



## TRANSCRIPT

### Environmental Insights Episode #7, 2024

**Guest:** Wolfram Schlenker

**Record Date:** August 29, 2024

**Posting Date:** September 9, 2024

LINK to podcast: <https://on.soundcloud.com/HBEd3EgyTN3e5rBZA>

**Wolfram Schlenker:** When I was a grad student, there was actually a very active debate whether the U.S. agriculture would benefit or be harmed from climate change. That's how I got really interested in it, because it seemed like an unresolved issue. I think one of the common things I think I was one of the first to identify, at least statistically, is this crucial role of extreme heat.

**Rob Stavins:** Welcome to [Environmental Insights](#), a podcast from the [Harvard Environmental Economics Program](#). I'm your host, [Rob Stavins](#), a professor here at the [Harvard Kennedy School](#) and director of the program.

I've had the pleasure of including in these podcast conversations over the past five years a significant number of leading economists who have carried out important work that's relevant for environmental, energy, and natural resource policy. Today is no exception, because today I'm joined by [Wolfram Schlenker](#), who is the Ray Goldberg Professor of the Global Food System at the [Harvard Kennedy School](#). He was, until recently, a faculty member at Columbia University's School of International and Public Affairs. He is a leader among scholars studying the relationship between global climate change and agriculture, which, obviously, is quite frequently the most climate sensitive sector in economies around the world so it's an important topic.

Welcome, Wolfram.

**Wolfram Schlenker:** Thank you for having me.

**Rob Stavins:** Before we talk about your research and your current thinking about agricultural economics, the global food system, and climate change, let's go back to how you came to be where you are, because our listeners always find that of great interest. Tell us, where did you grow up?

**Wolfram Schlenker:** I grew up in Germany. I actually come out of a family where several of my uncles were physics professors. I had determined that the least thing I want to become

in life was a professor, so I enrolled in business school growing up. It's actually a bit of a historic accident that I ended up in the field.

I had a friend who went to, during high school, to the United States, and he wanted to go back during college. He convinced me to apply for a one-year exchange program. At the time, there was this new Nicholas School of the Environment.

**Rob Stavins:** Right.

**Wolfram Schlenker:** I contacted them. I got to take classes with Kerry Smith. I thought it was a one-year thing, where I'd try out something new, environmental economics. Then I just fell so much in love that I stayed in the U.S., did my Ph.D., and then became an academic in the area.

**Rob Stavins:** Primary and what we call here high school, those were in Germany. Your bachelor's degree, in engineering and management science was in Germany. Then, another master's degree, that's in environmental management. That was from Duke, is that right?

**Wolfram Schlenker:** That's correct. That's when I came to the US. Initially, I only wanted to come for a semester, but then I stayed and worked with Kerry and then did the whole Master's, for the two-year program.

**Rob Stavins:** Right. That happens. For our very young listeners, the name of Kerry Smith might not be familiar, which is unfortunate because for many years, I think it's fair to say that Kerry Smith was celebrated and recognized nationally and internationally as essentially the Dean of environmental and resource economics. He was the leader. Is that fair to say?

**Wolfram Schlenker:** Oh, yeah. He ignited the fire in me. I really enjoyed taking his classes. It was just fascinating to learn about the area. I don't think there's anybody better that could have gotten me started in this area than him.

**Rob Stavins:** From there then, you went to the Department of Ag and Resource Economics at UC Berkeley. How did that come about?

**Wolfram Schlenker:** That was when I had taken those classes with Kerry Smith at Duke, and we discussed about where to go for grad school, he mentioned Berkeley Ag Econ as one of the places that has a lot of good environmental economists, so I ended up enrolling there.

**Rob Stavins:** Because if it was strictly agricultural economics as opposed to environmental and resource economics then you might have considered instead, I would think, University of California Davis Ag Econ department as opposed to the Berkeley department.

**Wolfram Schlenker:** Correct. That's also a very good one. Like many students who think about applying for grad school, you usually apply to several schools.

**Rob Stavins:** Right.

**Wolfram Schlenker:** I applied to several ag econ departments and other departments. It just seemed like that was a very good fit. Even today, it's not just back then, they have a lot of environmental economists, as you mentioned.

