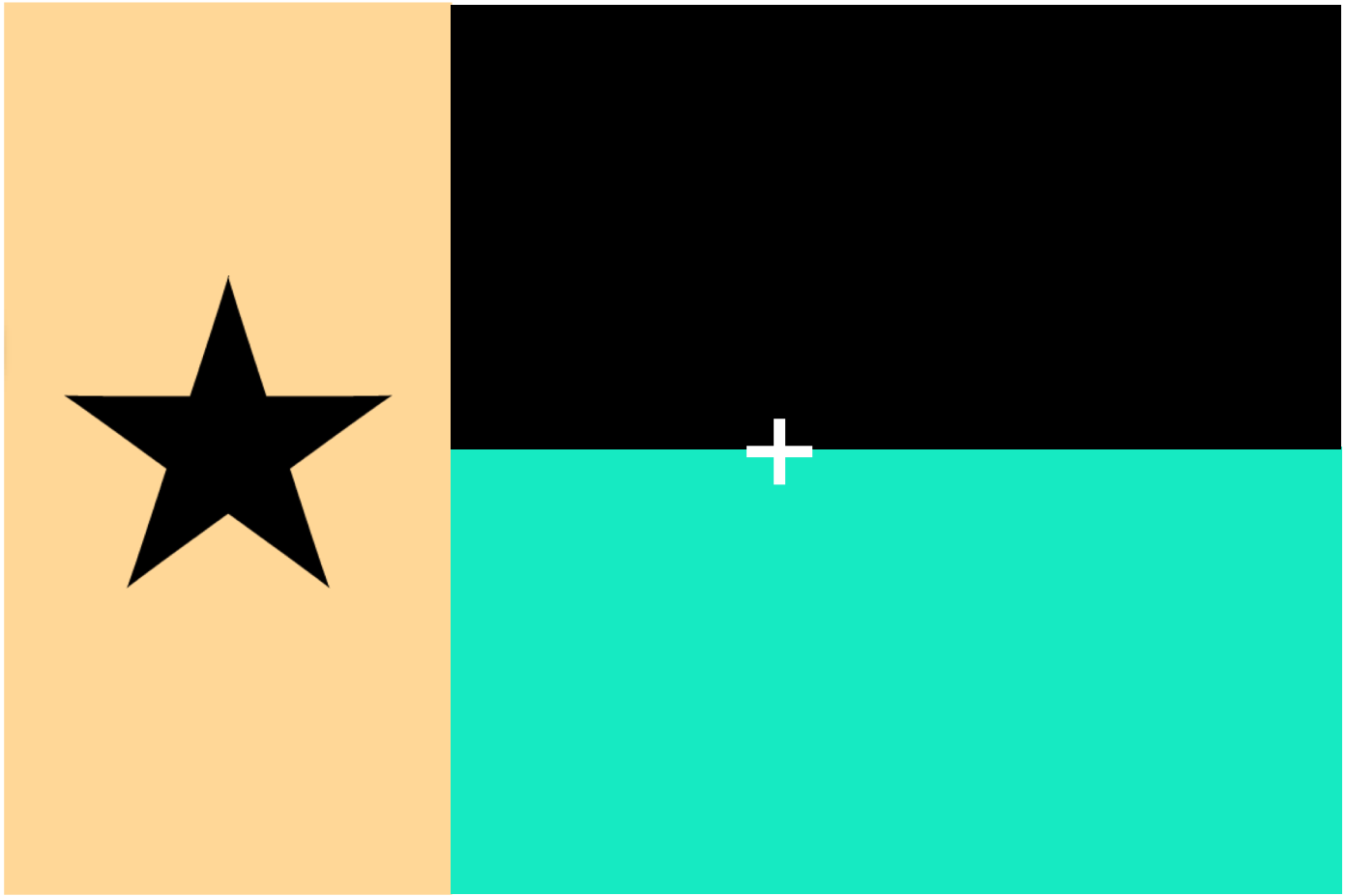
FEBRUARY 19, 2020

TEXAS
The University of Texas at Austin
Energy Institute

WILL TECHNOLOGY SAVE THE DAY?

OPTIMIST AND REALIST PERSPECTIVES

University of Texas at Austin, UT Energy Week 2020



We are part of an economic system, but can we understand it?

“It is sometimes said that no system can understand itself.

…

The way a system can understand itself is to develop simplified ideas, sometimes called models of itself, which have enough of the main features to have some reality but are simple enough to be understood.”

— Howard T. Odum (1997)

Most of us don’t make mathematical models of society & economy …

… we hear (and tell) narratives, or stories, about how the world works.

Narrative:

a story that connects and explains
a carefully selected set of supposedly true events or experiences intended to support a particular viewpoint or thesis

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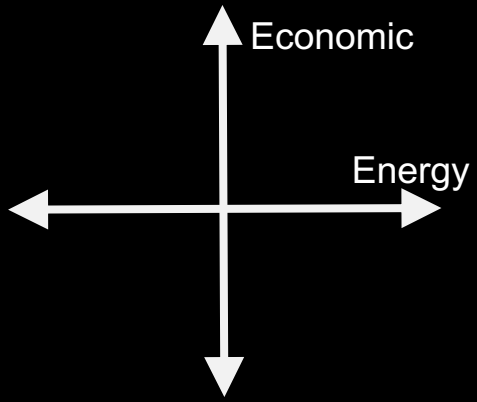
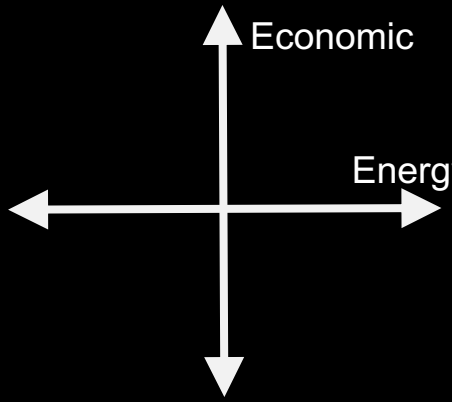

Economic
Energy

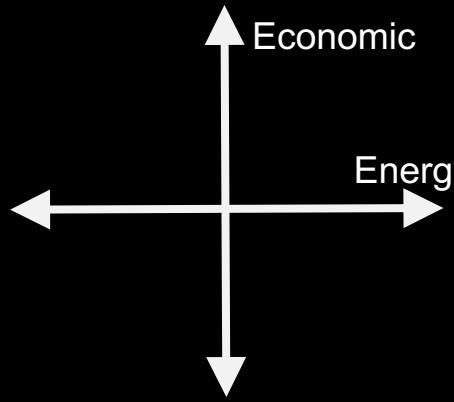
Fossil fuels



Renewables

Techno-optimism
(Infinite substitutability)

Fossil fuels

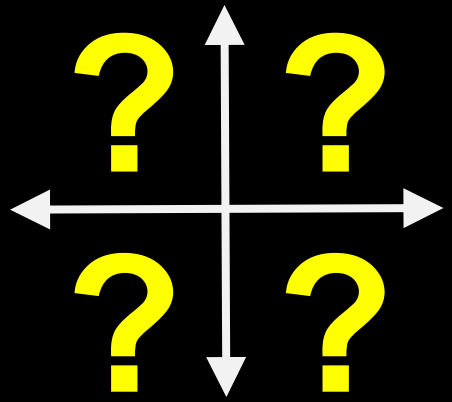


Renewables

Techno-realism
(Finite Earth)

Techno-optimism
(Infinite substitutability)

