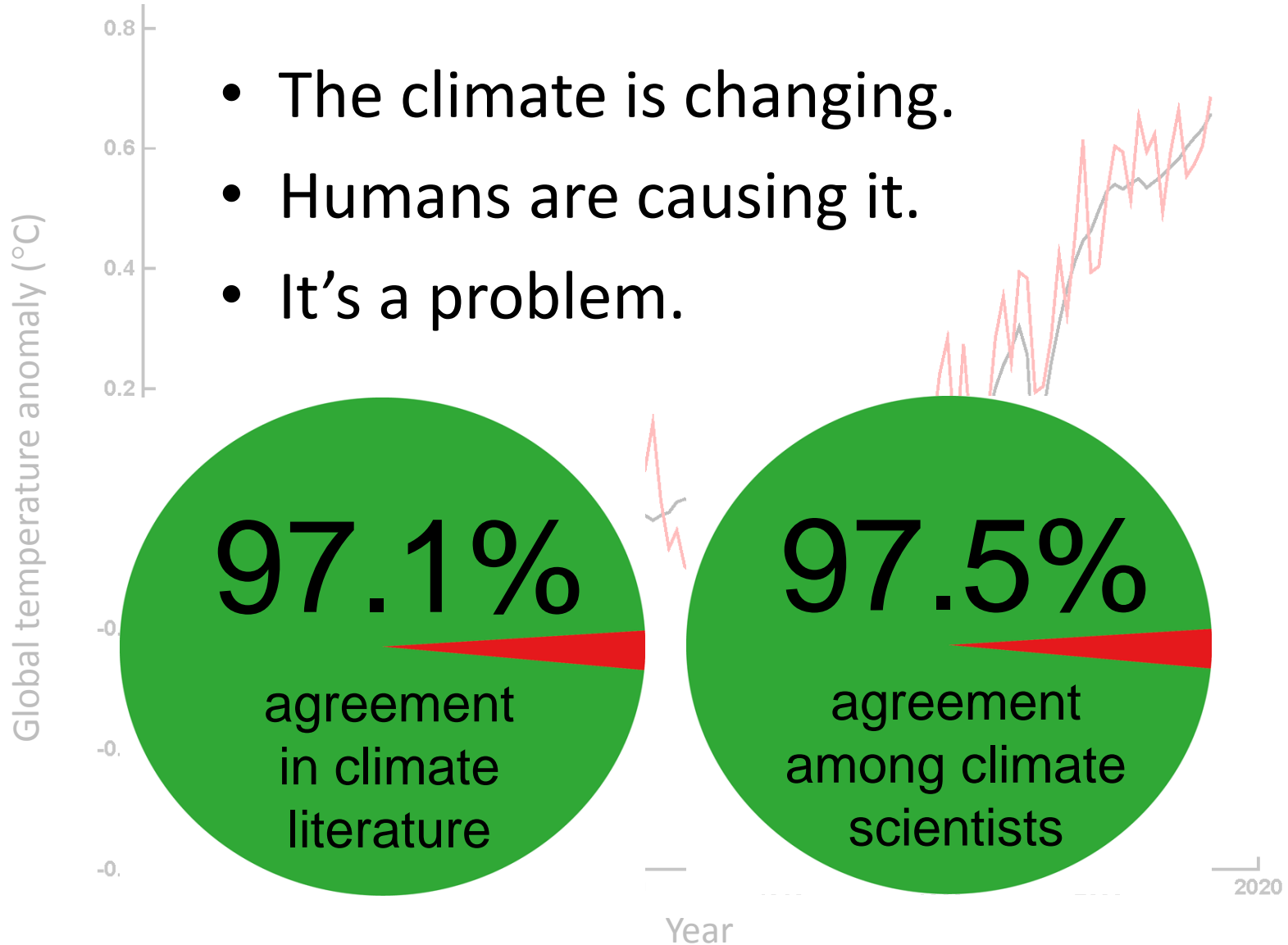


The Problem



The Problem

- The climate is changing.
- Humans are causing it.
- It's a problem.

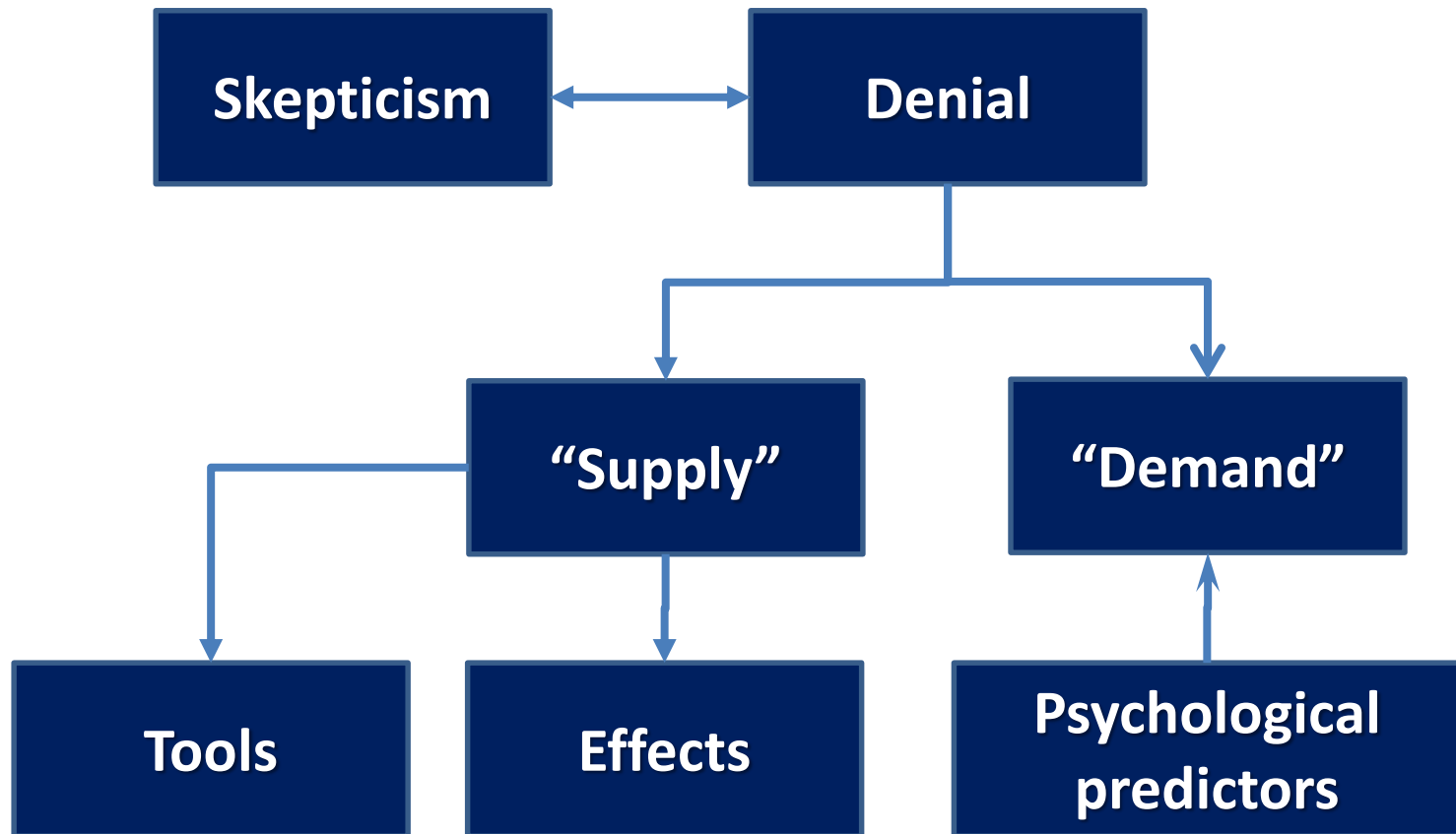


Another Problem

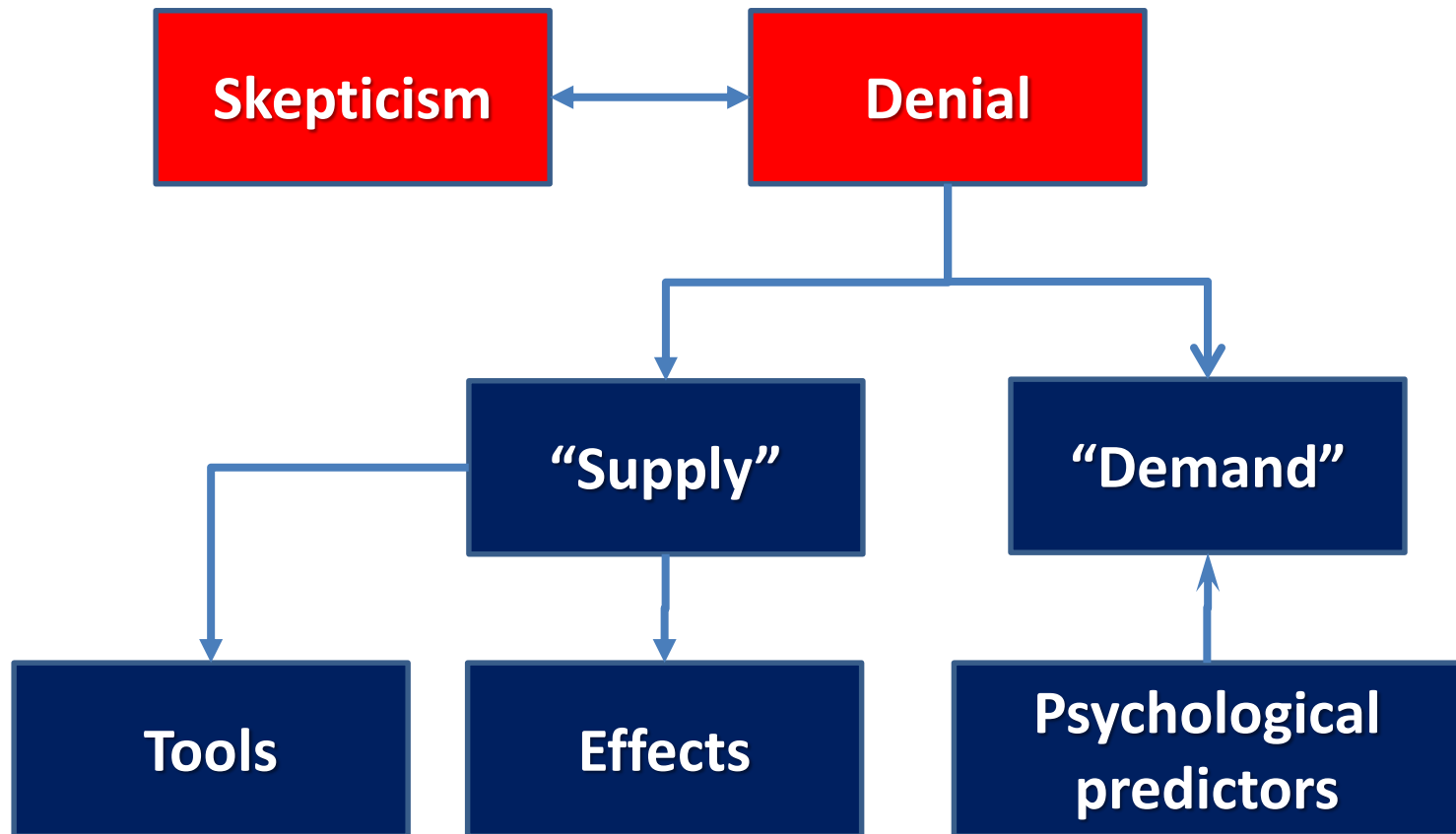
“With all the hysteria, all the fear, all the phony science, could it be that manmade global warming is the greatest hoax ever perpetrated on the American people? I believe it is.”

—U.S. Senator James Inhofe
Congressional Record, 2003

Rejection of (Climate) Science



Rejection of (Climate) Science



Historical Context:

President George W. Bush (2.5.2003)

- “In the battle of Iraq, the United States and our allies have prevailed. And now our coalition is engaged in securing and reconstructing
- Our coalition will stay until our work is done. Then we will leave—and we will leave behind a free Iraq.
- The battle of Iraq is one victory in a war on terror ...”

Benefits of Skepticism

(Lewandowsky et al., 2005, 2009)

- Examined the role of skepticism in information processing surrounding the Iraq War
- People who were skeptical about official motives for the Iraq War
 - disbelieved things they knew to be false
 - believed accurate information
- People who were not skeptical
 - believed in things they knew to be false

Scientific literature is
based on skepticism

Denial is not Skepticism: AIDS and South Africa

- President Mbeki's government (1999-2008) rejected Western medicine as "racist"
- Rejected offers of antiretroviral drugs
- Preferred to treat AIDS with garlic and beetroot instead

Denial is not Skepticism: AIDS and South Africa

Estimating the Lost Benefits of Antiretroviral Drug Use in South Africa

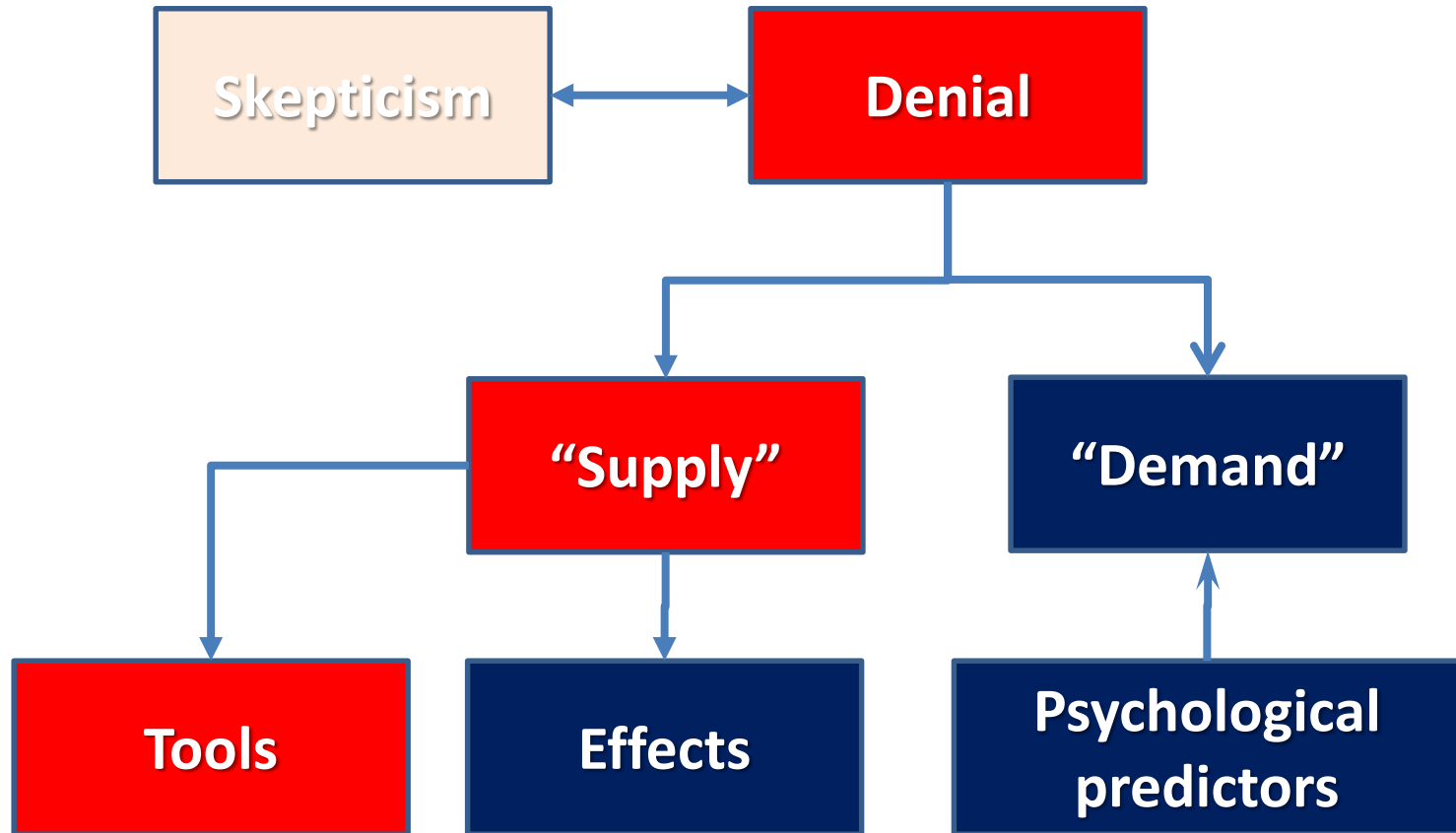
Pride Chigwedere, MD,† George R. Seage III, ScD, MPH,‡§ Sofia Gruskin, JD, MIA,||¶
Tun-Hou Lee, ScD,*† and M. Essex, DVM, PhD*†*

Abstract: South Africa is one of the countries most severely affected by HIV/AIDS. At the peak of the epidemic, the government, going against consensus scientific opinion, argued that HIV was not the cause of AIDS and that antiretroviral (ARV) drugs were not useful for patients and declined to accept freely donated nevirapine and grants from the Global Fund. Using modeling, we compared the number of persons who received ARVs for treatment and prevention of mother-to-child HIV transmission between 2000 and 2005 with an alternative of what was reasonably feasible in the country during that period. More than 330,000 lives or approximately 2.2 million person-years were lost because a feasible and timely ARV treatment program was not implemented in South Africa. Thirty-five thousand babies were born with HIV, resulting in 1.6 million person-years lost by not implementing a mother-to-child transmission prophylaxis program using nevirapine. The total lost benefits of ARVs are at least 3.8 million person-years for the period 2000–2005.

to-child HIV transmission (PMTCT) and AIDS treatment, announced that the drug was toxic and dangerous to health and that the government was not going to provide it.² He then questioned whether HIV was the cause of AIDS, and this broadened the debate from the usefulness of ZDV to the usefulness of all antiretroviral (ARV) drugs in fighting the AIDS epidemic because they all target HIV.³ President Mbeki's government restricted the use of freely donated nevirapine⁴ and obstructed the acquisition of Global Fund grants.⁵ The facts of the case have never been denied.

