

EconoFact Chats: Climate Change, Carbon taxes, and Techno-optimism

James Stock, Harvard University

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Michael Klein :

I'm Michael Klein, executive editor of EconoFact, a non-partisan web-based publication of The Fletcher School at Tufts University. At EconoFact we bring key facts and incisive analysis to the national debate on economic and social policies publishing work from leading economists across the country. You can learn more about us and see our work at www.econofact.org.

Michael Klein :

This summer, the heat dome that has been smothering the Pacific Northwest has caused unprecedented high temperatures. While weather is not climate, the number of unusual events from heat waves to storms and hurricanes makes apparent what the vast majority of climate scientists agree upon. We are facing drastic climate change. Scientists warn that if global temperatures increase more than 1.5 or 2 degrees celsius, there'll be severe damage to the Earth's ecosystem with accompanying adverse outcomes for human health and wellbeing. What is the evidence that human activity has contributed to climate change, and what can be done to slow or reverse it? To answer these questions, I'm very pleased to be speaking today to Professor James Stock of Harvard University. Jim is widely recognized as one of the world's foremost experts in econometrics, the statistical analysis of economic data.

Michael Klein :

In the past few years, he's been using these tools to look at climate change and he's focused on climate issues. Jim served as a member of president Obama's Council of Economic Advisors in 2013 to 2014, where he had the climate and energy portfolio. Jim, welcome to EconoFact Chats.

James Stock:

Thanks Michael.

Michael Klein :

Jim let's first discuss the evidence that climate change is caused by human activity. The ten or so warmest years since 1880 have occurred since 2005. Climate scientists have used complex models of the climate system to show that this is extremely likely to be the result of human activity. In an EconoFact memo, you used a simpler method drawn from economic analysis and found a similar result that confirms those of the complex climate models. Is there really any question anymore that global warming is a consequence of human activity?

James Stock:

No, there's no question whatsoever.

Michael Klein :

Okay, well that was a quick answer. Thank you. Are we past the point of no return? Have doom-loops already been set off, for example, the melting of the polar ice caps, which limits the amount of sunlight reflected back to space, which leads to higher temperatures, which leads to more melting of the ice caps and so on.

James Stock:

Well, we still have time, but the situation is increasingly urgent. We've wasted a decade or more at least in the United States, not making any significant progress, and we can't afford to waste another decade.

Michael Klein:

If global warming and the resulting climate change are largely due to human activity, how can a change in human activity reverse this? I read your forthcoming article in the IMF publication, Finance and Development, and you described how the decline in the price of certain green technologies changes the way we should think about climate policy.

James Stock:

That really is an important change. Historically, it's been cheaper to use fossil fuels than any green alternative. But as economists have pointed out, things that are priced below their true social costs, like fossil fuels, will be over-used. Because carbon emissions aren't priced, it's cheaper to emit carbon dioxide than not to when producing energy. So the core message of climate policy has been self-restraint. Now and into the indefinite future, through policies such as carbon pricing and energy efficiency standards, and through changing behaviors such as flying and driving less. So according to that view, if it's cheaper to be dirty, reducing pollution is costly, but the benefits are worth it.

Michael Klein :

So you're mentioning this basic idea in economics that sometimes the private cost of something and the social costs of things, diverge -- what economists call externalities. And then in this view, the way to reduce carbon emissions is to raise their costs to reflect the social costs through a carbon tax. We have a number of memos on this with my Tufts colleague, Gib Metcalf as well as a podcast episode with him. You and Gib have co-authored work, right?

James Stock:

Yeah. We do. Gib has just been a leader in thinking through the details of carbon taxes. And it was a lot of fun working with him. What Gib and I did is we looked at the macro impact of carbon taxes in 15 European countries. And although there's been an awful lot of work on the micro details of what carbon taxes do, there hasn't been really any empirical large scale work on the GDP or jobs effects of having a carbon tax. So I mean, to your question, a carbon tax is not only is a way to put a price on carbon, but it actually, what we found is that it has a negligible impact on GDP growth or jobs.

Michael Klein :

So the price of wind turbines, solar panels, and batteries for electric vehicles have fallen dramatically over the past decade. What are the implications of that?

James Stock:

Yeah, well these cost declines make the energy transition a lot more feasible economically. They also reshaped policy priorities. So it might be useful, maybe a little bit unfair, but useful, to contrast a traditional economist perspective, which advises self-restraint, with what you could call a techno-optimist view, which is that technological revolutions can and will make it cheaper to be green. This is different from saying that there's \$20 bills lying around all over the place. And we just need to save money by for example, weatherizing homes. Rather in the techno-optimist view, the transition to green technologies will unleash innovation that will eventually make green technologies cheaper than fossil fuels.