Fossil fuels



Renewables

Techno-realism
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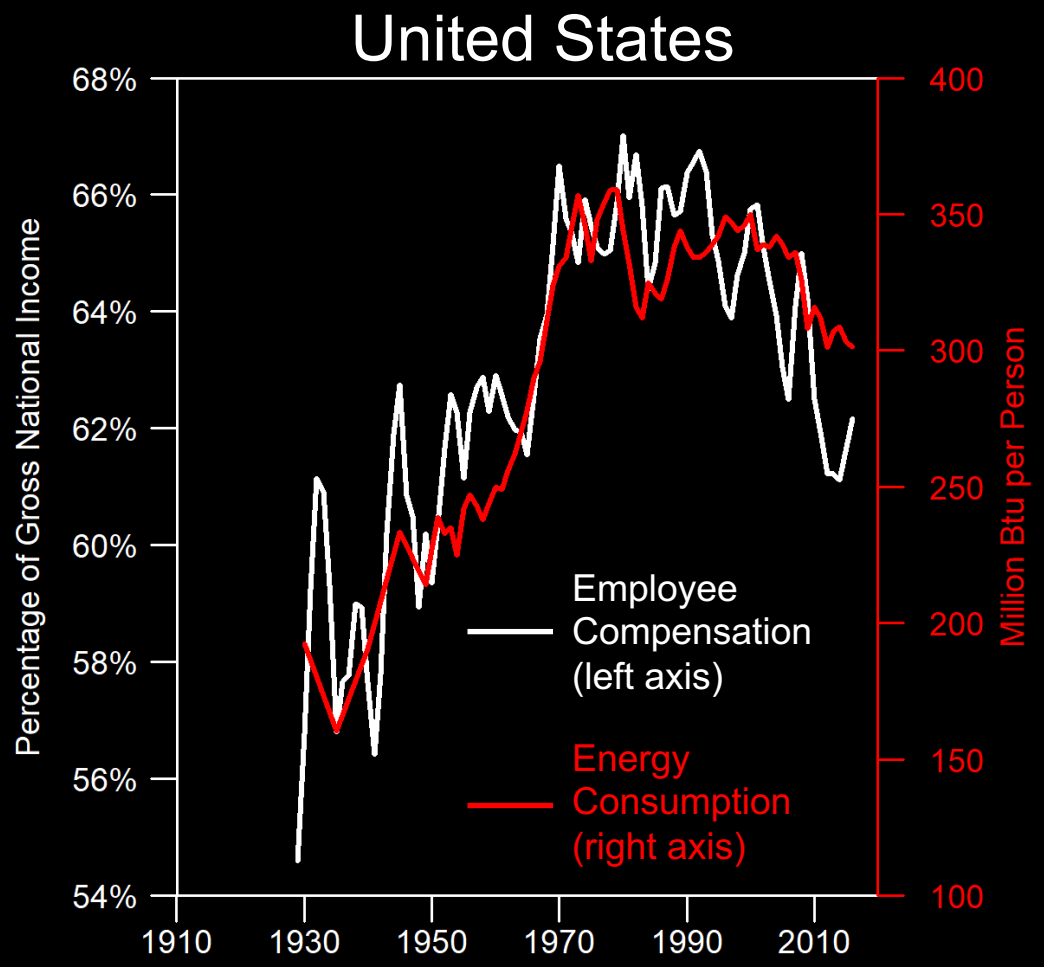
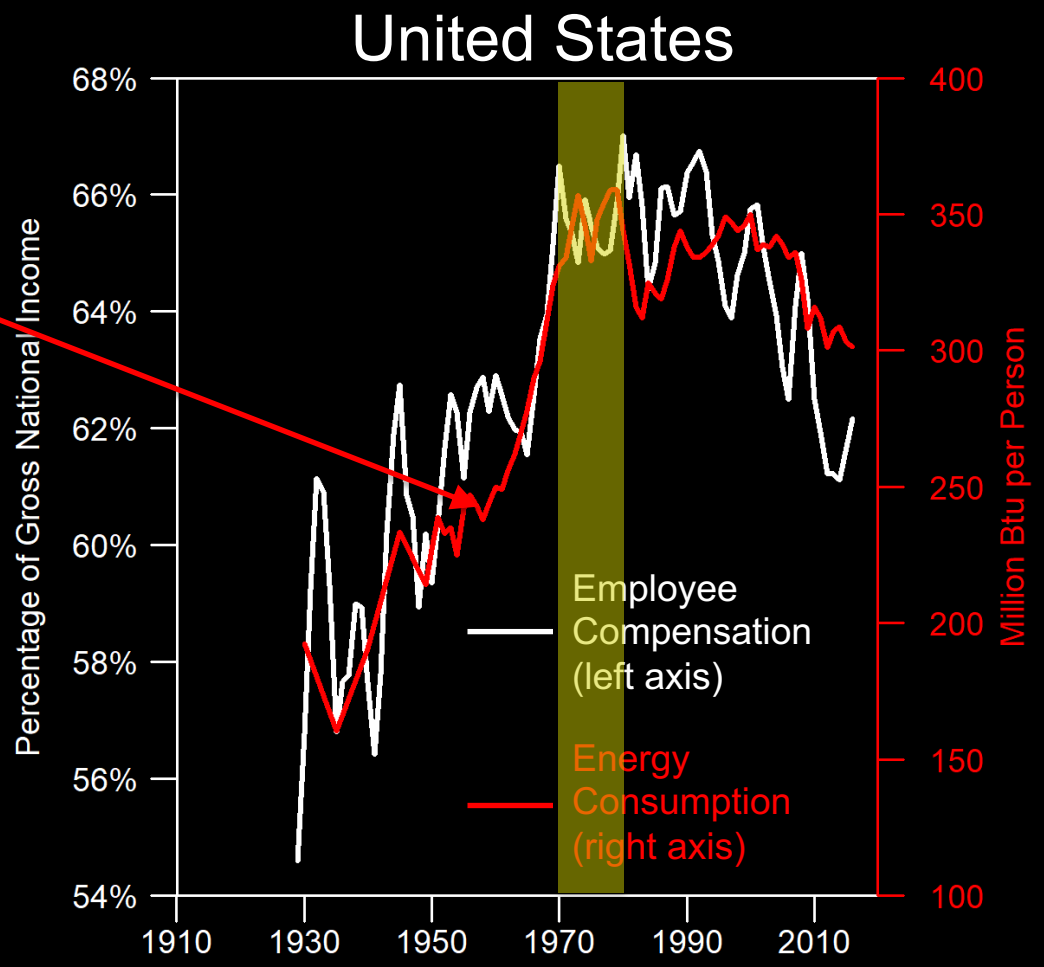

United States
68%
66%
64%
62%
60%
58%
56%
54%
Percentage of Gross National Income
400
350
300
250
200
150
100
Million Btu per Person
1910
1930
1950
1970
1990
2010
Employee Compensation (left axis)
Energy Consumption (right axis)

