

Demetri Kofinas: 00:00:00 Today's episode of Hidden Forces is made possible by listeners like you. For more information about this week's episode, or for easy access to related programming, visit our website at hiddenforces.io and subscribe to our free email list. If you listen to the show on your Apple podcast app, remember, you can give us a review. Each review helps more people find the show and join our amazing community. With that, please enjoy this week's episode.

Demetri Kofinas: 00:00:47 What's up, everybody? My guest today is Professor Steve Keen. Steve is a distinguished research fellow at University College London, and one of the few economists to correctly and publicly anticipate the global financial crisis of 2008, as well as the subsequent deflationary forces that would frustrate and confound policy makers in the years afterwards. He is also the author of "Debunking Economics: The Naked Emperor Dethroned," as well as his more recent book titled, "Can We Avoid Another Financial Crisis?"

Demetri Kofinas: 00:01:30 Steve and I have known each other going back almost 10 years now. He was a frequent guest on my old television program Capital Account. Over those years he really helped me gain a more complete picture of the monetary system and how money is actually created, which I think is so counterintuitive that I think, for most people, it takes some time for it to really sink in. I think if you want to challenge your understanding, especially if you're wedded to an Austrian theory of money and credit as I was for so many years, Dr. Keen's work can really help to stimulate your curiosity because it draws from so many different perspectives, and also because Steve is a gadfly of sorts in the economics community. He likes to find these areas where he feels that thinking has stagnated or become conventional, or where the consensus has gotten it wrong, and go in there and stir things up.

Demetri Kofinas: 00:02:43 And we stir things up today, for sure, but it's also a jovial conversation because, again, we've known each other for so long, and also because I only found out Steve would be in town a few days before this recording, and so I didn't have time to create a rundown. So, this conversation is not structured in the way that most of my conversations are, but it is no less engaging and interesting because Steve has been spending more and more of his time lately on the economics of climate change, which is something we haven't really talked about on this show. It's something we spend a lot of time on today, including a host of other topics, many of which we get into in the overtime, which goes on for an additional 40 minutes or so.

Demetri Kofinas: 00:03:26 Also, for anyone interested, Steve has a Patreon page where he posts a ton of educational material, including podcasts, video blogs, eBooks, you name it, so make sure to check that out. It's at patreon.com/profstevekeen. Without any further ado, please enjoy my conversation with Professor Steve Keen. (music)

Demetri Kofinas: 00:03:56 Dr. Steve Keen, welcome to Hidden Forces.

Steve Keen: 00:03:59 Good to be here, mate. Good to be with you in a bit different venue to our previous life as interviewer and interviewee.

Demetri Kofinas: 00:04:04 For sure. Well, I wasn't the interviewer in the previous life.

Steve Keen: 00:04:07 You might as well have been.

Demetri Kofinas: 00:04:08 (laughs) I drove the agenda.

Steve Keen: 00:04:11 You did drive the agenda.

Demetri Kofinas: 00:04:12 Oh my God, and what an agenda it was. We were just talking about that outside in the green room. There was definitely an agenda. Every morning with Capital Account we would have show meetings. Everything had to fit within a particular angle. How does this reinforce the fact that central banks are bad, governments are bad, the markets are good? You know? You get boxed into it. It wasn't something that I came up with disingenuously. I got boxed into an ideology that no longer really fit.

Steve Keen: 00:04:38 Yeah. Yeah. It gives you a formula, but a formula can lead you astray as well as give you a structure.

Demetri Kofinas: 00:04:43 Yeah. It's kind of one of the problems with a lot of the way that media's done today. It doesn't offer the opportunity to grow because growing means breaking with your stated beliefs, and those beliefs also are what the audience has come to expect. They're coming to you for validation that their views of the world are correct, and if you give them something else, they feel betrayed.

Steve Keen: 00:05:06 Sometimes. I mean, most media is like that these days. It makes it very frustrating to work with it.

Demetri Kofinas: 00:05:12 I had that happen with, and it shouldn't have happened because I don't know, I'm not really sure what the general audience listener of this show thinks, but I did an episode with Andrew

Marantz who is a lefty. He's a staff writer for The New Yorker. You know what I mean?

- Steve Keen: 00:05:27 That makes him a lefty? Okay.
- Demetri Kofinas: 00:05:28 Well, New Yorker is a lefty magazine in New York. He grew up in Park Slope, Brooklyn. He wrote a book on online troll culture, Milo Yiannopoulos, those guys. He embedded with them for a while, and whatever. We've done episodes that I've been very critical of cancel culture and political correctness and stuff. So, this is the one episode where I covered the obscene, kind of right-wingish, trollish people, and I got a couple of emails from people who felt like I was shilling for the deep state. That was one of the subjects of the email. Deep state shill. Hidden Forces is now a deep state shill. So, I don't know. What are you going to do? It's a few extreme voices, they get amplified. You must have to deal with that, too, though.
- Steve Keen: 00:06:18 All the time. I mean, you can imagine what conventional economists think of me. I caught crap from them, and I have for the last, literally, 50 years. Just shy of 50 years. It'll be 50 years-
- Demetri Kofinas: 00:06:26 Don't say 50.
- Steve Keen: 00:06:26 50 years of copping shit from neoclassical economists will be in 2021, so not too far away from it. So that gave me a fairly thick skin for somebody who's inherently fairly sensitive having to cope with being rubbished and ridiculed all the time. Then, of course, I take on the Austrian perspective. Even though I've got sympathies with some parts of Austria in thinking, so I cop it from there. My first target in terms of academic writing was Marxists because I could not accept the labor theory of value.
- Demetri Kofinas: 00:06:54 When you were still studying? When you were-
- Steve Keen: 00:06:55 Yeah, when I was still studying. I was-
- Demetri Kofinas: 00:06:56 Undergrad or graduate student?
- Steve Keen: 00:06:57 Undergrad. There's-
- Demetri Kofinas: 00:06:58 You went to the University of Sydney?
- Steve Keen: 00:06:59 Yep. Yep. Which was a fabulous place to go in the period I went. It's still a pretty good university, but when I was there, it was right in the middle of the Vietnam War, so we were stupid enough to join America in invading Vietnam, and-

Demetri Kofinas: 00:07:11 Did you have long hair back then?

Steve Keen: 00:07:12 Yeah, I did. In fact, it was actually an afro.

Demetri Kofinas: 00:07:14 Oh really?

Steve Keen: 00:07:14 Yeah. I-

Demetri Kofinas: 00:07:15 I feel like I've actually seen that picture.

Steve Keen: 00:07:17 I remember once I just-

Demetri Kofinas: 00:07:17 Bell bottoms, jeans-

Steve Keen: 00:07:19 Bell bottoms, yes. I could admit to those.

Demetri Kofinas: 00:07:21 Leather jacket?

Steve Keen: 00:07:22 Never a leather jacket, but I had some pretty amazing crocheted tops and stuff like that. I remember one time, my hair was so curly once, I'd just look in the mirror and made just a little mental note of what I looked like, and my girlfriend remarked on how curly it was. I said, "It looks like I comb my hair with an Alka-Seltzer."

Demetri Kofinas: 00:07:37 Alka Seltzer.

Steve Keen: 00:07:38 She broke down, broke up. Yeah, that's how hairy, and of course, now I'm down ... Usual story, gray, short-haired, and if it goes along it looks scraggly. I'll have to get it cut after this interview, I think.

Demetri Kofinas: 00:07:48 That's so interesting. We should actually get into the whole Boomer thing on the Bitcoin. We were talking about that earlier, but you mentioned Austrian economics. This is something else we were talking about before we started. When I had Capital Account, well, before the financial crisis to back up, the way that I undid a lot of the misperceptions that I had developed during the course of my undergraduate degree in economics was to chance upon Austrian economic theory. Particularly the theory of the business cycle. I was reading those guys and those guys helped me see the crisis. Then, when the crisis came, I doubled down on Austrian economic theory and I kind of became very ideological. I've spent the last however many years, maybe seven years, really since 2012 ... Since it became clear that the Austrian models that I was using to interpret the economy were not explaining what I was seeing.

Steve Keen: 00:08:41 Yeah, well, they got their ... It was certainly OK about getting the approach of the crisis. The aftermath of the crisis they got completely wrong because they basically accepted ... because of the government response they predicted hyperinflation. I don't know how many of them are aware of this, but they're based on the model that banks lend out reserves, this money multiplier model. And then you had this enormous increase in reserves by Bernanke. I think he literally added about \$2 trillion to the reserve accounts of banks in less than a year. It was a ridiculous increase in the reserves. And then if you'd believed that model, then there was going to be an enormous surge of inflation.

