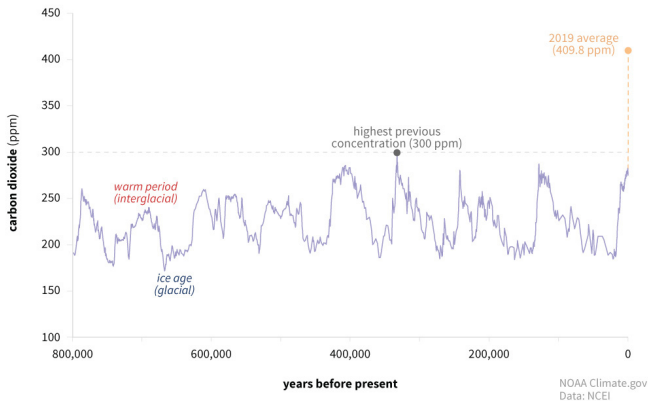


# Climate Emergency: Micro, Macro and Social Solutions

Daron Acemoglu

NY Fed, May 2022.

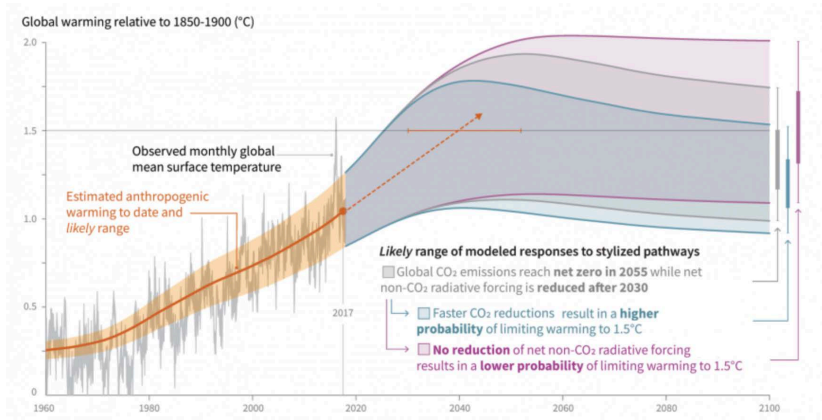
# Climate Change Problem: CO<sub>2</sub> over 800,000 years



Source: National Oceanic and Atmospheric Administration

- ▶ No serious doubt that this is anthropogenic.

# Costs Multiplying: Predicted Increases in Temperatures



Source: IPCC

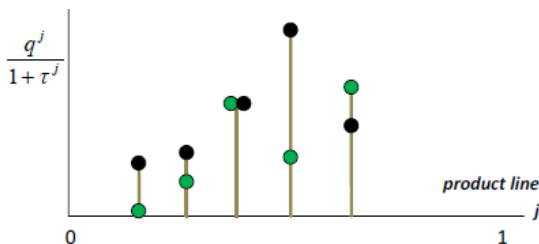
- ▶ May be much worse with tipping points and mass emigration.
- ▶ A true emergency.

## Way Forward

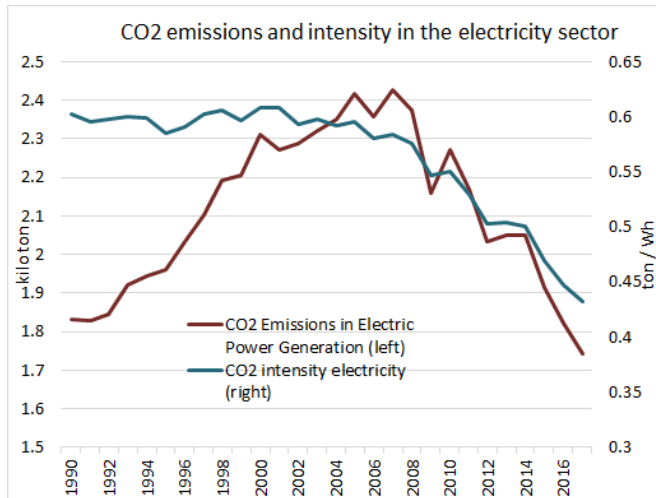
- ▶ De-growth not really an option.
- ▶ About 5 billion people around the world are still in moderate or extreme poverty — living on less than \$10 a day.
- ▶ Growth without energy is difficult as well — though improvements in energy efficiency of existing sources is feasible to some degree (as I show next).
- ▶ Geo-engineering is, in my opinion, no more than a dangerous chimera — and most of the techno-utopian calls for reliance on geo-engineering are no more than excuses for not doing anything.
- ▶ Real solution: [transition to clean energy](#).