Except among very few scientists, such as Peter Duesberg, the scientific community has accepted HIV as the cause of AIDS for more than 20 years.⁶ HIV satisfies all 3 of Koch's postulates, the traditional standard of infectious disease causation,⁷ and all of Sir Bradford Hill's epidemiological guidelines for assessing causality.⁸ ZDV was tested for AIDS treatment in controlled randomized clinical trials,⁹ and its side

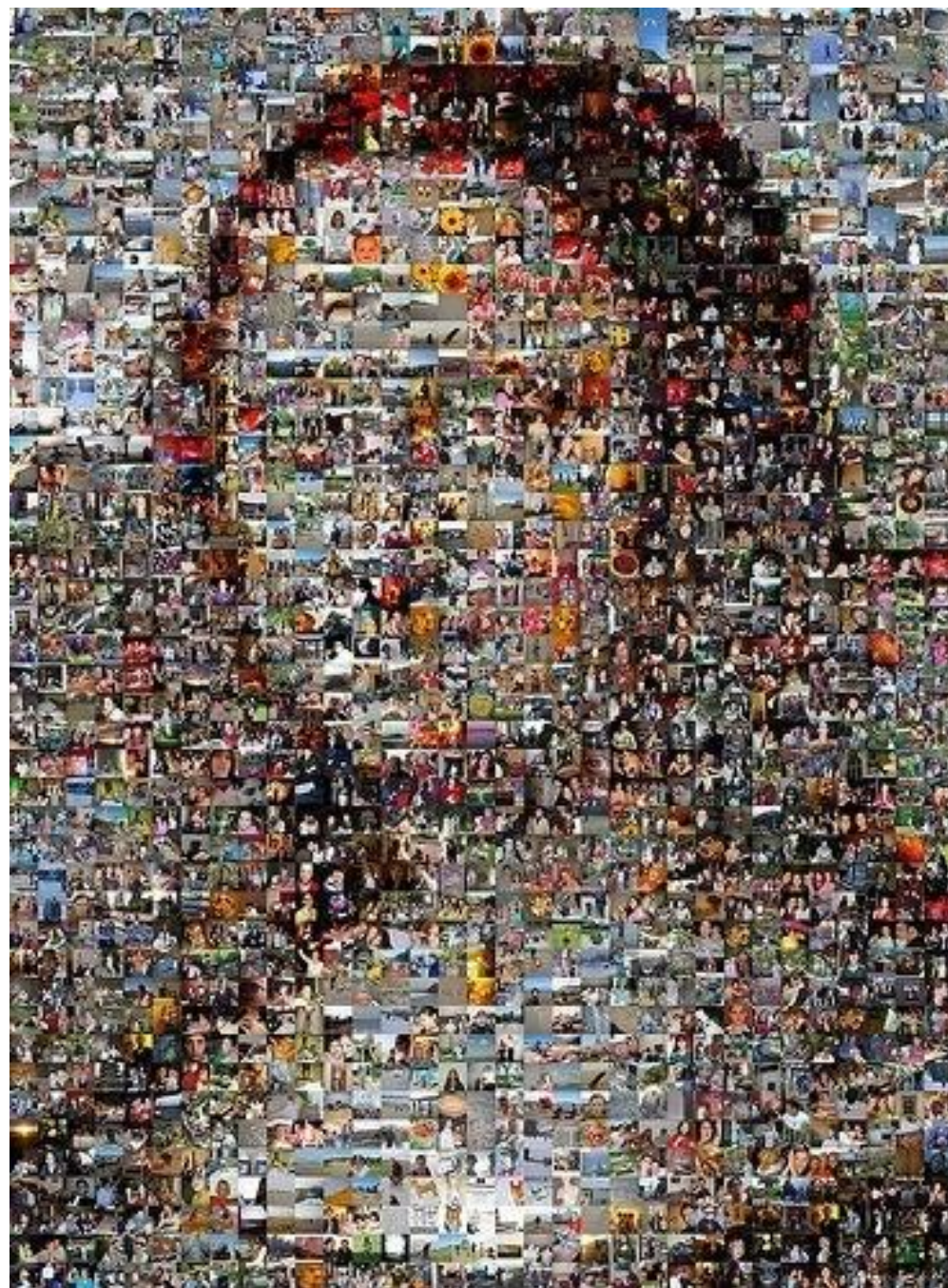
Rejection of (Climate) Science

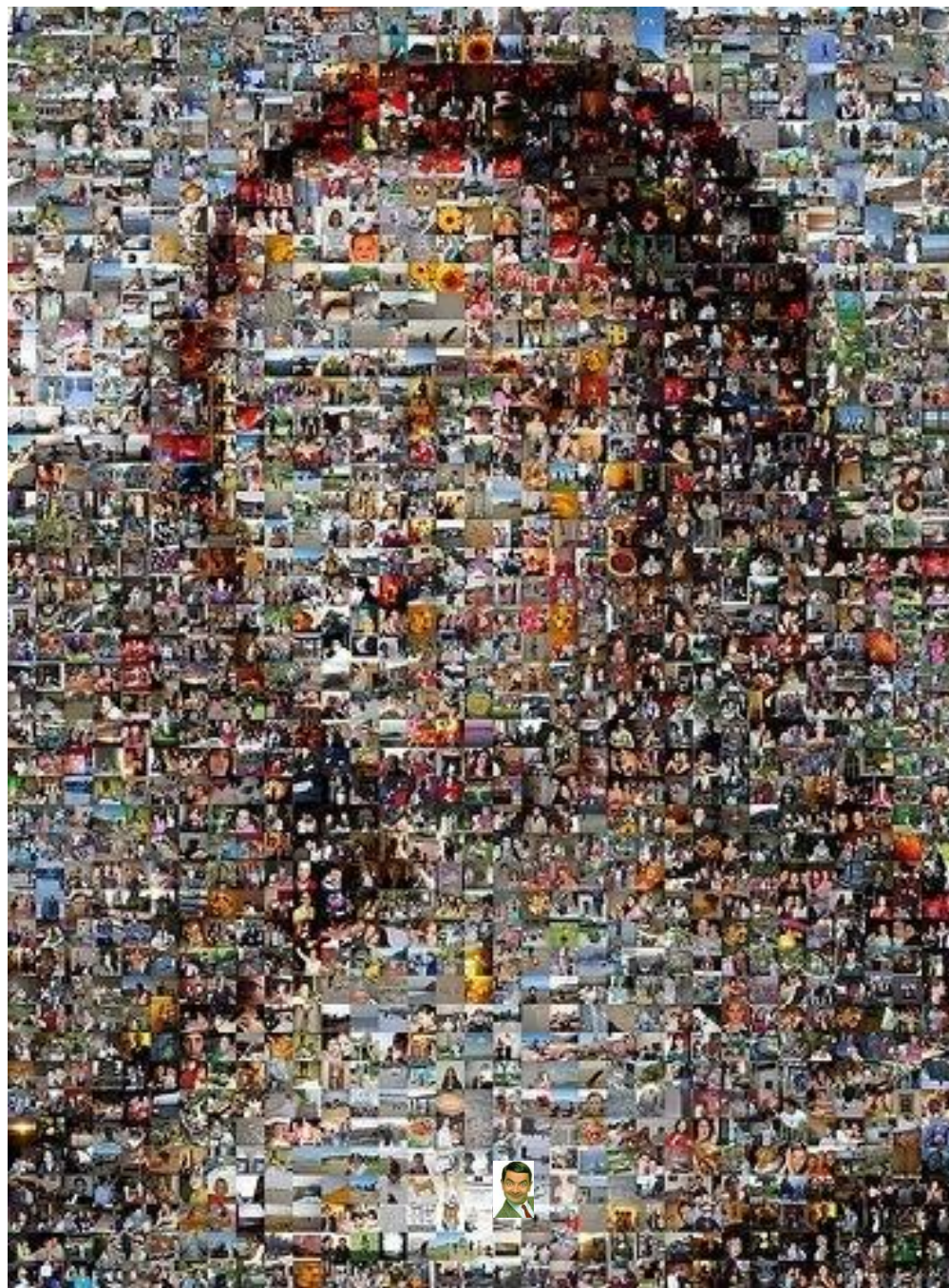


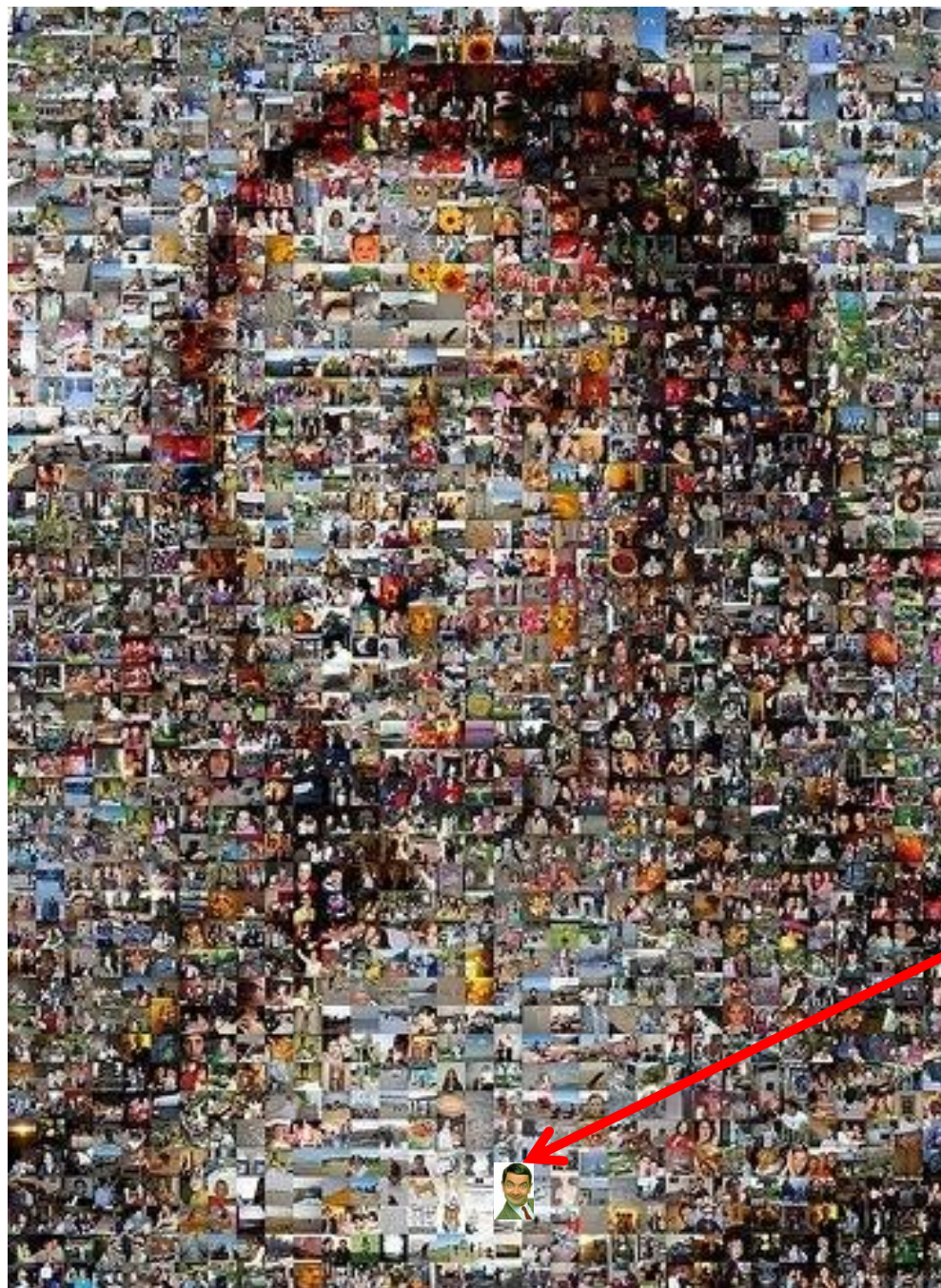
Denial vs. Skepticism: The Triage

5 CHARACTERISTICS OF SCIENCE DENIAL









Contrarian Media Coverage

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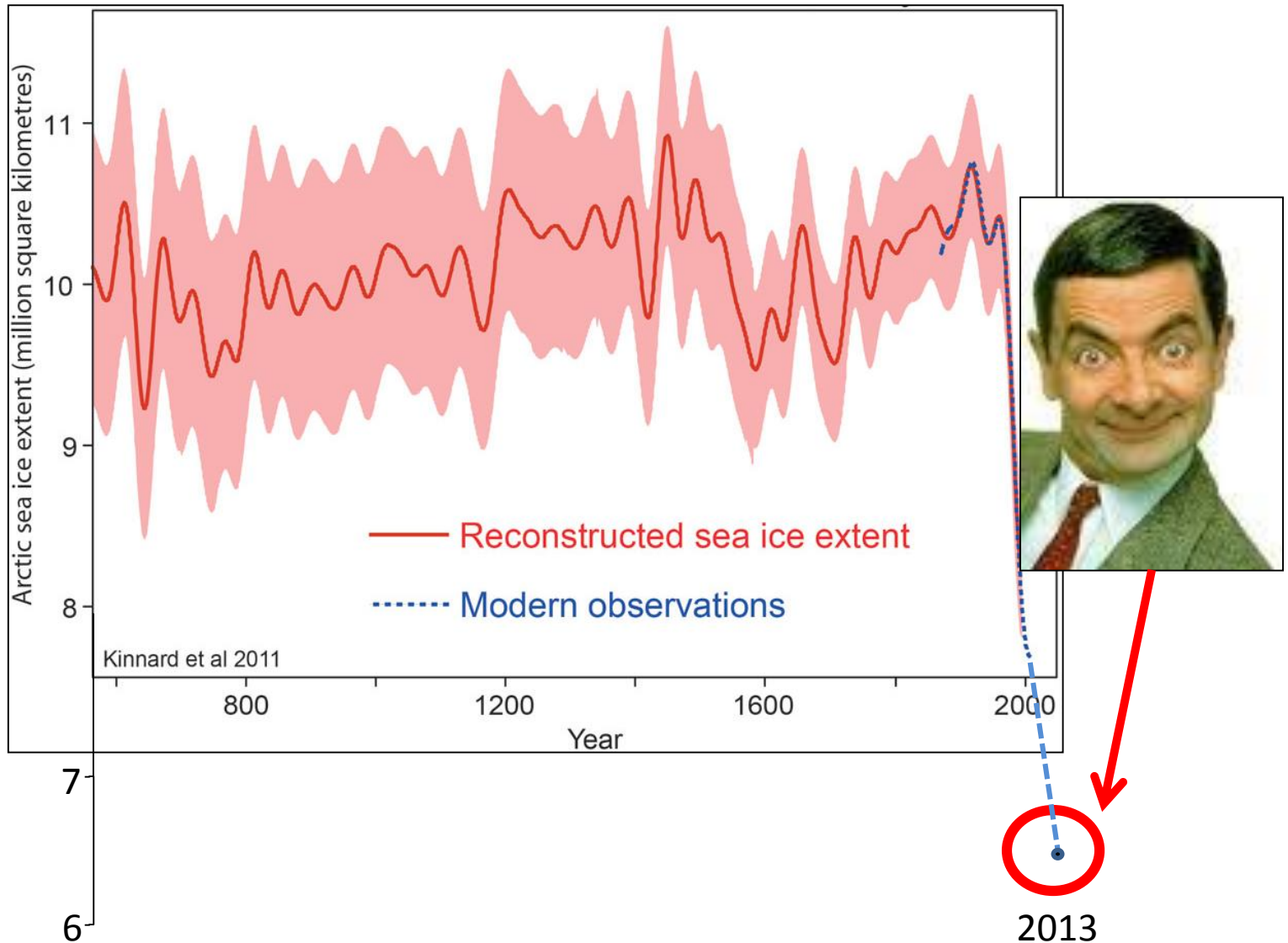
And now it's global COOLING! Return of Arctic ice cap as it grows by 29% in a year

- 533,000 more square miles of ocean covered with ice than in 2012
- BBC reported in 2007 global warming would leave Arctic ice-free in summer by 2013
- Publication of UN climate change report suggesting global warming caused by humans pushed back to later this month

By [DAVID ROSE](#)

PUBLISHED: 18:37 EST, 7 September 2013 | **UPDATED:** 13:45 EST, 28 September 2013

Contrarian Media Coverage



Contrarian “Think” Tanks

The organisation of denial: Conservative think tanks and environmental scepticism

Peter J. Jacques^{a*}, Riley E. Dunlap^b and Mark Freeman^c

^aDepartment of Political Science, University of Central Florida, Orlando, USA;

^bDepartment of Sociology, Oklahoma State University, Stillwater, USA; ^cDepartment of Political Science, University of Central Florida, Orlando, USA

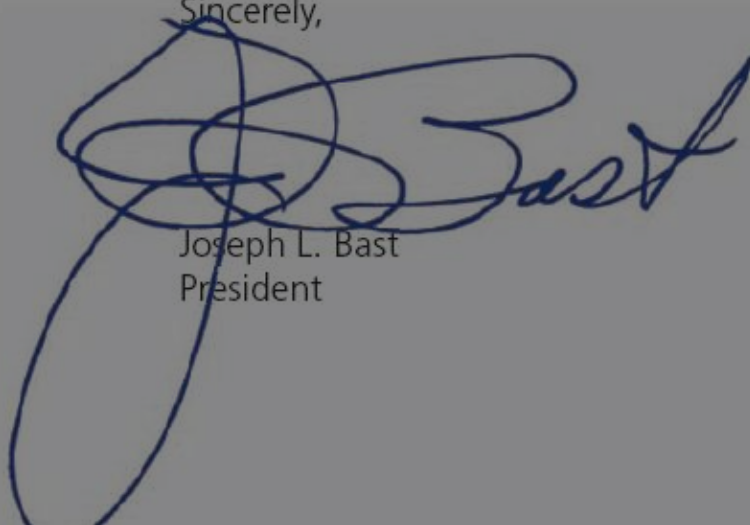
Environmental scepticism denies the seriousness of environmental problems, and self-professed ‘sceptics’ claim to be unbiased analysts combating ‘junk science’. This study quantitatively analyses 141 English-language environmentally sceptical books published between 1972 and 2005. We find that over 92 per cent of these books, most published in the US since 1992, are linked to conservative think tanks (CTTs). Further, we analyse CTTs involved with environmental issues and find that 90 per cent of them espouse environmental scepticism. We conclude that scepticism is a tactic of an elite-driven counter-movement designed to combat environmentalism, and that the successful use of this tactic has contributed to the weakening of US commitment to environmental protection.

From the Heartland Institute's 2010 Prospectus

The Heartland Institute is also outside the beltway, founded and operating continuously in Chicago since 1984. We actively oppose junk science and the use of scare tactics in the areas of environmental protection and public health. And we help governments lower taxes and spending by exploring opportunities to privatize services that are delivered poorly by government bureaucracies and impose constitutional tax and spending limits on state governments.

We welcome your support.

Sincerely,

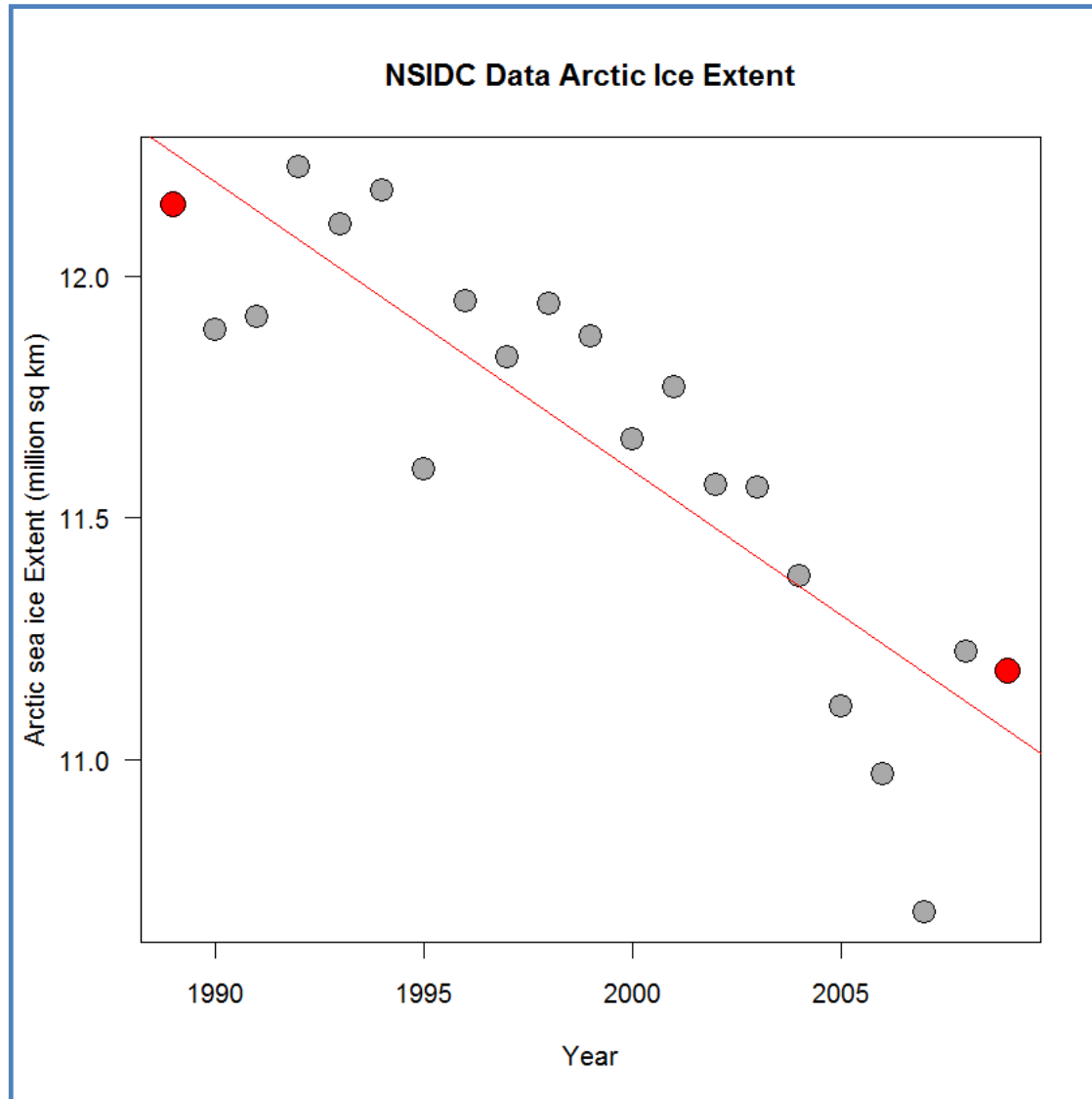
A handwritten signature in blue ink, appearing to read "J. Bast", with a large, loopy flourish extending from the bottom left.