Steve Keen: 00:09:12 And the more pragmatic approach to economics that I come from, which is the Post-Keynesian school, although I'm in ... I won't say I come from influence by the Post-Keynesian ... Call myself a complexity theorist when I actually want to put a serious tag on myself. But they looked at the mechanics of banking, and this was actually understood before the Great Depression as well by people like Schumpeter. Even some mainstream economists. Banks create money by lending. But they cannot lend out reserves.

Steve Keen: 00:09:37 There's one condition under which they can lend reserves and that is all loans are in cash. Now if you walk into a bank and they lend you a million dollars, and you have to walk out with a wheelbarrow, then maybe the idea that lend reserves makes sense. But they don't do that. They give you an increase in your deposit account. And that means they simply, in the terms of accounting, cannot lend the reserves out. So, from that point of view that's not going to do anything.

Demetri Kofinas: 00:10:00 Well they create the reserves.

Steve Keen: 00:10:01 Well they're ... lending ... It actually works in reverse in some ways. A loan creates a deposit. So, you go to the bank, they say, "Yep, buying that flat in Manhattan is a great idea. Here's \$2 million. And by the way you owe us \$2 million." So, their assets and your liabilities rise by \$2 million. Their liabilities and your assets rise by \$2 million. You then spend that \$2 million buying the property off somebody else, so you create demand doing it as well. But the reserves themselves play no role in that, unless you bank at a different bank than the person you bought the property off. And then the reserves act like deposit accounts for private banks that there is at the central bank. That's their main role. So, they circulate in a completely independent system.

Demetri Kofinas: 00:10:43 Is the reserve ratio an anachronism or a legacy of the gold standard?

Steve Keen: 00:10:50 To some extent. It's become a legacy because of textbook misinterpretations of what the reserve ratio is actually there for. There's a brilliant paper by a guy called O'Brien. I think he was reserve staff when he wrote it. Talking about reserve ratios in OECD countries. He goes through each of them. And the reserve ratio in America is 10%. Take a look at the fine print. It's 10% on banks above a certain level of deposit ... I think it's about \$30 million, so it's quite a small level. But it's %10 of household deposits.

Steve Keen: 00:11:17 For corporate deposits, it's 0. For overseas commercial haulings, it's 0. It's there in case the households panic, go to the bank and want to take money out. If 10% of your customers turn up in one day, withdraw their money, it's a bad day. But if you have 10% cash on hand you can catch them, and then the reserve will rush the cash to you before the next banking day starts and you won't run out of money.

Steve Keen: 00:11:41 So it's there in case there's a panic by the household sector, fundamentally. When you look at the actually proportion of the cashflow of America, which is actually affected by those reserve ratios, it's less than 2% of the money supply. There are some good federal reserve papers. O'Brien's one. Another by Carpenter and Demiralp, I think it is, do the same thing. And they go and say look, looking at the practicalities, it doesn't really exist as a ratio. But it's still part of the mindset people have about how they interpret banking.

Demetri Kofinas: 00:12:08 You and I got into a conversation about this on Twitter not long ago. There was someone else on that thread ... I can't remember who it was ... Someone from the Bitcoin community, and they were talking about reserve ratios, et cetera. You remember this conversation? And then Michael Kumhof's name came up.

Steve Keen: 00:12:25 Yeah, Michael's a good friend.

Demetri Kofinas: 00:12:26 Right. We had dinner with Michael in 2012, remember that?

Steve Keen: 00:12:29 Yeah, it was a great little dinner.

Demetri Kofinas: 00:12:30 It was a sushi restaurant-

Steve Keen: 00:12:31 And ... with the guy from the old American Monetary Institute? From Stephen Zarlenga?

Demetri Kofinas: 00:12:36 Maybe.

Steve Keen: 00:12:37 I think it was Stephen Zarlenga, yeah.

Demetri Kofinas: 00:12:38 Maybe. Because we had dinner another time with another guy who was a hedge fund manager here in New York. You're always bringing these interesting characters with you on your trips to DC. Or people would end up meeting ... It was a fun time doing that.

Demetri Kofinas: 00:12:50 So what are you working on these days?

Steve Keen: 00:12:53 Well, I'm still working on the monetary stuff. I've actually built a software package called Minsky, for mathematical modeling of financial dynamics and general dynamics as well. So, the monetary stuff is still alive and well. But one thing which has always troubled me about economics, and not just neo-classical economics here, but Austrian, Marxian, Post-Keynesian, none of them have acknowledged the role of energy in production.

Steve Keen: 00:13:17 So they all pretend you can produce output by combining labor and capital. And this always felt unsatisfactory to me. And I've seen various attempts to try to bring energy into the theory of production. And what fundamentally said, well you've got labor, and you've got capital, and you've got energy. And they'll then say there are three factors of production. And I looked at that and thought, well, two things are wrong with that. First of all, if you use the neo-classical model, which is called the Cobb-Douglas production function, after the two people who dreamt it up in the 1920s or 30s I think, it has labor raised to one power, capital to another power, and then if you have energy, one minus the other two powers. So, it gives you what they call constant returns to scale. I'll show you the maths later.

Steve Keen: 00:13:59 But when you do that, if you set the coefficients at the "right level," you can say you have output with no energy input. Still. Using it that way. Which just felt ... I was never satisfied with that. Even people who did a more advanced model would still go through that stage.

Demetri Kofinas: 00:14:14 Did they set up any kind of constants to deal with that? How did they deal with that?

Steve Keen: 00:14:18 Well, they just assumed they could leave it out. And I thought that is not adequate. So, I was working with a guy who was the leading physicist involved in economics, trying to bring energy in, and a guy called Bob Ayres. Bob's house was full of status, as it happens. And just walking back from the bathroom one night, this little insight popped into my brain, which was labor without

energy is a corpse. Capital without energy is a sculpture. And I thought, holy shit, that's the solution. Energy is an input to labor and capital, mathematically speaking. You put energy as an argument into your labor, energy in your argument into capital, and that gives it the role that says if you don't have energy input, you can't get output either. It makes it absolutely fundamental.

Steve Keen: 00:14:58 So I worked that out in about 2016. I've been working in that since. And of course, that's dragged me into climate change. And in looking at it-

Demetri Kofinas: 00:15:06 So you started researching climate change in 2016?

Steve Keen: 00:15:09 Probably actually last year, 2018.

Demetri Kofinas: 00:15:10 2018.

Steve Keen: 00:15:11 Because I had to write up these papers and I was still working on the monetary work. So, I decided ... of course in 2018, Nordhaus gets the Nobel Prize for Economics, and my initial reaction-

Demetri Kofinas: 00:15:22 What's his specialty in economics?

Steve Keen: 00:15:23 Climate change.

Demetri Kofinas: 00:15:24 Oh, really?

Steve Keen: 00:15:25 The economics of climate change. And so, my initial reaction was, well, at least they've given it ... I mean, I'm a huge critic of the Nobel Prize. I think it should be abolished. The Economics Nobel Prize. You do know that it's not a Nobel Prize?

Demetri Kofinas: 00:15:37 You know what? So, I know a little bit about this because we had Brian ... I can't remember his last name now ... He was in competition to win the Nobel Prize in Physics. This was an episode on--

Steve Keen: 00:15:46 That's a real Nobel Prize.

Demetri Kofinas: 00:15:47 The real Nobel Prize. And I learned as a result, a lot of the dirty politics that have to do with the Nobel Prize.

Steve Keen: 00:15:53 There's politics in all elements of the prize, no doubt about that.

Demetri Kofinas: 00:15:56 But what do you mean it's not ... The economics prize is not a Nobel Prize?

Steve Keen: 00:15:57 Well, the actual title of the prize is ... I can't pronounce it properly. It's the Swedish Central Bank. The Sveriges Bank Award in Economics in Honor of Alfred Nobel. That's its proper title. It was invented in 1969. This is all in the literature of course-

Demetri Kofinas: 00:16:14 So does the Nobel Committee have any view on this?

Steve Keen: 00:16:15 Well, because they got 1.4 million krona, or whatever it was, \$1.4 million effectively, from the central bank to pay for the prize each year-

Demetri Kofinas: 00:16:23 Oh, they license it.