**Rob Stavins:** Right, right. What was your dissertation topic and who was on your committee for the PhD at Berkeley?

**Wolfram Schlenker:** Mine was three essays in resource economics. My advisors were Michael Hanemann, Anthony Fisher, and then Quigley, who was the outside member from the business school.

**Rob Stavins:** That's a stellar committee. Tony Fisher, Michael Hanemann, and John Quigley. Was one of those your dissertation committee chair?

**Wolfram Schlenker:** There were co-chairs.

**Rob Stavins:** I see.

**Wolfram Schlenker:** Hanemann and Fisher. Because we also have several publications together.

**Rob Stavins:** Yes.

**Wolfram Schlenker:** They always advised me jointly.

**Rob Stavins:** I see. What was your first position out of graduate school?

**Wolfram Schlenker:** I stayed in California. I became an assistant professor in economics department at UC San Diego.

**Rob Stavins:** Which is an excellent economics department.

**Wolfram Schlenker:** Yes. Great place to start. Not too far, moving to south. Lots of friendly colleagues over there as well.

**Rob Stavins:** You were there for, what is it, two or three years?

**Wolfram Schlenker:** Two years.

**Rob Stavins:** Two years. Then what happens with your professional history?

**Wolfram Schlenker:** At that time, Columbia University started the new program in sustainable development. A new Ph.D. program, I should be more specific.

**Rob Stavins:** Yes.

**Wolfram Schlenker:** They recruited several faculty members to teach in this program. I was very interested in their proposal. It was jointly started, the idea, by Joe Stiglitz and Geoff Heal was on the committee, and Jeff Sachs. They outlined to me how they want to make it a more interdisciplinary Ph.D. program, where students do the full training in economics in the econ department, but also take some natural science class.

Since I had taken this engineering and management science degree you talked about earlier in Germany, and I come from this family of a lot of physics professors, this link between natural sciences and economics is always something that has appealed to me. I do feel that sometimes economists oversimplify the natural system in their models. This sounded like a very interesting and challenging opportunity, so I jumped on it. So, joined Columbia, after only having been two years at UC San Diego.

**Rob Stavins:** Indeed, that's something that still, today, that the Columbia program celebrates, is the set of links between the natural sciences and economics, demonstrated, for example, by your former mentee and Ph.D. student, Charles Taylor, who was I think my most recent guest on this podcast.

**Wolfram Schlenker:** Yeah, I heard his. He was last month. Yes. He was a graduate student of that program.

**Rob Stavins:** Yeah. It's a wonderful group. Now I have that you've also had visiting stints at Princeton, Resources for the Future, Stanford, Ecole Polytechnique, and the University of Zurich. How did you find time for all of that?

**Wolfram Schlenker:** Some of it is unique to Columbia. They have a very, very generous junior leave policy. After three years, you get to go, either for half a year or a full year if you find some outside funding. That's where I got fellowships to visit some of those universities. Then some of those others were just sabbaticals. University of Zurich was a sabbatical. I just moved a bit around.

Also, I have coauthors in all those places. It's just been great to be at the location. There's still something about being physically located in the same place as your coauthors.

**Rob Stavins:** Right.

**Wolfram Schlenker:** It makes working with them much more efficient.

**Rob Stavins:** You've held faculty positions, as I understand, in a department of economics, a department of agricultural and resource economics, the School of International Affairs, and now with me at a school of government. Do I have that right?

**Wolfram Schlenker:** Yeah, that's correct.

**Rob Stavins:** Okay. I would love for you to compare these. Not the specific institutions, in terms of quality, I wouldn't ask you to do that, at least not in public. But I'm thinking, can you compare them generally, in terms of these different categories of scholarly institutions? What are the differences, in terms of perspective? What are the differences, in terms of your role as a faculty member? Does it affect your research? Does it affect your teaching? How would you reflect on that?

**Wolfram Schlenker:** It's not that easy to answer. I think I might be biased, because I spent two years as a econ department, 19 years at Columbia, the School of Public International Affairs, and then one year at the ag econ in Berkeley as a professor. By far, my longest time period has been at Columbia.

I would say it has less to do with the disciplines of the department where I was, than more like how individual universities are set up differently. For example, even though Berkeley ag econ has a lot of environmental economists, I feel like the environmental group in ... You didn't want me to talk about specific institutions.