Change in the 1970s

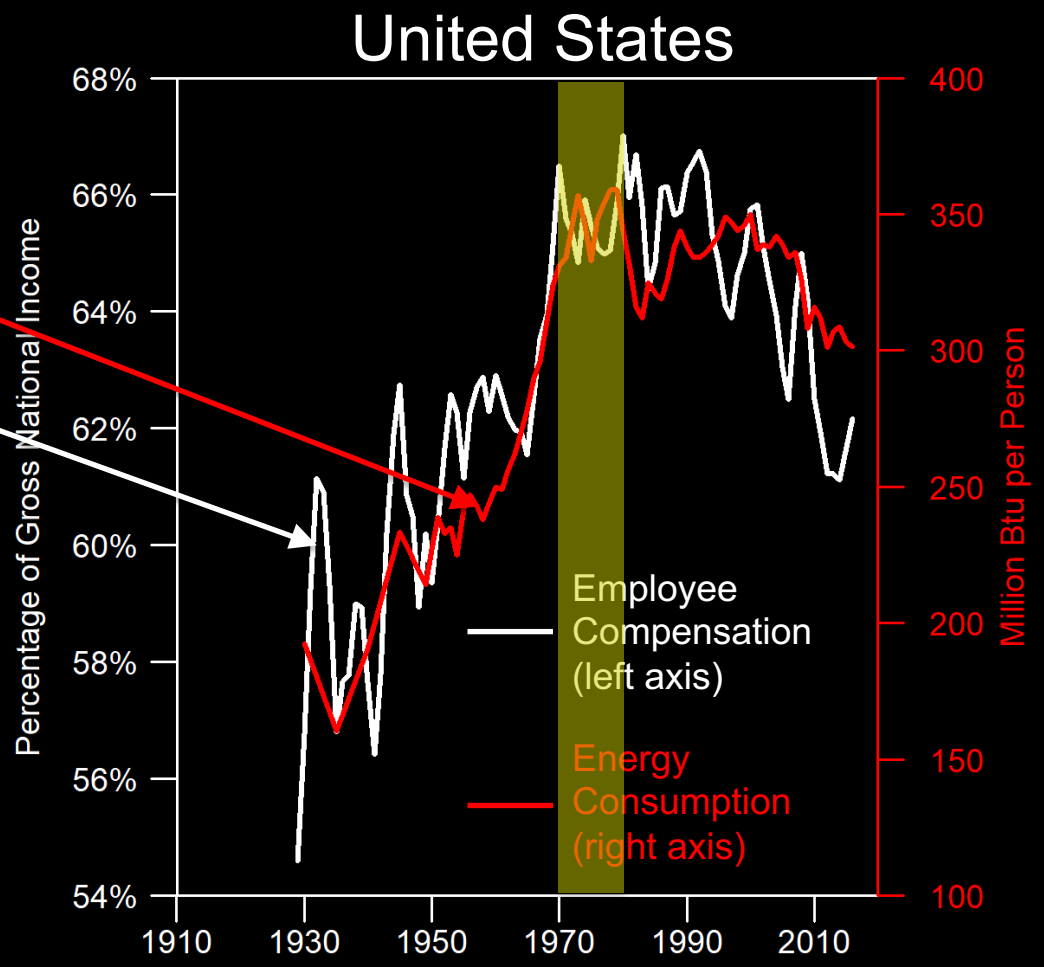
U.S. per capita energy consumption leveled off.



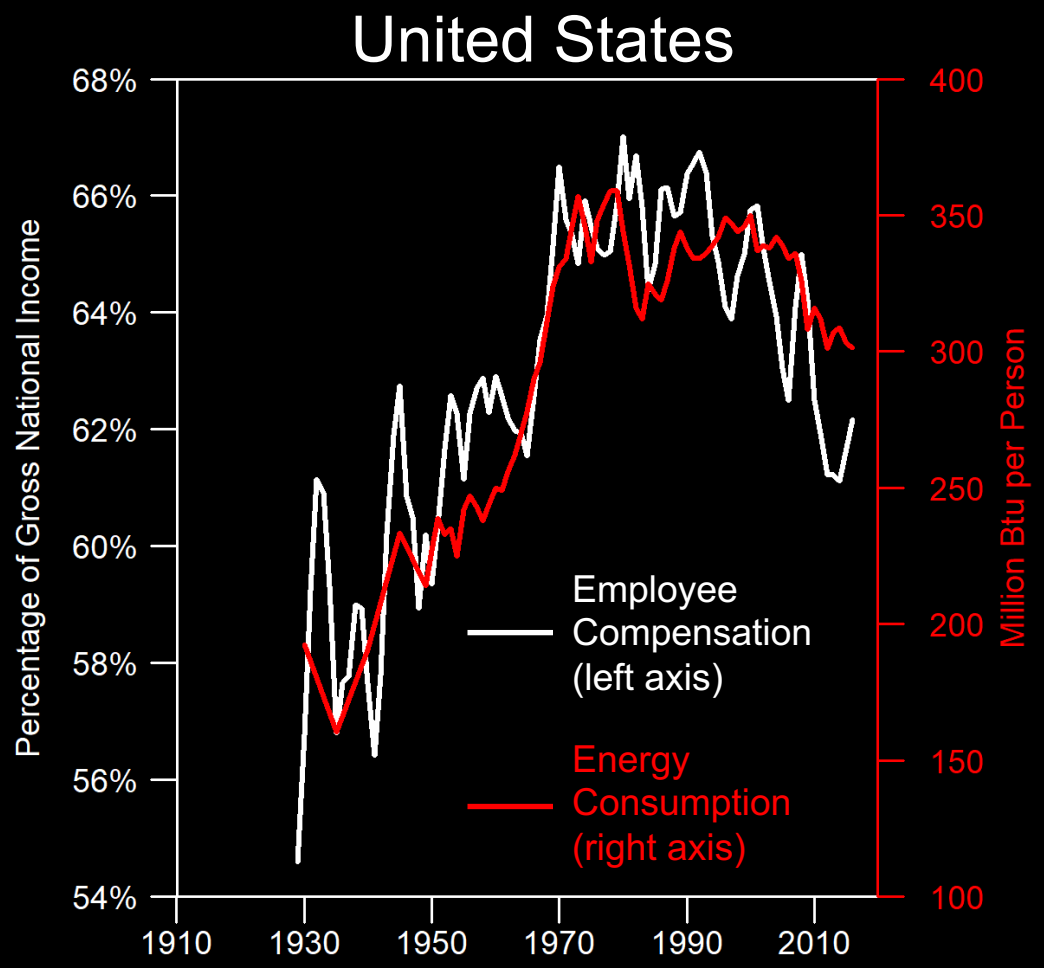
Change in the 1970s

U.S. per capita energy consumption leveled off.

The share of national income to workers also leveled off.

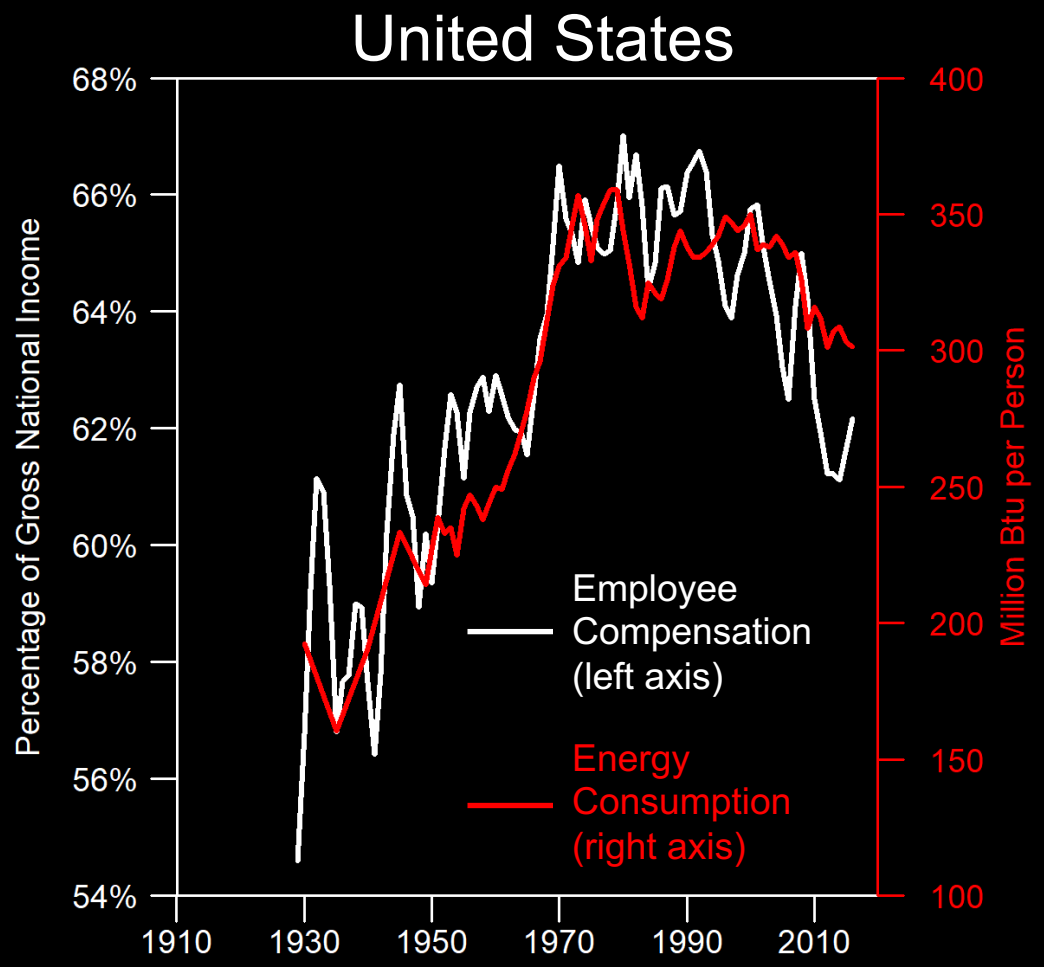


The structure of our society & economy is affected by how and how much we extract energy from the environment.