Michael Klein :

Do you put yourself in the techno-optimist camp?

James Stock:

Yeah, I do. Although it's not either, or, and I think I probably would want to put in some caveats and nuances. My own reading of the evidence is that the techno-optimist view is right for light duty vehicles. Remarkably and quite unexpectedly, we're on the cusp of electric vehicles or EVs being less expensive than conventional vehicles once you incorporate the lower operating costs. It's a little more complicated in the power sector. In some parts of the United States, it's cheaper for a power generator to install a new wind or solar farm than to run an existing coal or natural gas plant, but that's not true everywhere. And once we achieve deeper renewables penetration, it will be needed to pair renewables, solar and wind, with batteries or other methods for handling intermittency. And there's a lot of exciting innovation going on in technologies that could help the power sector manage renewables intermittency.

Michael Klein :

How important is policy for realizing these things?

James Stock:

Yeah, well, from a policy perspective, the priorities really change under this techno-optimist view. So if we just stick with light duty vehicles for a moment, it's useful to think about a carbon tax of say \$50 a ton of CO₂. Well that only amounts to about 45 cents a gallon of gasoline. A gas price increase of 45 cents is at best a small factor into whether or not to buy an electric vehicle. In fact, there's actually a body of careful econometric research that finds that car buyers don't really properly factor gasoline prices into their decisions. But one thing that really does matter is whether you can take your car on a road trip or be a 100% confident that you can charge it overnight or at work so you can do your commute. So a different externality, the network externality, or chicken and egg externality at charging stations looms larger, much larger than the price of gasoline. As a result, there's a role for government to facilitate the transition to a greener, cheaper equilibrium by subsidizing charging stations.

Michael Klein :

So that would be one policy that would help make this move.

James Stock:

Yep, yep. It would. And in a techno-optimist view, the role of policy, one way to think about it, is to facilitate the transition to a cleaner, cheaper equilibrium. So it's not a sure thing that we'll get there of course. I mean, there's a lot of work to be done and getting there requires addressing other externalities. One that we haven't addressed is the innovation externality, which arises because an innovator can't capture all the returns from their inventions, or processes, or management improvements. And then the other externality is what we had discussed in that EVs, which is arising from infrastructure and the lack of charging stations.

Michael Klein :

But all of this still wouldn't solve the problem of climate change by itself, would it?

James Stock:

No, it doesn't. And we've been talking about policies other than carbon taxes, and I don't want the American Economics Association to cancel my membership. So I need to stress that carbon pricing

actually plays an important role, especially a carbon tax with its certainty. It's just that in some areas and in those areas where green technology approaches cost competitiveness with fossil fuels, other policies come to the fore.

Michael Klein :

What's an example of that?

James Stock:

Well, I mean one example of where they come to the fore where policies, where the technology is approaching cost competitiveness is as we discussed, light duty vehicles. But I guess it's also important to keep in mind that there are some areas where it's just going to be...at the moment, we just don't actually have any good sense as to what the technological path is going to be going forward, especially one that's going to be cost competitive with fossil fuels. So these are what's called, so-called 'hard-to-decarbonize' energy uses. An example, that I think is a really good one is aviation. So in its most recent Annual Energy Outlook, the US Energy Information Administration projected the price of petroleum jet fuel in 2050 to be \$2.77 a gallon.

James Stock:

Currently, there's a lot of excitement about what's called sustainable aviation fuels. And those are non-petroleum fuels that can be used in existing jet engines. Some of those fuels currently exist like, using waste vegetable oils and oil crops as a feed-stock to make what's called renewable diesel or renewable jet fuel. Those feed stocks are limited in quantity though. And some of them are highly problematic because they encourage deforestation for palm oil plantations and other problems like that. There are other pathways, more advanced technologies, second and third generation technologies, that exist in the lab such as low or negative carbon alcohols, converting them to jet fuels. But those are not in production at the moment. The prospect of such fuels competing with petroleum jet fuel at \$2.70 a gallon without an implicit or explicit carbon price is daunting.

Michael Klein :

So that get us to a reversal of climate change?

James Stock:

Well, I think that's a tough question. I mean, I think this is multifaceted. If you think about the path that we might need to take to get to 1.5 degrees, that's going to require an enormous amount of the energy transition technologies that I've been talking about and policies. But realistically, and in many of the simulations, we end up overshooting 1.5 degrees, and then need to reduce the concentrations in the atmosphere so that we maintain a reasonable temperature. So there are technologies for doing that, direct air capture and then sequestration. Those technologies are nascent. There's a lot of interest in them, but those, if you think about it for a minute, there's absolutely no productive reason why anybody would ever do direct air capture, take carbon dioxide out of the atmosphere and then put it into the ground, if it weren't for the fact that that has negative consequences on the climate, you'd never do it. So those things simply aren't going to exist without a carbon price.