**Rob Stavins:** That's okay. You can. I just didn't want to force you to.

**Wolfram Schlenker:** The one thing that was unique, I feel like, about Columbia... I don't think that's due to the fact that it was at the School of International Public Affairs, but just the way Columbia was, is that I felt like there was very few barriers between departments. I don't know whether this is an effect of this interdisciplinary Ph.D. program in sustainable development, because we were encouraged to work with people across the field.

It might also have something to do with the fact that Columbia is very small. The campus is a very small footprint. Meeting somebody is actually very, very easy because it's often just like a two-minute walk. Rather than, when I was at Berkeley for example, you had to walk 20 minutes to see somebody. I think one of the Columbia's challenges, which is the small footprint, might also be one of its advantages in trying to get people to work together.

**Rob Stavins:** Oh, that's interesting.

**Wolfram Schlenker:** Then, I think it always depends also on just the people you meet and who you connect with. Yeah. I think I've been, by far, the longest at Columbia. Maybe then, also, it's that it was easy for me to connect with people because just I've been there for such a long time, and I got to know all those people that I never had the chance to make the same kind of connection at other institutions where I only spent a year or so. I'm not sure I can give you a satisfactory answer to your question.

**Rob Stavins:** No, that was helpful. Something that people often take note of, with regards to Harvard, is that the different parts of the university, the faculty parts, and sciences, the business school, the Kennedy School, the law school, et cetera. Each of these, the phrase we use is “each tub on its own bottom,” which means that they have separate budgets. They raise revenue in various ways and they spend revenue in various ways. That provided or generated a lack of interaction among the different parts of the university.

But I'm delighted to say that, in the environment and natural resources area, specifically in climate change but broader than that, that's become an exception to what may or may not have been the rule in the past. Namely, there's a tremendous amount of collegiality and interaction.

For example, and I'd love you to tell us about this, you're about to launch, together with Jim Stock, a Ph.D.-level course in environmental economics in the economics department in the Faculty of Arts and Sciences. Can you say something about that course?

**Wolfram Schlenker:** Sure, I'd be happy to. I'm very excited to co-teach this with Jim Stock, who is also running the Salata Institute.

**Rob Stavins:** Yes.

**Wolfram Schlenker:** Which brings people from campus together, as you mentioned. I've only been here for two months, and I feel like, as you say, Harvard has been very open for people across fields to work together.

In our course, we basically teaching ... We're splitting it, so I'll teach roughly the first half, he teaches roughly the second, with some lectures interspersed in between. It's based partly on the class I taught at Columbia. It's also based on Jim Stock's experience that he had for being on the Council of Economic Advisors in Washington, DC, where he worked a lot on biofuel standards and energy transition, and so forth. We're trying to merge both the classics, the fundamentals of environmental economics, with recent policy relevant topics, and then teach that.

**Rob Stavins:** This course can be taken independently on its own, or as the first of a two-course sequence, with the second course being offered by the MIT Department of Economics.

**Wolfram Schlenker:** That is correct. Ben Olken and Jacob Moscona are teaching a new class in environmental economics. They had emailed all kinds of people to ask for syllabi, to get an idea. When they reached out to us, we said, “Wow, this is great. We should make it a sequence.” We had to have theirs in the spring. Jim Stock and I moved ours to the fall, to make this that we don't compete at the same time. It will obviously be great.

We had several meetings where we discussed topics. Some overlap because they're independent classes on their own but we tried to also split them up enough that students don't see the same topic twice.

**Rob Stavins:** It's wonderful news for Ph.D. students focusing on environmental resource energy economics at Harvard and MIT. It's been, gosh, is it already five years, or maybe four years since Marty Weitzman sadly passed away. That was the last time in which the economics department at Harvard was offering a truly Ph.D.-level course in the area. We'd have to even go back earlier than that, to when Michael Greenstone was at MIT teaching such a course. This is a wonderful development.

But I want to do now is to turn to your scholarly work, in the world of environmental and resource economics. Your published work and your working papers for that matter are actually very diverse. I'm wondering if you can identify any common themes across at least some of your work?

**Wolfram Schlenker:** The largest majority of my work is on empirically identifying the effect of weather and climate on agricultural yields and prices, using various statistical techniques.