Steve Keen: 00:16:24 They effectively licensed it. They subcontracted it.

Demetri Kofinas: 00:16:27 They licensed the name, they're like Trump. Trump Hotel.

Steve Keen: 00:16:29 And they like the whole thing. The Nobel Prize family has been up in arms about it, because apparently Nobel himself, Alfred Nobel-

Demetri Kofinas: 00:16:37 He was the inventor of gunpowder, wasn't he?

Steve Keen: 00:16:39 One funny story about ... and I'm not sure this is true, I've got to read more thoroughly on this, but what I have been told is that Nobel read his own obituary.

Demetri Kofinas: 00:16:47 I think that is true.

Steve Keen: 00:16:48 Okay. [crosstalk 00:16:49]

Demetri Kofinas: 00:16:49 This is coming back to me-

Steve Keen: 00:16:50 He was in Russia I think it was. And his brother died. And the newspapers mistook his brother for him, and published the ... of course, all newspapers [crosstalk 00:16:58]

Demetri Kofinas: 00:16:58 Yes, it's correct. This is correct. [crosstalk 00:16:59]

Steve Keen: 00:17:00 And there it is saying, "slaughtered so many people, greatest mass killer in history," and he apparently looked and thought, "That's how I'm going to be remembered? No thank you." So, he invents the prize so his name is now associated with

something positive. And that's of course how we think about him these days. But he had the prize in chemistry, in physics, in medicine. I think in literature and peace. Okay, there were five actual-

- Demetri Kofinas: 00:17:22 The peace one is the biggest bullshit. Kissinger got that in like '74 [crosstalk 00:17:25]
- Steve Keen: 00:17:24 And Obama gets it as well. It's ridiculous.
- Demetri Kofinas: 00:17:27 But the Kissinger one is like the worst. The moment Henry Kissinger got it, it completely delegitimized the Nobel Peace Prize.
- Steve Keen: 00:17:31 The Nobel Prize for Economics was never legitimate. It starts with people like Milton Friedman being awarded it. You know, my opinion of Friedman is unprintable.
- Demetri Kofinas: 00:17:42 Also Krugman got it.
- Steve Keen: 00:17:44 Ditto, unprintable. We can print a few things on that front. I had no respect for the prize itself. But the prize was invented by the Swedish central bank and there's a very good book called The Nobel Factor which explains the history of it and it was at a time when the central bank in Sweden was effectively at war with a progressive political leadership of the country and they were championing a neo-liberal ... what we'd now call a neo-liberal economics approach, by instituting the prize. And it's been highly successful. So, I've always been skeptical of it, critical of it, thinking it should be shut down.
- Steve Keen: 00:18:17 When Nordhaus got it, my first reaction, "Well at least they gave it for climate change" And then I thought, hang on a second. I was one of the first people to read The Limits to Growth. Okay? We had a [crosstalk 00:18:26]
- Demetri Kofinas: 00:18:26 Donella Meadows.
- Steve Keen: 00:18:28 1972. It's my most-thumbed book. Was badly bound, it's fallen apart like crazy. But I bought a copy in '72 and read it back then and I was, as somebody with a mathematical training at the time, I really appreciated what they were doing with the technology of system dynamics. So, I liked it. Nordhaus destroyed it. Nordhaus destroyed its credibility with a set of papers, one of which was called Measurement Without Data, disparaging it completely, and played a major role in driving this approach out of economics. And in subsequent years I've met

one of the three authors, Randers. In fact, I met him again about two weeks ago, in Norway.

- Steve Keen: 00:19:06 And Randers told me when I first met him, this was back in Sydney in about 2009 I think, that when they developed Limits to Growth they thought economists would be really happy about the idea because it was a technology that meant you didn't have to assume equilibrium anymore. Because what was actually lying behind Limits to Growth is what I'd call system dynamics engineering, and that fundamentally says that every ... effectively, the old story "everything is connected to everything else." But you then put the feedback effects between those various things, and you can both model a system out of equilibrium, and you can also try to get the magnitudes right so you don't get the case that, you know, you've got to ignore everything. Rather than ceteris paribus, you have the major feedbacks tied together-
- Demetri Kofinas: 00:19:46 But they've only been able to begin to model these systems recently, right? They weren't able to use these models to model them because of the computational overload-
- Steve Keen: 00:19:54 Well, Limits to Growth was the first major computational model. And it was done between 1968 and 1971. [crosstalk 00:20:00] They had mainframe computers back in those days that cost ... you know, back in those days the actual cost was well over \$1 million to build the model and run it. It took weeks in what was then a super computer to get the runs out.
- Steve Keen: 00:20:12 These days you can run ... There's actually a program on the web called Insight Maker. Insight Maker. And Insight Maker ... Somebody has used Insight Maker to build Limits to Growth as an Insight Maker model. You run it on a PC, it runs on a cloud a swell and it takes a matter of seconds to run the model. Back then it took weeks for any of the particular runs to be done. It was a giant supercomputer, in those days, doing the work. So, it was very difficult.
- Steve Keen: 00:20:37 But we could've been doing this approach to modeling the economy from the early 1970s. Now instead, not only do they reject The Limits to Growth, they specifically being Nordhaus who led the charge by economists against Limits to Growth, they also rejected the whole technology. So, rather than learning how to model systems out of equilibrium, with interacting systems and feedbacks often being more important than direct effects, they got even more obsessed with the approach of equilibrium thinking.

Steve Keen: 00:21:05 And so the divergence of economics from understanding the real world ... which, the real world is a complex system which is normally far from equilibrium, that's the methodology we need to get to.

Demetri Kofinas: 00:21:17 Wouldn't they argue that they try to approximate that complexity by thinking about it in terms of dynamic equilibria?

Steve Keen: 00:21:23 Well, yeah, but there's no such thing.

Demetri Kofinas: 00:21:26 And you're still stuck in a paradigm of equilibrium.

Steve Keen: 00:21:27 Yeah, I mean like when I first arrived at university as [inaudible 00:21:30] do my Master's degree, as [inaudible 00:21:32] my PhD, which was about 10 or 15 years after I finished my undergraduate degree, one of the colleagues I had at the University of New South Wales, I think I might've even mentioned, a guy called Peter Kriesler, he's still there today ... Peter would talk about how, from his post-Keynesian point of view, economics can talk about the equilibrium but what about the traverse?

Steve Keen: 00:21:52 And I looked at him and sort of shook my head, "What do you mean, traverse?" He said, "Well, the movement from one equilibrium to another." And coming from a dynamics background I said, "Well, you don't actually start in equilibrium. You don't end there either." You move ... Equilibria are reference points for an overall system. But virtually every interesting system is being driven by some external force.

Steve Keen: 00:22:12 Like for example, you and I are driven by the sun. If it wasn't shining most of the time then life wouldn't exist, let alone the conversations we're having. So, there's a force that gives you a pressure that means the system is driven away from its equilibrium. And things like the way we model the weather these days, that was the weather system in terms of the ultimate nonlinearity of weather and the fact that it's out of equilibrium. That was first put into meteorology by a guy called Lorenz in 1963.

Demetri Kofinas: 00:22:43 Edward Lorenz.

Steve Keen: 00:22:44 Yeah, yeah. And Lorenz-

Demetri Kofinas: 00:22:46 He was a climatologist.

Steve Keen: 00:22:47 A mathematical climatologist. And he was critical of all the models of the weather that existed at the time, which would do things like pattern matching. So, like 7 days in a row like this had happened 32 years ago so we're going to predict whether tomorrow is going to be like it was on the 8th day 32 years ago. Or they do linear regressions. And yes, look, we know the major forces are nonlinear. And he took what's called the Navier-Stokes equation, which are equations that describe fluid dynamics. Incredibly complicated. What are called partial differential equations. I think there's about 11 components, so that's what I call 11-dimensional model.

Steve Keen: 00:23:22 He reduced it, using mathematical procedures, to a set of what are called ordinary differential equations. So, only time rather than space and time as the causal, driving variables, with just 3 variables and 3 constants for those 3 variables. Incredibly simple model, which generated incredibly ... what we ... first of all, called chaotic, we now call complex systems [crosstalk 00:23:43].

Demetri Kofinas: 00:23:43 Very dense data set.

Steve Keen: 00:23:45 Dense, but it doesn't occupy the entire, what's called "phase space." So, if you drew a container, saying where could you be in this space, and you put a Lorenz model inside it, there'd be parts that it would never occupy and 3 parts that it would never occupy are the equilibria. They're all unstable, all 3 of them. But the system remains inside the bounding box defined by the overall system. But nowhere near the equilibria. It's actually repelled from the equilibria.