## A Framework

- ▶ One useful framework may be that of Acemoglu, Akcigit and Kerr (2016):
- ▶ Many “energy tasks”, each one of which can be produced using **clean** or **dirty** technology.
- ▶ Advances in both technologies are feasible (hence energy efficiency improves even with dirty technologies).
- ▶ Switching to clean will happen unevenly across tasks because:
  - ▶ clean is further behind in some tasks;
  - ▶ clean is technically harder in some tasks.

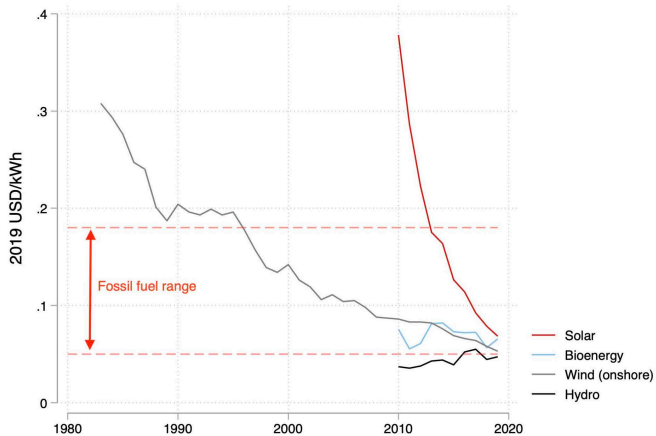


## Advances: Lower Carbon Emissions from Energy



- ▶ Fewer emissions in the US energy sector today than in the 1990s.

# Why the Improvement? Costs of Energy by Source

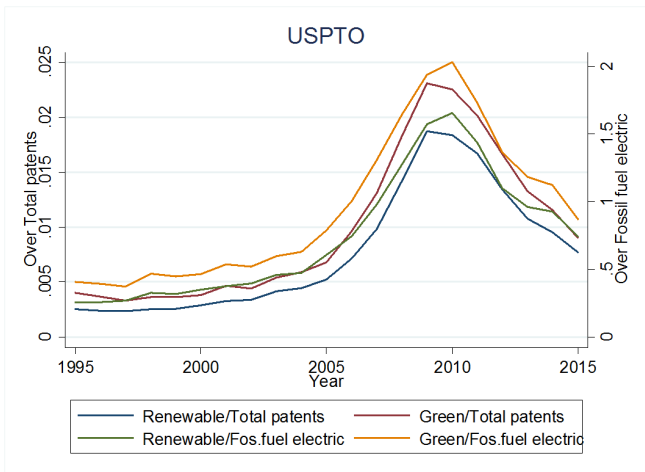


Source: IRENA

- ▶ Huge advances in renewables, especially solar and wind.

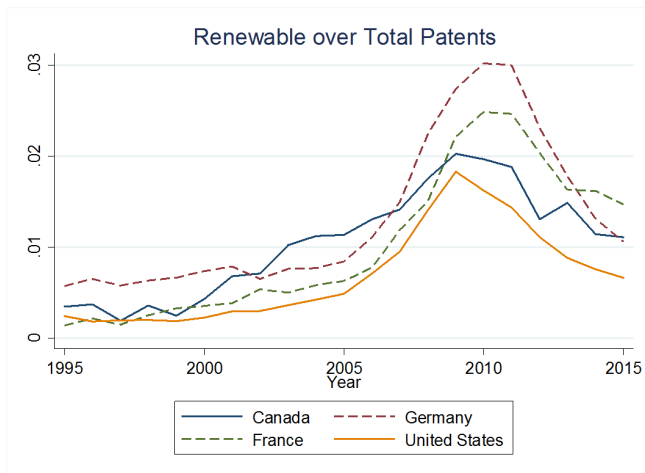
## But Already a Slowdown

- ▶ This was achieved by innovation targeted to renewable energy.
- ▶ But already a slowdown.



