Debate with Tarja Knuuttila after her presentation

Heymann: I don't know if you've had any interaction with practicing economists. I'm a practicing economist. This is fascinating to me, because on the one hand these are questions that in practice you ask yourself. I want to go back to your last statement. The way one looks at the thing in a practical way, it's not a question of adding elements to make it real, it's a question of eliminating elements and still making it real. That's the game one plays. Going back to your Lucas quote. I think Lucas is wrong in most texts. Particularly in Rational Expectations, with which I've had some sort of problem issue with it in probably decades. I want to return to that. I think that in the way is done it's not unrealistic, it's inconsistent. And I think there are reasons why it may not work. But the thing is that you get the model from a question. Let's see. You have the devaluation. You ask what will happen. Will the economy go up, will the economy go down? Will inflation go up, will inflation not go up? Will the real wages go down? And so on and so forth. So, that's your problem and you have to deal with it in some way or the other. Now you know that the system is indescribable. So what you do is you try to find the easy way of dealing with these which still maintains some reference to the real stuff that you want to understand. One thing that I've seen is not mentioned often in these discussions is the very basic concept of range of validity. In essence, you write or you think about representations that have the range of validity imagined, considered by you. And you know that the model is going to say things that you don't believe in. That's why I think two things. One, introduction and conclusion are so important. If you present a model and you don't say "I want to use it for this or for that", it's not going to work. You, and the one reading it, must have a frame of mind to understand "what does this person want to tell me". It's not only what the model says, it's what the model's meant to talk about. And that also has to do with social construction. Which may be very bad because you get locked. I think Rational Expectations has this property of locking in. We have gone with this weird thing of trying to explain crisis with Rational Expectations. Two things that don't go together, by construction. The fact that there are these sorts of conventions, so to speak, makes sense. It may be a problem. I would like to insist on the specificity of the model from the question. The notion that each model has implicitly and perhaps should have more explicitly, an argument about what it's talking about, about what thing you believe the model should tell you and you should believe and what things you believe the model should tell you that you don't believe. Then you put it on a shared language. It's not fiction. But sometimes a novel it's more about things than a chronicle, isn't it?

Knuuttila: Yeah, yeah, precisely. And maybe this is the reason why I want to talk about models as artifacts, but then point out the similarities between models and fictions. Because there are. Like you said, sometimes a novel tells you much more. Of course what I was thinking is that you can often treat these things like in separation from any consideration of reality. So it's like, you know, the study in theory. But eventually, of course, the theory is motivated by what happens in the world. But still you can go on with that.

Heymann: You can think about it in a sort of professional heuristics. I have a model which allows me to do this and that. And now a natural question is "what can I derive from that model? What extension does it suggests? What exemption does it suggest?" It's a sort of exploration of the feeling within the model. It's a sort of learning exercise. All I do is I take this existing model and I say "OK, I meant to say

that" or "This is not where I want to go". I have this framework on which to learn. In playing with the logic of the model has this thing of accepting and rejecting. Finding ways that you didn't anticipate, it's a sort of exercise.

Knuuttila: Yes, that's a really interesting proposal. About this "professional heuristics", I started to wonder. If we are drawn to models as a kind of professional heuristics tools, what are kinds of things that we can then learn from them? It seems there's something related to mathematics. How you get mathematics to work.

Heymann: Put it this way. I get an idea of this and that. Maybe I'm inconsistent. So I want to check whether the intuition that I got, which is founded on observation, holds together. So the exercise of modelling is a way of confirming or rejecting my intuition. That on one hand. On the other, if I see something interesting on a model I can play with it. I ask myself "how far am I willing to go with it?" I might go where the model takes me, or say "No, I stop here".

Knuuttila: That's interesting. It comes even somehow closer to philosophy. Because in philosophy, my feeling is, often we follow an argument where it takes us. So there's an argument and it might take us very far. But at the same time even the mildest argument might be good in making it clear the path where this argument is taking us.

Heymann: And I think this sort of abstract exploration makes sense in that regard. The model is not a true thing by itself.

Knuuttila: I'm trying to remember this "professional heuristics". It's a pity I don't have paper. It's a marvelous thing.

Legris: Any other question or comment?

Zagarese: Yes. I was wondering whether you had taken into account the distributed cognition framework.