Steve Keen: 00:24:10 So this is common knowledge in genuine sciences. But economics is stuck with this obsession that everything's in equilibrium. Or you talk about a movement from one equilibrium to another. Which is what you mean by dynamic equilibrium.

Demetri Kofinas: 00:24:21 These neoclassical models came out of the late 19th century?

Steve Keen: 00:24:27 Yeah-

Demetri Kofinas: 00:24:28 Was that when Walras was writing?

Steve Keen: 00:24:29 Neoclassical economics has changed more than the neoclassical economists realize. They're actually ignorant of their own history. So, if you go back and see who were the progenitors of neoclassical economics, you go back to Cournot, who was a

mathematician writing in the early 1800s in France, [inaudible 00:24:44] interesting, both French, and Jean-Baptiste Say. And Say was a foil for Ricardo. And Ricardo was somebody who came from the classical school of economics.

- Steve Keen: 00:24:53 I don't know if you chat about Ricardo. He was actually a conman, too, by the way.
- Demetri Kofinas: 00:24:54 Who? Ricardo?
- Steve Keen: 00:24:56 Ricardo was a conman. I've written a cartoon book ... I should've brought a cartoon book for you. I'll send you an electronic copy. But anyway, Ricardo followed what's called the classical school of economics. And the classical school-
- Demetri Kofinas: 00:25:08 Ricardo gave us comparative advantage.
- Steve Keen: 00:25:10 Yeah, and other pieces of garbage as well. The main thing he gave us was-
- Demetri Kofinas: 00:25:14 Well, there is some truth to that theory, right? That there-
- Steve Keen: 00:25:17 No.
- Demetri Kofinas: 00:25:17 None at all?
- Steve Keen: 00:25:17 No.
- Demetri Kofinas: 00:25:18 So, for our listeners, why don't you put forward what the theory of comparative advantage is and why it doesn't work in your view? I'm not saying all the extrapolations of it, but the basic idea that you could be better in two things than I am in those two things, but it could be to my comparative advantage to do one of them and allow you to do the other. In our little microeconomy.
- Steve Keen: 00:25:38 In a micro world, that sort of stuff makes sense. I mean, I am, for example, a lousy housekeeper, okay? My partner is a brilliant housekeeper. She actually drives me away from the housekeeping. So, in that-
- Demetri Kofinas: 00:25:49 How convenient.
- Steve Keen: 00:25:50 How convenient. Yeah, I'm really sorry about that. I mean, we can easily extrapolate that individual experience to an economy level, which is where comparative advantage is applied. Now, if you look at Ricardo, you can see what he was trying to do. That

is, he had a fundamental belief that capitalism would grow faster and last in its growth phase longer, if you could get money away from the landlords and get it to the capitalists. That was his real intention. He actually says that at one stage. "It's been my objective to show that wages cannot rise without a fall in profits, and vice versa."

- Steve Keen: 00:26:22 So that the way to get more growth is to get more money to profits. Workers get a subsistence wage, therefore the way to increase the gap is to reduce the cost of subsistence, which you do by abolishing the corn laws and bringing in corn more cheaply. Meaning wheat, as it happens. But that was the logic. But in the theory of comparative advantage, what he did was a brilliant piece of debating. He said, "I'm going to accept the case made by my opponents, the mercantilists. Who said that, "Look, we believe ... " In those days, Portugal was the major rival that the UK faced.
- Steve Keen: 00:26:55 Portugal is better at producing everything than we are. So, if we have free trade, Portugal will wipe out all our industries. And what Ricardo said, "I'm going to take your belief that Portugal is better at everything than us, and show you that it's still in our advantage to have trade." So, it's a very clever, and it's a con man argument, okay? So-
- Demetri Kofinas: 00:27:12 He was writing in the late 18th century?
- Steve Keen: 00:27:15 No, the early 1800s.
- Demetri Kofinas: 00:27:18 Early 19-
- Steve Keen: 00:27:19 1812, 1817, that sort of period. Late-
- Demetri Kofinas: 00:27:20 So late 19 ... I mean early 19th century.
- Steve Keen: 00:27:23 Yeah, late 1700s, early 1800s. He actually ... The reason I said he's a conman, is that I remember a friend of mine [inaudible 00:27:29] doing a thing called Planet Wall Street back in Australia, told me a story about the Battle of Waterloo. Here's one of the ultimate evil people in capitalism. The Rothschilds or that sort of-
- Demetri Kofinas: 00:27:40 The Rothschilds. They're definitely at the very top.
- Steve Keen: 00:27:42 One of those, he told me, had a runner at the Battle of Waterloo to see who won.

Demetri Kofinas: 00:27:47 Oh, right, I've heard the story.

Steve Keen: 00:27:47 And as soon as the battle was over, the rider just rode as fast as he could, boat was ready, all the stuff, to get to the London Stock Exchange. And Rothschild, this is what my friend tells me, he walks out onto the floor of the London Stock Exchange, goes, "Sell!"

Demetri Kofinas: 00:28:02 I wish that our listeners could see your dramatic performance right now.

Steve Keen: 00:28:06 And there's absolute panic on the ... Pandemonium, everybody thinks, "Oh, my god! We must've lost the Battle of Waterloo." Massive sale. And then he says, "Buy!"

Demetri Kofinas: 00:28:15 (laughs)

Steve Keen: 00:28:17 It wasn't ... I've still got to check this fully, but it wasn't a Rothschild. It was David Ricardo. And he made a profit, at the time estimated at over one-

Demetri Kofinas: 00:28:26 How do we know this is true? This could be fake news. In all seriousness it could be fake news.

Steve Keen: 00:28:29 I've got to check it out because I've only seen it- [crosstalk 00:28:31]

Demetri Kofinas: 00:28:31 We're spreading rumors, we're defaming this man. More than 200 years since his death.

Steve Keen: 00:28:34 Well, anyway, I'll do more research [crosstalk 00:28:35] Because I went looking for it, because I wrote a cartoon book on this topic, you see. Part of a cartoon was an introduction to how bad economics ... It was called eCONcomics.

Demetri Kofinas: 00:28:45 I think I read that.

Steve Keen: 00:28:46 Did you?

Demetri Kofinas: 00:28:47 They used to do Superman pictures of you.

Steve Keen: 00:28:48 That's right, that's right.

Demetri Kofinas: 00:28:48 That's the guy that used to do it.

Steve Keen: 00:28:49 Yeah, yeah, yeah. So anyway, I wanted to write this thing about not David Ricardo, but David Trickardo. Okay?

Demetri Kofinas: 00:28:55 Har-har.

Steve Keen: 00:28:57 Which is what I did. And I was looking ... I knew about this story and I went back and looked about when did Ricardo write, and so on, because I wanted to see the publication date of The Principles of Political Economy. And I wanted it to be an April Fools' joke gone bad. And it turned out it was published on I think the 17th of April. So, it was actually published the month I wanted. Then I found Ricardo was the one who pulled this stunt about the Battle of Waterloo. Made a million. Literally in those days. And had to leave the country and go and live in sort of rural exile before he finally bought himself a seat in Parliament and came back and lobbied for the corn laws.

Steve Keen: 00:29:32 So, that's the guy we're talking about. No doubt a great intellect, but a conman.

Demetri Kofinas: 00:29:36 Financial history is full of these really great stories, because they're so personal. You know? And they're people under immense stress. We did this episode with Daniel Paris on the history of financial theory, where we covered this in part. But to bring it back to the conversation about climate change, I haven't read Limits to Growth but I have read Thinking in Systems by Donella Meadows.

Steve Keen: 00:29:58 That's good.

Demetri Kofinas: 00:29:58 It was a fantastic book. I would recommend it to anyone who's interested in learning about systems theory and nonlinear dynamics. I also read James Gleick's book Chaos-

Steve Keen: 00:30:08 Yeah, it's pretty good.

Demetri Kofinas: 00:30:09 Where he talked about Lorenz and lots of other people. Mandelbrot. And you've written about the physiocrats. Which deals with this thing about bringing energy into the equation. But let's go back to ... you said, 2018, about a year or two ago. So, first of all, how did you educate yourself on climate change? How did you go about doing that?

Steve Keen: 00:30:29 Oh, I've been reading this for the past 30 or 40 years.