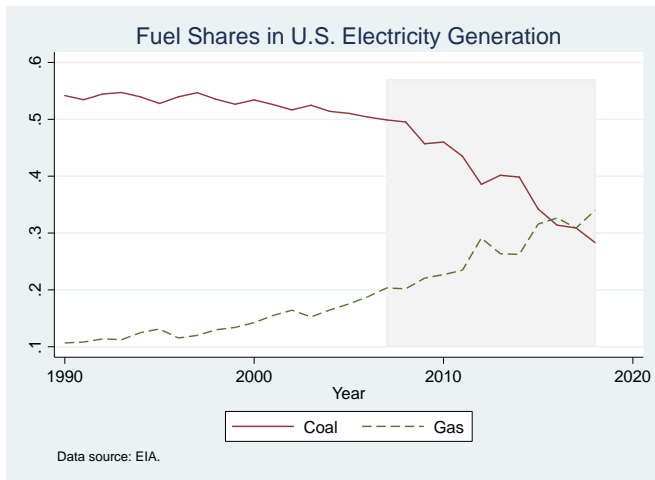


# Slowdown not Just a US Phenomenon



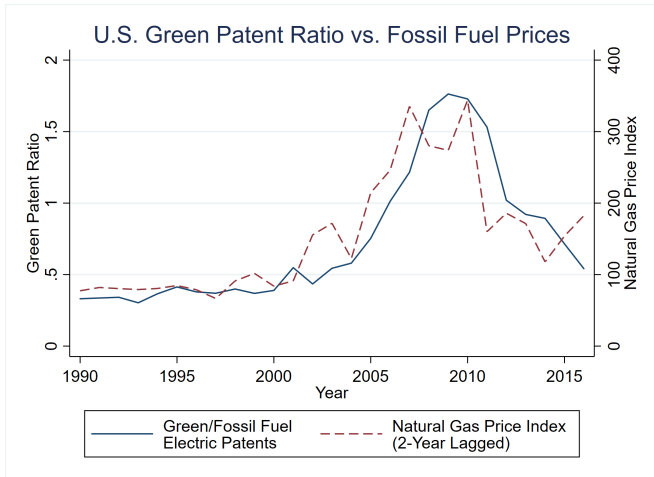
# Why the Slowdown/Reversal?

- ▶ Shale gas and the relaxation of strong incentives for renewables (Acemoglu, Aghion, Barrage and Hemous, 2022).



# The Role of Shale Gas

- ▶ Shale gas expansion strongly associated with reversal in green patents.



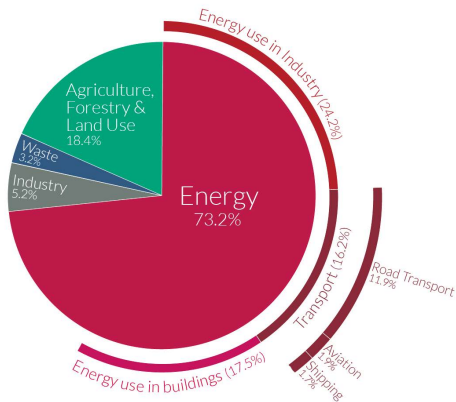
# Insufficient Progress, Even Without the Slowdown

- ▶ Lots of energy tasks where we have not made much advance:
  - ▶ industrial energy needs (greater reliability and storage necessary);
  - ▶ land transport (switch to electric vehicles and storage);
  - ▶ airlines (reduce use and switch to renewable fuels?);
  - ▶ agriculture (very little progress so far);
  - ▶ deforestation (obvious policies, but difficult to implement).

# Sources of Greenhouse Gas Emissions

## Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO<sub>2</sub>eq.



OurWorldinData.org – Research and data to make progress against the world's largest problems.  
Source: Climate Watch, the World Resources Institute (2020).

Licensed under CC-BY by the author Hannah Ritchie (2020).

Source: IPCC

- ▶ Little advance in many of these sectors.
- ▶ More radical policies will be necessary moving forward.

