Climate Change: How to Slow It Down

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What to do about climate change?

A scientific consensus:

- that humans cause warming
- that warming can be substantial.

Less agreement (or at least uncertainty) on

- how much warming
- how warming affects human welfare.

Thus, the "optimal" path for emissions sits in wide range.

However: consensus that we *should* limit emissions substantially.

The question is HOW?

Enter economics

- The HOW question fundamentally needs to be answered based on an understanding of how our societies work—how our economies work.
- Natural scientists are NOT good at this (nor are engineers), though they are not necessarily aware of it.
- We have a golden opportunity to help the world AND showcase (to econ-skeptics) what our subject is useful for.

How, in principle

From a classical economics perspective, the problem of climate change is trivial!

- Warming: a *byproduct* of economic activity.
- Classic case of a *pure externality*: markets fail in this regard.
- 100 years ago an economist figured out what to do in such cases (Pigou, 1920): apply a tax equal to the total marginal "externality damage" the polluter is otherwise not paying for. With this tax in place, markets work well again!
- No quibble with this insight since 1920.
- Carbon spreads super-quickly in atmosphere: damage identical regardless of where it is emitted.
- So solution is: a uniform, global carbon tax.

We have been repeating this message like parrots

Result:

- mostly, no effect
  - exceptions: some countries, EU ETS system
  - but the exceptions involve a tiny part of total emissions
- why?
  1. sounds more natural to do other things (e.g., regulate)?
  2. people don't understand why it's good?
  3. fairness concerns?

This talk: focus on explanation 2 (and to some extent 3).

Interlude: an economist's self-critique

We have beautiful insights (and formulas):

- conditions for optimal behavior of firms, households, government
- often in terms of math ("marginal conditions")
- the Pigou tax is an example, and it even has a formula associated to it—very nice!

But: we are not good at explaining why our proposed solutions are so much better than those of others.

The situation is actually worse than this:

- we typically **don't know** why
- and, worse still, sometimes it isn't even true.

So how much better is the Pigou tax than the alternatives?

In our recent research (carried out primarily with John Hassler and Conny Olovsson), we have examined the Pigou tax and compared it to some often-proposed (worse) alternatives.

We examined three ways of NOT following economists' advice.

- Use the **right kind** of policy—a global, uniform tax on carbon—but set it **too high**, or **too low**.
- Use a carbon tax but at **different rates in different parts of the world**. (Motivation: fairness to developing countries—let's not force them to tax carbon.)
- Promote green energy a lot, but **without** taxing carbon.

Results

The mistakes are all much more costly than we expected. In particular,

- it's very costly to set a carbon tax based on the hope that climate change is mild/not very costly;
- it's very costly to let countries/continents off the hook; and
- relying only on green initiatives is very hazardous.

One exception: it is not very costly at all to set a carbon tax that is too high—a tax based on thinking that climate change is drastic/costly, when in fact it turns out that climate change is mild/not very costly.