When I was a grad student, there was actually a very active debate whether the U.S. agriculture would benefit or be harmed from climate change. That's how I got really interested in it, because it seemed like an unresolved issue. I think one of the common things that I think I was among the first to identify, at least statistically, is this crucial role of extreme heat.

I think nowadays, if you look at the EPA's latest proposal for the revised social cost of carbon, and you look at all the sectoral impacts and mortality, energy consumption, labor productivity, agriculture, the common theme across all of them is that it's pretty much all driven by how much of the temperature distribution we push into the really upper tail where the outcomes are just very negative. I think that's something that's been coming back repeatedly in many contexts, and one of the most consistent and robust findings I personally seems to have had.

**Rob Stavins:** You mentioned, Wolfram, during your time in graduate school at Berkeley, about the controversy and the debates that were taking place. I assume you're referring to the article that was in the *American Economic Review* by Mendelsohn, Nordhaus, and Shaw, and then the various responses to it. Is that right?

**Wolfram Schlenker:** Yes. That was one among them.

**Rob Stavins:** Yeah.

**Wolfram Schlenker:** There was one by Cynthia Rosenzweig.

**Rob Stavins:** Yes.

**Wolfram Schlenker:** Who [inaudible 00:17:20] the crop models. Yes.

**Rob Stavins:** You could do a tremendous public service for our listeners, particularly those who are not old enough, and we have a lot of Ph.D. students around the world who listen to this podcast, to tell them about that debate. What were the findings on each side, and how is it, if you can say this, how they came up with different findings?

**Wolfram Schlenker:** I think the initial idea was that if temperatures go up and we keep everything fixed, yields go down, so there's big damages. Except for potentially CO<sub>2</sub> fertilization, which has always been a bit of this overseen force.

**Rob Stavins:** Right.

**Wolfram Schlenker:** Then the really innovative idea of Mendelsohn, Nordhaus, and Shaw, which are economists, was this is too static thinking, we're keeping everything fixed. Once things start to change, farmers will adapt and they will grow different crops, they do something completely different. Maybe it might not be as bad as the initial models predicted. That was their big approach.

In their paper ... It's interesting, because the paper's always being cited for the fact that they find benefits, but in their paper, they actually have two models which are different statistical weightings. One finds pretty severe negative impacts, and the other one finds very positive impacts. They say their preferred model is the one that had the positive impact on U.S. agriculture.

They did that because it was what they called a crop revenue weight, which basically, they weighted each county in the U.S. by how much they produce. If you know something on U.S. agriculture, by far, the most productive is California. The Central Valley has all the high-valued crops – almonds, lettuce, all those things. So, when you weight it with the crop revenues, you placed all the value in California agriculture.

Now the tricky thing is California, in the western United States, and you have worked on this too, is a property with water rights, where it's basically this first come, first serve. Whoever filed the first claim has the highest priority. If then there's water left over, the next person gets it, and so forth. As you might imagine, the places that are hotter needed more water, and got the water first. There's a huge correlation between how hot it is in a place there, and how much water rights you have. Obviously, those water rights capitalize into farmland prices. What the authors did is they ran a hedonic analysis where they linked farmland prices to climate variables, but didn't really account for those water rights.



Then if you place all those weights on California, basically the regression integration gives you back, "Oh, it's hot, it's good." But that's not really because it's good for productivity, it's because you get those huge water rights. Because for example, Imperial Irrigation District, at some point, sold some of their water rights to LA in urban use. They got more than one billion dollars for that. Then there's even China, there's movies, and things. Water rights in California are just very, very valuable.

They capitalize on the farmland prices too because historically the cost of basically building them have been paid for by the taxpayer. There's a study by Wahl saying it's 86 percent, I believe, somewhere in the 80s, of the costs are basically subsidized. Those subsidies then get into the farmland values.

That's I think the biggest reason why you suddenly got in this one model, benefits, and you didn't have it in the other. It's not that you have the regression truly represent the benefit of hotter temperatures, but a confounding variation that was an emitted variable.

**Rob Stavins:** Was it Tony Fisher, Michael Hanemann, and you, or perhaps others, that then they said, "Wait, we've got to take account of irrigation as a control variable?"

**Wolfram Schlenker:** Yeah. We have one paper. One was we just look at the eastern United States. They have this 100-degree meridian, which roughly cuts the United States. It's basically 100-degree longitude through the west.