Joseph L. Bast
President

Heartland Institute

- “National Snow and Ice Data Center records show conclusively that in April 2009, Arctic sea ice extent had indeed returned to and surpassed 1989 levels.”
— *Heartland Institute*, 24 January 2011

The Data

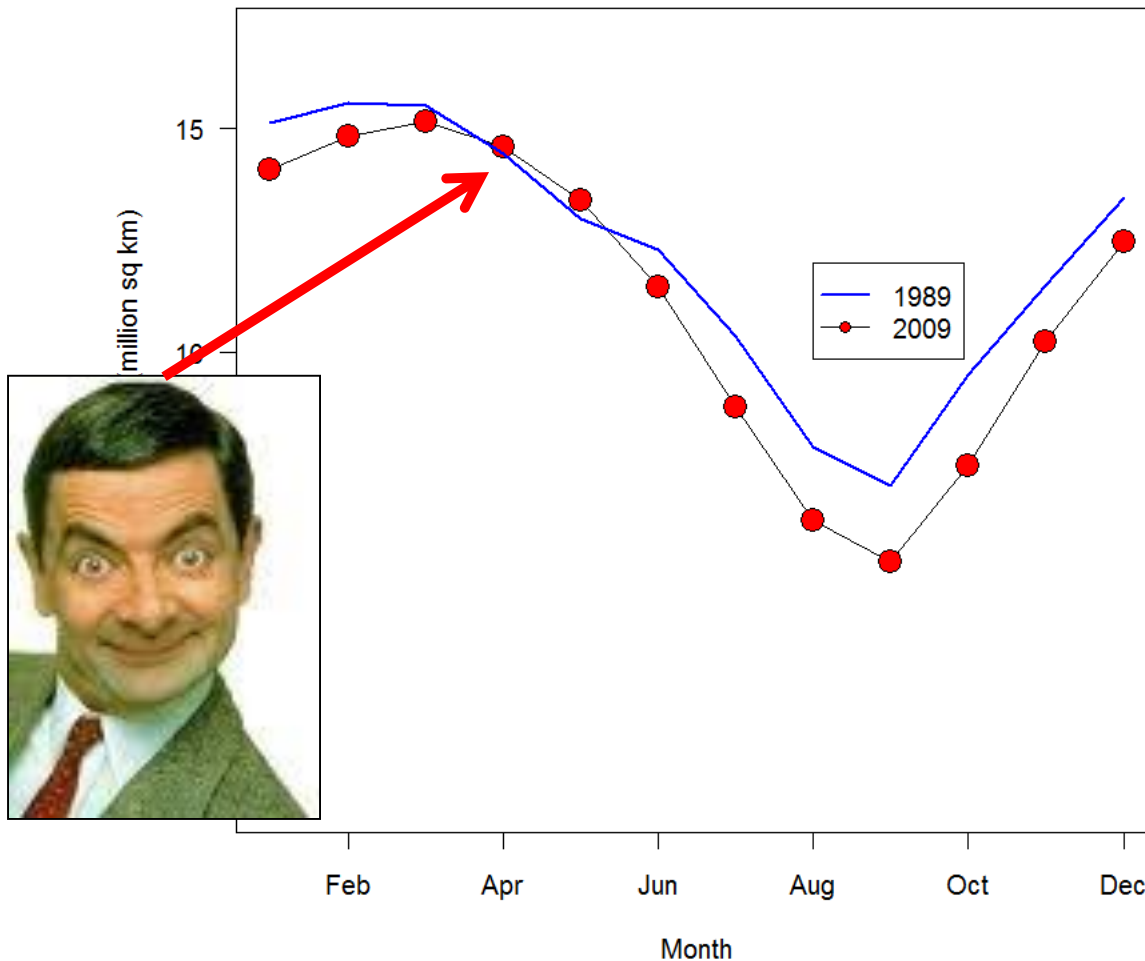


Another Look

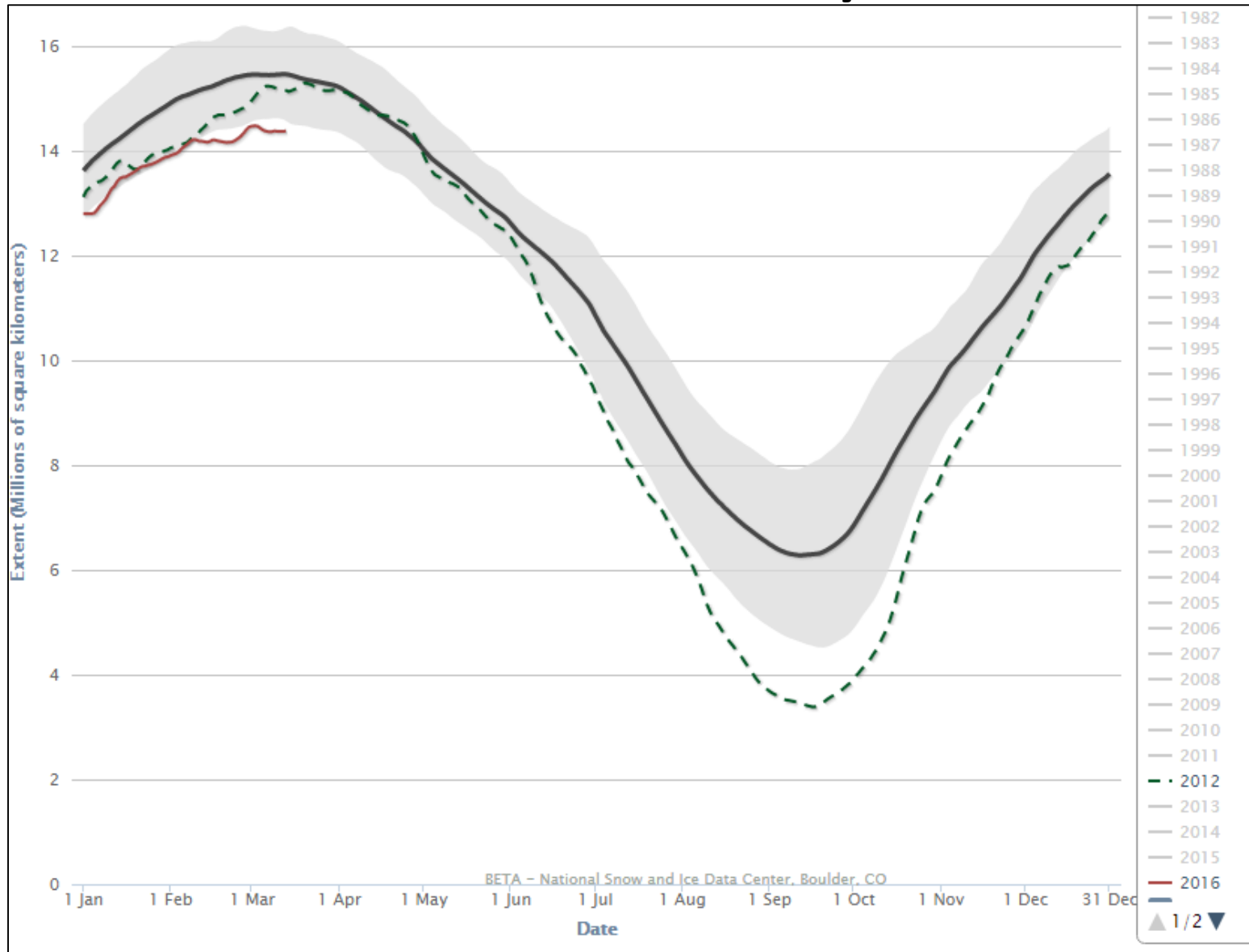
- “National Snow and Ice Data Center records show conclusively that **in April 2009**, Arctic sea ice extent had indeed returned to and surpassed 1989 levels.”
— *Heartland Institute*, 24 January 2011

NSIDC Data 1989 and 2009

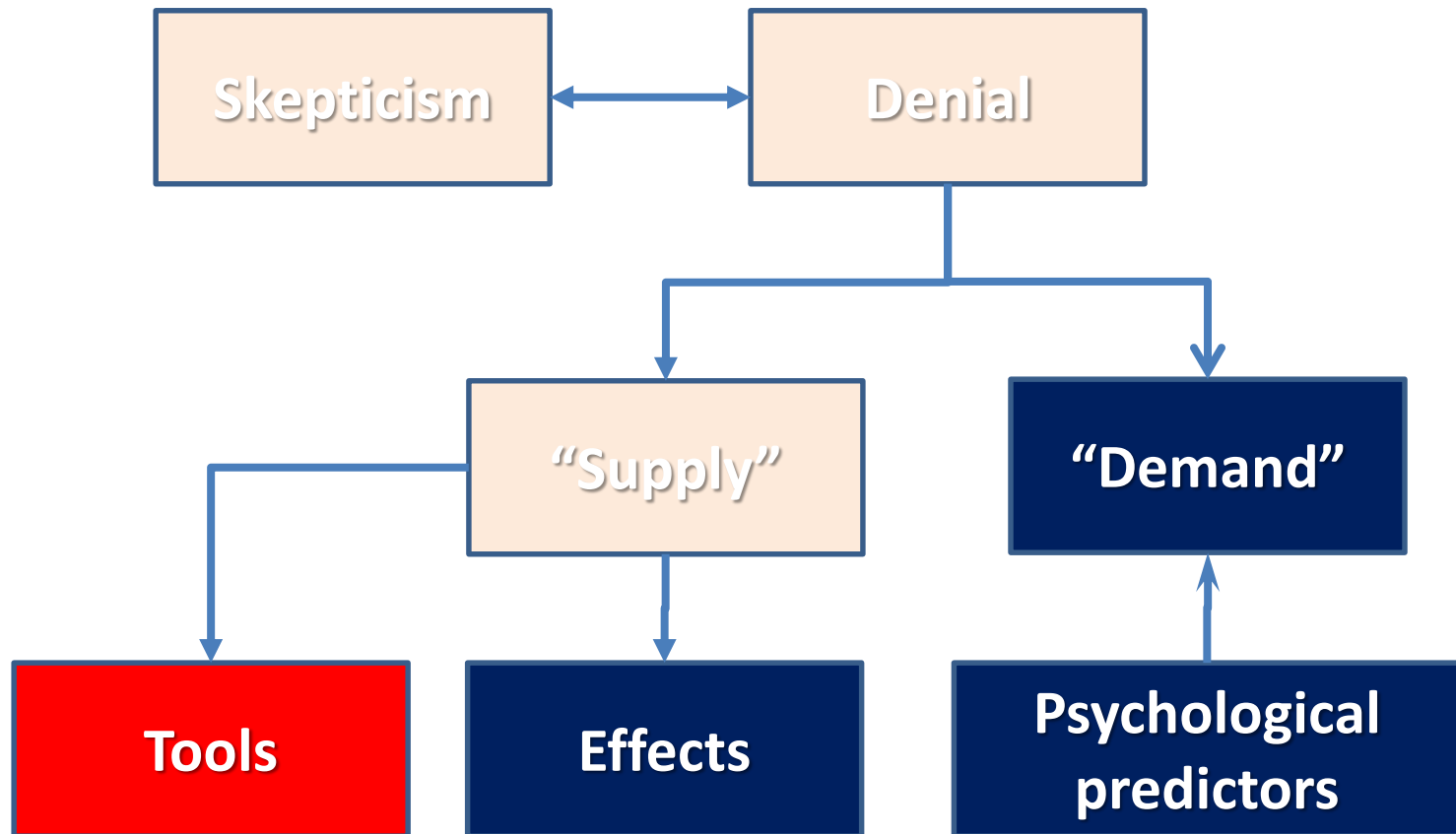
NSIDC Monthly Data Arctic Ice Extent



As of Today



Rejection of (Climate) Science



Adjudication?

- “... manmade global warming is the greatest hoax ever perpetrated on the American people” (U.S. Senator Inhofe)
- Climate scientists say otherwise
- How to adjudicate?
- Blind test of representative contrarian arguments

Blind Test With Economists and Statisticians

- Public statement by the CEO of the supreme widget corporation (SWC), made a few months ago:
 - “our auditors' records show conclusively that in April 2009, our profits had indeed returned to and surpassed 1989 levels.”
 - “the underlying trend in our profits has been consistently negative between 1989 and 2009.”

Blind Test With Economists and Statisticians

- 6 different scenarios involving various climate indicators
 - contrarian statements sampled from media and online sources
 - climate experts judged their prevalence to be high
 - Google search reveals high prevalence on contrarian blogs
 - mainstream scientific statements checked by climate experts

Sample Trial

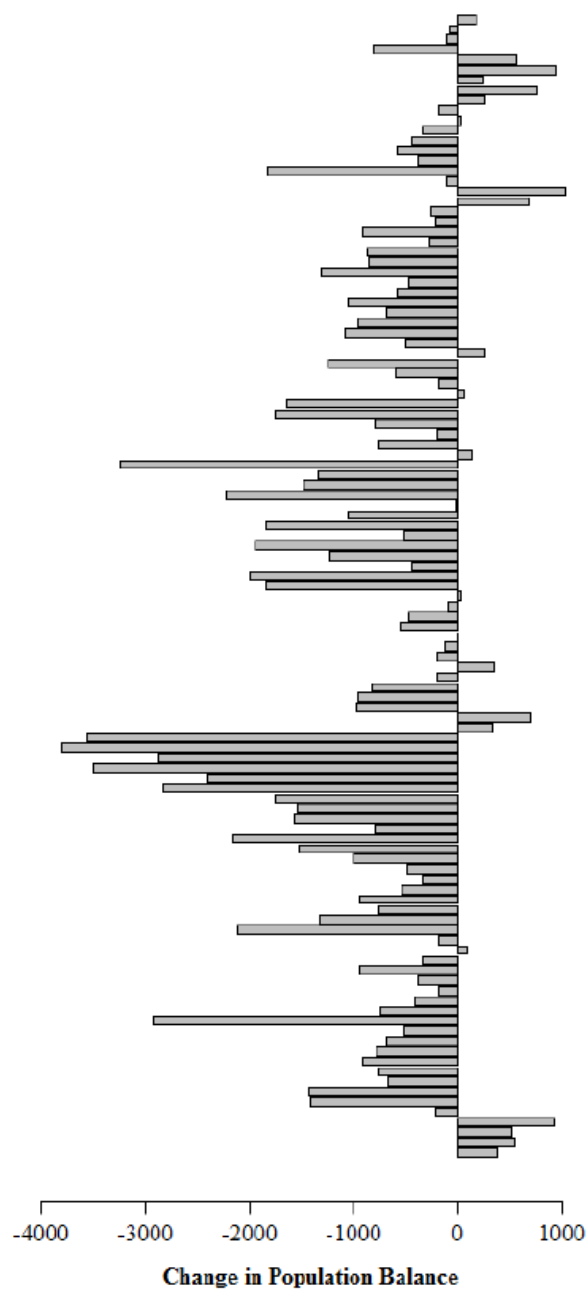
A blogger who comments on population migration issues, Mr. Z, wrote an article in 2010 with a title that claimed:

“Our country's rural population is growing, not shrinking.”

The article proceeded to identify rural villages in different parts of the country that are growing, claiming that:

"almost all of the rural regions of the country are now *gaining* population."

Individual Village Population Change Between 2009 and 2010



The data confirm the claim made by Mr. Z.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

The data confirm the claim made by Mr. Z.