Demetri Kofinas: 00:30:30 Okay, so you've been interested in the subject going back to the 70s?

Steve Keen: 00:30:33 Ever since reading Limits to Growth in the very first instance. I've always kept an eye of the physics of the biosphere. So, I've

had awareness of the research being done and how serious it was. And then, of course, because I'm now going to be start writing on the economics of it ... But bringing in the role of energy, because I can now do equations about production where energy is necessarily involved, and with energy necessarily involved you necessarily have waste because of the second law of thermodynamics.

Steve Keen: 00:30:59 And so I can tie economics and ecology in at the foundational level. And that's what I'm working on as a positive agenda right now. But I also remembered Nordhaus, went back and saw this Measurement Without Data evisceration of Limits to Growth, where he clearly didn't understand the technology he was dealing with. And then I started reading his material. And actually, I thought I had ... If I'm going to make comments on climate change from my perspective, then I have to understand the orthodoxy as well.

Steve Keen: 00:31:26 And what I expected was that even I can be naïve on neoclassical economics. Which is ridiculous, because I'm probably the most cynical person about neoclassical economics on the planet. But I still had higher expectations of them than I actually found. Because what I thought was, they would've taken the damage estimates that were being made by physicists and meteorologists about what's going to happen with climate change, and then they were discounting those because they're far in the future and saying, "It's trivial now. Why worry about it?"

Steve Keen: 00:31:55 They do that as well, but in fact they haven't used the damage estimates of physicists and scientists. They've made their own ones up. And the way they've made them up is, about three methods they've used. One is what they call the statistical method. And that, on the surface, sounds reasonable. Let's use statistics. What they've done is assume that the weak relationship we can find today between income of a particular region and the temperature of that region can be used to predict what's going to happen with climate change.

Steve Keen: 00:32:30 So they literally ... Take, for example, the gross state product data for America. Output per capita in Nevada, output per capita in Florida, output per capita in New York. Take that data, take the data as well on temperature, do a scatter diagram, do a fit to it, and they say that fit will tell you what's going to happen when temperature rises ten degrees.

Demetri Kofinas: 00:32:55 So what's the reasoning behind that? I'm not sure I follow.

Steve Keen: 00:32:57 Can I swear on your podcast?

Demetri Kofinas: 00:32:59 No. With these-

Steve Keen: 00:33:01 It is sheer, unbelievable ignorant stupidity. It is because neoclassical economists-

Demetri Kofinas: 00:33:09 I love how you used stupidity in place of whatever it is that was in your head originally.

Steve Keen: 00:33:13 Oh, mate, I mean I ... When I first read this material, the line- [crosstalk 00:33:17]

Demetri Kofinas: 00:33:16 Weren't you at the OECD giving a presentation-

Steve Keen: 00:33:19 Yeah.

Demetri Kofinas: 00:33:21 ... and it was this? Was he there?

Steve Keen: 00:33:22 Richard Tol? No, he wasn't. Nor Nordhaus. They wouldn't have enjoyed it.

Demetri Kofinas: 00:33:26 Someone was sitting next to you and laughing, though, when you brought up some ... You gave an example of what would happen in their model if temperature dropped by like-

Steve Keen: 00:33:33 Four degrees. Yeah, yeah.

Demetri Kofinas: 00:33:35 Four degrees. And that GDP would drop by like 2% or something? Some small-

Steve Keen: 00:33:39 I think it was 3.6% fall in GDP if temperature fell by four degrees.

Demetri Kofinas: 00:33:41 But you also showed a map of like-

Steve Keen: 00:33:43 What the- [crosstalk 00:33:44]

Demetri Kofinas: 00:33:43 Half of North America would've been frozen.

Steve Keen: 00:33:45 Yeah. Because what they have done ... It's something which neoclassical economists do all the time. They think they need a simplifying assumption. And what they call a simplifying assumption, any sane person would call a fantasy. And that's what they did in this particular case. So, they said, "We don't have any data on what's going to happen to income as temperature rises, so let's assume that the relationship we see

between temperature and GDP today can be used as a proxy of what's going to happen to GDP as temperature rises over time."

- Steve Keen: 00:34:14 And the way that's stated ... The paper I first read it in was by Richard Tol, I think it was the economic-
- Demetri Kofinas: 00:34:20 Why do I know that name?
- Steve Keen: 00:34:22 He's a Tol, he's a troll, you'll find him on Twitter all the time.
- Demetri Kofinas: 00:34:25 His last name is not Troll though, it's Tol.
- Steve Keen: 00:34:26 It's damn close. It'd be more honest if it was Troll.
- Demetri Kofinas: 00:34:29 But why do I know that name, though? It sounds familiar.
- Steve Keen: 00:34:30 He's fairly prominent. You would've ...
- Demetri Kofinas: 00:34:31 Richard Tol.
- Steve Keen: 00:34:32 He actually writes the IPCC reports.
- Demetri Kofinas: 00:34:34 Maybe I'm thinking of Richard Vague.
- Steve Keen: 00:34:36 Very different human being.
- Demetri Kofinas: 00:34:37 Very different human being. You like Richard-
- Steve Keen: 00:34:38 You have to have Richard on your show. He's brilliant. Tol's a troll. But anyway, in this article, which was used as the basis for the, inverted commas, "data," that Nordhaus fitted what he calls his damage function to, which shows the relationship between ... his predicted relationship between increase in temperature and change in GDP. Tol's paper from 2009 was the basis of that. So, I'm reading this paper, and there are various points in the paper where he hedges quite sensibly about how reliable what's being done by economists is. But at one point he says that a particular study by a guy called Mendelsohn assumes the temperature and GDP relationships we see across space will apply across time as well. Something to that effect.
- Demetri Kofinas: 00:35:25 I don't understand that. I think I saw-
- Steve Keen: 00:35:25 Neither does he.
- Demetri Kofinas: 00:35:26 I think I saw that in your presentation. [crosstalk 00:35:28] What does that mean?

Steve Keen: 00:35:29 I'll actually grab it and quote it, because I've got it in my machine. Do you want the quote? Can we do that?

Demetri Kofinas: 00:35:32 Sure.

Steve Keen: 00:35:32 Okay. So, the ... Richard Tol wrote a survey paper of the work that economists had done to try to predict the damages from climate change, and it's called The Economic Effects of Climate Change, published in the Journal of Economic Perspectives in 2009. And I'll now find the quote where he points out how they develop the data. One type of set of data that is used to calibrate the economists' estimates of the damage from climate change. Okay.

Steve Keen: 00:36:02 "Mendelsohn's work can be called the statistical approach. It is based on direct estimates of the welfare impacts, using observed variations (across space within a single country) in prices and expenditures to discern the effects of climate. Mendelsohn assumes that the observed variation of economic activity with climate over space holds over time as well; and uses climate models to estimate the future effect of climate change."

Demetri Kofinas: 00:36:30 Yeah, I mean, I'm not sure ... I still don't really understand what that means.

Steve Keen: 00:36:32 Okay. What it means is, how important do you think is temperature in determining the income of New York versus the income of Florida? Compared to everything else?

Demetri Kofinas: 00:36:40 I'm sure it's important. I don't know how important it is.

Steve Keen: 00:36:41 No, it's trivial.

Demetri Kofinas: 00:36:42 Okay.

Steve Keen: 00:36:42 It's the technology that's in New York. If-

Demetri Kofinas: 00:36:44 Yeah but, that can't be true. Well, in other words, what I'm saying is-

Steve Keen: 00:36:48 Temperature plays a minor role. Okay?

Demetri Kofinas: 00:36:51 But temperature plays an important role in determining what type of economy is born out of that region, right? Like you don't have a tropical vacation economy in New York.

Steve Keen: 00:37:01 No, but you couldn't use climate to rule out Singapore.

Demetri Kofinas: 00:37:04 To rule out Singapore?

Steve Keen: 00:37:05 Yeah, as a wealthy country. Okay? It's got a really hot climate, it's got a wealthy country.

Demetri Kofinas: 00:37:11 Yeah, but I'm not saying that but like, I mean, you know, there are important different ... anyway, I mean, I think there are important differences ... It depends on how you're sort of describing it.

Steve Keen: 00:37:18 It plays a role. Because if you actually plot the data, and I've done this to my own little fit, you can find a rough relationship, a very, very trivial relationship between temperature and GDP.

Demetri Kofinas: 00:37:28 Aren't hotter areas-

Steve Keen: 00:37:31 Yeah, generally lower income.