The structure of our society & economy is affected by how and how much we extract energy from the environment.

If we change how we extract energy, how will society & the economy change?



Can technological innovation allow us to attain a zero-carbon future while maintaining or increasing our current lifestyles?

Is social innovation/change (reversion to lower lifestyles, less energy/person) required to achieve a zero-carbon future?

What is the role and challenge for journalists, and the media, in conveying complex topics in energy-climate-economics?

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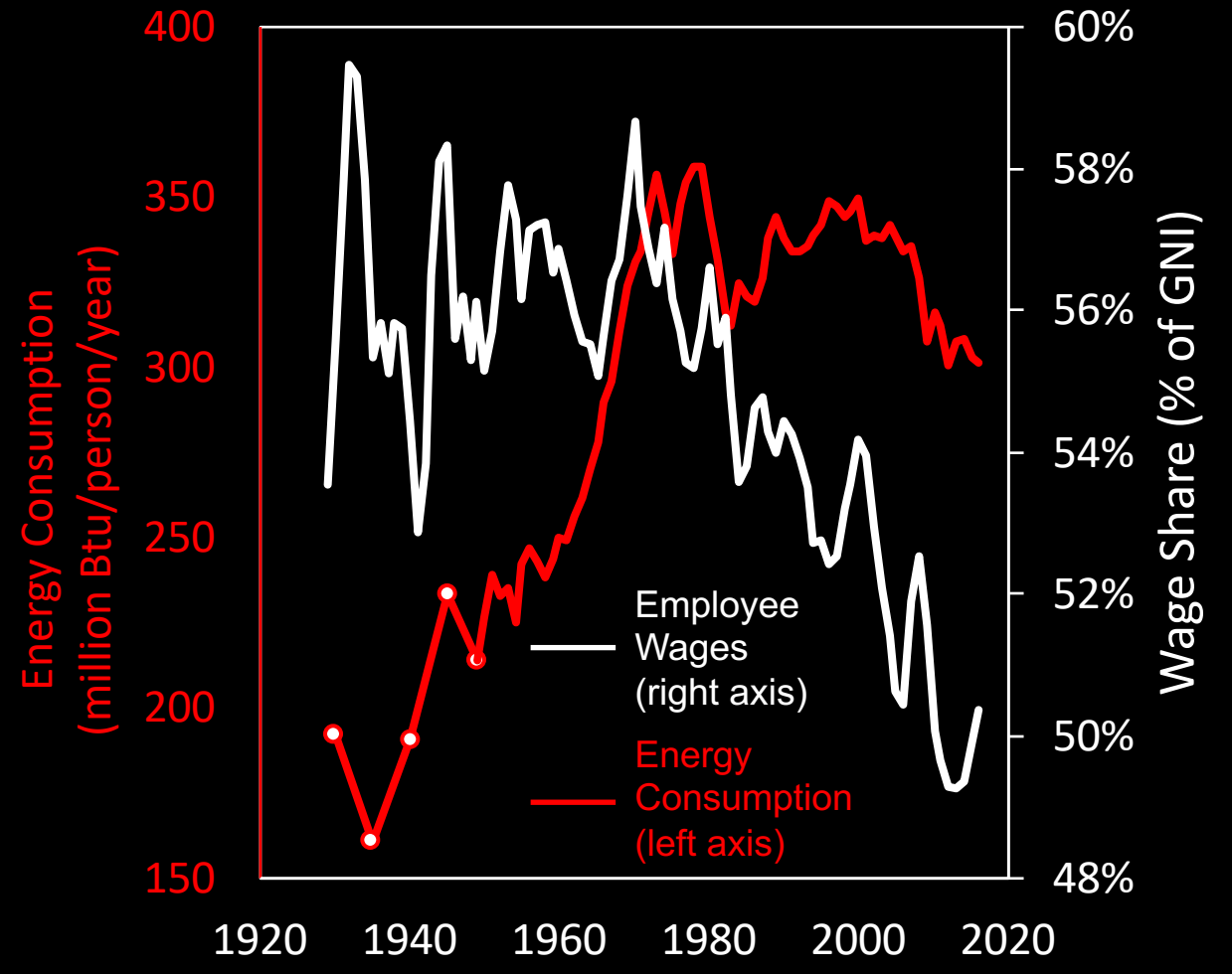
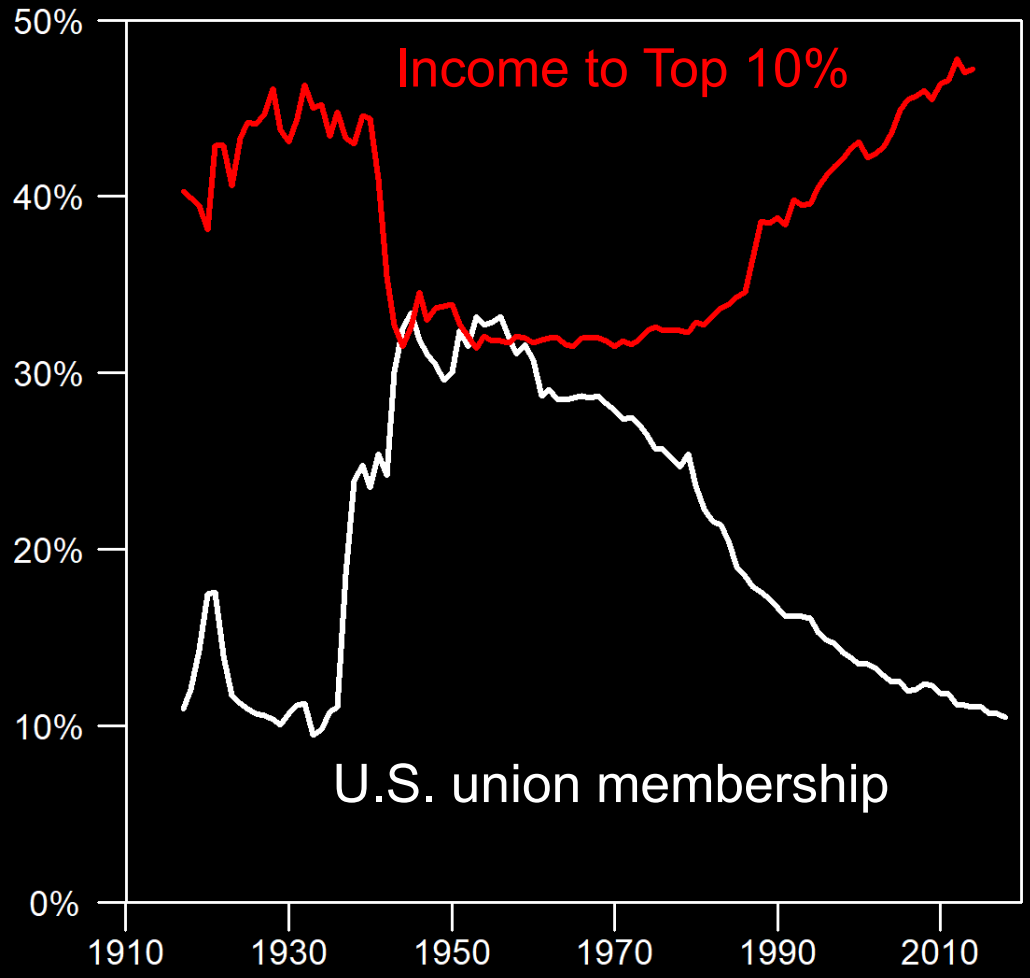
extra

The % of GDP going to wages ↓ when energy/person stopped ↑



Many energy and economic trends changed in the 1970s.