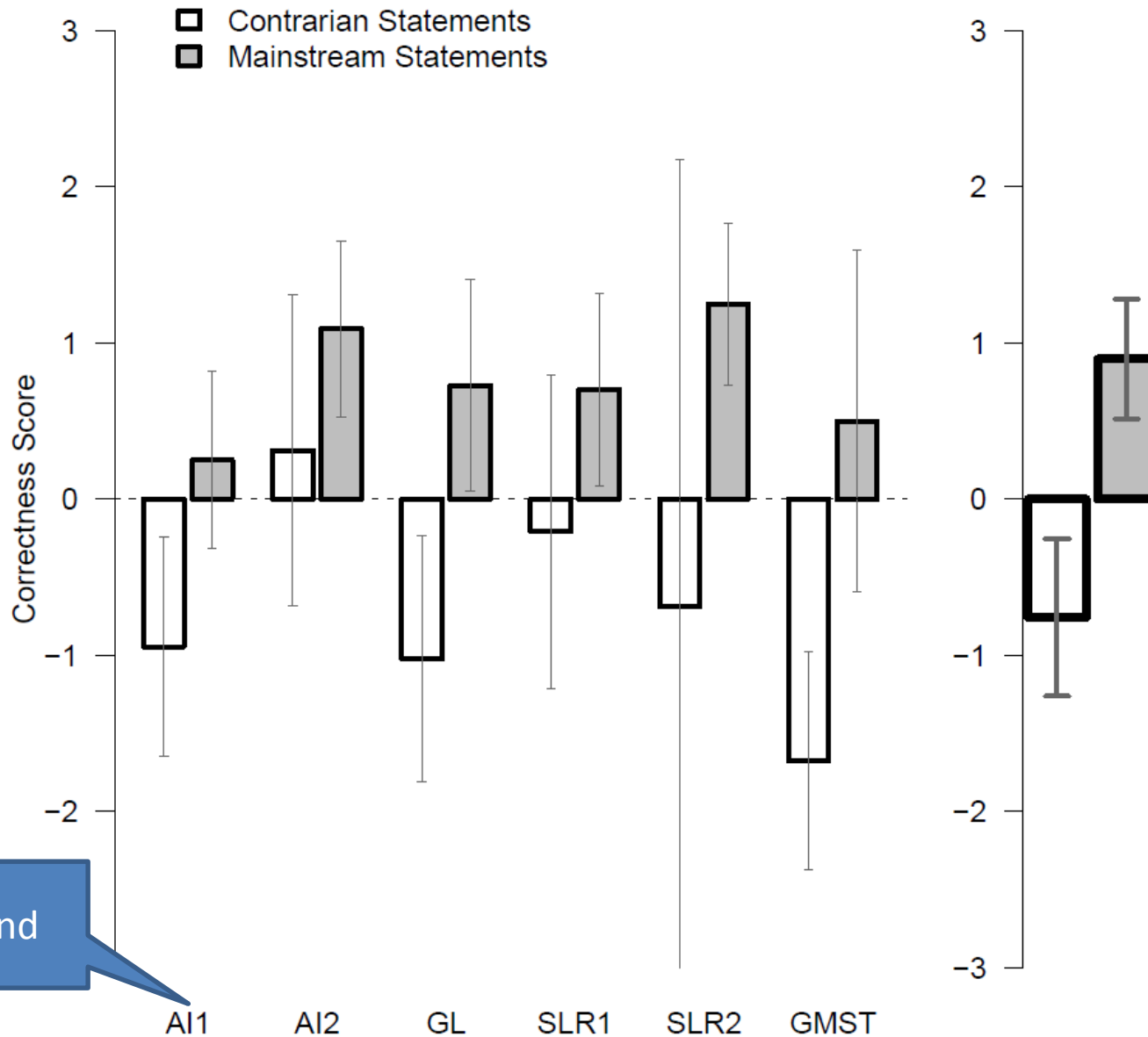
- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

Combine items into correctness score

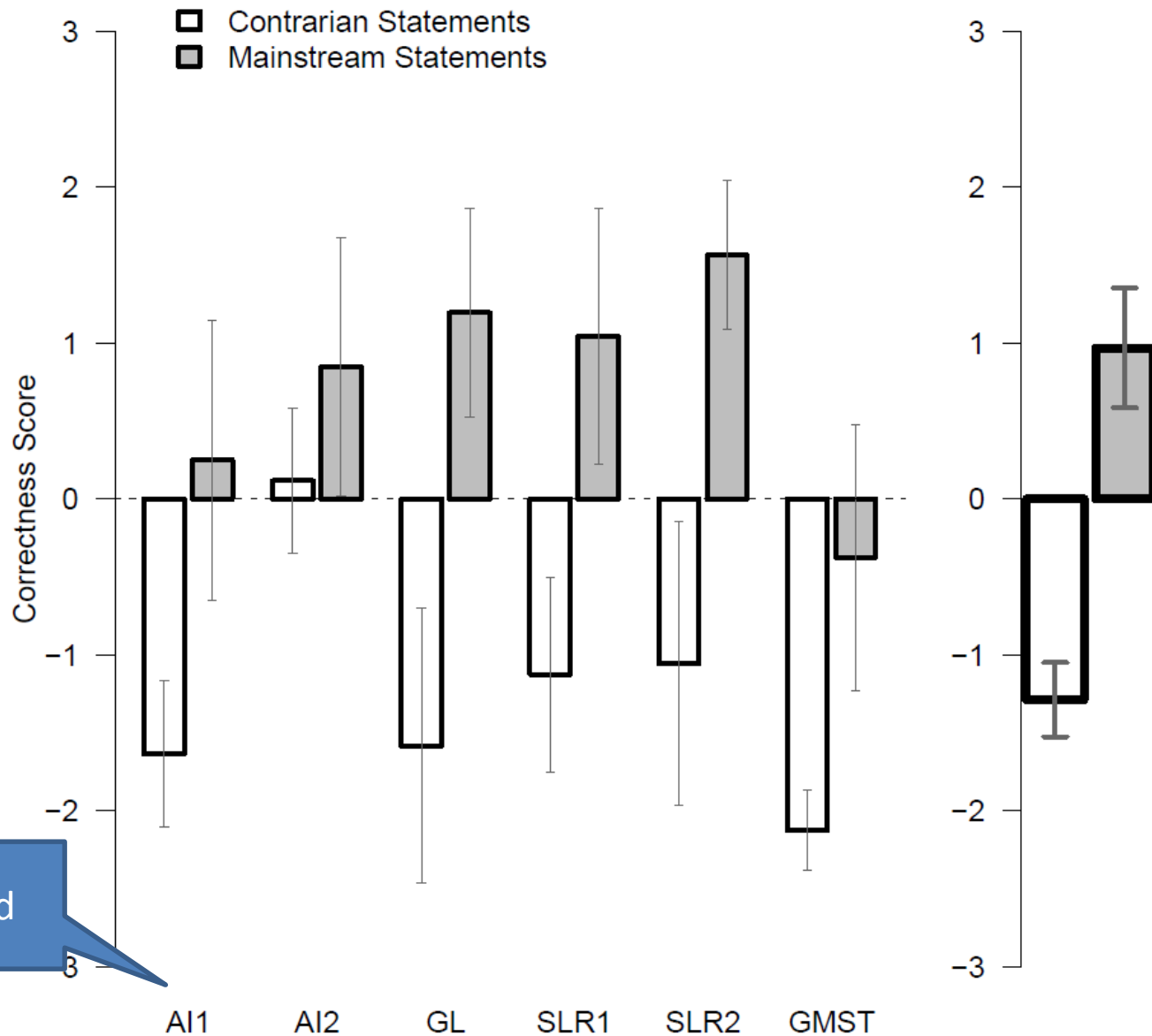
The claim made about the data by Mr. Z is misleading.

- ☐ Strongly disagree
- ☐ Moderately disagree
- ☐ Slightly disagree
- ☐ Slightly agree
- ☐ Moderately agree
- ☐ Strongly agree

Blind Test With Economists



Blind Test With Statisticians



Denial vs. Skepticism: The Triage

5 CHARACTERISTICS OF SCIENCE DENIAL



Conspiratorial Denial of Science is a Global Phenomenon

- [xxxxxxx research is] “a vertically integrated, highly concentrated, oligopolistic cartel” that “manufactures alleged evidence.”
- “billions of dollars of public and private capital have been expended on the xxxxxxxxxxxx industry in the last 20 years.”

—

Conspiratorial Denial of Science is a Global Phenomenon

- [Medical research is] “a vertically integrated, highly concentrated, oligopolistic cartel” that “manufactures alleged evidence.”
- “billions of dollars of public and private capital have been expended on the anti-smoking industry in the last 20 years.”
 - *internal memo of the tobacco industry (1983)*

Scientific Facts or Conspiracies

- HIV causes AIDS
- Tobacco smoke causes lung cancer
- Greenhouse gases cause climate change
- Western medicine is racist
- Medical research is an oligopolistic cartel
- Global warming is a hoax



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live? Take this**

How green zealots planet: The prov vilified for denyin

By JAMES DELINGPOLE

UPDATED: 09:06, 7 February 2012

“The experts had ... been twisting the evidence, abusing the scientific process, ... illegally hiding or deleting emails ... and silencing dissent...”

Climate sceptic clouds the weather issue

February 2, 2010

Adam Morton



Lord Christopher Monckton in Melbourne. *Photo: Justin McManus*

A NASA satellite that would have measured atmospheric carbon dioxide with unprecedented accuracy fell into the Indian Ocean in February last year.

NASA said the crash was "extremely disappointing". Viscount Christopher Monckton of Brenchley, dubbed the "high priest of climate sceptics", doubts the space agency meant it.

"Not greatly to my surprise - indeed I predicted it - the satellite crashed on take-off because the last thing they want is real world hard data," he told a climate sceptics' lunch in South Yarra yesterday.

NASA understood that getting the satellite into orbit would have demonstrated "the whole darn thing" - climate-change science - "is nonsense".

Adjudication?

What Do People Make of This?

(Lewandowsky et al., 2015)

- Blogosphere response to one of my papers provided potentially conspiratorial material
- Blind and naïve participants rated web content on attributes of conspiracism
- “To what extent does the content express ...”

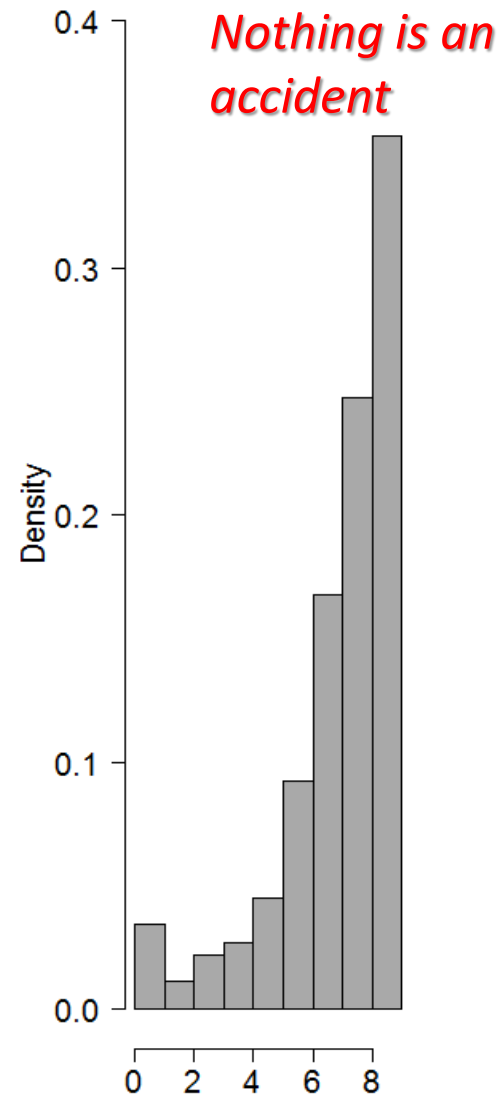
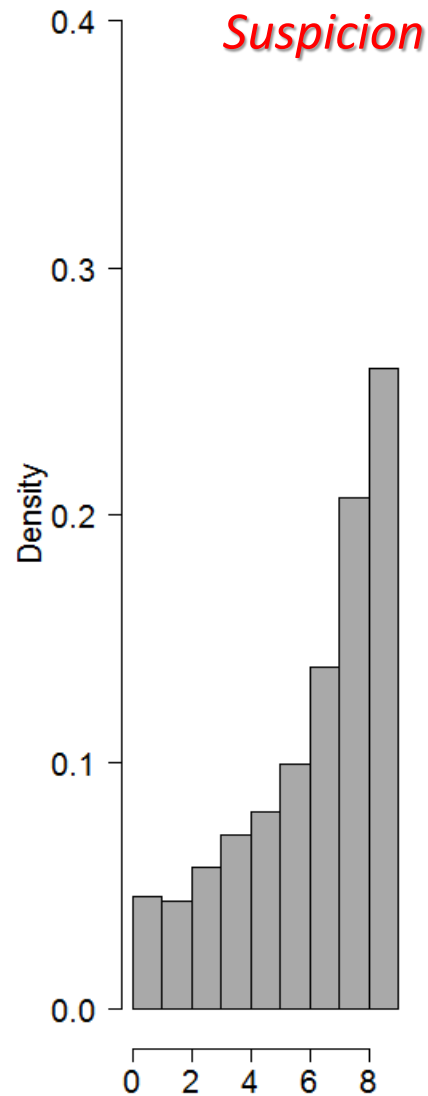
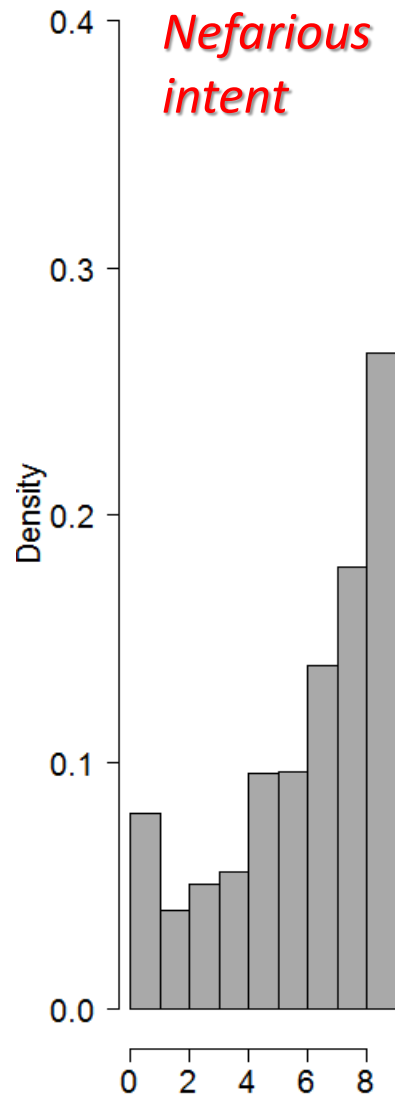
Nefarious intent

Deep-seated suspicion

Nothing is an accident

(0-9 scale)

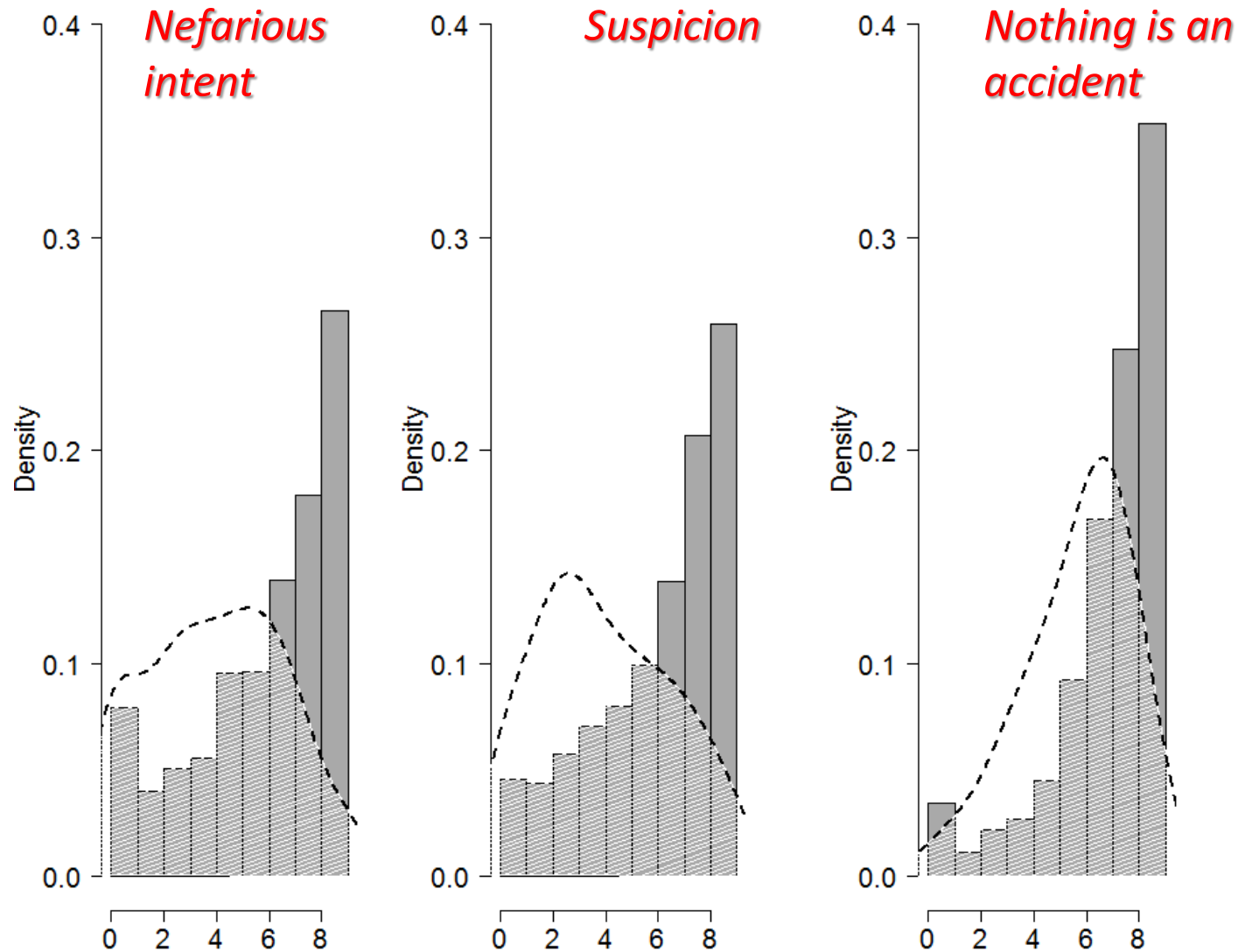
Web Content (Comments & Posts)



Web Content vs. Scholarly Critique

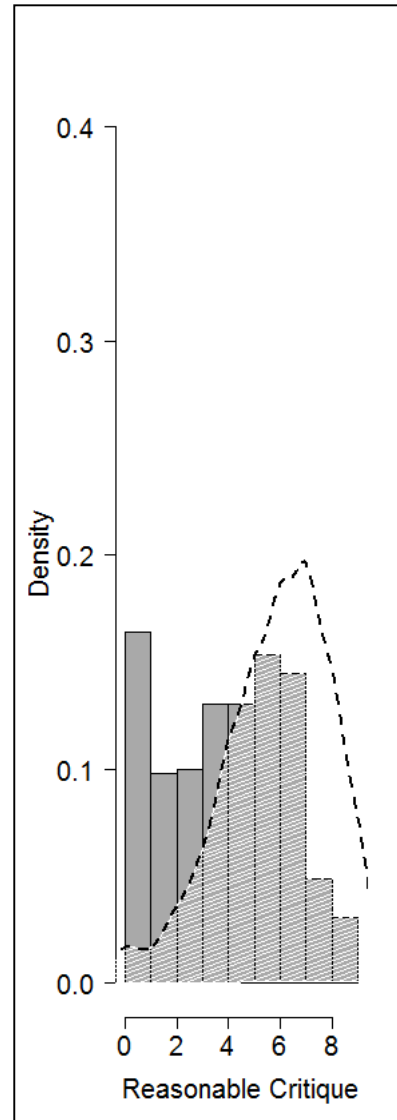
- PhD students asked to be as “critical as possible” to generate comparison stimuli