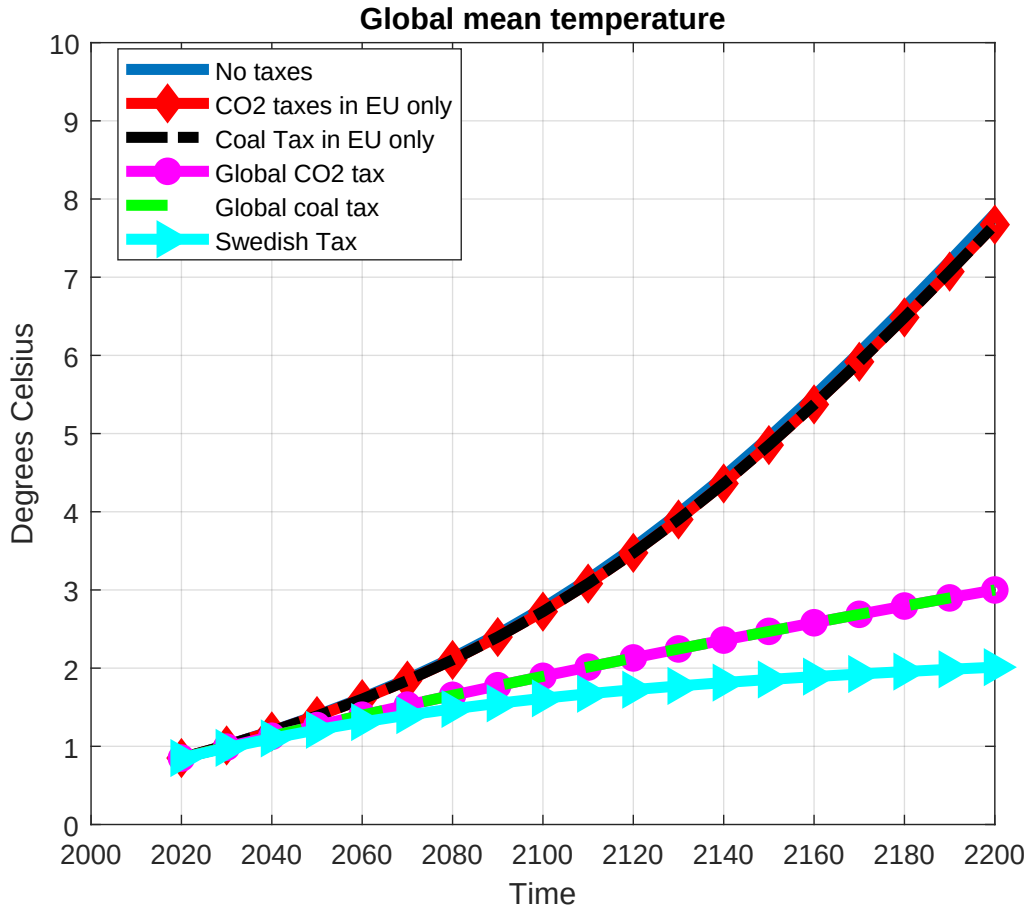
Comment on methodology

These results are all obtained using **quantitative theory**:

- a model like DICE—Nordhaus's celebrated framework
- contains equations from natural sciences and economics that are "calibrated" to match historical data
- and can be used to simulate paths of economic outcomes and climate outcomes
- and that have well-defined notions of "human welfare".

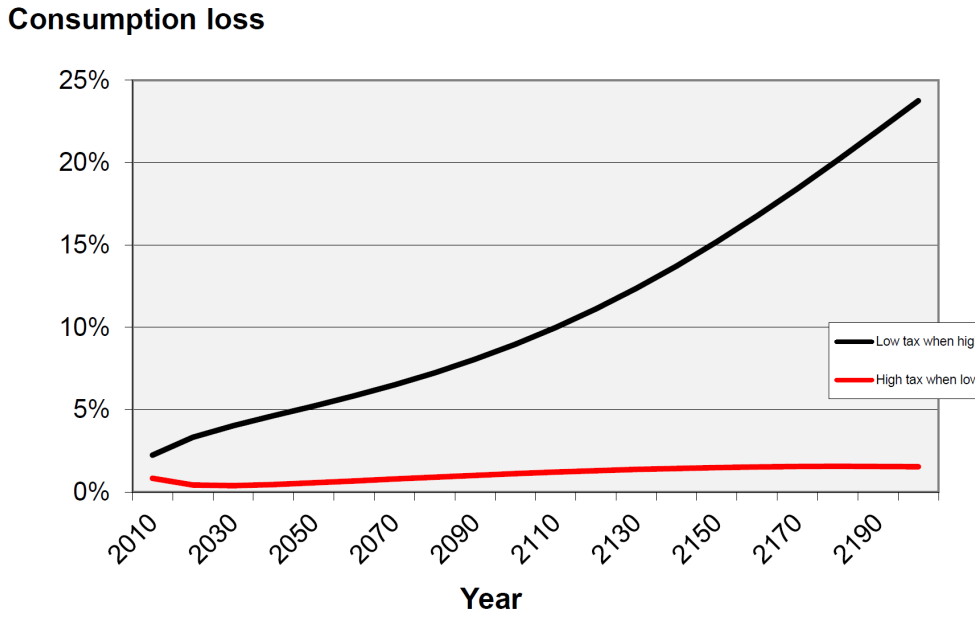
The model is analyzed using a computer and not using pencil-and-paper methods.

