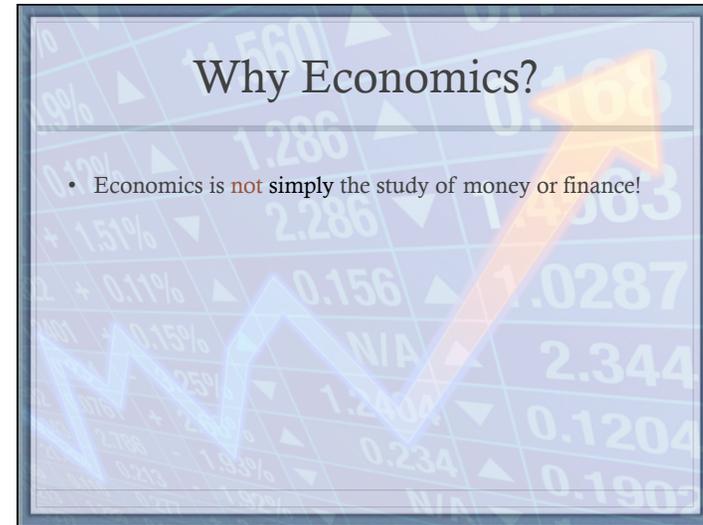


A Brief Introduction to the Economics of Climate Change

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Why Economics?

- Economics is **not** simply the study of money or finance!



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- Economics is **not** simply the study of money and finance!
- It is about the allocation of resources (including time) among alternative uses.
- Environmental issues are central to economic activity.
- Realistic assumptions about human behavior
- Practical insights for public policy

Also, the causes of climate change are the byproduct of economic activities, so understanding these activities—and options for changing them—is central

Does it make economic sense for the world to tackle climate change?



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YES!

The world would be substantially better off with a strong, binding global agreement that reduces greenhouse gas emissions now and in the future

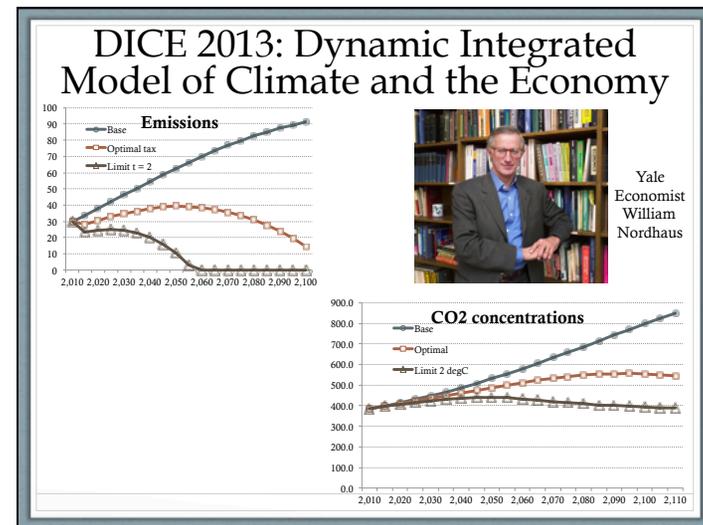
Does it make economic sense for the world to tackle climate change?

But, while benefits of lowering ghg emissions likely very large, cost of achieving this also very large

According to IPCC 2013: to ensure a 66 percent chance of keeping warming below 2 degrees C, abatement will cost 1-4% GWP in 2030, 2-6% GWP in 2050 and GWP 3-11% in 2100

Does it make economic sense for the world to tackle climate change?

Consequently, many economists argue that lowering emissions enough to avoid a 2 degree C rise in mean temperature does **not** make economic sense

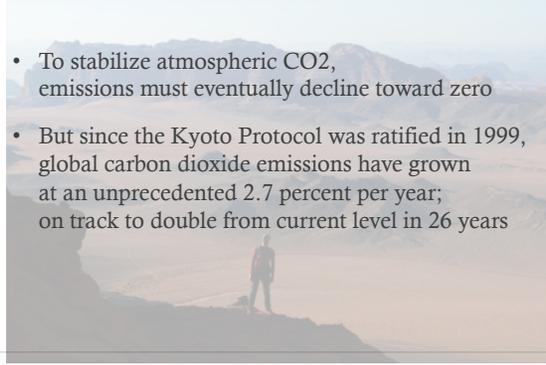


Whatever the objective,
the world has a long ways to go!

