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Robert Pindyck: What we'd like to do is to sharply reduce CO2 emissions and prevent a temperature increase of two degrees Celsius. And as I started doing a bunch of calculations, it just became clear to me that, that's very unlikely. And then the question is, what should we do?

Rob Stavins: Welcome to Environmental Insights, a podcast from the Harvard Environmental Economics Program. I'm your host, Rob Stavins, a professor at the Harvard Kennedy School and director of the Harvard Environmental Economics Program and the Harvard Project on Climate Agreements. As listeners know, in these podcast episodes I engage in conversations with leading experts from academia, private industry, government, and NGOs with our focus always on environmental energy and resource economics and policy. And today we're fortunate to have with us a true world class leader in energy economics and related fields, my long-term colleague, friend, and neighbor Robert Pindyck, the Bank of Tokyo-Mitsubishi Professor of Economics and Finance at MIT's Sloan School of Management. Also a fellow of the Econometric Society and past president and fellow of the Association of Environmental and Resource Economists, and I'm pleased to say an associate scholar of the Harvard Environmental Economics Program. Bob, welcome to Environmental Insights.

Robert Pindyck: Great to be here. And thank you for inviting me.

Rob Stavins: Good to be talking with you as always. In preparing for this podcast episode, I noticed that we share two things in common. One is the same birthday, January 5th, which I never knew. And the other is that we've both spent our entire academic careers at a single institution with time off for sabbaticals and the like visiting other institutions. And that's quite unusual nowadays, in my case, obviously at the Harvard Kennedy School and in your case at the MIT Sloan School of Management. Now, I'm very interested to hear your thoughts about the economic dimensions of energy and environmental and climate change policy. But I know from experience that our listeners will enjoy learning about how you came to be where you are and where you've been. And so I want to go way back. So, let's start. Where did you grow up, Bob?

Robert Pindyck: So, I grew up originally in New York City, the Upper West Side, and then in Westchester, north of New York City. And left the city when I went to college. So I lived in New York for quite a while.

Rob Stavins: So for primary and high school, you were in New York City?

Robert Pindyck: Well, actually in Mamaroneck, which is a suburb of New York in Westchester, and I went to Mamaroneck High School.

Rob Stavins: And then you went off to MIT, where it looks like you majored in engineering and physics for your bachelor's degree. Is that right?

Robert Pindyck: That's right. In fact, I never had an economics course as an undergraduate, never even thought about economics. My plan was to do physics or applied physics and stayed at MIT after I finished my undergraduate work. Stayed in the EE department and began work at a master's degree at electrical engineering began work on actually plasma physics, and then discovered economics and moved over and finished in economics. So, I really shifted over time.

Rob Stavins: So, now I've just discovered something else that we have in common. I never took an economics course as an under graduate and I majored in astrophysics and philosophy.

Robert Pindyck: Oh, there we go. And I think that's a good training actually.

Rob Stavins: Actually, for me the combination of philosophy, where you just learn to ask questions as opposed to answering them, but you ask questions. And obviously physics because of the rigor and the mathematical foundations are ideal, as you said, for economics. So for your PhD, what was your dissertation on, who was your committee?

Robert Pindyck: So. Robert Solo was the chair of my committee, and the dissertation was really in macroeconomics. I had done work before I got into economics on control theory and information theory and had the idea of applying some of these thoughts to economic policy. And so my dissertation was about stabilization policy, monetary and fiscal policy to reduce inflation and control inflation and output. And that's really what I worked on. It was not anything involving microeconomics or energy or resources.

Rob Stavins: Oh, interesting. Yeah. And when it came, it really came in a torrent apparently.

Robert Pindyck: Yeah. I really moved over, shifted. I looked around in different areas, different problems and became very interested in resources, energy, and related issues.

Rob Stavins: Now you graduated with the PhD from MIT. Did you immediately join the faculty at the Sloan School?

Robert Pindyck: Yes, I did. It was just very fortuitous. They were looking for somebody who was an economist, but also had a background in engineering because they were starting a new energy laboratory and they wanted to promote research in energy but related to engineering issues. And they thought I was a very good

choice for this. So, I had an offer to come and immediately start teaching at Sloan and I did.

Rob Stavins: And so, you were an assistant professor and associate professor, full professor, and then chair, all at MIT Sloan. Is that right?

Robert Pindyck: Exactly. Yes. Yes. Long time.

Rob Stavins: So apparently, it fits you like a glove?

Robert Pindyck: Well, it certainly fits. I've been very happy here. I really like being at MIT, working here. It's been a very nice place for me.