Before we start, a few basic points



- Taxation only in the EU doesn't help at all (still huge warming).
- It's all about coal (taxing oil or not makes no difference).
- A modest (EU-ETS level) tax helps a lot, if global.

Bad policy I: right kind of tax, wrong level

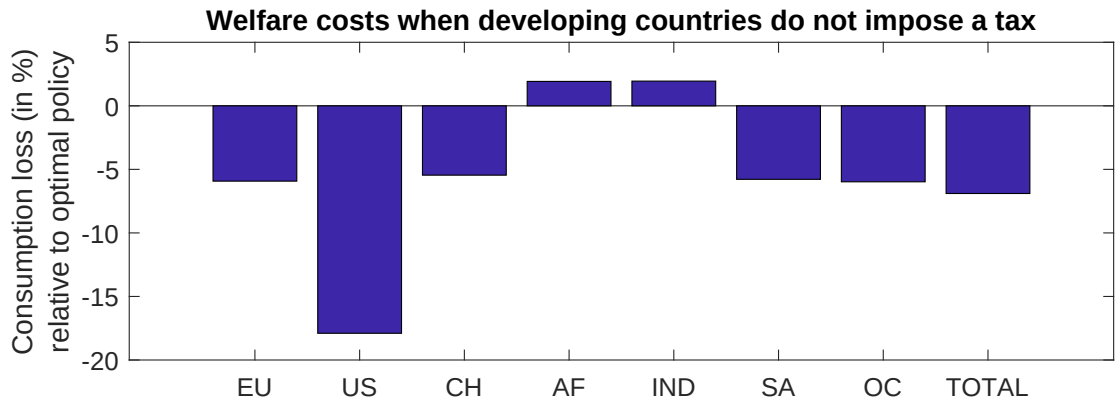


Black: global carbon tax based on most optimistic scenario for warming and damages, but reality turns out at other end of spectrum (very high warming and damages).
Red: reverse.

Message: high tax excellent precautionary instrument.

Bad policy II: non-uniform carbon tax

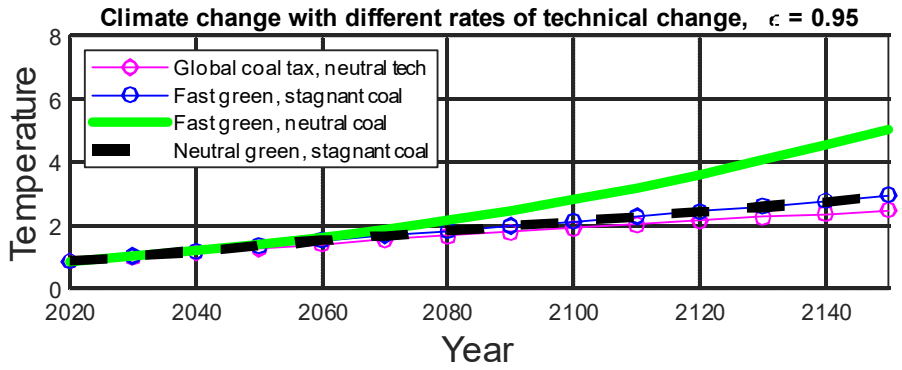
Target 2.6° heating by 2165, let Africa and India off the hook; losses relative to uniform tax.



$\Rightarrow$ non-uniform very bad idea—a comparatively small compensation would be enough.

Bad policy III: green energy push, no fossil tax

Suppose there is no Pigou tax but we instead make green technology more productive over time (+ 2%/year).



Doesn't help the climate! Only raises energy use, doesn't compete out coal. Reason: they are not such great substitutes. So green subsidy NOT good Pigou-tax substitute.

Slower productivity growth in coal-energy production helps—it's like a tax.

Conclusion

Main point: extremely productive area to work in for economists.

- We can evaluate common policy proposals and help determine how good/bad they are.
- It turns out that several policies are really very bad compared to a Pigou tax.
- It's our job to explain these things—we cannot expect others to understand it!
- On a general level, it is **cost-benefit** analysis applied to an extremely important topic.

So, though it wasn't obvious to me before doing this research: I am now even more convinced that taxing carbon—globally and uniformly and at a high rate—is the way to go.