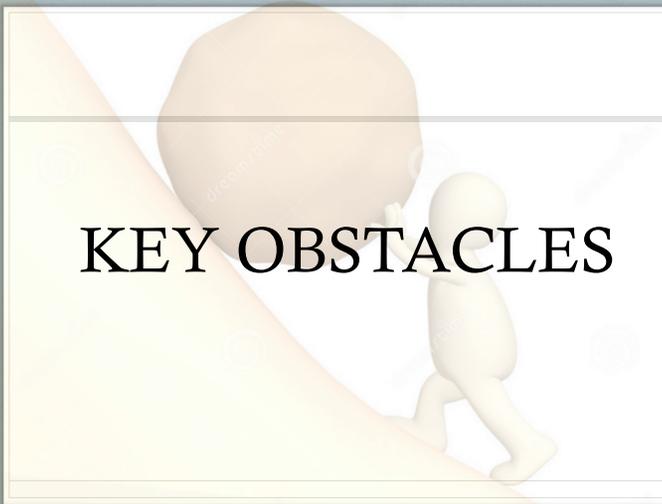


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- To stabilize atmospheric CO₂, emissions must eventually decline toward zero
- But since the Kyoto Protocol was ratified in 1999, global carbon dioxide emissions have grown at an unprecedented 2.7 percent per year; on track to double from current level in 26 years



KEY OBSTACLES



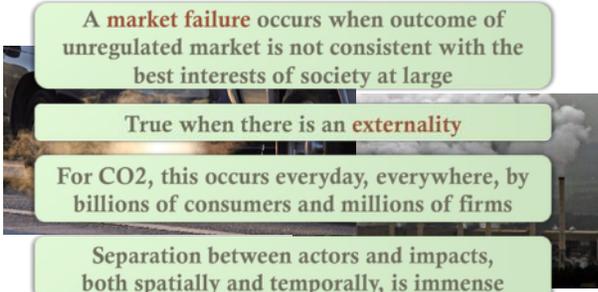
1. It is “the greatest market failure of all time” (Nicholas Stern)

A **market failure** occurs when outcome of unregulated market is not consistent with the best interests of society at large

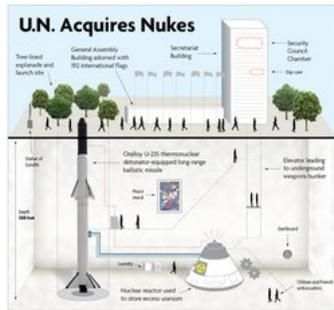
True when there is an **externality**

For CO₂, this occurs everyday, everywhere, by billions of consumers and millions of firms

Separation between actors and impacts, both spatially and temporally, is immense



2. Correction requires government, but no global authority with power



The prisoner's dilemma of global climate policy



Incentives in a multilateral environmental agreement

Situation	Costs	Benefits	Net Benefits
1. All countries agree to reduce emissions.	10	20	10
2. No agreement is reached.	0	-5	-5
3. All other countries agree to reduce emissions, but country A does not.	0	19	19

- All countries face an incentive to “free ride”—coast on the benefits of other nations actions while trying to avoid costs on self

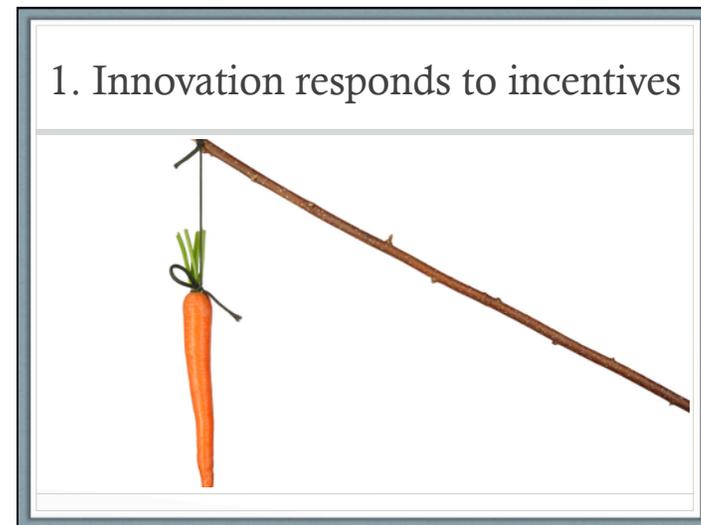
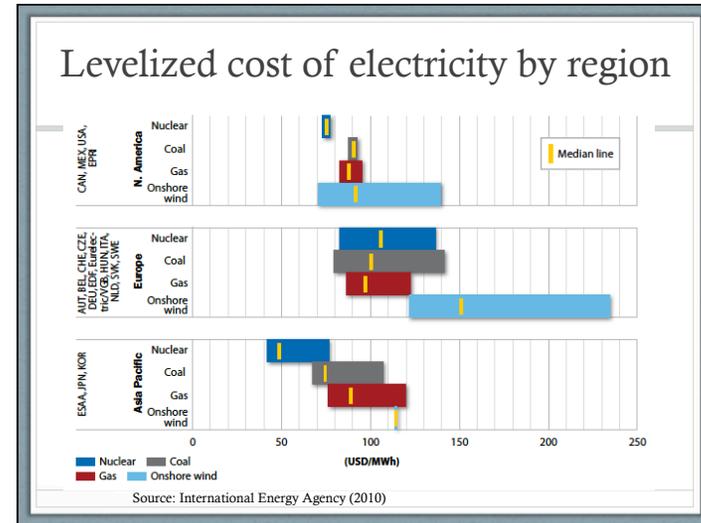
3. Current renewables not enough