Demetri Kofinas: 00:37:31 ... not as wealthy? Yeah?

Steve Keen: 00:37:33 Yeah. And really cold ones are not as wealthy as well. But what you get out of that is a weak relationship because there are many other factors that are more important. Culture being one.

Demetri Kofinas: 00:37:43 Sure.

Steve Keen: 00:37:43 Lee Kuan Yew in Singapore being another. Factors that are more important than temperature itself, overall. And secondly, it's a mild relationship. It's not the case that if you move to a place that's 10 degrees warmer the economy will disappear completely. It'll be less than now, but it won't be completely obliterated.

Demetri Kofinas: 00:38:06 So your argument is not ... Or the point your making isn't that temperature doesn't play an important role in the type of economy, it's just that it doesn't play an important role in the extent of income [crosstalk 00:38:16] economy.

Steve Keen: 00:38:16 Yeah, [crosstalk 00:38:16] I'm saying that it can't show you what's going to happen if you increase or de-increase the entire global temperature that much. Because what's happening with global warming, fundamentally, is we're blanketing ... using chemically blanketing, if you like ... the sun, so that some of the energy which is normally reflected off the earth gets trapped for

a longer period and therefore warms the overall planet. So, there's an increase in the- [crosstalk 00:38:38]

Demetri Kofinas: 00:38:38

In the lower atmosphere.

Steve Keen: 00:38:39

Yeah. There's an increase in the energy in the biosphere overall. Okay? And that energy increase is why we're talking about a temperature increase. Now the energy increase, the amount of extra energy we're retaining from the sun is gigantic. I did an estimate at one stage of how many atom bombs we'd need to explode to make similar increase in energy for one and a half degrees Celsius. I mean, you're talking thousands of Hiroshima bombs a day, type level of increase of energy in the biosphere, given the amount of extra energy we're retaining from the sun. So, it's a huge change in the energy in the system.

Steve Keen: 00:39:12

Now when you're saying, "Let's compare the GDP of ... gross state product of Dakota to New York to Miami," that's all with a constant level of energy in the biosphere. Now the important question is, what happens when you change the amount of energy in the biosphere? So that relationship exists, but it's not going to tell you anything about increasing energy on the overall planet. Which is why I use the example of global cooling rather than global warming. Because the relationship they've fitted to this current GDP and temperature data is simply a parabola. Y equals X squared. Okay?

Steve Keen: 00:39:48

The X there being the difference between current temperatures and the temperature before industrialization began. So, if you're talking a temperature 4 degrees higher than pre-industrial, then you're going to say it's 16 times a coefficient. Well, the coefficient tells you how much damage does that do to your GDP. Now the coefficient Nordhaus is now using is .00227 times the temperature difference squared over pre-industrial. That's less than one quarter of 1%. Point two-five, .0025 is one quarter. He's using .00227. So, what he's saying, a 1 degree increase in temperature over pre-industrial will reduce GDP by less than one quarter of 1%.

Steve Keen: 00:40:32

A two degree ... [inaudible 00:40:33] be 2 squared which is 4, by less than one-

Demetri Kofinas: 00:40:36

So you're saying he won the Noble Prize for this.

Steve Keen: 00:40:38

He won the Nobel Prize for it. And if you take a look at his Nobel Prize lecture, you'll see he has a graph showing various

temperature directories depending on whether we do or don't try to-

Demetri Kofinas: 00:40:46 So what does he get for a 10 degree rise?

Steve Keen: 00:40:47 About a 23% fall in GDP.

Demetri Kofinas: 00:40:50 A 10 degree rise would be catastrophic for the planet.

Steve Keen: 00:40:55 Life would cease.

Demetri Kofinas: 00:40:57 That means, first of all, at 10 degrees, all the ice caps melt, right?

Steve Keen: 00:41:00 Oh, they're gone at probably about 5, but yeah.

Demetri Kofinas: 00:41:02 Right. Just to be clear we're not having a conversation here about whether or not the earth is warming, we're having a conversation here about is if-

Steve Keen: 00:41:08 If it did [crosstalk 00:41:09]-

Demetri Kofinas: 00:41:08 If temperatures rose-

Steve Keen: 00:41:10 By 10 degrees.

Demetri Kofinas: 00:41:10 Yeah.

Steve Keen: 00:41:11 The only ice that'd be left would be on the cap of Mount Everest.

Demetri Kofinas: 00:41:14 And the ... yeah.

Steve Keen: 00:41:15 So you'd be talking 70-80 meter sea rise. You'd be-

Demetri Kofinas: 00:41:18 Is that how much it would be really?

Steve Keen: 00:41:20 Something of that order. 70 to 80 meters of extra ocean.

Demetri Kofinas: 00:41:23 Wow.

Steve Keen: 00:41:23 And the life ... I mean, you've heard of what's called the wet bulb temperature measure?

Demetri Kofinas: 00:41:28 No. What's that?

Steve Keen: 00:41:29 Okay. You know you use the thermometer to measure temperature obviously. The mercury thermometer. If you wrap that in a wet cloth, then the evaporation of the cloth-

Demetri Kofinas: 00:41:40 Oh, is this about water vapor in the atmosphere?

Steve Keen: 00:41:41 Water vapor, yeah. It's saying if you complete this-

Demetri Kofinas: 00:41:43 Complete the feedback loop.

Steve Keen: 00:41:44 Well, not so much the feedback loop but the evaporation ... I could say it's 50 degrees outside, and you put a sock around something then the evaporation will cool as much as the heat rises. So, it turns out that if you measure 35 degrees on a wet bulb thermometer, that is a temperature at which our cooling systems, human's cooling systems, break down. So, we can no longer sweat to drive our body temperature down below the exterior temperature, and we will die within 6 hours at that temperature.

Steve Keen: 00:42:18 Now, if you had a 10 degree increase in temperature, that would mean that most of the tropics, and a fair bit of the subtropics, would be uninhabitable. Now, so these enormous changes are being trivialized. What Troll will say is that, oh, he has a cutoff point. He doesn't imagine it's going to go that high so let's only go to 4 or 6 degrees. But he literally also talked about 6-degree temperature increase, and 4 degrees, this is Nordhaus, talks about a 4-degree temperature increase as optimal. Literally.

Demetri Kofinas: 00:42:46 Optimal based on the cost that it would take to intervene and reduce emissions.

Steve Keen: 00:42:53 On that chart in his 2018 Nobel Prize lecture, which you can find online, he has one chart showing this set of trajectories, and without any mitigation at all, that trajectory shows temperature being 6 degrees above pre-industrial by about 2160, 2170. His optimal eventually stabilizes at 4 degrees above pre-industrial in about 2140. And he calls it optimal because when he does the cost of climate change versus the cost of mitigation, the smaller sum of the two is with the 4-degree increase.

Demetri Kofinas: 00:43:24 I feel like the conversations about what to do miss the point that the point of friction isn't the dollar amount. And let's actually move beyond simply talking about climate and talk about the environment more broadly. Because I think you and I will both agree that the environment's important and

conserving the environment is something that we should aim to do. It's sort of organically already happening, with plastics, with straws, and things like this. But this thing about the money and how much it would cost, I don't think that's the point of friction. The point of friction is the political inertia. Right?

- Demetri Kofinas: 00:44:04 How are we supposed to do something about the environment in a world where we require international cooperation, and we're at a time where international cooperation is moving in the other direction?
- Steve Keen: 00:44:15 Yeah. Well, I think we're going to be forced into it. The climate doesn't give a shit about our politics. It doesn't give a shit about our paralysis either. So, whatever we do or fail to do, ultimately the consequences of climate change will strike us. And then we'll make reactions in that political environment. And I think that political environment is going to be so severe, so extreme, that what we call capitalism will no longer survive.
- Demetri Kofinas: 00:44:40 So, I should also mention to listeners, two great episodes to listen to that are related to our conversation today are with Brian Arthur on complexity science and complexity economics, and the other one is with Geoffrey West on what are effectively the limits-
- Steve Keen: 00:44:57 Scale. Brilliant book, yeah.
- Demetri Kofinas: 00:44:58 Exactly. There are physical limits to growth and that socioeconomic limits are not the same as physical limits. And those two systems don't really work very well together at the limit. So, to go back to what I was saying, some of the things I've seen related to what the effects of climate change, or the projections of what climate change ... the effects of that, are going to be, the most damaging are not climate related directly. They're population related. Right? Because if you do have flooding in all those low-lying areas in Southeast Asia-
- Steve Keen: 00:45:33 Then people have got to move. Or drown. Yeah. And some later studies have found we've actually been overestimating the height of some of those regions. Not underestimating the amount of water that's going to be produced, but overestimating how tall they already are. And it looks like most of Vietnam and a fair bit of Bangladesh will be underwater in the next 20 or 30 years. It's ridiculous how close that could be.
- Demetri Kofinas: 00:45:57 So what does that mean for the world? Let's just follow one particular outcome. Let's assume that we do see rising

temperature levels and that we just continue on the path that we're on right now. Sort of the path of least resistance. Give me a scenario that you've come up with in your head about what the world could look like 10, 20, 30, 50 years into the future.