Income inequality increased (also in most other OECD economies).



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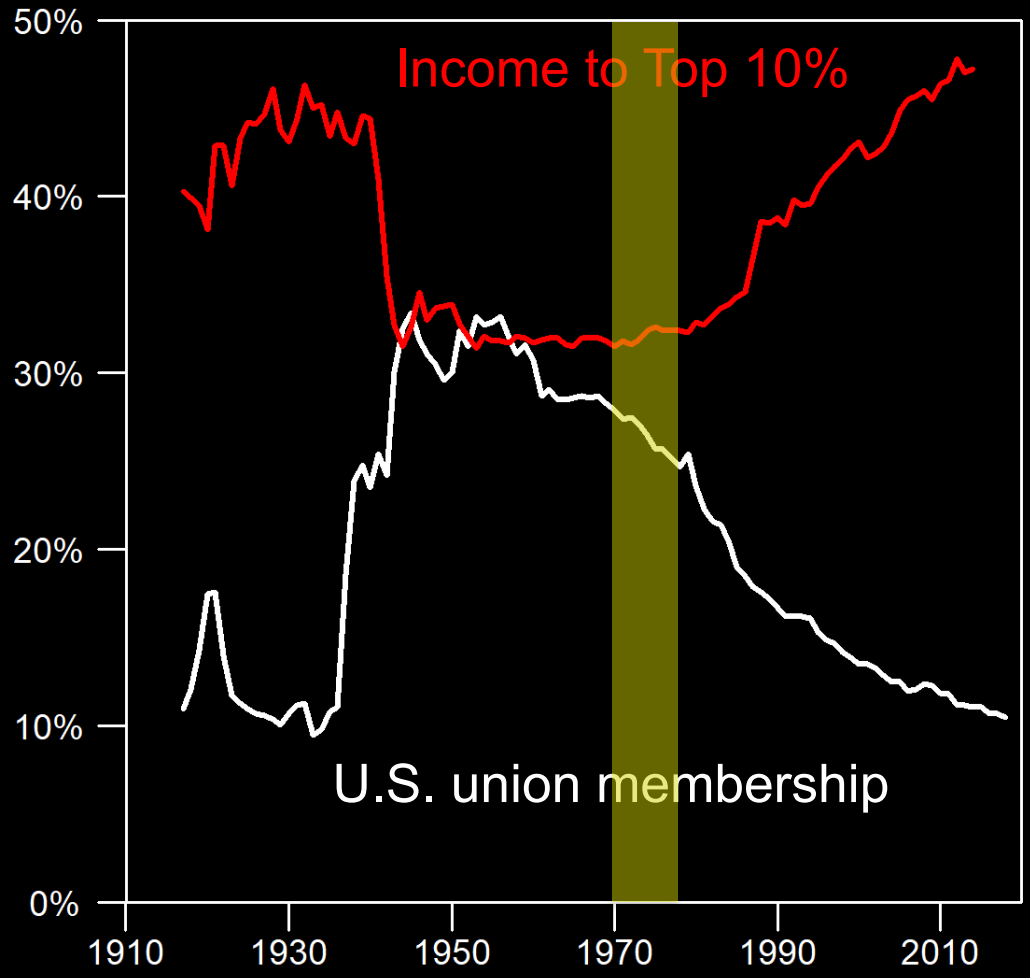

“One of history’s few iron laws is that luxuries tend to become necessities and to spawn new obligations.”

— Yuval Noah Hariri (*Sapiens*)

“Societies adopt increasing complexity to solve problems, becoming at the same time more costly. In the normal course of economic evolution, this process at some point will produce diminishing returns. Once diminishing returns set in, a problem-solving society must either find new resources to continue the activity, or fund the activity by reducing the share of resources available to other economic sectors. The latter is likely to produce economic contraction, popular discontent, and eventual collapse.”

– Joseph Tainter (author of *The Collapse of Complex Societies*)

“But those who clamor for “conscious direction” --- and who cannot believe that anything [the price mechanism] which has evolved without design (and even without our understanding it) should solve problems which we should not be able to solve consciously --- should remember this: The problem is precisely how to extend the span of our utilization of resources beyond the span of the control of any one mind; and, therefore, how to dispense with the need of conscious control and how to provide inducements which will make the individuals do the desirable things without anyone having to tell them what to do.”

“It is a profoundly erroneous truism that we should cultivate the habit of thinking what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them. (quoting philosopher Alfred Whitehead)

– Friedrich Hayek (1945, “The Use of Knowledge in Society”)

Questions

General Questions

1. Can technological innovation allow us to attain a zero-carbon future while maintaining or increasing our current lifestyles?
2. Is social innovation/change (reversion to lower lifestyles) required to achieve a zero-carbon future?
3. What is the role and challenge for journalists, and the media, in conveying complex topics in energy-climate-economics?
4. I've spent years thinking about how to model and understand energy and the economy. Greta Thunberg skips class every Friday, sails across the Atlantic Ocean to speak to the United Nations, and speaks at the World Economic Forum.
    1. How do you perceive this?
    2. How should reporters discuss what is occurring?
    3. What would happen if instead of Thunberg, the UN and WEF invited people who agree with Thunberg, but have spent their careers studying this problem and justifying her conclusion with economic models? Example: *The Limits to Growth* authors Dennis Meadows

Bob Jensen's thoughts:

1. What is the sustainable ***size*** of the human population?
    1. [Carey]: With size has to come structure, that is to say sustainability is only defined in the context of BOTH size (quantity) and structure (e.g., agrarian vs. industrial)
2. What is the appropriate ***scale*** of a human community?

3. What is the ***scope*** of human competence to manage our interventions into the larger living world?
    1. [Carey]: This brings up the possibility of linking to your first two questions. Are we competent to answer the first two questions? Can we collectively act on any answer to the first two questions.

Clay Butler's thoughts (call 2/12/20):

1. His role is apply his "applied" perspective to our theories
2. Been in solar since 2010
3. Can discuss political messaging (e.g., climate change, etc.),
    1. how messages have changed
    2. What messages are political vs. pure economic
4. Doing advising for all of US add some international
5. No one really understands the scale of what is happening (e.g., in solar), press and lay people are behind
6. Challenges and pitfalls to meet targeted carbon goals
7. EIA reports, why they are wrong and why; they have flipped in the last AEO to a more increased role of renewables …
8. He can discuss who is investing in renewable projects, such as oil majors
9. Blah …

Jeff Ball's thoughts (call 2/10/20):

1. He lives in a dorm (@ Stanford) of 300 students
    1. It is the sustainability dorm
2. He senses world is at a important turning point (public attitude, public consciousness), but it is not clear people are willing to pay, but people do realize "NOW" is the time, not tomorrow
3. He thinks all will agree that we're not really doing anything right now (grand scale of GHG decline)
4. How has journalism changed how it covers this issue today vs. 10 yrs ago?
    1. Reporting what people say vs. what is happening, and reporting any discrepancy.
5. He has written a lot on "emperor has no clothes". He says good journalism debunks pretty assumptions.
6. He can talk about the challenges of journalists talking about "complexity" (complex topics), and he likes to do this.