Web Content vs. Scholarly Critique



Web Content vs. Scholarly Critique

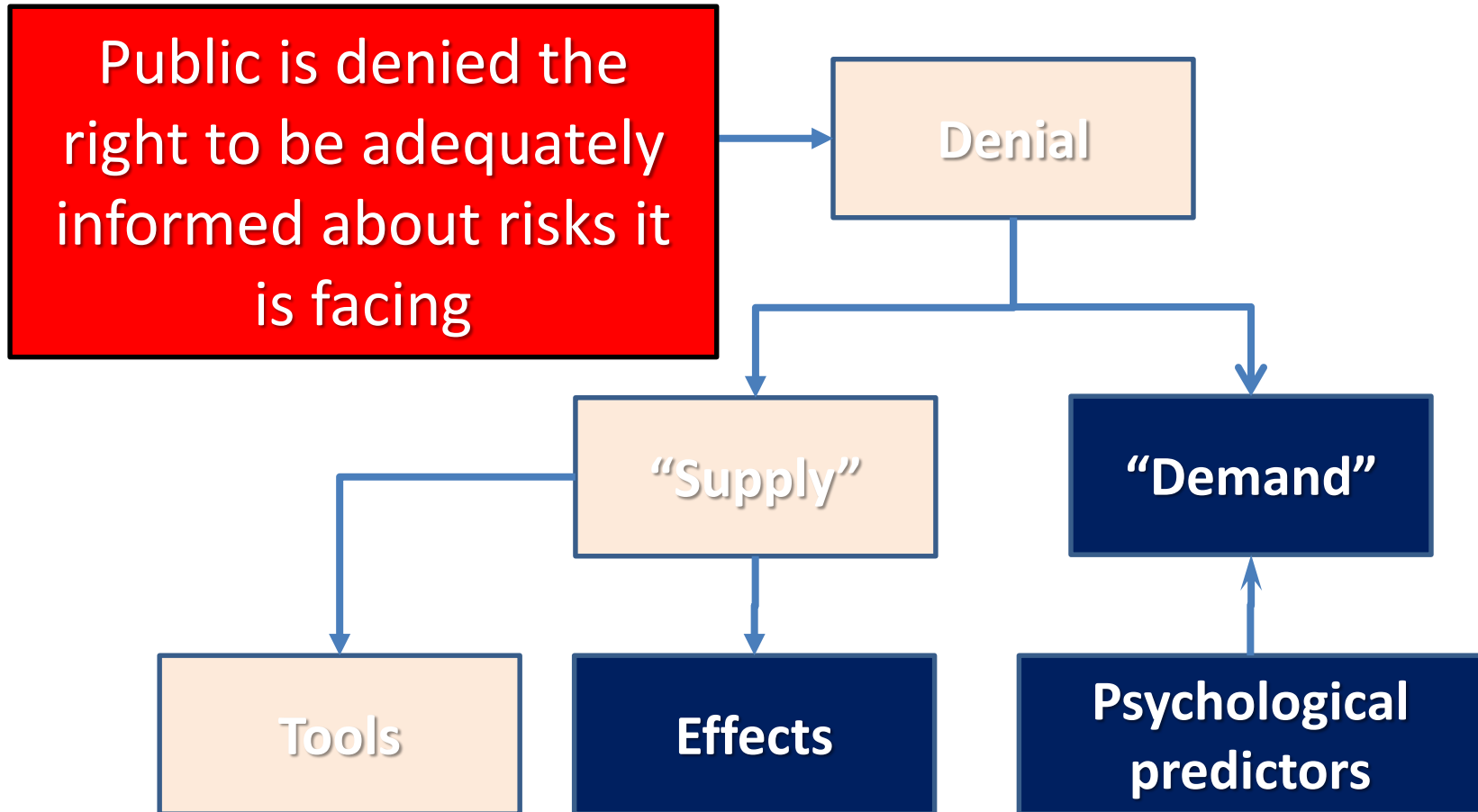
*“...reasonable
and well thought
out criticism of
the research?”*



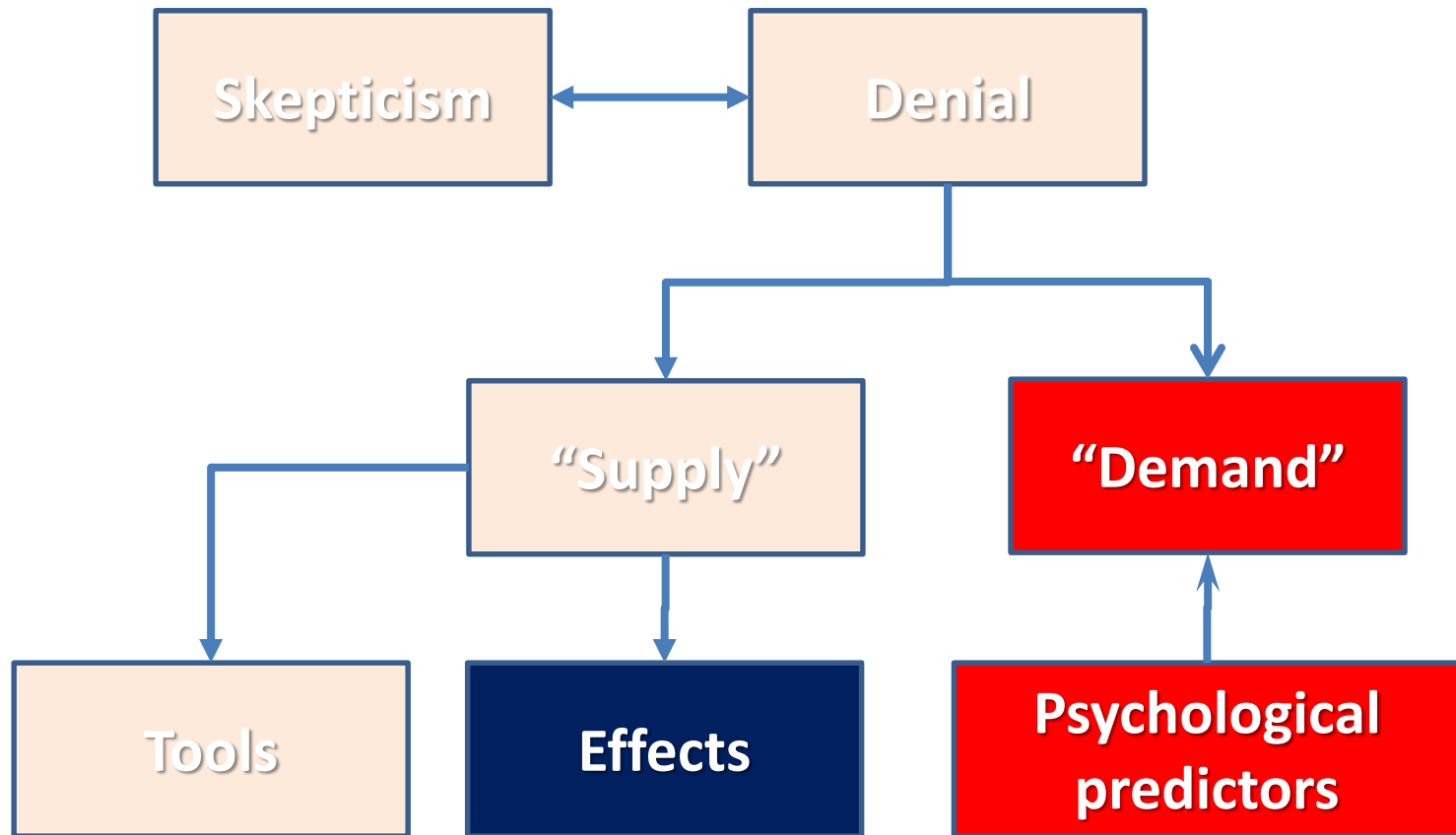
Conspiratorial Discourse

- In the eyes of naïve and blind participants
- ... climate blogosphere discourse is identified as conspiratorial using well-established attributes.
- Climate blogosphere discourse is *not* judged to be reasonable and thought-out criticism.

Rejection of (Climate) Science



Rejection of (Climate) Science



Why do People “Buy” Organized Denial?

Worldview (“Ideology”)

- People’s basic beliefs about how society should be structured and how goods should be distributed.
- Nuanced concept
 - cultural cognition (e.g., Kahan, 2012)
 - here focus on people’s view of the free market (Heath & Gifford, 2006)

Worldview and Science (Lewandowsky et al., 2013)

Free market:

An economic system based on free markets unrestrained by government interference automatically works best to meet human needs.

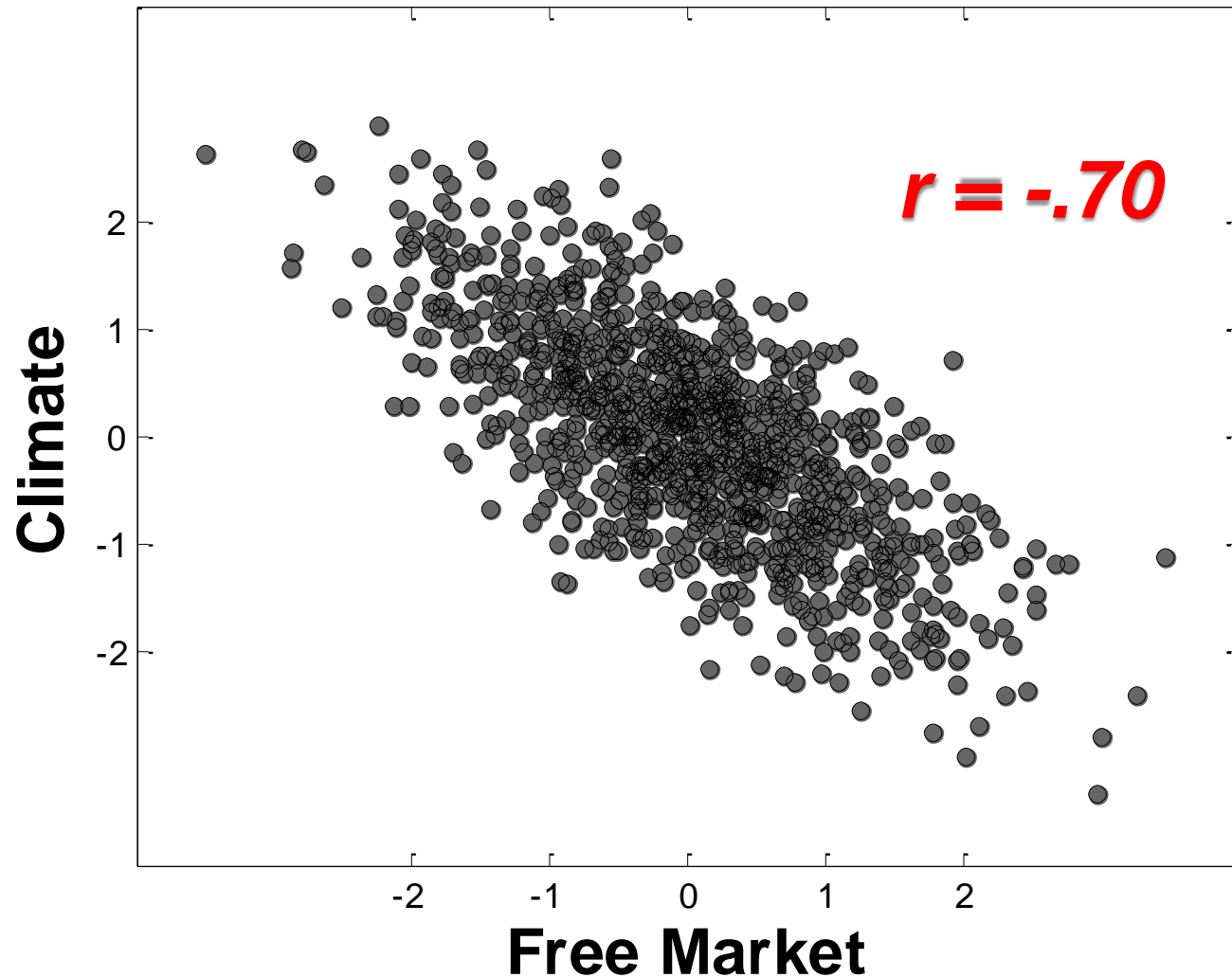
The free market system may be efficient for resource allocation but it is limited in its capacity to promote social justice. (R)

Climate:

I believe that the climate is always changing and what we are currently observing is just natural fluctuation. (R)

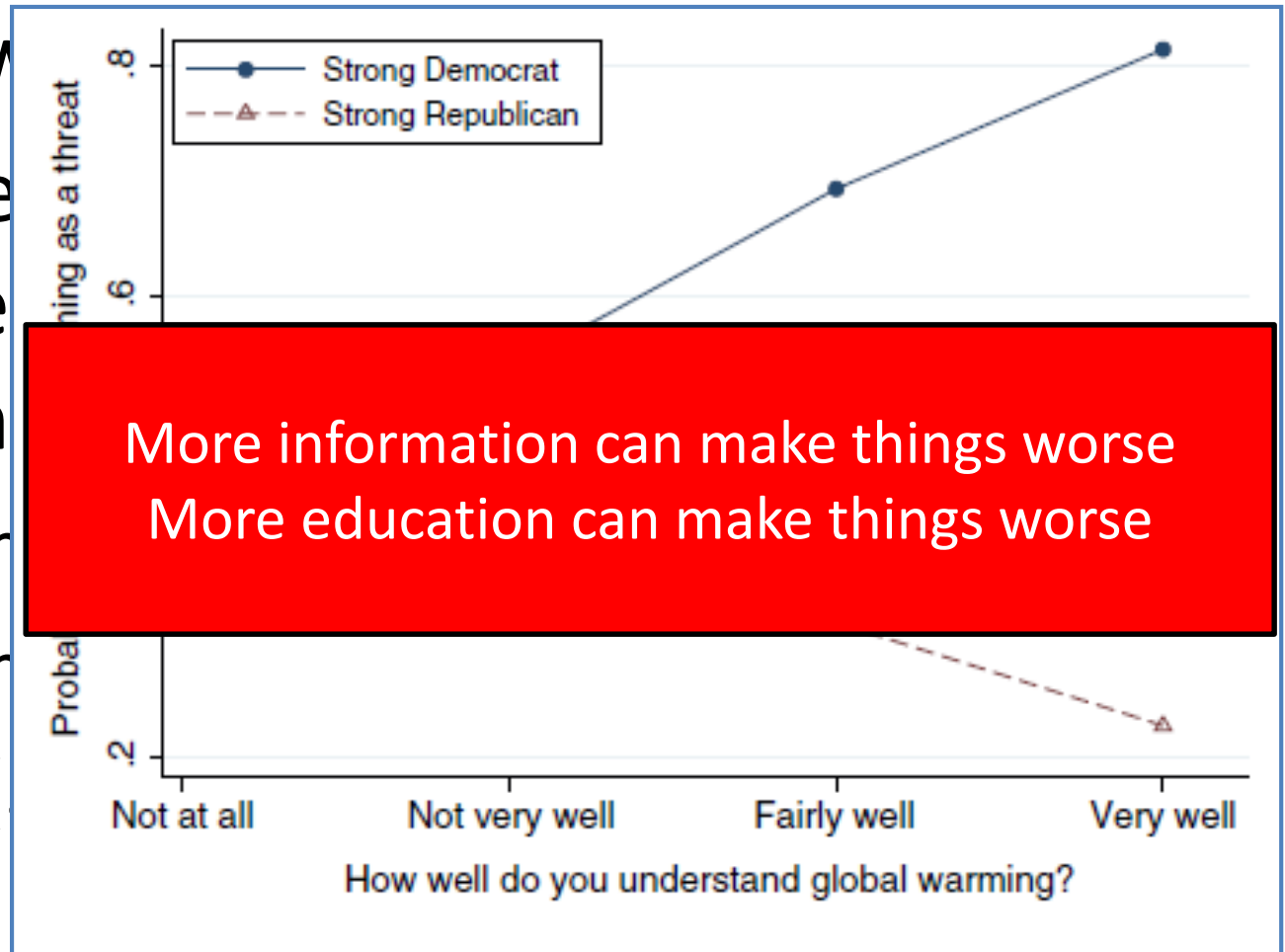
I believe that most of the warming over the last 50 years is due to the increase in greenhouse gas concentrations.

Worldview and Science (Lewandowsky et al., 2013)