Rob Stavins: Now many of our listeners are going to think of you as an energy economist, but your research, your writing, indeed your expertise is much broader than that. And it makes me reflect on two of your several books, namely two textbooks, "Econometric Models and Economic Forecasts," which I'll tell you, I found immensely helpful during my years in graduate school, and "Microeconomics, an Intermediate Textbook," I believe that's now in its ninth edition. Both of those are coauthored with your friend Daniel Rubinfeld. What's the origin of your collaboration with Dan Rubinfeld?

Robert Pindyck: Well, I knew Dan when I was a grad student and when I started teaching at Sloan, he was here. He was also a graduate student here. And then he taught... I think he was teaching at Wellesley originally. And we started working together. He wrote up some notes on econometrics. When I began teaching, taught a course in econometrics in the Sloan School and gee, I thought it would be really easy to write a textbook. I mean, what's the big deal? It turned out it was not so easy. But he and I got together and we wrote the econometrics book. And then later on, I think around 1985, or 84-85 we had this idea to write the microeconomics textbook. And both of those books, the idea, the motivation, the key feature was to make them applied, to reduce the amount of theorems and proofs and mathematics, and really focus on applications. And in the case of microeconomics – why is this useful? What can we do? What can you do with this? And so, the book at the time first edition came out in 1986, was really one of the first books that focused on examples and applications to real world problems. Now all the books do that, but I think ours was a leader in that area.

Rob Stavins: Now the microeconomics text is, I assume aimed at undergraduates who are concentrating in economics or are taking a course in intermediate course after an introductory course. Is that right? Or is there a different..?

Robert Pindyck: Yes and no. It certainly... MIT used it in the introductory course. Many schools use it in the intermediate micro course undergraduate, but it's also been used very widely in business schools. And most business schools, most MBA programs require a course in microeconomics. And in many cases, they've used our book for that, again because it's applied because of the applied nature.

Rob Stavins: Now, you just written a treatise on climate change, economics, and policy titled "Climate Future. Averting and Adapting to Climate Change," which is forthcoming from Oxford University Press. First of all, what motivated you to... Why did you write this new book?

Robert Pindyck: Well, I've been working on climate change now for about a decade, eight or 10 years. And I've been interested in a variety of problems related to climate policy, most importantly the role of uncertainty. There is a lot we don't know about climate change and how the system works. And my interest is what does that mean for policy? What do you do when you don't know certain things, when you're uncertain, when many of the characteristics of the system are uncertain? So that got me interested in this. I wrote several papers on climate change, and then I thought that I'm done with it, I've written enough, worked enough. I wanted to turn my attention to other things, but it occurred to me that we're not going to be able to do what we'd like to do. What we'd like to do, is to sharply reduce CO2 emissions and prevent a temperature increase of two degrees Celsius, and as I started doing a bunch of calculations, it just became clear to me that, that very unlikely. Maybe I'm a pessimist by nature, but it just seemed very unlikely. And then the question is, what should we do if that's very unlikely? Just say that's too bad or what? And I came to the view that we need to now start working on adaptation to get ready for that possibility. So I thought to write an article about that and our former friend and colleague Marty Weitzman convinced me to write a book instead. And that's what got me started, and then I wrote the book.

Rob Stavins: So you mentioned that adaptations would be necessary. And it's interesting because I think about the fact that not so many years ago, there was resistance from the environmental advocacy world for doing research or any kind of action on adaptation because the view was that's throwing in the towel. We should be focused exclusively on reducing emissions. That's changed over time. And it seems that maybe the next frontier now is geoengineering, direct carbon removal from the atmosphere and solar radiation management. Do you have any views on those approaches?

Robert Pindyck: Yes. And I talk about that quite a bit in the book. So I think that geo and solar geoengineering is very important and is something that we definitely have to work on. We definitely have to prepare for that. We have to make the investments in developing new airplanes that can fly at high enough altitudes to distribute the sulfur that would be needed to actually do solar geoengineering. As for removing CO2 from the atmosphere it's a nice idea, but we really don't have the technology to do that. And in any economically meaningful way right now. Maybe someday we will maybe R&D will lead to new technologies. But right now it's not very promising. In the book, I also talk about trees, planting trees, and I explain why that too could help, but it can't do much. They just don't absorb enough CO2.

You would need so many trees and it would be so expensive and difficult. It's just unlikely to make that much of a difference. But I think that when it comes

to adaptation, solar geoengineering is extremely important. And other area that's important is dealing with the possibility of flooding. And we build homes and places where we shouldn't build homes in the United States, we subsidize the insurance of homes built in places that we have no business building homes in that are going to be washed away. And we need to start working on ways to prevent flooding because we may have it. It may come.