extra extra

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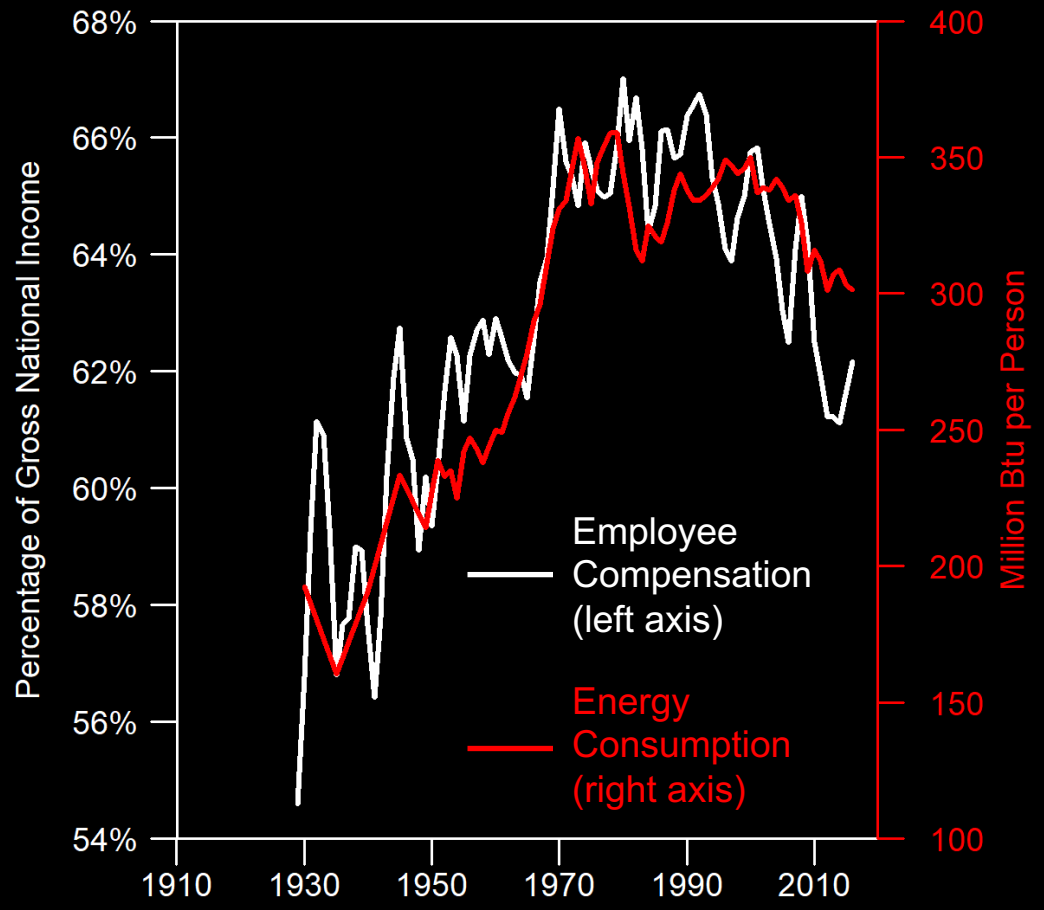

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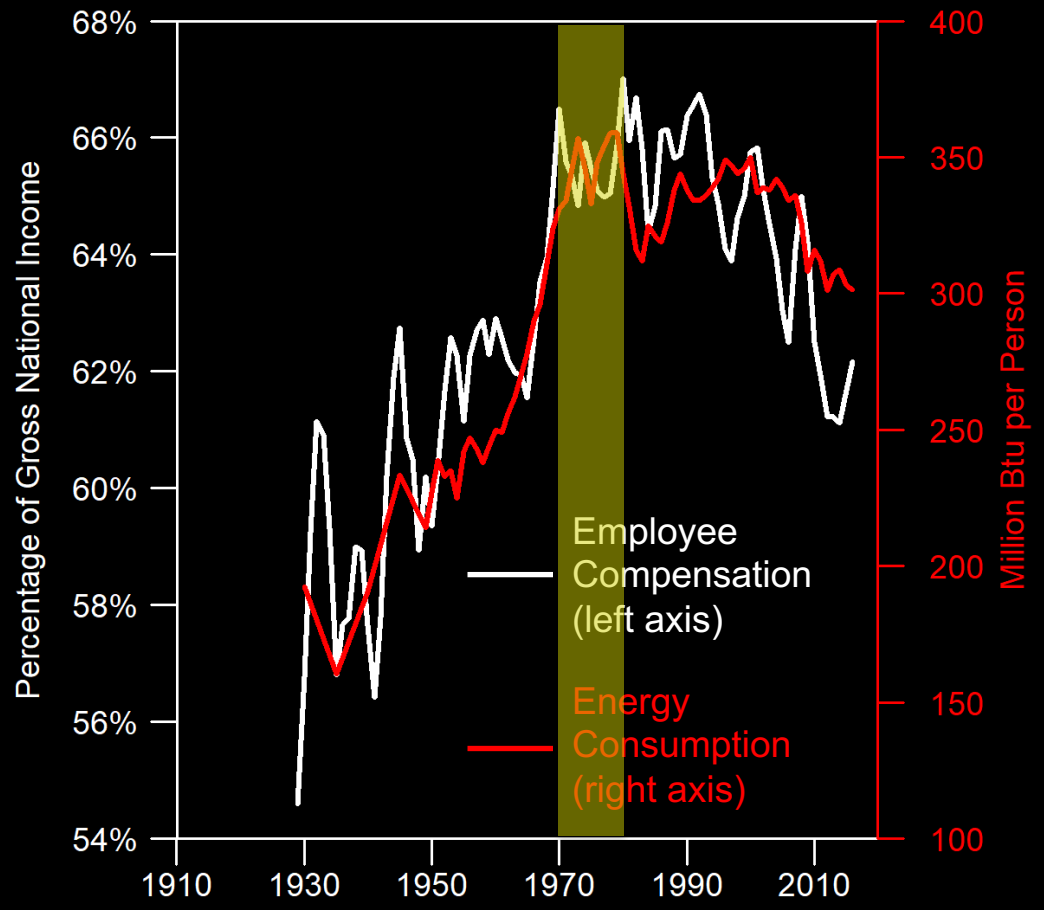
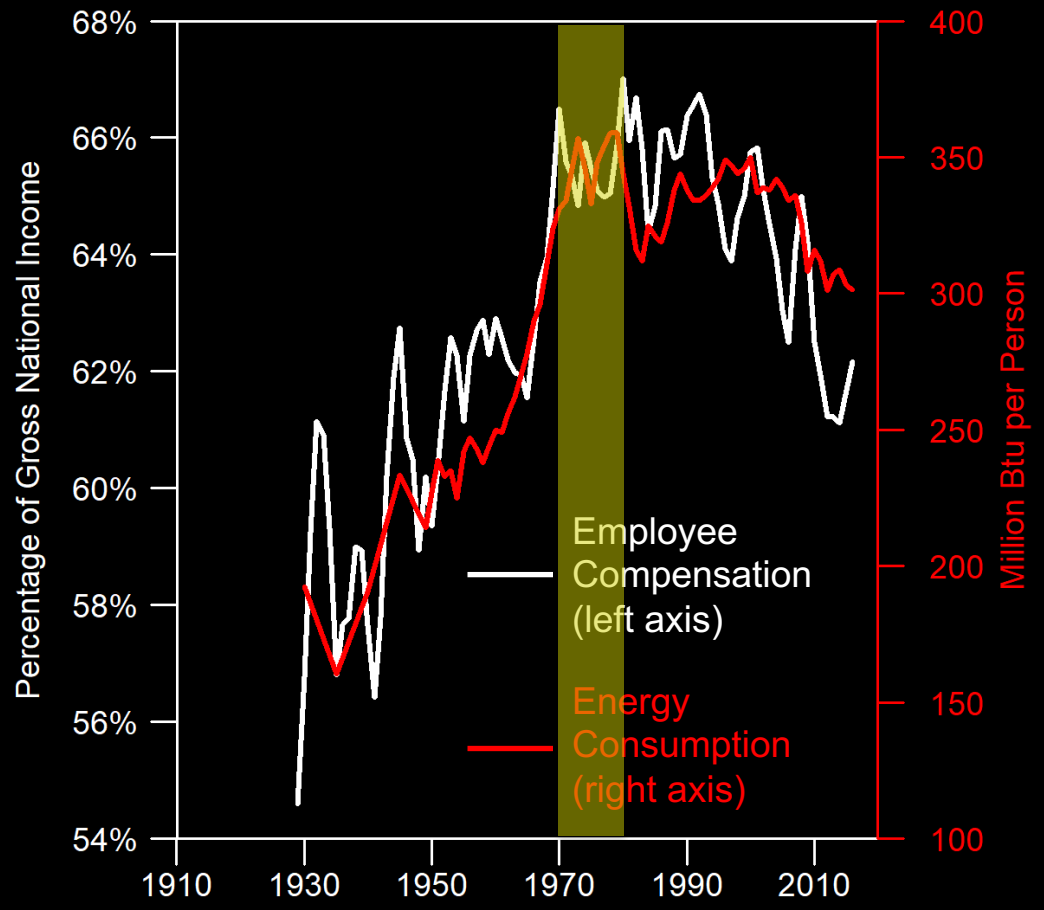