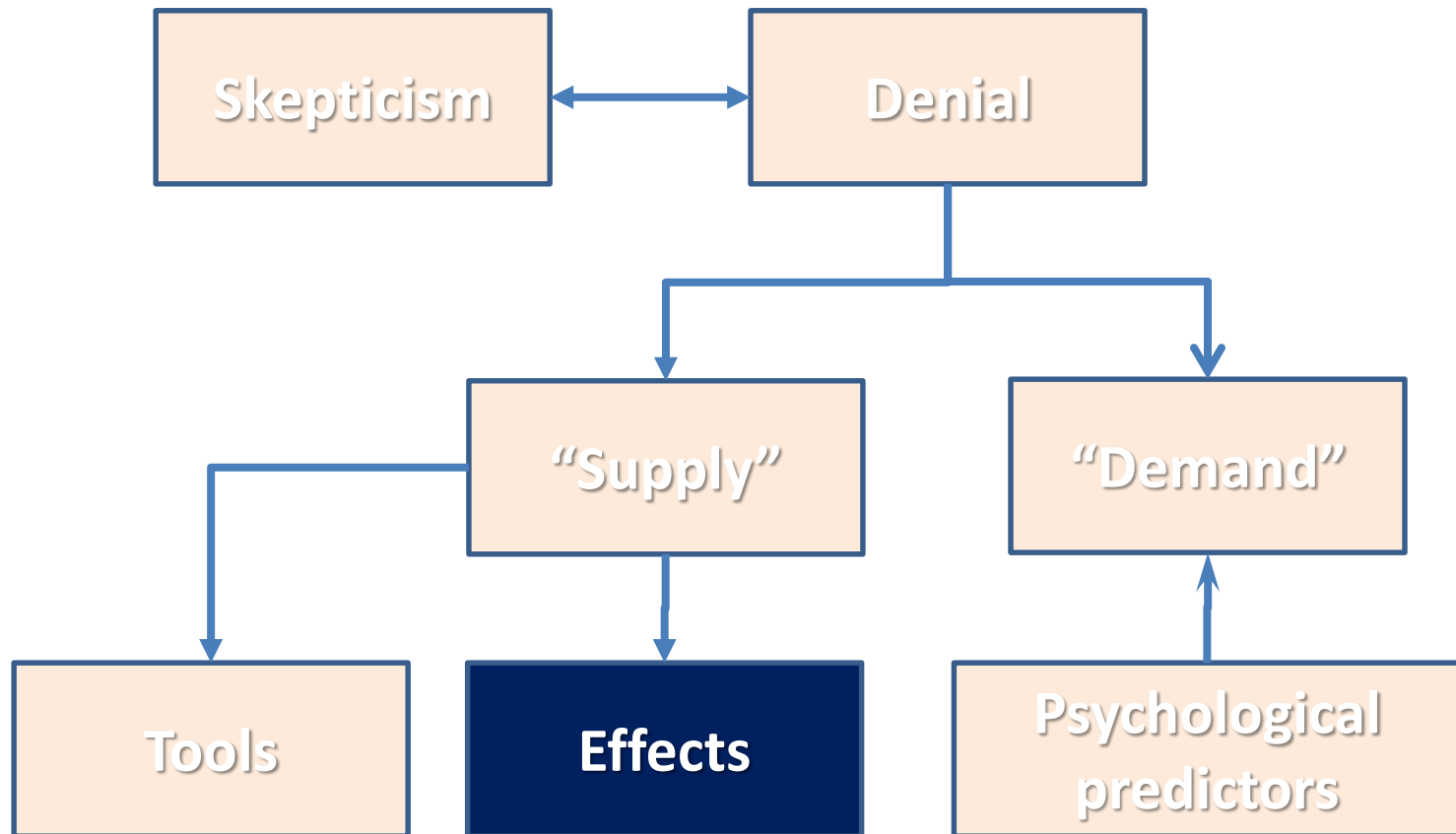


Worldview (“Ideology”) and Science

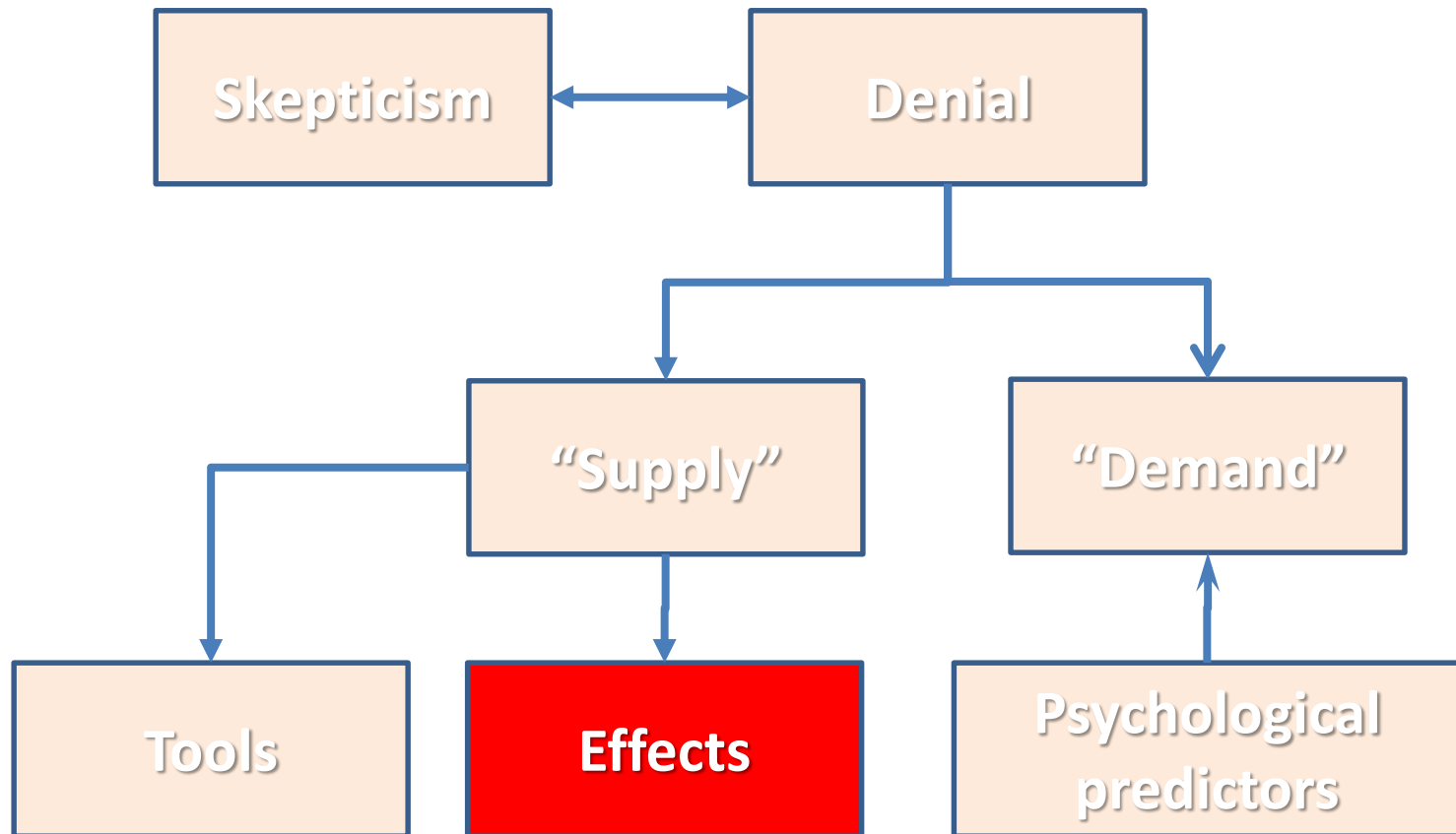
- Worldview
- Among Rep
of science
education
 - 31% with
 - 19% with
 - reverse (



Rejection of (Climate) Science



Rejection of (Climate) Science



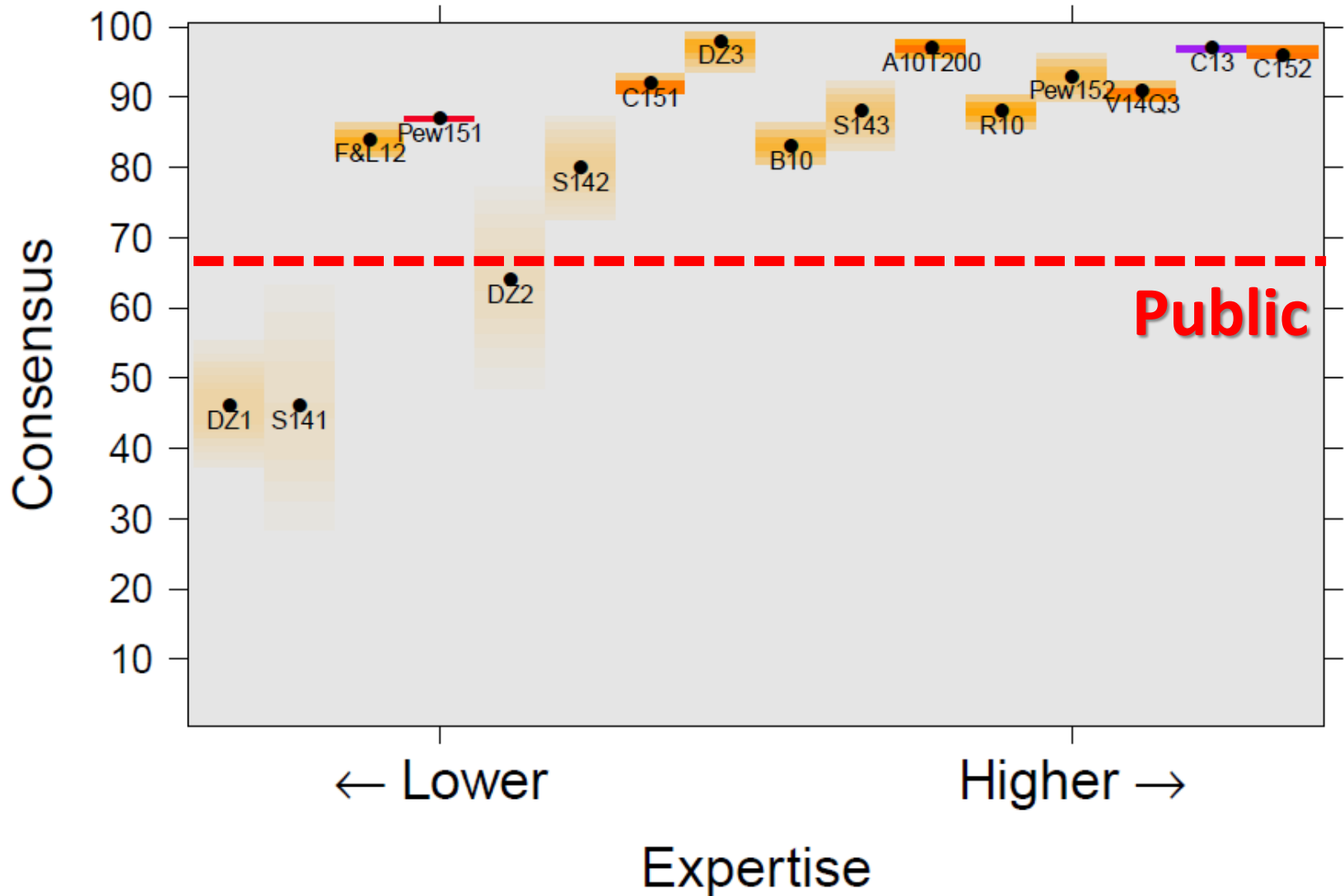
Public

Analysis of Media Opinion Pieces (Elsasser & Dunlap, 2013)

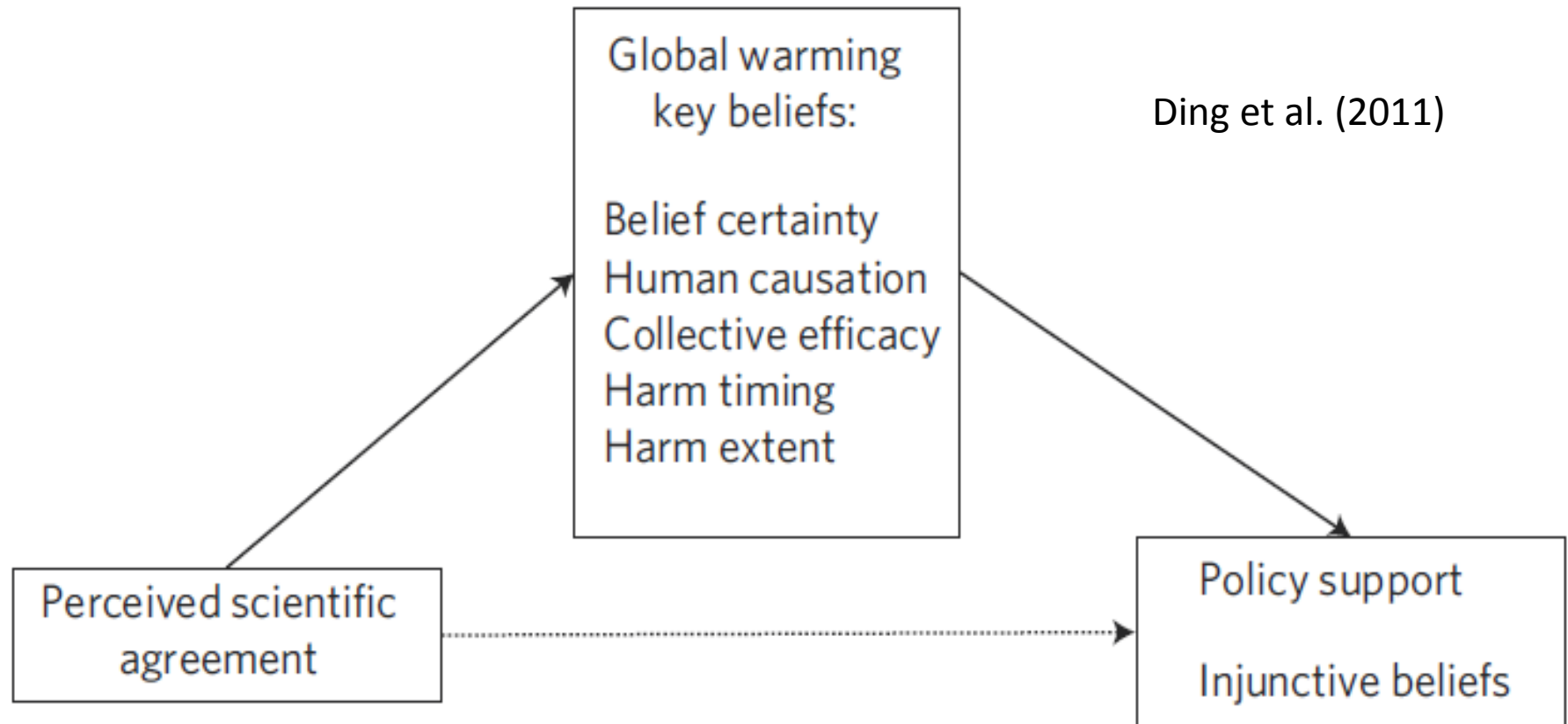
Table 3. Skeptical Arguments by Category and Year

	2007	2008	2009	2010	Total
It's not happening					
Temperature record is unreliable	4	1	4	4	13
It's cooling	17	9	31	23	80
Ice isn't melting	16	6	11	12	45
Climategate/CRU email suggests conspiracy	0	0	27	13	40
Sea level rise is exaggerated	6	0	2	4	12
There is no consensus	45	17	28	39	129

Problem: Misperception of Scientific Consensus



Consensus as a Gateway Belief



Scientific Community

“Seepage”

- Climate scientists operate under very difficult conditions
 - institutional support not necessarily sufficient
 - death threats
 - hate mail
 - repeated “hacks” of personal correspondence
 - serial misrepresentation by certain media organs
- Climate scientists have shown great courage

Linguistic Landscape of Science

- Scientific “reticence” (Hansen, 2007; Risbey, 2008)
 - inhibiting the communication of a threat of a potentially large sea level rise
- IPCC AR4 conservative (Freudenburg & Muselli, 2010)
 - 85% of news articles reveal climate disruption to be worse than expected
- “Erring on Side of Least Drama” (Brysse et al., 2013)
 - public backlash if predictions are too “alarmist”

From Conservatism to “Seepage”



ELSEVIER

Contents lists available at [ScienceDirect](#)

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

Seepage: Climate change denial and its effect on the scientific community

Stephan Lewandowsky^{a,b,*}, Naomi Oreskes^c, James S. Risbey^d, Ben R. Newell^e,
Michael Smithson^f

Seepage

- Tacit acceptance of a particular frame or narrative
- Highlighting one aspect over another in a complex situation
 - e.g., uncertainty rather than firm knowledge
- **Not** massive and not easily detectable
- Departure from previously accepted scientific practice without explicit justification

The language of denial: text analysis reveals differences in language use between climate change proponents and skeptics

Srdan Medimorec¹ • Gordon Pennycook¹

Abstract We used text analyzers to compare the language used in two recently published reports on the physical science of climate change: one authored by the Intergovernmental Panel on Climate Change (IPCC) and the other by the Nongovernmental International Panel on Climate Change (NIPCC; a group of prominent skeptics, typically without formal scientific training, organized by the Heartland Institute). Although both reports represent empirical research within the same scientific discipline, our analysis revealed consistent and substantial differences between them. Most notably, the IPCC was more cautious (as opposed to certain) language than the NIPCC and others, which in turn indicates that, contrary to that which is commonly claimed by skeptics, IPCC authors were actually *more* conservative in terms of language style than their NIPCC counterparts. The political controversy over climate change may cause proponents' language to be conservative (for fear of being attacked) and opponents' language to be aggressive (to more effectively attack). This has clear implications for the science communication of climate research.

IPCC WG1 (2013)
“uncertain” > 2,200
times



The “Pause” in Global Warming

2006

Thursday 03 March 2011

The Telegraph

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Personal View

There IS a problem with global warming... it stopped in 1998

By **Bob Carter** 12:01AM BST 09 Apr 2006

 Comment

For many years now, human-caused climate change has been viewed as a large and urgent problem. In truth, however, the biggest part of the problem is neither environmental nor scientific, but a self-created political fiasco. Consider the simple fact, drawn from the official temperature records of the Climate Research Unit at the University of East Anglia, that for the years 1998-2005 global average temperature did not increase (there was actually a slight decrease, though not at a rate that differs significantly from zero).

Yes, you did read that right. And also, yes, this eight-year period of temperature stasis did coincide with society's continued power station and SUV-inspired pumping of yet more carbon dioxide into the atmosphere.

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Personal View

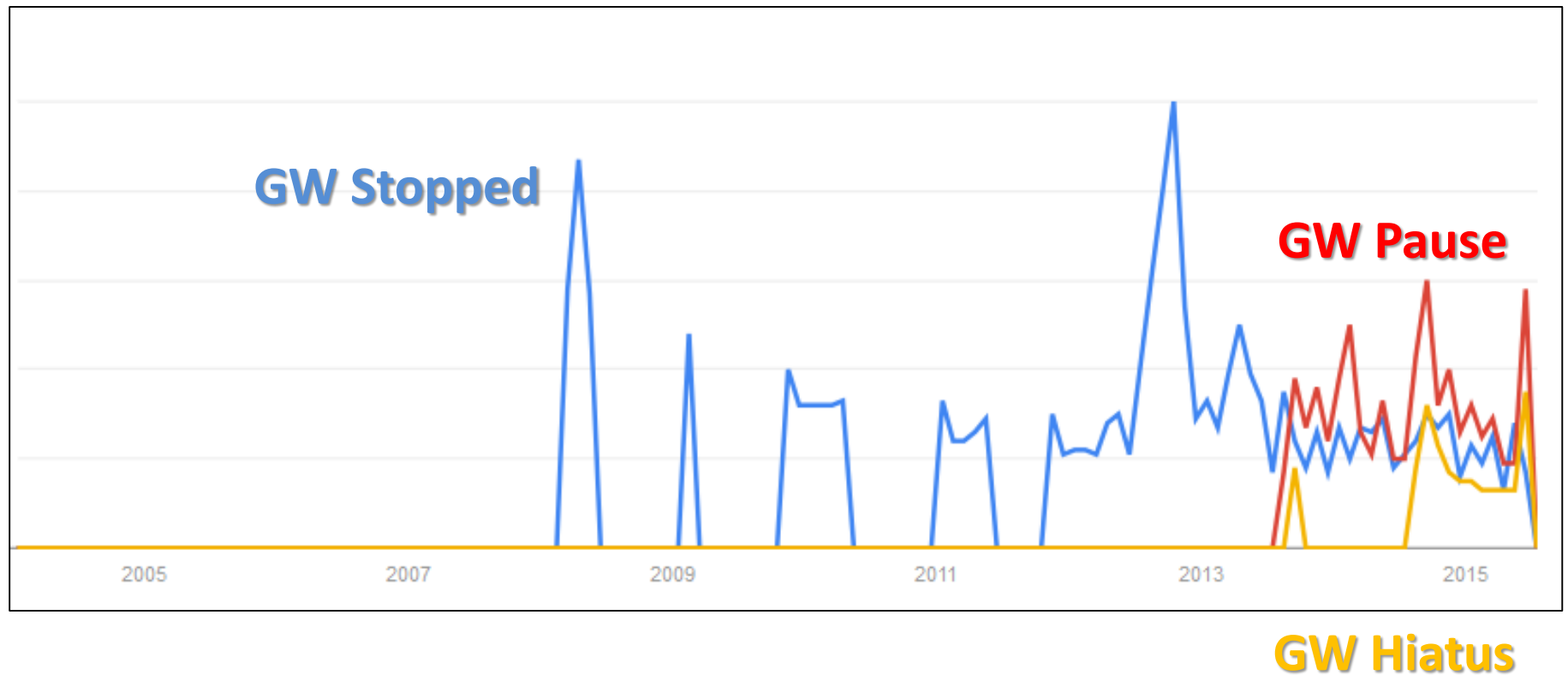
Comment »