Rob Stavins: So let me ask you, who's the audience for the book? Who should buy the book or if they can go to Amazon now and sign up to be alerted when it's available?

Robert Pindyck: Yeah, everybody. It's a great present for the holidays. It's a wedding present. It's a no... I'm kidding about that. But I hope it's a broad audience. The book requires some serious reading. There are parts of the book that you have to think through. There's some numbers in the book. For example, when I talk about forestation, deforestation, and reforestation, there are numbers about how much CO2 does a tree absorb and how many trees can you plant and all of that. So, it takes a little bit of work to get through the book, but I would think that anybody even without an economics background, any economics background, ought to be able to read the book. And I hope that anyone interested in climate and climate policy would read the book.

Rob Stavins: So my understanding from what you just said is that the text itself is devoid of mathematical formula and the like?

Robert Pindyck: Largely. There are a few places, there are a couple of appendices and there are a few places where I do throw in an equation or two, but it's for the most part, I don't for the most part, it's very readable without any equations. And the little bit that's there, you can easily skip over.

Rob Stavins: And when you use any kind of economics jargon, you probably explain it, you define the terms, I assume?

Robert Pindyck: Yes I do, and I do it... An example of that is a carbon tax. We know what a tax is, but I explain it in terms of paying for things you buy and paying for things you do. And what I say in the book is, if you get a new car, you expect to pay for it. And if you take the car and you're going to go on a trip, you expect to pay for the gasoline. And if you burn the gasoline and it hurts people, well, should you pay for that? If you drive your new car into your neighbor's car by mistake, and you crack up your neighbor's car, you would expect to pay for the damage, probably through your insurance. Same is true is if you damage the environment and that's the argument for a carbon tax, why we would tax carbon. So I try to explain this in very simple terms. I hope people can understand whether or not they agree is another story, but I hope they can understand.

Rob Stavins: So, in terms of agreeing or not, I suppose, is that a lot of research in economics in general, and certainly on climate change, has focused on economic concepts

of efficiency and cost effectiveness. But as you know, Bob, there's now a tremendous increase in attention, particularly in the United States to the concept of environmental justice, largely the distributional impacts of environmental problems and policies. And this other phrase, “just transition,” referring to the fact that climate change policies themselves will have significant some cases, negative consequences for some groups, such as coal miners. Do you think the profession does enough research in the case of climate change and climate policy on the distributional impacts?

Robert Pindyck: Yes and no. So, yes, I think it does in the sense, there are quite a few papers that have been written in the last several years on who bears the burden of a carbon tax for example. What are the distributional impacts of a carbon tax? What does it do to different group of people? Is it regressive and what do you do to deal with that problem? There's been quite a bit...

Rob Stavins: So, you're referring to like CGE models of Larry Goulder, Gib Metcalf, those sorts of analysis?

Robert Pindyck: Yeah, and others, CGE models are quite big and complex, but I'm thinking of the even simpler, not simple, but econometric studies of the incidents of attacks and how different groups would be affected and what you might do with that. So, there's been quite a bit of work on that. There has not been to my understanding much work done on the question of how do you deal with the fact that India is a poor country relative to the US in terms of per capita income. Its CO2 emissions are far lower than China's even though the population is similar but are growing rapidly, and any reasonable projection shows that India is going to be a big CO2 emitter over the coming decades. Well, what do you do when they believe that they shouldn't be asked to cut emissions that much, because it's costly and they don't have as much resources and money. How do you deal with that? And we don't really have answers for those questions, even though they're going to come up in any attempt to reach an international climate agreement.

Rob Stavins: And indeed, you mentioned international climate agreements. We're now at the beginning of the second week of the 26th Conference of the Parties of the UN Framework Convention on Climate Change, taking place last week and this week in Glasgow, Scotland. And indeed what you said is of course a huge issue there. I remember a few years ago, the Indian delegation was talking about dehyphenizing and couldn't figure out what they were referring to. What did that mean? And it turned out, they were very upset about the fact that everyone was referring to China/India as if the two countries were in the same situation. Whereas as you just alluded to China's in a very different economic position than India is. And that's been a tremendous concern to the Indian leadership right over time. More broadly, can you say, what are the major areas in climate change and climate change policy that you think merit more research attention than they're getting? I know you've been focusing on the uncertainty aspects. Is it there or are there other elements of the problem that just are not getting enough attention in your mind?

Robert Pindyck: Well, I think it's uncertainty as still very important. It's sort of funny, we know there's a lot of uncertainty over climate sensitivity. That means climate sensitivity is what happens to temperature when there's an increase in the CO2 concentration. And we know something about the distribution of... Well, we know something about the nature of that uncertainty. We know much less about the impact of higher temperatures. We really don't know what a three degree Celsius increase in temperature would do in terms of GDP, even GDP broadly defined. We have no theory. We have no evidence, no data. We really don't know what would happen. And part of the reason for that is that change happens slowly and you can have adaptation. So, this is a tough area to work in because you don't have data. You don't really have much in the way of theory, but it's very important.