Many energy and economic trends changed in the 1970s.

U.S. per capita energy consumption leveled off.

Is the economy's structure linked to energy and resource consumption rates?

Is society hitting diminishing returns on energy use?



Most of us hear narratives of energy and economics …

… not (mathematical) descriptions of models

Theory is expressed via mathematical models

“. . . all models are approximations. Essentially, all models are wrong, but some are useful. However, the approximate nature of the model must always be borne in mind.”

— George E.P. Box & Norman R. Draper (1987)

Narrative:

a particular viewpoint or thesis

↓

a carefully selected set
of supposedly true
events, experiences

↓

a story

Narrative:

a particular viewpoint or thesis

or theory

↓

a carefully selected set
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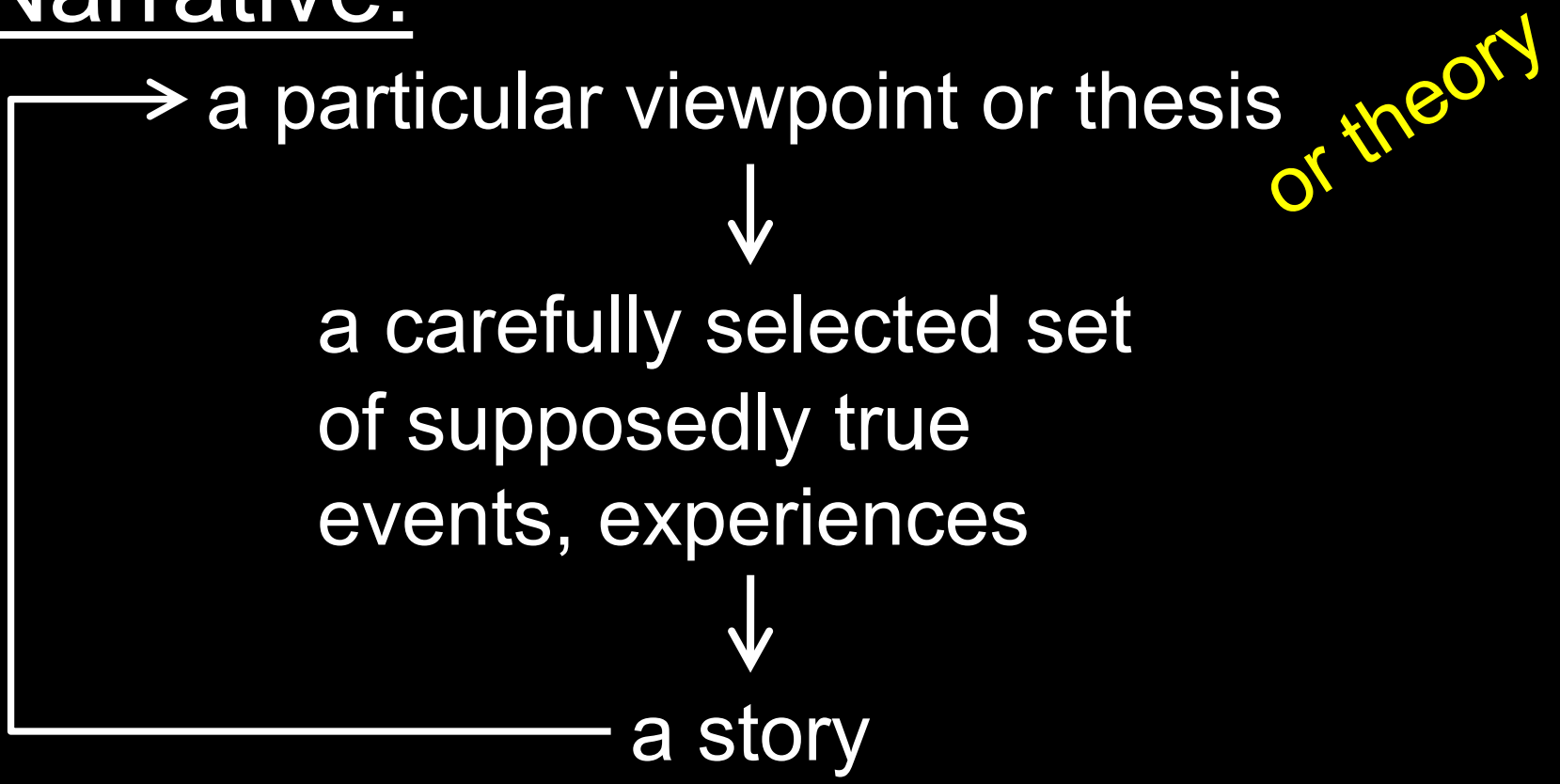
a story