Knuuttila: Yes. The idea is that models are external tools which help you gain knowledge which you couldn't get just by thinking about these things in your head. And even if you think about these things in your head, you need some external representation in order to internalize it. Typically, people tend to think that something external represents something which is internal and then it's externalized with the help of some representational tools. And these representational tools are often considered as something that's malleable. And that's the way with all tools. Some tools are good for this, and some tools are good for that. When I'm thinking about constraints, like something is constrained. It can be both positive and limited. Afforded and limited in a sense that that kind of tool affords you to make certain kind of thing but at the same time there are other kinds of thing you cannot do with that. Of course, you often don't know that in advance. There is something that it enables you to do, and other it doesn't. A constraint has this dual nature.

Zagarese: I was asking because I agree with the idea that with the use of models you get insights you wouldn't get if you used or manipulated the model but those insights are not necessarily true or useful.

So, how do you discriminate? Because, OK, models are fictions and that's great and you can learn a lot of stuff. We don't know what we'll learn from the model but hopefully we'll learn something about the world or we can use these insights to, I don't know, transform some aspect of the world in some manner. I think you're giving too much liberty to the idea that we can use models when we present them as fictions. Because, in some ways it's great that we can learn things from manipulating the models but exactly what is it that we're learning by using models as fictions?

Knuuttila: Philosophers of science have tried to make this to hang on the question on representation, and I think that's a mistake. Because if you think that the representational relationship is going to do this work for you then what would it be? There is something to ask about that. And those answers that have been given are really unrealistic when it comes to scientific practice, like when two things are isomorphic. Then when you say that two questions are similar, how are you supposed to analyze that similarity. And you can have very similar answers but this doesn't seem to be very helpful when it comes to actual practice. Part of what I'm thinking is that the justification has to be distributed too. Meaning that when you look at scientific practice, it's not that this or that model gives perfect rendering or partial accurately rendering of some system. But, you already have some kind of context when it's presented. There is already something to know, some theoretical knowledge. Then, of course, like you mention here, it's not he model itself which is doing this. It's the model user who has to make this work. What is it that you want this model to say? What is it that this model contributes to our understanding of, say, economics systems? My feeling is that philosophers go into all this detail about these worlds. And that was my feeling when I was a young economics student. I felt them to be too simplified a theory of knowledge in which these models or theories would represent things as they are. And they don't. But yet we are able to gain understanding. You have to triangulate a lot of things. You have experiments and you have these other models, you have experiences of economics systems, and you have experiences of using these tools. And all this you have to triangulate. There isn't an easy answer, that's the point, at least in my view. I mean, science it's very difficult.

Lerner: I'm interested in the materiality of the models as artifacts because I've read articles by you where you say exactly that "materiality has to do with what the model says". But I'm not clear about in which way exactly the materiality from a model constrains or has influence on the way the model says something.

Knuuttila: Of course, and that's a good question and unfortunately I cannot go into the details here, I haven't written too much about it, but the point is that in a science like economics, it's basically the materiality that does any epistemic work. You have to have a material medium because you can't play with models in your head. So you need this material medium. For communication you have to have this inference because you have to work with men or with computer with simulations. And already when there are simulations, this materiality plays a bigger role because the model has to be implemented as a computer program where the materiality of the computer and its constraints play a bigger role. The materiality plays an epistemic role in the sense that these influences are actual representations. And finally, if you go towards a more material spectrum, models adopt that because you have all kinds of model systems. If you go towards more 3D models, they're constructed for, say for instance, architects who want to conceive how to build something. They often say that these models give much more

information that this computer programs. And it's possible to build with them. And they actually prefer to use both which is interesting because it show that different kinds of representational tools are able to accomplish different partial things. And finally, the most extravagant things, the last year I've actually not been doing much economics. I'm going to do again because we have collaboration with Mary about these aspects of economics modelling. But the last few years I've been studying synthetic modeling that is people within the field of scientific biology who construct synthetic networks. They construct genetic circuits from genes and proteins which are then implemented within cells, within bacterial cell. What is really interesting about this practice is that they are doing this on the basis on mathematical modelling. So they first use mathematical models as templates and then these mathematical models they are implemented as biological tools. I mean, obviously there has to be a lot of interpretation. It's the same as when studying mathematical models and simulation models. Of course they are more radical here. Because here is different. Here the medium really plays an important role, because the whole point of building these small circuits is that scientists have all kinds of ideas about how these circuits function and they have all kinds of mathematical models that give you outcomes about what happens inside the cell but you don't know, you don't know what happens inside the cell. The way they started to study this was "Let's start building them". So the idea is that reality plays an ulterior role. Because these systems are constructed on the principles of electrical engineering. It's quite fascinating because they get their ideas from electrical engineering and they apply it to biological systems. So here, coming back to your question, you have that materiality play a huge role to the kind of conclusion you get. Depending on the representational means and practices in question, it plays a different role.