There's another area that's important. If you want to think about the social cost of climate change and the social cost of carbon. And that is the discount rate. How do we think about the costs and benefits that are going to happen a hundred years from now? How do we discount those? There's no agreement on this. It's kind of amazing. This is not a question of uncertainty over the physical system, over the climate system where the physics is complex. This is simply an area where despite many, many years of work on discounting, we really don't know how to address the issue of discounting climate damages that are going to happen 50 or a hundred years from now. What kind of discount rate do we use? Do we use market rates? Do we use ethical arguments for choosing a discount rate?

If so, whose ethics? How do you do it? So that's another area where we need to do work. And then finally in adaptation, I don't think there's nearly enough work that's being done on adaptation. And I think that if you look at geoengineering, it's a good example. You have colleagues that have been working on geoengineering. It's very few people. I did a pretty extensive survey of who's working on this very few people around the world have been working on geoengineering. And I think we need to do a lot more work on that. It's just very important. So, I think adaptation is another area where much more work is needed.

Rob Stavins: I can certainly validate that just by the fact that if you look at the most recent report, the 5th assessment report from the Intergovernmental Panel on Climate Change, there is an entire volume Working Group III, which has something like 20 chapters which are on the economics and the science of mitigation. But then if you want to look at what about the economics of adaptation? Well, in Working Group Two, there's a single chapter, which was chaired by Geoff Heal actually, a single chapter on the economics of adaptation. And that's because that's all it took; there just wasn't that much literature for them to survey and synthesize.

Robert Pindyck: And that's a shame because we're going to have to deal with adaptation. And by the way, environmentalism, both an area of research, science, economics and science, generally; it's also a religion for many people. And that's impeded work

on adaptation because as you said, many people feel that once we start thinking about adaptation, we're going to be distracted from the problem of reducing emissions. People claim that I am some kind of climate denier because I raise the issue of adaptation. I'm very, very clear in the book that it's extremely important to reduce emissions and that we have to do everything we can to reduce emissions quickly and as much as possible. But we also have to be realistic about what's going to happen. Despite our best intentions, the world may not succeed and likely won't succeed in reducing emissions enough to prevent a temperature increase [of] greater than two degrees. We can't just make believe that we're going to be able to do something that in fact we're not going to do. So I think that's important.

Rob Stavins: That raises in my mind, what I think is going to be a final question. And that is clearly over the last two years, principally in 2019 before this terrible pandemic arrived, there was an increase in youth activism both in Europe and in the United States with regards to climate change. And recently in London, there were tremendous demonstrations ongoing. in Glascow there are demonstrations. And youth activism, I see it as you probably do, I see it among Harvard College students, but I think it exists among much younger people than that. What's your reaction or your assessment of what has really become a movement?

Robert Pindyck: Well, I think the good part of it is that it will add to some of the pressure to do things that are politically difficult to do. Whether it's a carbon tax or whether it's government intervention in the use of coal to general electricity, whatever it is, it creates more pressure. And I think it makes it easier for the government take actions that are expensive. And I think that's a good thing. The problem with it is that if you look at what these demonstrations or these people are talking about, it is always reducing emissions. It's about, we shouldn't use coal. We have to stop immediately using oil and coal and natural gas. We're not going to stop immediately, but clearly we could do something to reduce the use of those resources, but that's all it's about. It's not about again, adaptation and I've spoken to some of the students.

And when you raise the question of adaptation, they get very upset. They say, "Well, look, you just want to evade the problem. You don't want to deal with the problem. We got to stop emitting CO2." And look, we're not going to turn out all the lights. I'm not going to turn off my computer right now because I'm interacting with you. If I did, we'd have to end the conversation.

Rob Stavins: Yeah, I appreciate that.

Robert Pindyck: So, we have to be realistic about what can happen and many of the young people who are demonstrating are... they're looking at this in a very narrow way, but maybe that will change. We'll have to see.

Rob Stavins: So I wouldn't characterize you as a pessimist, but as a pragmatist with regards to climate change policy. And we're going to have to end with that. So thank you very much, Bob, for taking time to join us today.

Robert Pindyck: It's been my pleasure. I enjoy this. And thanks for the conversation.

Rob Stavins: Our guest today has been Robert Pindyck, the Bank of Tokyo-Mitsubishi Professor of Economics and Finance at MIT's Sloan School of Management. Please join us 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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