**Rob Stavins:** Yeah.

**Wolfram Schlenker:** It roughly cuts the U.S. in the middle, roughly right through Texas. If you every fly from east to west coast, or the other way around, you really remarkably see how the landscapes change. The eastern United States has a lot of precipitation, is very green. Then once you hit the 100-degree meridian and you fly further west, you suddenly see how it's becoming much browner. Then you see those circles from the irrigated fields that you get if you fly over the Ogallala Aquifer for other things like that. You can't really do agriculture there unless you have a lot of irrigation. One approach is just to split the U.S. because it's so different hydrologically in east and west, then you get those results.

Another paper that you mentioned was we looked at irrigation water rights in California, only in how they capitalize into farmland prices. Since irrigation access is exogenous, we instrument it with a distance to the river, to try to get more exogenous variation.

**Rob Stavins:** That's very helpful. The last thing I actually would like to ask you about, in terms of your research anyway, is to ask you to step back and look at the whole body of your research, which, as I said, is both abundant, but also very diverse. Can you identify, if you don't mind, the one research publication of yours, or it could be a working paper, that you're most proud of?

**Wolfram Schlenker:** I do think it's that [2009 paper with Michael Roberts](#). Basically on, again, the extreme heat. It appeared in PNAS. I think that's been cited a lot. I think a lot of people have built on it. You mentioned earlier how Jacob Moscona is co-teaching with us at MIT. He has a really interesting new paper on adaptation in agriculture and crop variety selection. All the empirical specifications use this extreme heat measure degree days that Mike Roberts and I introduced. I think that had a lasting impact on the whole field going forward, and what people nowadays use.

**Rob Stavins:** I want to move, at the end here, from your research to some broader thoughts that you may have on what's been happening in the world, with respect to climate change. I'm not talking about the impacts of climate change, but rather, I want to reflect with you on what we've seen, in terms of public perceptions of climate change.

You have relatively small children, compared to mine, who are adults. I suspect that your children, in school in the U.S., will be hearing about climate change, but certainly, when my kids were in primary school and high school, there was not a word about climate change. But what's also happened, along with changes in the educational world, are these youth movements of climate activism. Obviously, most prominently, Greta Thunberg, but there are many others beyond that. This has happened in Europe. It's happened in the United States. Just before COVID is when we began to see a substantial amount of it.

What's your personal reaction to these youth movements of climate activism?

**Wolfram Schlenker:** I think there are two sides to this.

I think on the one side, fossil fuels are natural resources, which is scarce. I think sometimes, I have ... My kids are too young to really decide whether to fly anywhere or do anything.

**Rob Stavins:** Right.

**Wolfram Schlenker:** But I have some nephews and nieces. They are sometimes very idealistic in the fact that they say, "I don't want to fly because the environmental impact is too severe." Very respectable. But you sometimes have to be careful, because since this is a fossil fuel with a limited availability and a scarcity end, often times when you voluntarily yourself cut back on something, it doesn't really limit total fuel use because it just impacts the scarcity a little bit. Then some prices might fall a little bit because scarcity goes down, and somebody else uses the same fossil fuel.

I think this idealism, which is very recommendable, is great. But I'm not sure it helps us solve the problem, given how big it is and given how these are finite resources we likely would use up anyway. That's the one side.

The other side, do I feel like, is that they've been really good at setting the agenda, and having put pressure on policymakers to take this seriously. Then lead to regulation that could help us potentially make sure we don't use all those finite resources, and then, really have an effect on climate change.

**Rob Stavins:** I must say, Wolfram, that your answer of combining those two perspectives on the roles of the youth movements of climate activism are very, very, very highly correlated with what Michael Greenstone had to say on this podcast when I asked him the same question. You're obviously in good company. Perhaps I should say, Michael's in good company that he shares this with you.

Listen, Wolfram, I want to thank you very much for having taken time to join me today.

**Wolfram Schlenker:** Thank you very much again for having me on.

**Rob Stavins:** My guest today has been [Wolfram Schlenker](#). He's the Ray Goldberg Professor of the Global Food System at the [Harvard Kennedy School](#).

I hope you will join us again for the next episode of [Environmental Insights: Conversations on Policy and Practice](#) from the [Harvard Environmental Economics Program](#). I'm your host, [Rob Stavins](#). Thanks for listening.

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