Narrative: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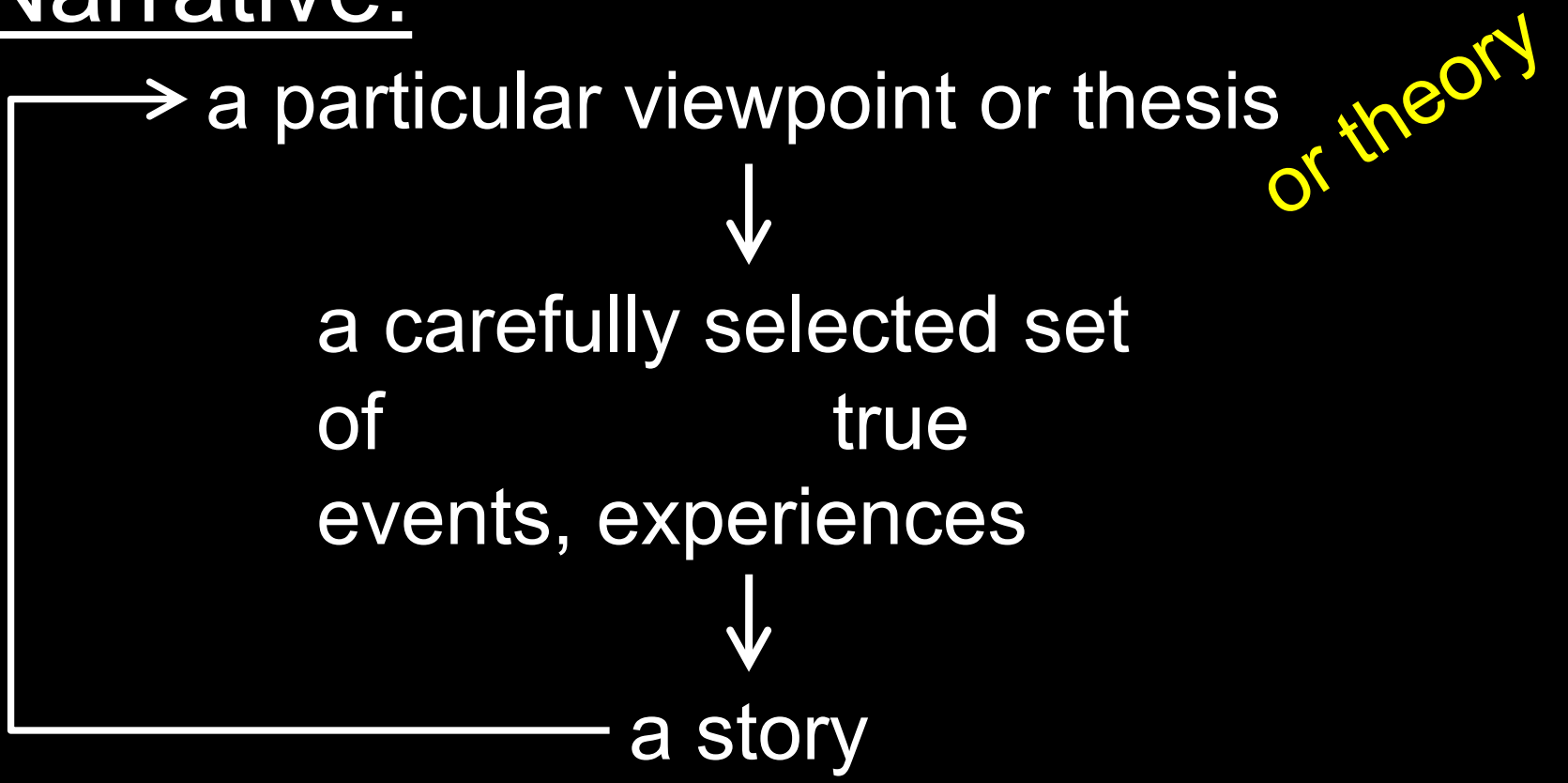
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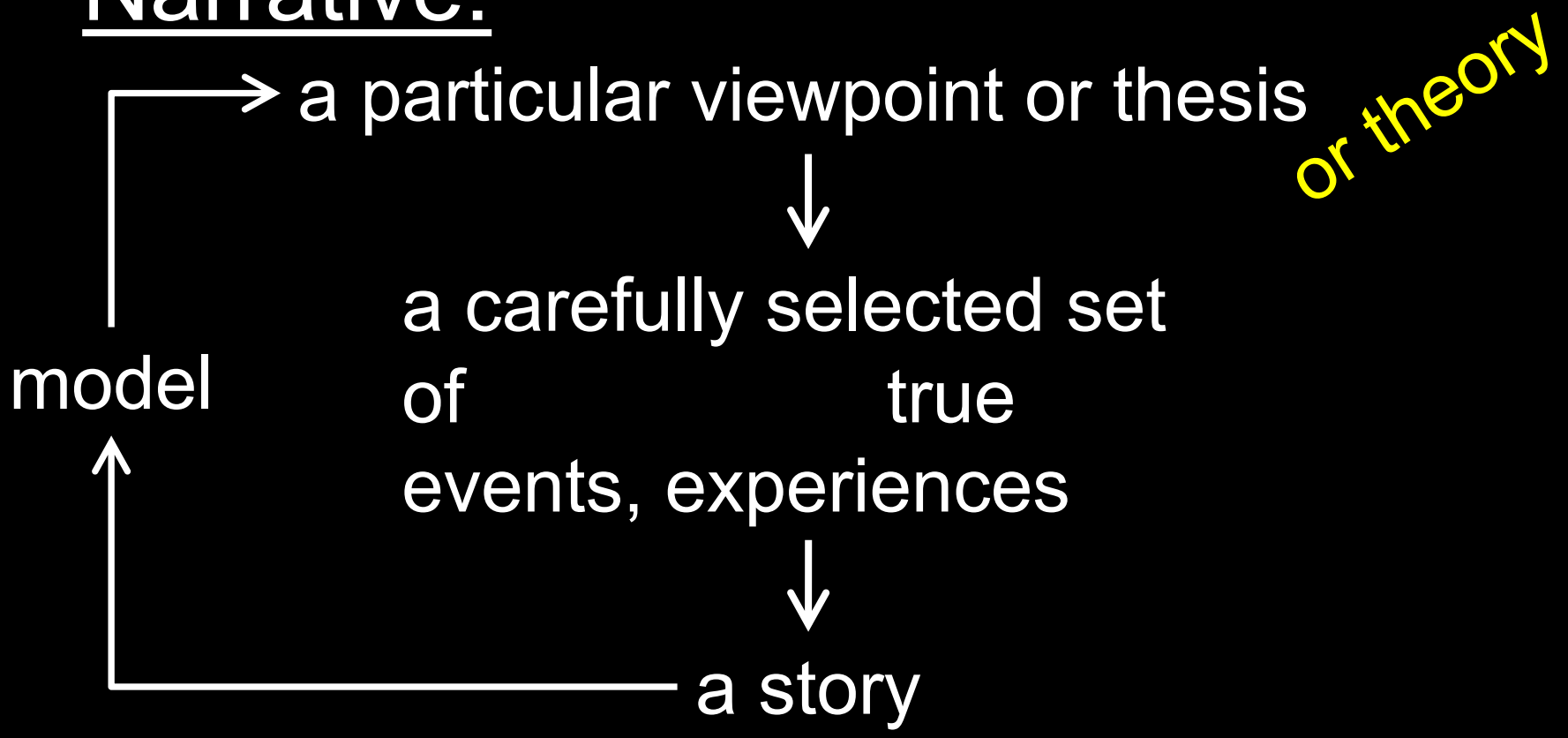
a particular viewpoint or thesis
or theory
a carefully selected set
of true
events, experiences
a story
model

Abstract …

- We see the reverse color image of TX flag, and when I remove it we envision something different (even color blind people might see the same colors)
  - In no case is there an image of a flag still on the screen
- Likewise, we see technology and data on energy/economy, but when they are not in our view, or we look away, then what is ingrained in our mind?
- People will come to different conclusions from looking at the same data and world … narratives
-

Upayan questions

- Can technological innovation allow us to attain a zero carbon future while maintaining our current lifestyles (e.g,. Driving a car, HVAC systems, personal electronics)? How much social innovation/change is needed (reversion to lower lifestyles)?
- Can we continue with our existing luxurious lifestyles (driving a car to work, living in large suburban homes, etc.) and hope that a technological miracle will save us or must we undergo a social transition to dramatically scale back our energy consumption?
- "One of history's few iron laws is that luxuries tend to become necessities and to spawn new obligations" – Yuval Noah Hariri (*Sapiens*)
  - The media impresses the idea of suburban household with a personal care as the "gold standard" success in achieving the American Dream. Should these luxuries be given up in order to achieve a zero carbon future?

Question for opening statements

- "One of history's few iron laws is that luxuries tend to become necessities and to spawn new obligations."
  – Yuval Noah Hariri (*Sapiens*)

- "Societies adopt increasing complexity to solve problems, becoming at the same time more costly. In the normal course of economic evolution, this process at some point will produce diminishing returns. Once diminishing returns set in, a problem-solving society must either find new resources to continue the activity, or fund the activity by reducing the share of resources available to other economic sectors. The latter is likely to produce economic contraction, popular discontent, and eventual collapse."
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- Can technological innovation allow us to attain a zero-carbon future while maintaining or increasing our current lifestyles?
- Is social innovation/change (reversion to lower lifestyles) required to achieve a zero-carbon future?
- Many energy and economic trends changed in the 1970s. In the 1970s, U.S. per capita energy consumption leveled off and income inequality increased (also in most other OECD economies).
  - Were these structural changes linked to energy and resource consumption rates?
  - Is society hitting diminishing returns on energy use?

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