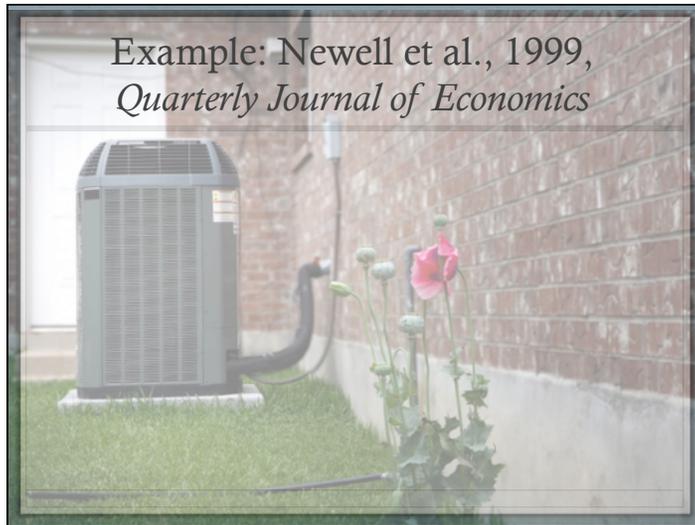


Estimated generation costs for 2019 installation, US (\$/MWh)

	Production costs	Levelized Costs	Intermittency Costs	Levelized cost+ Intermittency
Coal:	~20	96	0	96
Natural Gas:	~40	66	0	66
Wind:	~0	80*	5-100	85-180
Solar:	~0	130*	2-10	132-140

* Assumed capacity factor at high end of plausible range.
Source: Energy Information Agency (2015)





Example: Newell et al., 1999,
Quarterly Journal of Economics

- Prior to 1973, most innovations in air conditioning technology led to cheaper units, but not to more energy efficient units
- In contrast, with higher energy prices after 1973, most innovations favored more energy efficient units

Clean energy innovation will only happen on large scale if the products have a market; only true if carbon emissions are regulated

2. There is a (second) market failure for green energy innovation

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Full benefits of green innovation not appropriated by the inventor

Time horizon of private research and development investments too short

Need government to fund green energy innovation and related basic science research (in addition to regulation on emissions)

3. Carbon tax (or cap & trade) is overwhelmingly the best option

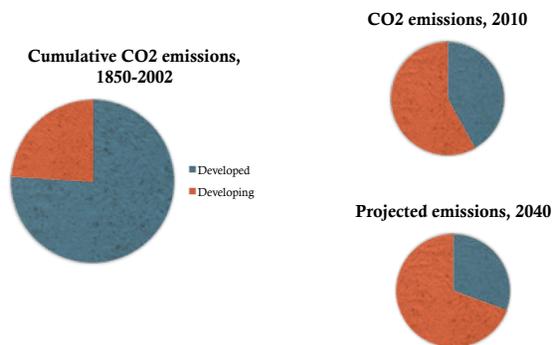


3. Carbon tax (or cap & trade) is overwhelmingly the best option

1. Minimizes costs by ensuring that abatement occurs wherever it is cheapest
2. Achieves strongest incentives for innovation of any single policy option (though R&D subsidies also necessary)

There are second-order economic reasons to prefer carbon tax, but potentially first-order political reasons to prefer cap and trade

4. The source of emissions is moving



Source: Energy Information Agency (2012)

5. Unilateral policy has problems



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Carbon leakage: When emissions reductions in one region lead to an increase in emissions elsewhere, at least partly offsetting initial benefit

POSSIBLE CAUSES

- Price effect
- Firms relocate
- Industries relocate
- Supply-side leakage

6. There are options to reduce leakage

Border tax adjustment

Supply side policy:
Buy coal!

Carbon capture
and storage