Steve Keen: 00:46:20 Well, the transition will involve some parts of the world being forcibly evacuated. Which means, of course, massive refugee flows. Which means refugees flows into countries that they're not wanted in, which means political conflict. And I think to me the most volatile area is going to be around Bangladesh and India. And of course, Bangladesh, so far as we know, doesn't have nuclear weapons but Pakistan does. And the potential is there for political and nuclear conflict between those countries.

Steve Keen: 00:46:48 We have ... collapse in food systems will happen, because the analogy that I make to climate change is like putting the lid on the pot that's on the stove already. And the temperature of course is going to rise because of that, which means that the circulating cells in there ... which they're called Bénard cells ... they're going to change location. Where the water goes up and where the water goes down will change because of putting the lid on the pot. The same thing with increasing the temperature. Those up and downs are what give us the large-scale climatic effects that give us rain in the wheat belt and things like that.

Steve Keen: 00:47:21 If they move, and they're moving quite rapidly already, if they break down as well ... So, for example, the, what are called the polar vortex and the Antarctic vortex, if they break down, then those regions which are freezing now will suddenly become affected by the overall circulation of the rest of the planet. Meaning the climate changes radically there as well. So, the food systems we rely upon will break down. We can't necessarily move to areas where the rain will occur, because you need topsoil to grow. And topsoil does not grow in a matter of centuries.

Demetri Kofinas: 00:47:50 Also you need sunlight. And the areas that have the most sunlight are in areas now that are warm enough but not too cold. In other words, if you had all the ice melt in Canada, even if you had all the topsoil in the world you will only have so many days of sunlight.

Steve Keen: 00:48:05 Yeah, that's true. That's true.

Demetri Kofinas: 00:48:06 There are only certain types of crops that will grow in those areas.

Steve Keen: 00:48:08 That's a good point. I hadn't actually thought of that one before now but you're right. So those sorts of things, I mean you can't just simply shift the physical location of growing wheat from somewhere in Iowa to somewhere in Alberta.

Demetri Kofinas: 00:48:19 Is that one of the reasons that some people are investing early stage in some of these Soylent or Impossible Burger style companies? It isn't just a cultural fad but in fact there's a push to try and find alternative sources of food? I've seen similar stuff with cricket protein.

Steve Keen: 00:48:37 Yeah. I can imagine that's happening. I mean, if you're a technologist ... I'm unfortunately an economist by training ... but if you're a technologist and you're seeing this is a possibility then you're going to be researching that as a potential profit opportunity, let alone survival opportunity in future. But yeah, all this stuff means a breakdown of the structure of the climate that currently sustains our civilization. And when scientists have looked at this, their estimates are that if we had a 4 degree increase in temperature, we might be able to sustain a billion people.

Steve Keen: 00:49:10 Now, Nordhaus is calling 4 degree increase in temperature "optimal," and his model has no link between population growth and climate. Population's just simply assumed to grow to the estimates of the United Nations of the peak carrying capacity of the planet, which I think is 10 1/2 billion people. So, his model assumes we're going to have 10 1/2 billion people with a 4 degree increase in temperature, and GDP will be about 3.6% lower than it would've been in the complete absence of climate change.

Demetri Kofinas: 00:49:38 First of all, how reliable are these estimates either way? The carrying capacity of the planet-

Steve Keen: 00:49:42 Absolutely-

Demetri Kofinas: 00:49:42 Who the hell knows what the carrying capacity of the planet is?

Demetri Kofinas: 00:49:44 You can make extremely rough estimates-

Steve Keen: 00:49:45 Well, that's the trouble. See, we are trying to predict what's going to happen in circumstances that the planet itself potentially has never experienced. But that's why I like, one thing we were talking about earlier, looking at global cooling. Because the damage function the economists use, and particularly Nordhaus, is simply $Y = X^2$. So, you can

have X being minus 4 rather than plus 4, and therefore he's going to say that the damage of a 4 degree fall in temperature would be about a 3.6% fall in GDP.

- Steve Keen: 00:50:16 Now, that's what I did at the OECD showing those old maps. And of course, they're based on what knowledge we actually have of where the ice sheets got to. And at 4 degrees temperature below pre-industrial levels, New York was below about half a kilometer of ice. Chicago is below a kilometer of ice. The whole of Canada was gone. And his prediction is that would cause a 3.6% fall in GDP. I'm sorry. That is just ridiculous. You cannot make that sort of extrapolation.
- Demetri Kofinas: 00:50:43 You know, I think ... putting aside all of these models and predictions and climate change and everything else, We do have a really screwy growth model.
- Steve Keen: 00:50:54 Oh, totally screwy.
- Demetri Kofinas: 00:50:55 Of like this ... I was walking to the studio today because I was thinking about this, and I was just looking at all the people just passing me by, and we generate so much waste, the fashion industry, all the clothing, we're a consumption-driven economy. And when I say "we" I mean the globe, but there's only a small percentage of the planet that actually drives that consumption beltway. And I think we do it because the models we use don't price the externalities. The things that are most valuable, that are worth the most, the quality of the air, the water, the climate, everything, and also things that are far out in the future. If you have children ... And even if you don't have children, and you care about humanity, you should care about, let's say, at the very least your theoretical grandchildren. Right?
- Demetri Kofinas: 00:51:41 So none of that's priced in. And because it's not priced in, the economy doesn't see it so it value it, and so, what do we do? We make trade-offs that we wouldn't normally make if they had a price attached to them. So that's a major shortcoming of our system. And whenever you challenge that, when I say "you" I don't mean you specifically though I'm sure this happens to you, whenever you challenge that, people immediately have a reaction. Not people. Not everyone. But a lot of people think that you're attacking capitalism. And that by attacking capitalism you are somehow suggesting that we should create some alternative system that is socialistic or whatever, and I don't even know if people think that hard about it. I think it's just defensive. People are knee-jerk defensive about it.

Steve Keen: 00:52:25 It's a visceral reaction which thinks you're attacking a social system that has clearly given enormous benefit to humanity over time. But what you're saying is, this'd be a great social system. If the earth was the scale of Jupiter. If we could continue-

Demetri Kofinas: 00:52:41 If there were new "new found lands."

Steve Keen: 00:52:43 New found lands.

Demetri Kofinas: 00:52:44 New Americas.

Steve Keen: 00:52:45 New found lands. If that all existed, there was tons of this space, we'd be fine. And in fact, a very conventional economist, William Baumol, wrote a very nice article about this decades ago called Spaceship Earth, and he said, we have a cowboy economics, where there's vast prairie-

Demetri Kofinas: 00:53:00 That's fascinating.

Steve Keen: 00:53:01 Okay. And instead we live in a crowded economy. What's sustainable in one is not sustainable in the other.

Demetri Kofinas: 00:53:06 Totally.

Steve Keen: 00:53:07 So in that point you have to say, if we get to the crowded point, then we can't have unbridled capitalism. Or unbridled anything. A socialist system would be just as bad. If you see what the social ... what the Russians did to ... I've forgotten the name of the lake, but it's the deepest lake in the world. It's one of the many lakes that was polluted by the soviets as well. So, it is just unbridled growth which is the problem. And therefore, you say, "How do you control growth when you have a disaggregated system?" It becomes something which you can't do just on the basis of individual behavior.

Demetri Kofinas: 00:53:37 Well, I mean the aboriginal lands of Australia, the Americas, these were a very fortuitous bounty that the Europeans came upon. You know? Where would the Europeans be if they hadn't discovered the rest of the world? How long would they have been able to run that model?