Michael Klein :

So the private benefit of that is zero even if the social benefit is quite high. So again, we get to this issue of externalities, which pervades all of these issues having to do with climate change.

James Stock:

Yeah, exactly.

Michael Klein :

So what are the differences in policy prescriptions based on these different views of how climate change could be addressed through carbon tax, through technology and so on?

James Stock:

Well, I see these nuances and the declining green energy prices as leading to a fundamental shift in climate policy economic thinking. From how can we make it more expensive to be dirty, to how can we accelerate the date at which it becomes cheaper to be green. But whether we actually reached that low cost green equilibrium is far from a foregone conclusion, whether we get there and how quickly hinges on policy

Michael Klein :

Also, isn't it the case that every sector and even every country are different from each other. So there's not a single one size fits all solution.

James Stock:

Yeah, absolutely. I think that's completely true. The sectors are very, we're very different. So we talked about light duty vehicles and charging stations. Well, charging stations actually are quite important to the EV transition, but if we think about aviation, and fuels that can actually be used in existing jet engines and can be dispersed through existing technologies that exist at airports and so forth, then there really isn't this chicken and egg problem. So we're going to need to have different solutions for different sectors, and we're going to have to have different carbon pricing schemes for different sectors. I think that would be the efficient way to roll things out. In some sectors it's important to have carbon pricing early on. Right now, I think that in the power sector, having carbon pricing for solidifying and jump-starting the transition to deep renewables penetration would be actually quite important. Whereas in other sectors like aviation, I don't see carbon pricing as having a particularly important role at its point, it would probably drive up the price of flying on a jet somewhat, but that's not really going to help with deep decarbonization.

Michael Klein :

You're talking about differences in sectors, but also differences across countries. And this raises some broad ethical issues.

James Stock:

Yeah, that's for sure. This view that it is more expensive to be green has really lasting problematic implications. And it's one reason to think about how important it is to drive these technologies to a cheaper future.

Michael Klein :

The West was able to industrialize in a very dirty way and raise its living standards. And now countries like China or India want to make their people wealthier as well. But the West is now saying, well, you can't really do that the way we did it because it will ruin the environment.

James Stock:

Yeah, absolutely. I mean, on a moral level, the climate crisis is the West's, it's our collective responsibility, and it seems appropriate, it is appropriate for us to bear the cost of decarbonization for the benefits of others, but it's really hard. And it's really also really hard to see how we can ask developing countries permanently to be in a situation where they're foregoing the benefit of cheap energy. Now that could lead to another layer of self-restraint where rich countries pay transfers, provide transfers to developing countries to subsidize their use of clean energy. Given political dynamics here and globally, it's hard to see how that's sustainable. I mean, if fossil fuels really are the cheapest option, then we're going to be asking every day into the indefinite future that billions of people pay more to avoid using cheap fossil fuels. And I just don't see how that's a sustainable future. So it really stresses the underlying importance of driving the development of green technologies.

Michael Klein :

Yeah, it's very hard to imagine the United States Congress paying China these days, or anytime in the future to develop these technologies and to use them. But even within the United States itself, policies need to have political support to be enacted and to be durable. What was your experience, Jim, on the Council of Economic Advisers about the politics of climate change and the political feasibility of getting these programs enacted?

James Stock:

Well, there has really been a sea change since I was there in 2013, 2014. Putting aside the pendulum swings, the Obama administration at the time was very forward-leaning. We tried to enact an economy-wide cap and trade system. And then later implement, when that didn't work, we went ahead to implement an ambitious regulatory approach to reducing emissions in the power sector. I worked on that latter effort, which led to the Clean Power Plan, which was then suspended or replaced by the Trump administration.

James Stock:

But the scope of what we could contemplate back then even just eight years ago, was a lot more circumscribed than what we can contemplate today. I'd say the biggest change in the climate area, the reason that we can talk about greater ambition, the biggest change in the climate area has actually been the rise of the youth movement in the past few years. In the US, the Sunrise Movement for example, has been incredibly influential and really a force for good. We focused on technology during this conversation, but the most fundamental reason for optimism I think is that today's young people want to fix the problems that our generation created, and they want to do so quickly. That political support makes ambition possible and our job now is to turn that ambition into action.

Michael Klein :

Well, I hope that that can be the case, and it's not just young people. I think more and more people, with extreme weather events, as I mentioned in the introduction, are recognizing the implications of this. It's no longer just a theoretical possibility. So, Jim, thank you very much for speaking with me today about climate change and policies to address it. Perhaps it's the most important issue facing all of us as well as our children and generations yet unborn.

James Stock:

Well, thanks Michael, for having me.

Michael Klein :

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