IN COMMENT

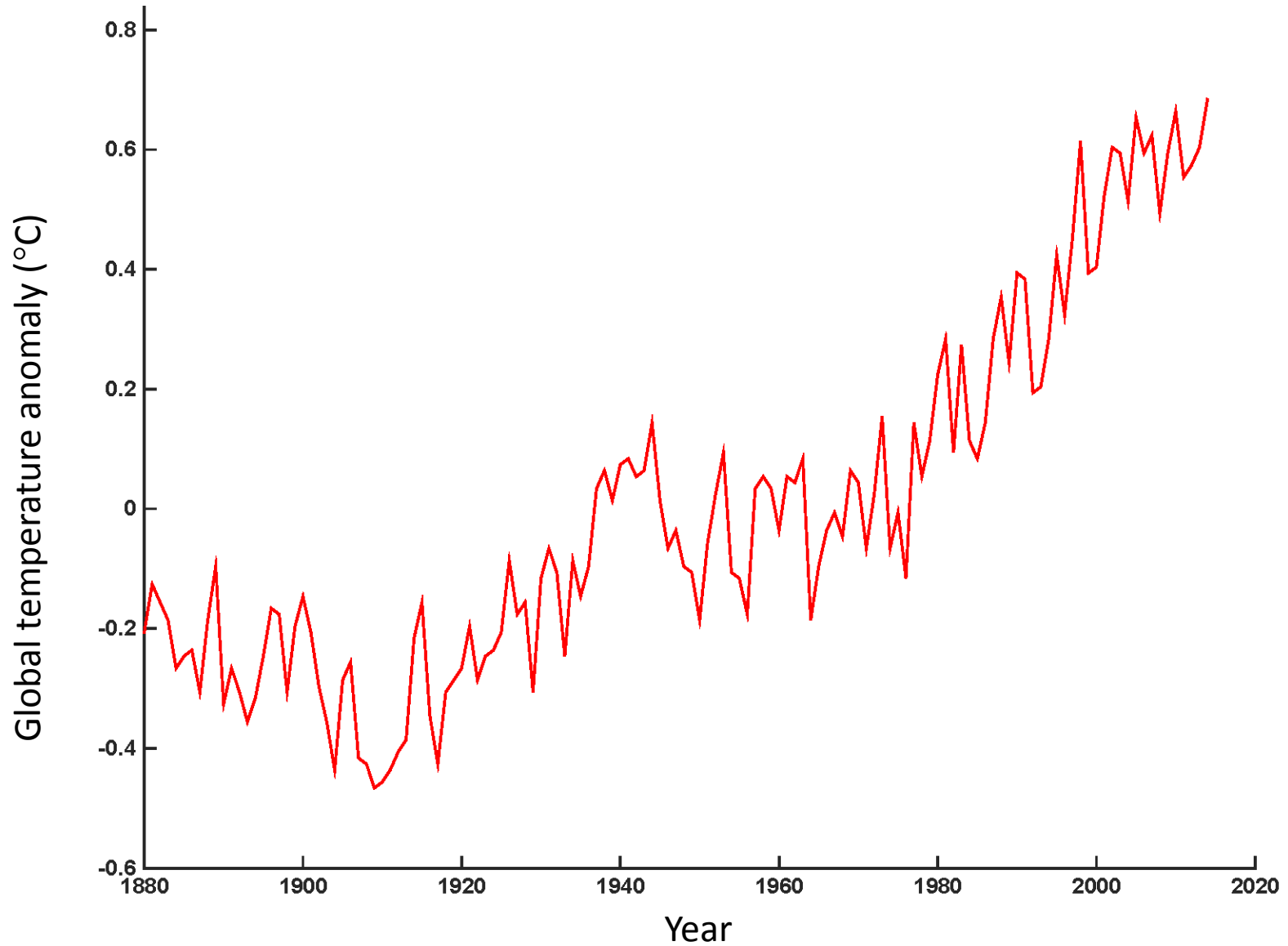


Politics Blogs

2004 – 2015: Google Trends



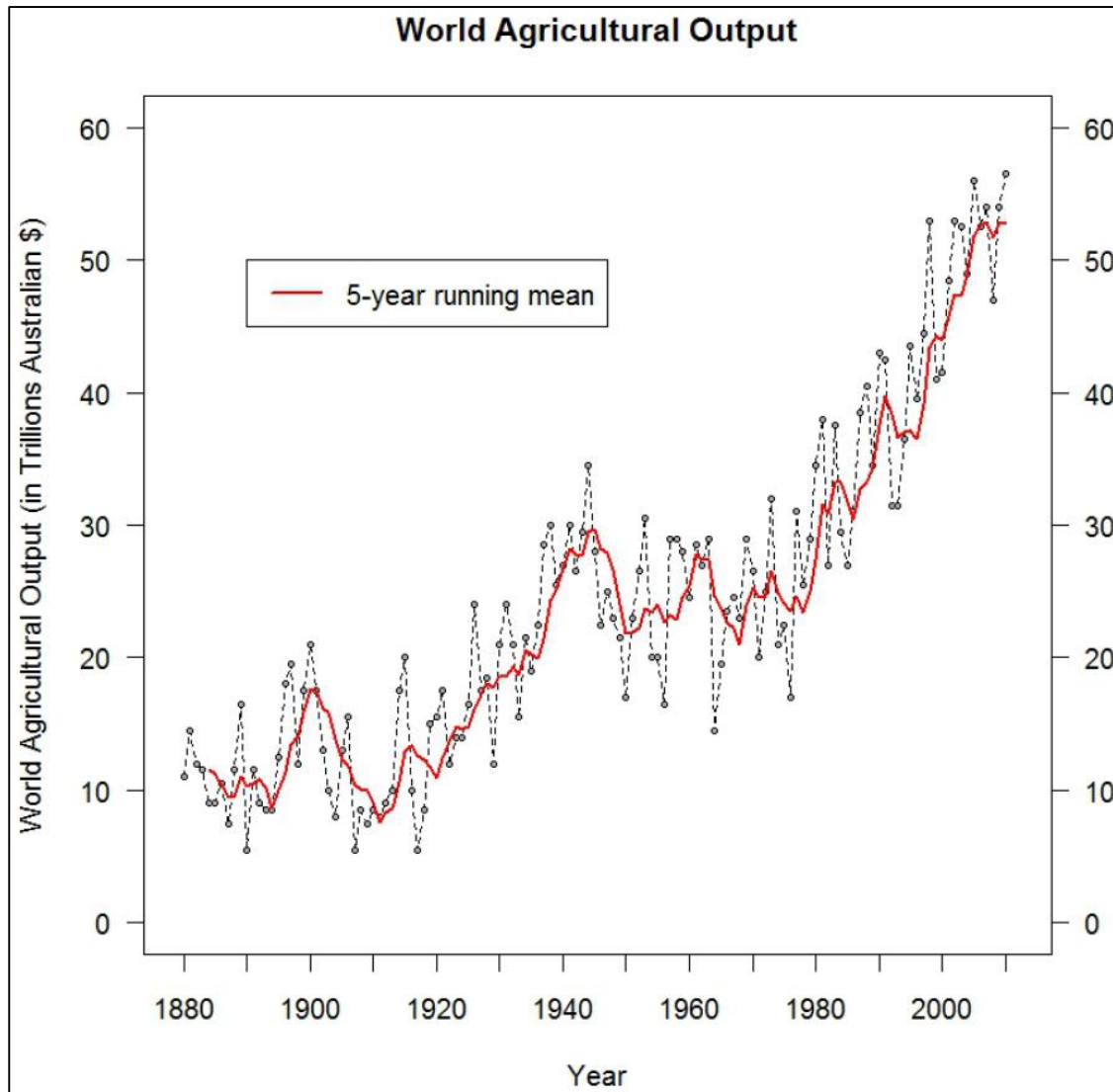
What “Pause”?



Forensic Cognition

- Present “skeptical” statements to experts in a blind test:
 - A prominent Australian critic of conventional economics, Mr. X., publicly stated in 2006, that ‘There IS a problem with the growth in world agricultural output—it stopped in 1998.’ A few months ago, Mr. X. reiterated that ‘... there's no trend, 2010 is not significantly more productive in any way than 1998.’

Forensic Cognition



Forensic Cognition

**Strongly disagree
(1)**

Midpoint = 3.5

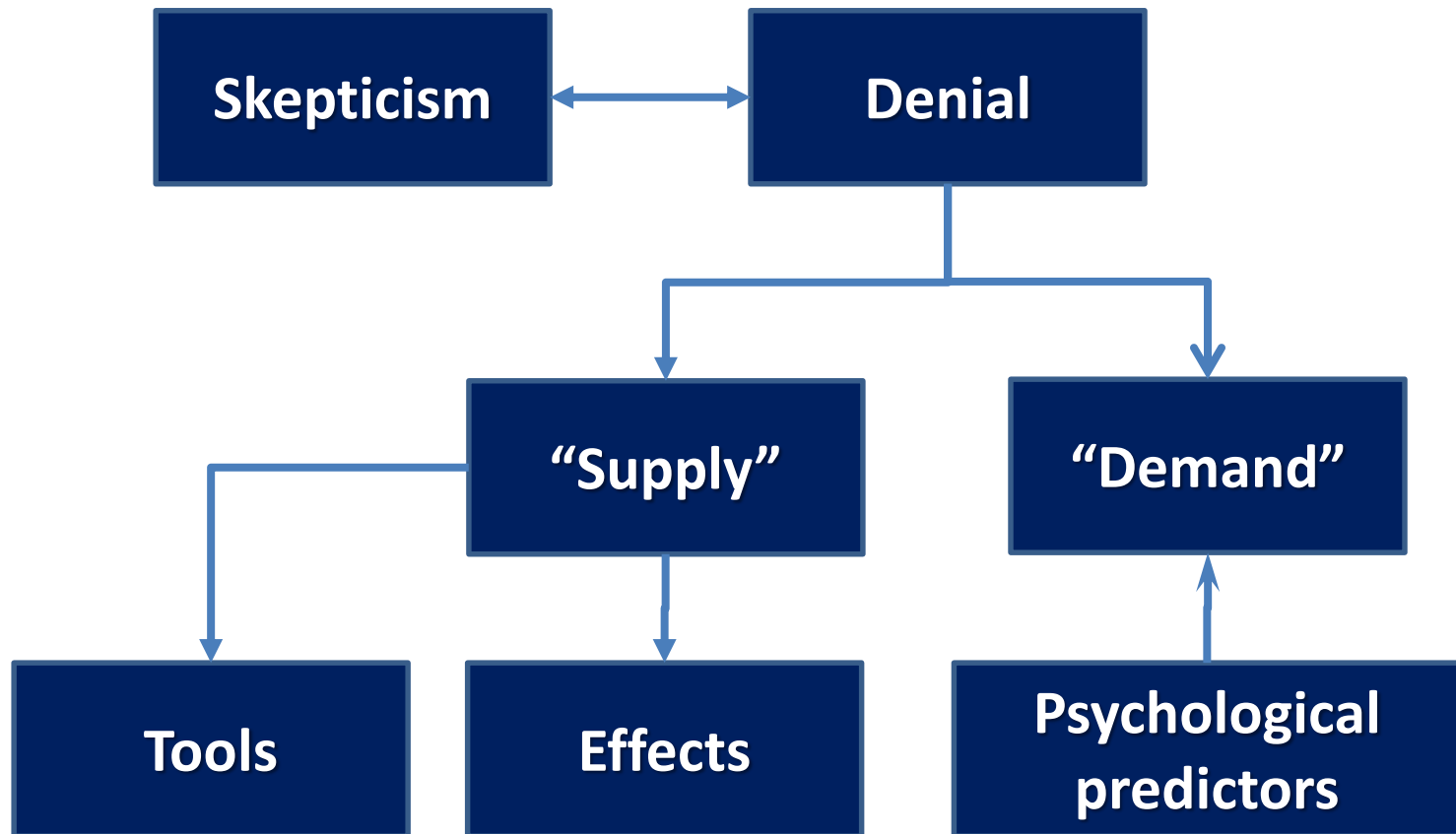
**Strongly agree
(6)**

Test item	Agreement ^a	Mean ^b	<i>t</i> ^c	<i>p</i> ^d
The data confirm the claim made by Mr. X	.36	2.84	−2.72	< .02
The data contradict the claim made by Mr. X	.68	4.12	2.58	< .02
The claim made about the data by Mr. X is misleading	.76	4.28	3.67	< .002
The claim made about the data by Mr. X is ill-informed	.76	4.04	2.38	< .03

The “Pause” in Global Warming

- Does not pass blind expert test
- No statistical evidence for slowing or stopping
- However, *for some time there was the appearance of a departure* between projected temperatures and observations
- Linguistic framing inappropriately seeped into the scientific community

Thank You



END

A Partial List of Tools

- Underscoring scientific consensus
 - Lewandowsky, Cook, Myers, Maibach
- Providing factual information (400 words)
 - Ranney
- Framing solution as business opportunity (nuclear) and losses as foregone gains
 - Kahan, Lewandowsky
- Framing climate change (and solutions) as a health issue
 - Maibach, Nisbet

Is this enough?

Critique of Cook et al. (2013)

Quantifying the consensus on anthropogenic global warming in the literature: A re-analysis



Richard S.J. Tol ^{a,b,c,d,e,*}

^a Department of the Economics, Jubilee Building, University of Sussex, Falmer BN1 9SL, United Kingdom

^b Institute for Environmental Studies, Vrije Universiteit, Amsterdam, The Netherlands

^c Department of Spatial Economics, Vrije Universiteit, Amsterdam, The Netherlands

^d Tinbergen Institute, Amsterdam, The Netherlands

^e CESifo, Munich, Germany

"There is no doubt in my mind that the literature on climate change overwhelmingly supports the hypothesis that climate change is caused by humans. I have very little reason to doubt that the consensus is indeed correct." (p. 704)

Conspiracies and Science

- [Medical research is] “... a vertically integrated, highly concentrated, oligopolistic cartel” that “manufactures alleged evidence”
 - internal memo of the tobacco industry (1983)

If virtually all scientists agree that evidence is overwhelming, but evidence is too threatening, then it's a conspiracy

all the phony
e global
perpetrated on
is.”
(2003)

Exposing rather than Engaging

- *Merchants of Doubt* (Oreskes).
 - similarity to tobacco
 - ideological underpinning
- “Cool dudes” (Dunlap, McCright).
 - ideological motivation
- Conservative “think” tanks (Jacques, Dunlap).
 - 92% of “skeptical” books have think tank background
- Psychological variables (Lewandowsky, Smith).
 - conspiratorial thinking

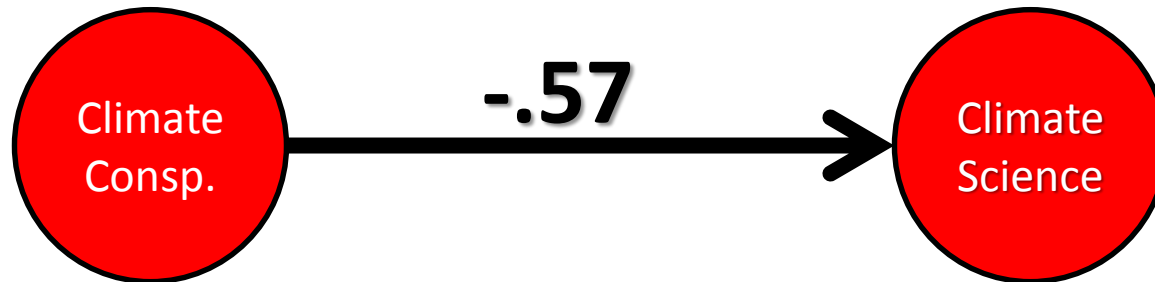
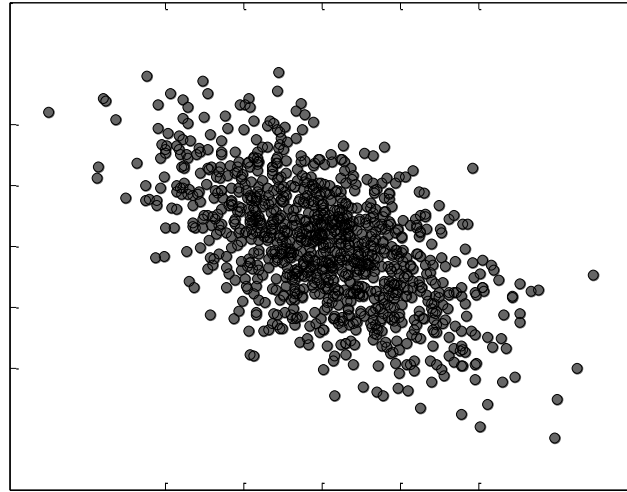
Scientific Facts or Conspiracies

- HIV causes AIDS
- Tobacco smoke causes lung cancer
- Greenhouse gases cause climate change
- Western medicine is racist
- Medical research is an oligopolistic cartel
- Global warming is a hoax

Conspiratorial Thinking and Rejection of Science

- Survey items
 - “Human CO2 emissions cause climate change”
 - “A powerful and secretive group known as the New World Order are planning to ... replace sovereign governments”
 - “Area 51 in Nevada is a secretive military base that contains hidden alien spacecraft”

Conspiratorial Thinking and Rejection of Science



Representative
U.S. sample

Conspiratorial Thinking and Rejection of Science

- Vaccinations -.54
- Smoking and lung cancer -.55
- HIV and AIDS -.55
- Genetically modified foods -.13
- Climate -.20 to -.57

Conspiratorial Thinking and Rejection of Science

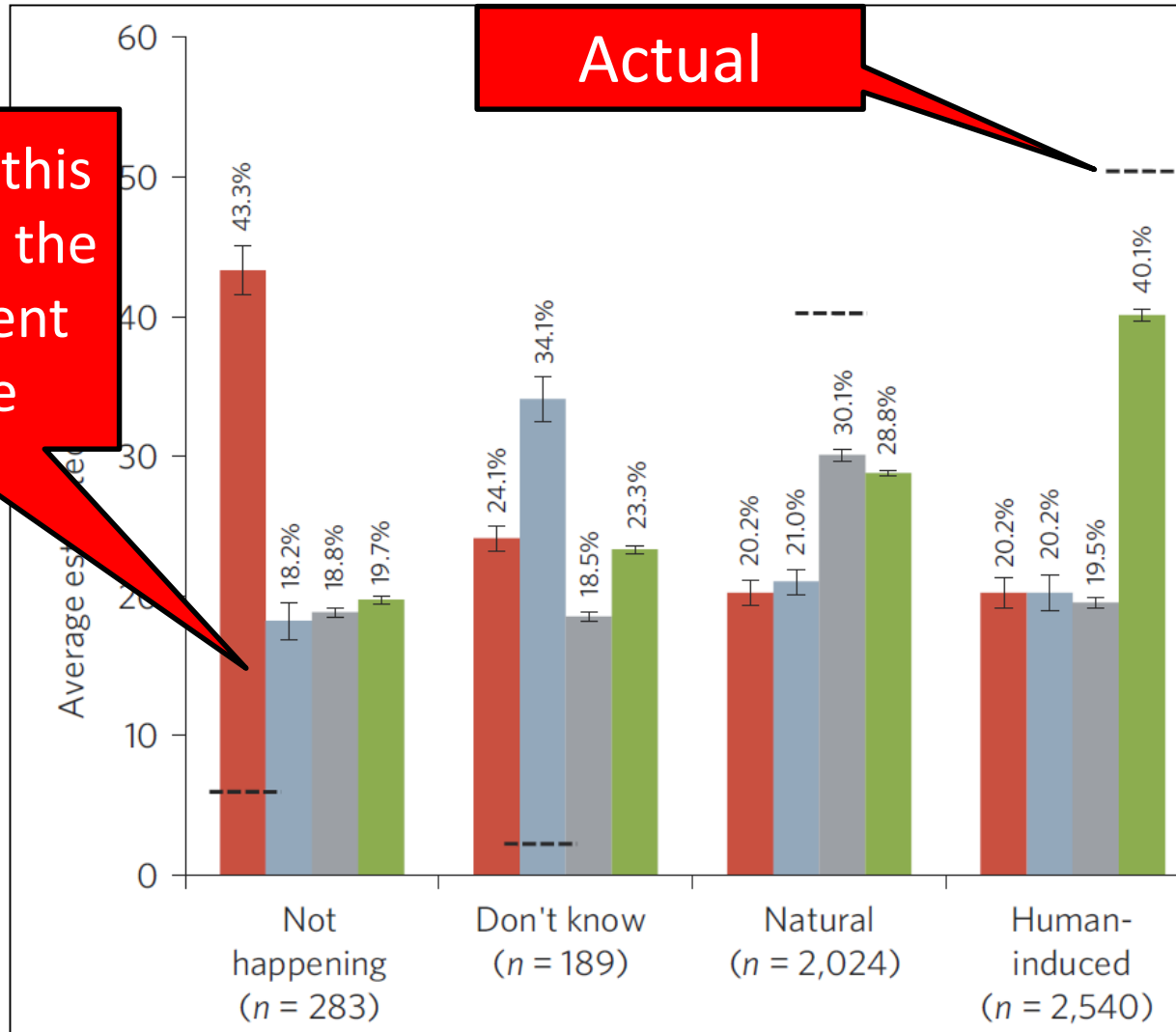
- Vaccinations -.54
- Smoking and lung cancer -.55
- HIV and AIDS -.55

20% of Representative U.S. sample:
Climate change "... is a hoax perpetrated
by corrupt scientists who wish to spend
more taxpayer money ..."