Steve Keen: 00:53:54 Well they couldn't ... I mean, yeah, we'd run it more slowly in many ways. I mean, slavery. When I look at what slavery is, slavery is a way of finding cheap, directable energy. You tell a slave to go and move something, the food the slave [inaudible 00:54:06] means the slave can make that effort. So, the slave

economy was a major factor in pre-Civil War America. It was a major factor in Britain, until Britain abolished slavery. So, they all harnessed this source of controllable energy for a long time, and then we discover coal.

- Steve Keen: 00:54:22 And not just discover coal, we realize you can use coal in steam engines and then we don't need the animal power anymore, we've got the power of the coal. We don't realize we're burning an accumulated mass of previous organic matter into the atmosphere. Which is where we start [inaudible 00:54:38] with the carbon dioxide. And now we're in the situation where, if we'd stopped doing this or started slowing down doing this 50 years ago, roughly when The Limits to Growth came out, we could still be within the bounds of the cowboy economy.
- Steve Keen: 00:54:54 There were also scenarios in The Limits to Growth, I think there were 7 scenarios they played. And with one of them we had population control, where we had increased efforts on moving across to green energy, more work on pollution sinks, and a range of other changes. Those policies together, the model said we could continue indefinitely. But we didn't. And what we've done is we've more than doubled population since that came out. We've more than doubled per capita energy use. So, we've more than quadrupled the load we're putting on the biosphere, and that's where the breakdowns we're seeing are coming from.
- Demetri Kofinas: 00:55:26 Weren't we like 2 million people on the planet back in the 70s?
- Steve Keen: 00:55:29 About 3. 3 billion. So, there's about 7 1/2 billion now.
- Demetri Kofinas: 00:55:33 You know, this is a really tough thing because most people, what matters to them first is themselves, their family and their friends, right?
- Steve Keen: 00:55:41 Yup. Mm-hmm (affirmative).
- Demetri Kofinas: 00:55:42 That's true for me. I don't know if it's true for you.
- Steve Keen: 00:55:43 Well, yeah, yeah.
- Demetri Kofinas: 00:55:44 Yeah. And I don't trust our government, or any other government to be quite honest with you. Maybe the Norwegian government. I don't know the Norwegian government. Maybe there are governments out there that I could theoretically trust if I knew something about them. But I don't trust them enough to put all my eggs in that basket, right? What I think about is

how can I protect myself and my family. I feel like that's what most people think. Right?

Steve Keen: 00:56:09 Yeah. And the trouble is, your basket is affected by everybody else's basket.

Demetri Kofinas: 00:56:14 Yeah, exactly, and [crosstalk 00:56:15]

Steve Keen: 00:56:15 No man is an island.

Demetri Kofinas: 00:56:15 Exactly, exactly. And there's also the other issue which is that the people that are most in favor of climate change are of course people that are already rich. Right?

Steve Keen: 00:56:25 Yep.

Demetri Kofinas: 00:56:26 People that, let's say, are trying to generate income ... So, what I'm trying to say is that this requires a very strong socialist response.

Steve Keen: 00:56:33 Yes, it does.

Demetri Kofinas: 00:56:33 Yes, it does. I mean-

Steve Keen: 00:56:33 Socialist in the sense that we do it collectively.

Demetri Kofinas: 00:56:36 Absolutely. And it requires redistribution of capital, it requires huge collective effort. I mean, you're talking about something analogous to the buildup for World War II.

Steve Keen: 00:56:44 It is exactly that. That's my normal analogy is World War II on steroids.

Demetri Kofinas: 00:56:48 So that ... Again, America. Think of the sort of cultural economic model. This is a pioneer country. Right? It's very much about empowerment of the individual, the individual goes out ... Let's leave aside the fact that that is a very sort of simplified model-

Steve Keen: 00:57:01 Fairy tale view of American History.

Demetri Kofinas: 00:57:01 ... of reality, but also it's become much more difficult because of the lopsided wealth distribution, the regulatory capture, all the ... you know, we saw those ridiculous bailouts after 2008. But still, what it would require is all sorts of, let's say, people in the country to reorient dramatically the way that they think about, or the way that they even go about engaging in the world. It's such a dramatic rethinking. You know what I mean? And on top

that you need international cooperation. So, I just don't see it happening.

Steve Keen: 00:57:33 Neither do I.

Demetri Kofinas: 00:57:33 You know what I'm saying?

Steve Keen: 00:57:36 Neither do I.

Demetri Kofinas: 00:57:36 So then the question is, what do we ...

Steve Keen: 00:57:37 What are the consequences?

Demetri Kofinas: 00:57:38 So you and I have talked a little bit about this. An eco-fascist model. Where a kind of eco-fascism would arise out of this environment from a minimal friction sort of pathway. What are your thoughts on that?

Steve Keen: 00:57:55 Quite scary. Because I think, first of all, I agree that we will not make the political decisions necessary to reverse direction until it's obvious we should've reversed direction 20 or 30 years earlier. But like that's my Titanic model. You know. You see the iceberg, but you see it too late to change direction. You're going to hit. So, the question is, when you hit, what the hell is going to happen? And in that world, one of the decisions people will make is there are too many of us.

Demetri Kofinas: 00:58:21 This is basically the Treaty of Rome, a little bit. Not exactly, but there were some ... I may be ... Either I'm referencing a conspiracy theory, or there was something in the Treaty of Rome ... Not the Treaty of Rome, sorry.

Steve Keen: 00:58:33 The Club of Rome?

Demetri Kofinas: 00:58:33 The Club of Rome. Not the Treaty of Rome, the Club of Rome-

Steve Keen: 00:58:35 The Club of Rome [inaudible 00:58:36] population control.

Demetri Kofinas: 00:58:38 Right, Club of Rome. The Treaty of Rome was the European Union.

Steve Keen: 00:58:40 When they did the 7 scenarios, the only scenario that actually managed to mean a sustainable load on the biosphere over time included population control. So, I'm not saying population is the problem. It's all a problem. But it is-

Demetri Kofinas: 00:58:52 But it would be a problem at a higher temperature.

Steve Keen: 00:58:57 Yeah, it's a problem now. We've gone beyond the carrying capacity of the planet. However, you estimate it, we are-

Demetri Kofinas: 00:59:01 But we don't really know that, though.

Steve Keen: 00:59:03 We don't know it-

Demetri Kofinas: 00:59:04 We might feel it. It certainly feels that way in New York.

Steve Keen: 00:59:07 Yeah. Well, there's what's called the human ecological footprint, which is an attempt to work out how much of the sustainable reproduction capability of the planet are we absorbing as a species. Now, it does include ... I know there are plenty of climate skeptics who'll be listening to this. Hello. But, so it does include the carbon dioxide load as part of that measure of the human ecological footprint. But even if you take that out, and so you don't talk about the carbon dioxide load as part of the pressure we're putting on the planet, they are saying we are using about 80% of the complete renewable resources of the planet every year for our species alone.

Steve Keen: 00:59:41 When you include the carbon footprint, it's 1.6 times.

Demetri Kofinas: 00:59:45 So, Steve, I'm going to move us to the overtime. For regular listeners, you know the drill. If you're new to the show, or you haven't subscribed yet, head over to patreon.com/hiddenforces. Or go into the description to this week's episode. I have a link where you can sign up to our audio file subscription and get access to this week's overtime. Or to The Autodidact, or Super Nerd tiers, which give you access to the transcripts and rundowns. This week there is no rundown because Steve called me a few days ago, or emailed me a few days ago to tell me he'd be in town, and this is going to be an additional episode in addition to what we normally put out every week.

Demetri Kofinas: 01:00:25 So there's no rundown, but if you want to hear the overtime or get access to the transcript, again, head over to patreon.com/hiddenforces and join us in our conversation.

Demetri Kofinas: 01:00:37 Today's episode of Hidden Forces was recorded at Creative Media Design Studio in New York City. For more information about this week's episode, or if you want easy access to related program, visit our website at hiddenforces.io and subscribe to our free email list. If you want access to overtime segments, episode transcripts, and show rundowns full of links and detailed information related to each and every episode, check

out our premium subscription. Available through the Hidden Forces website. Or through our Patreon page. At patreon.com/hiddenforces.

Demetri Kofinas: 01:01:16 Today's episode was produced by me and edited by Stylianos Nicolaou. For more episodes, you can check out our website at hiddenforces.io. Join the conversation at Facebook, Twitter, and Instagram at hiddenforcespod, or send me an email at dk@hiddenforces.io.

Demetri Kofinas: 01:01:36 As always, thanks for listening. We'll see you next week.