# What Does This Imply for Growth?

- ▶ Acemoglu et al. (2012) and Acemoglu, Akcigit and Kerr (2016): switch to clean innovation can be **growth-enhancing** rather than growth-retarding.
- ▶ We will likely have cheaper electricity for most tasks, brand-new climate-related investments can increase growth.
- ▶ But timing is of the essence (**sooner rather than later**).
- ▶ Use of the correct mix of policies critical:
  - ▶ **Not just carbon taxes** (but of course we do need aggressive carbon taxes);
  - ▶ Substantial **subsidies to clean technology** to facilitate energy transition.

## What Does This Imply for Labor?

- ▶ **The bad scenario:** the US already has a **good jobs problem**, especially for workers without a college degree.
- ▶ Many men without a college degree are still employed in manufacturing, and greater environmental regulations and higher energy costs can destroy these jobs.
- ▶ Walker (2013) finds that workers in newly-regulated plans under the 1990 Clean Air Act Amendment lost jobs and earnings, with a total labor income cost of \$5.4 billion.
- ▶ Can a full transition to clean energy be equally costly?
- ▶ We do not know, but probably not.
- ▶ Most manufacturing plants can switch to clean energy.
- ▶ As we have seen, **renewable costs are already lower** than fossil fuels. With appropriate subsidies, the effect on manufacturing may not be very large.
- ▶ The coal industry will be negatively affected, but employers just over 40,000 people at the moment.
- ▶ There is still hope that the clean energy sector can generate higher-quality jobs (in construction, operations, technical occupations, and precision work).

# What Does This Imply for Macroeconomic Policy?

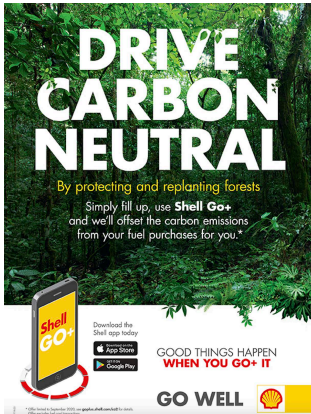
- ▶ The general approach in macroeconomic policy based on **two ideas**:
  - ▶ Welfare maximization based on discounted utility.
  - ▶ Tinbergen principle: each policy instrument dealing with a specific market failure/externality.
- ▶ **It may be time to abandon both.**
- ▶ Discounted utility maximization, as used, e.g., by Nordhaus, makes no sense for climate policy.
- ▶ With standard discount rates, climate damages in 100 years time matter almost not at all.
- ▶ There are good philosophical reasons for considering other social objective functions.
- ▶ For systemic, existential challenges, such as global warming, we should also abandon the Tinbergen principle.
- ▶ Already when technology can be directed it is optimal to heavily rely on subsidies to green technologies, as well as carbon taxes.
- ▶ But even more radically, there are grounds for using monetary, fiscal and financial policies for combating climate change. For example, reducing credit and/or other transfers (such as during the pandemic) to fossilfuel energy companies, and to airlines and car companies not making sufficient investments in reducing emissions.



## Even Further Beyond Economics

- ▶ How did the major improvements in wind and solar take place?
- ▶ Some of it was (neoclassical) economics: subsidies to new technologies and economies of scale.
- ▶ But equally important was societal pressure:
  - ▶ Organizations such as Greenpeace prioritized climate change and new NGOs such as 350.org mobilized citizens on climate change ahead of all other issues.
  - ▶ In the words of Bill McKibben,  
*“In 50 years, no one will care about the fiscal cliff or the Euro crisis. They’ll just ask: So the Arctic melted, and then what did you do?”*
  - ▶ Consumers demanded cleaner products.
  - ▶ Employees demanded lower carbon footprint from their companies.

# Effects of Societal Pressure



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**Education** BP's A+ for Energy program has awarded \$4 million in grants and scholarships to 3,000 California teachers over the last two years. BP supports energy education throughout the country, from a traveling classroom that teaches alternative energy, to the Solar Decathlon in Washington, D.C.

**Environment** To provide heat, power and mobility for the U.S., new pipelines have to be built. In Louisiana, BP pioneered a new standard for pipeline construction. Working with environmental groups, community leaders, even local systemmen, we produced a solution that will help preserve wetlands.



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- ▶ Of course, some of this is greenwashing. But the fact that it's happening is evidence of societal pressure.
- ▶ We need more of this, much more.