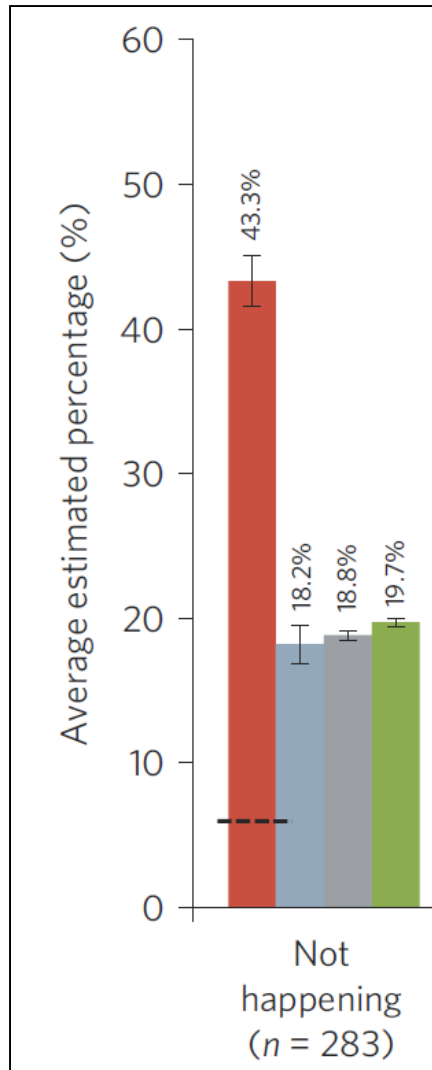
(Lewandowsky et al., 2013b, *PLOS ONE*)

False Consensus Effect (Leviston et al., 2013)

The greater this discrepancy, the more resilient to change

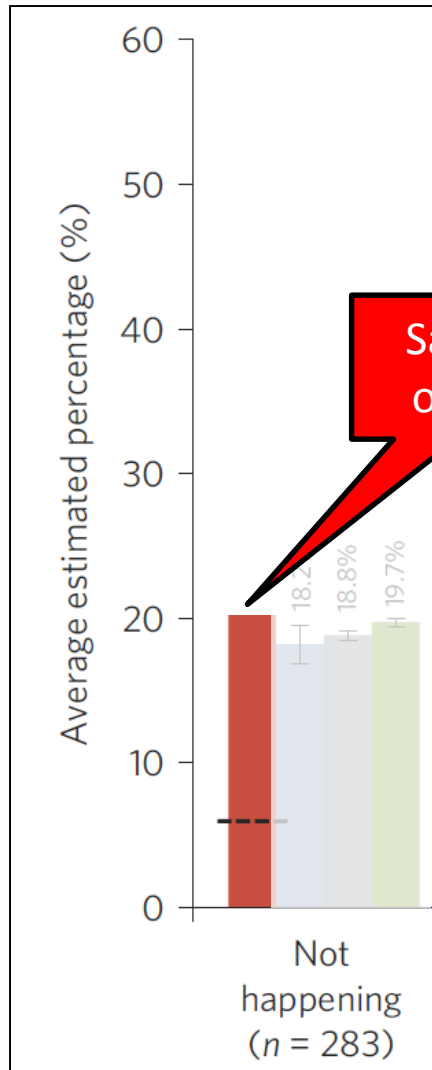


Perils of Motivated Cognition



- Small group of people who deny that climate is changing.
 - motivated cognition
 - epistemological closure
 - false consensus effect
 - conspiracist ideation
- Very difficult target group.
- Engagement fraught with risk.

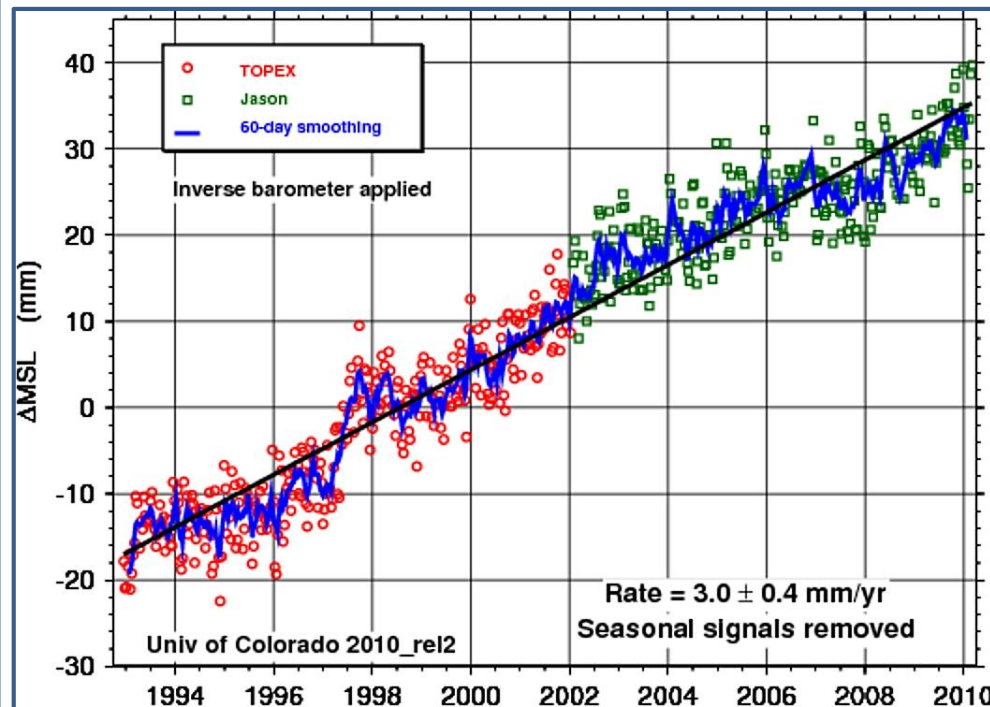
Perils of Motivated Cognition



- Small group of people who deny that climate is changing.
 - motivated cognition
 - epistemological closure
 - false consensus effect
 - conspiracist ideation
- Very different
- Engager

Do not mistake the opinion of this group for a plurality (let alone majority) opinion

Contrarian Media Coverage



But Sometimes “Irrelevancies” Are Not Irrelevant

nature
climate change

LETTERS

PUBLISHED ONLINE: 20 MARCH 2011 | DOI: 10.1038/NCLIMATE1059

Perceptions of climate change and willingness to save energy related to flood experience

A. Spence^{1*}, W. Poortinga², C. Butler³ and N. F. Pidgeon^{3*}

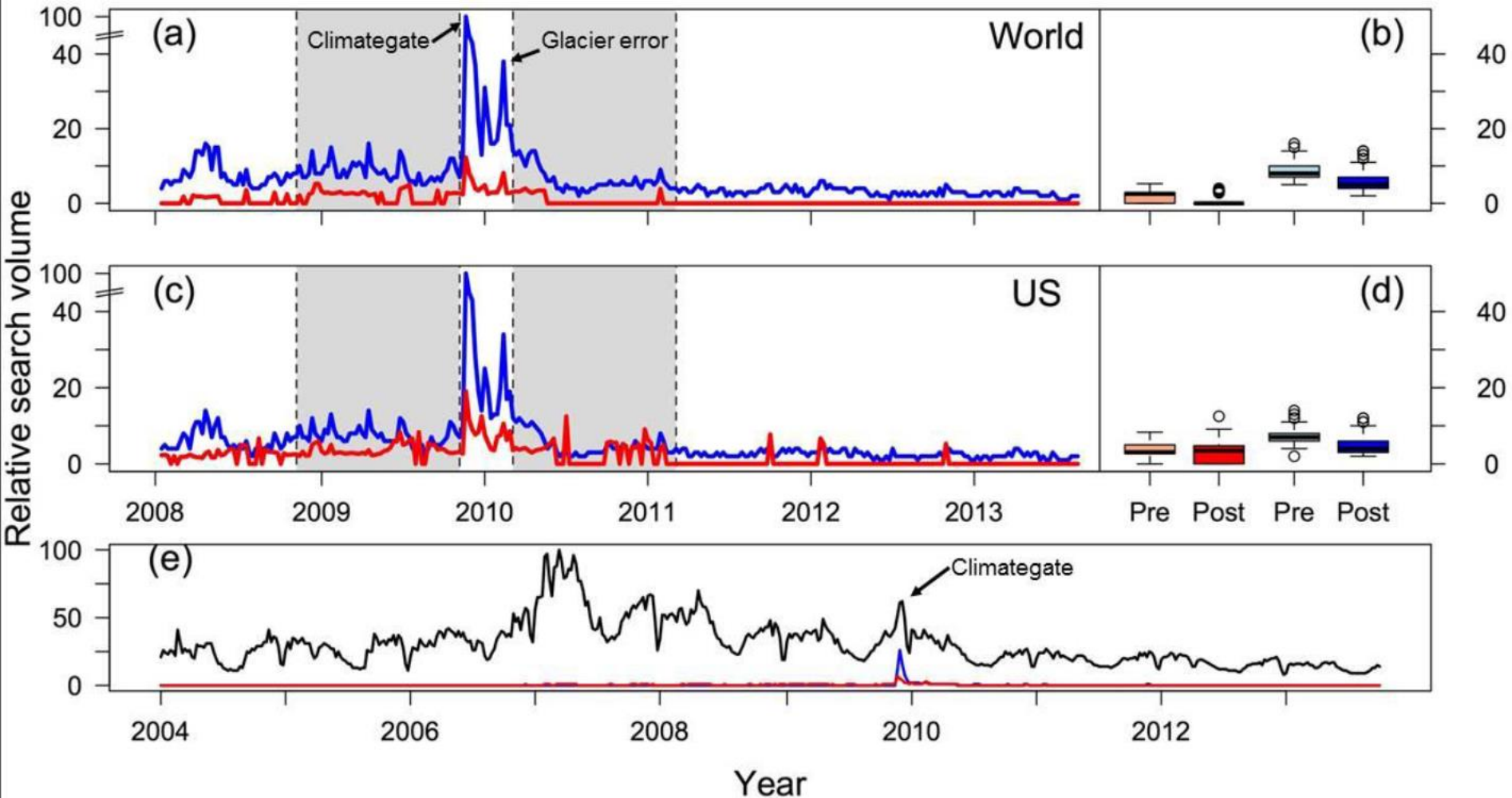
One of the reasons that people may not take action to mitigate climate change is that they lack first-hand experience of its potential consequences. From this perspective, individuals who have direct experience of phenomena that may be linked to climate change would be more likely to be concerned by the issue and thus more inclined to undertake sustainable behaviours. So far, the evidence available to test this hypothesis is limited, and in part contradictory^{1–4}. Here we use national survey data collected from 1,822 individuals across the UK in 2010, to examine the links between direct flooding experience, perceptions of climate change and preparedness to reduce

energy use. We show that those who report experience of flooding express more concern over climate change, see it as less uncertain and feel more confident that their actions will have an effect on climate change. Importantly, these perceptual differences also translate into a greater willingness to save energy to mitigate climate change. Highlighting links between local weather events and climate change is therefore likely to be a useful strategy for increasing concern and action.

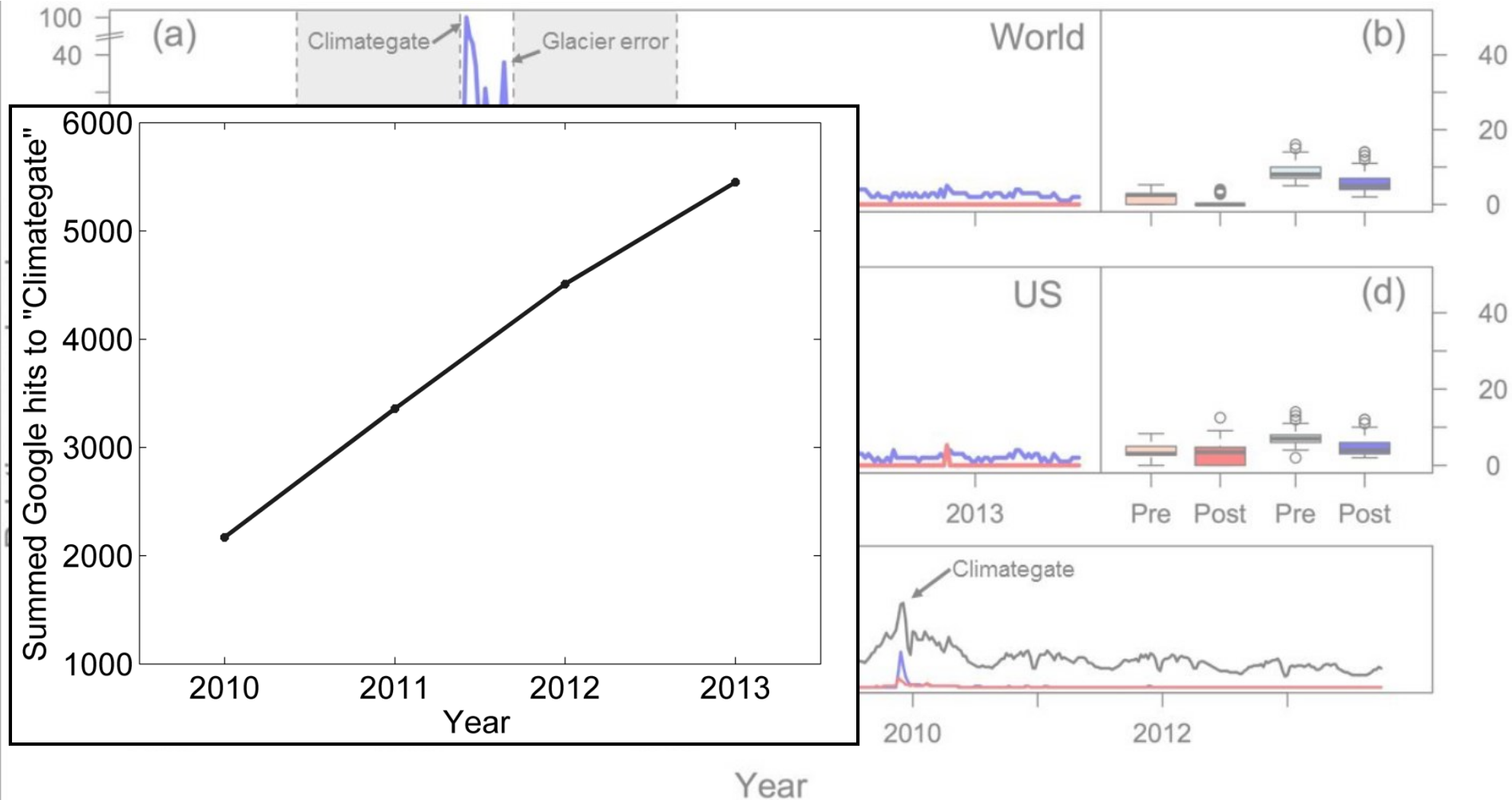
make the issues less distant and more tangible. It might be expected that experiencing some kind of (generally negative) event that could be attributed to climate change would leave people feeling helpless. However, goal-setting theory¹⁷ highlights the benefits of setting concrete, specific goals in increasing instrumentality (that is, an individual's belief that actions will lead to outcomes) and the likelihood of subsequent action being taken. In line with this, if people are better able to relate to the potential consequences of climate change impacts, they may also be more likely to feel that their behaviour can lead to changes in these impacts.

Climate change itself is not directly observable by individuals, it being a reference to average climate conditions over a long period of time rather than that observed on a daily or seasonal basis, and is perhaps really understood only through mathematical models and scientific measurement¹⁸. However, given that seasonal events and the weather are the primary means by which individuals can experience and observe the climate, it is understandable that this is a means by which people may judge climate change. Note that phenological research (the recording of seasonal events), for

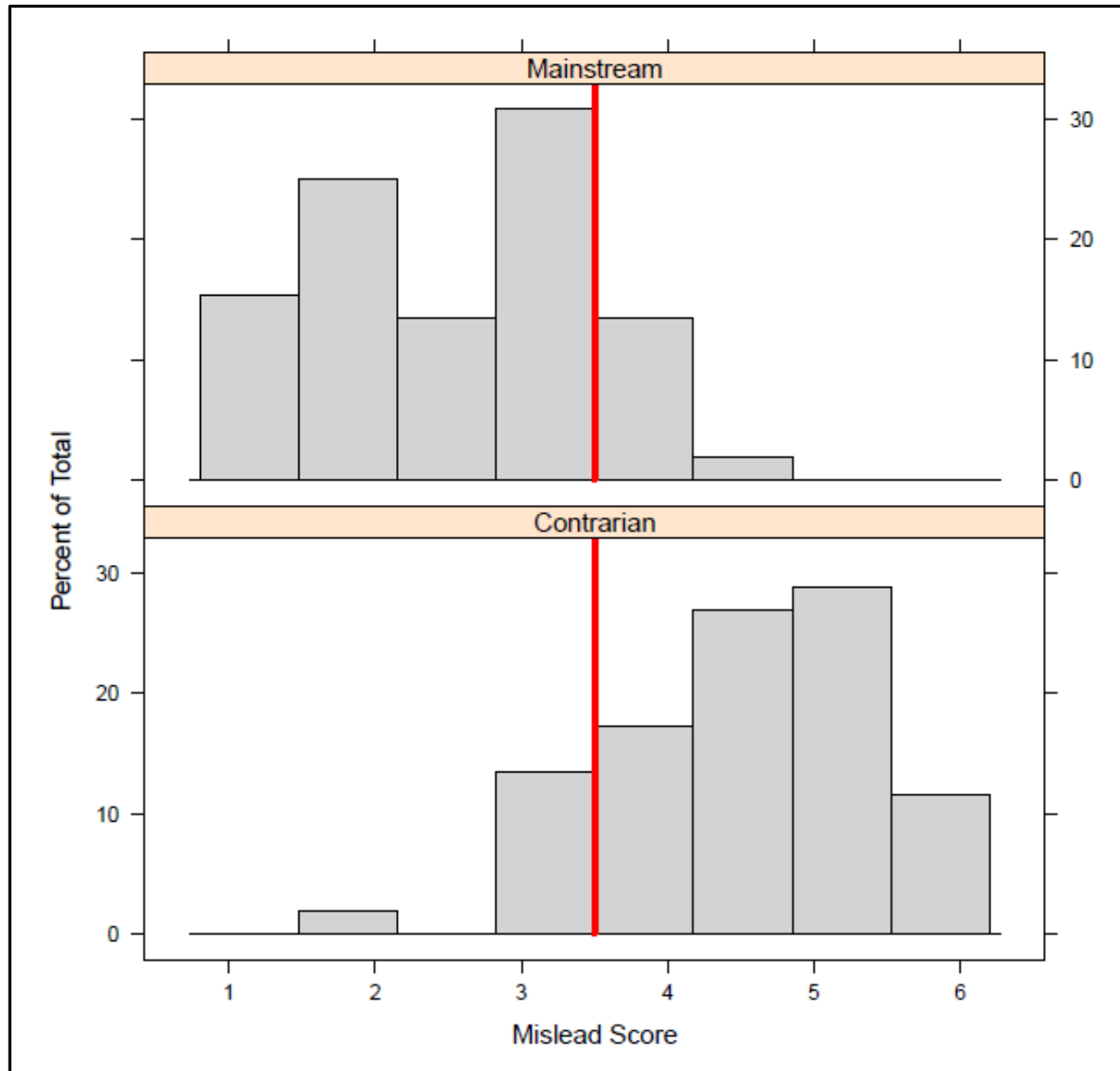
“Climategate”: Public



"Climategate": Blogosphere



Distribution of Mislead Scores



„HOUSTON, WE HAVE A
PROBLEM.“



GO BEYOND.



But There is no Houston



In whose hands the future?