GEQ1000 Asking Questions
Economics (Social Science) Segment
Video 2-1
Models in Economics

Last week, we explored aspects of empirical studies in the social sciences. We found out that answering the question “Does X cause Y” is difficult when X and Y concern humans. There are always a multitude of factors that can affect the decisions and actions of people. We have the wonderful capacity to think, reflect, and change our minds. But that same capacity makes it impossible to describe our behaviour by using unchanging mathematical equations.

Still, we need to make sense of the world, and empirical work is certainly necessary to help us do that. But we will also need theory to inform us about what causal effects to test, and whether our results can be generalized to different circumstances.

So this week we will talk about theory. Well, not exactly. We will not use the word “theory” very much. Economists prefer to use the word “model” to describe their theoretical work. You may have seen our Econ majors wearing T-shirts that bear the cheeky slogan “Economists do it with Models”. And if you ask first-year economics students about what they do in class, they’ll tell you that the slogan is accurate - they spend their class time grappling with models.

Model = A simplified representation

A model is a simplified representation of a part of the real world. It is built by removing features of the real world that the model maker believes is not essential for his purposes. Think of a model jet plane, built for wind-tunnel testing. It resembles an actual plane in its aerodynamics. There is therefore no need to build actual engines or seats into the model. These would be details that do not matter for the engineer’s tests.

Similarly, in economics, a demand and supply model condenses all the relationships and transactions in a market of buyers and sellers into a diagram of two intersecting curves, or a set of two equations. The sociologist may draw a graph model to capture the interconnectedness of a social network. The cognitive

psychologist may craft a flow-chart model of how people process information in their brains.

Models as maps

Why do we use models in the social sciences? Why do we suffer the loss of detail? In a classic 1975 book titled *An Introduction to Models in the Social Sciences*, economists Charles Lave and James March wrote that "Man is capable of producing more complex behaviour than he is capable of understanding." Therefore, to understand the world, we must simplify it. That's the biggest reason why we use models in the social sciences.

Models can be likened to maps. We do not want to build a map that is scaled one to one with the territory that it represents, for that would be no better than going without a map. Instead, we must scale things down to an appropriate size and discard unnecessary detail so that we can handle the map.

How much to scale down and how much detail to discard will depend on our purpose. To familiarize ourselves intimately with the neighbourhood we live in, we would use a small-scale street map that identifies the location of stores, the police station, parking facilities and so on. If we are visiting tourists planning the day's itinerary, we use a city map that shows different transport options and travel routes. If we are geologists studying the location of mountains, rivers and cities, we use a regional map that shows these natural features.

A useful map contains just enough detail to help guide us to where we want to go. Similarly, a good model will only retain the elements that are crucial for explaining the situation. All maps are inaccurate to some degree, but a well-made map can still help us. Similarly, all models are wrong to some degree, but well-made models can illuminate our understanding and help us make useful predictions.

Just as the same place can be represented by different kinds of maps, the same social situation can be represented by different models. For example, when examining the institution of marriage, sociologists may build models that emphasize how cultural norms shape the roles of the marriage partners, while economists may build models that describe how resources are distributed between husband and wife, based on their alternative market opportunities. Each model is built not to capture all aspects of the situation, but only to highlight a few elements.

Models as experiments

Models can also be used as thought experiments. This is particularly useful for the social sciences, for we have already seen how difficult it is to do actual experiments.

A model can be thought of as an artificial environment, free for us to manipulate some factors, while keeping other factors unchanged. In this way we try to uncover causal mechanisms and understand better what conditions matter. This is exactly the way we think of lab experiments.

Now this may seem far-fetched. Surely lab experiments are concrete in a way that thought experiments are not? After all, lab experiments happen in the real world. But the distinction is not as sharp as you might think. We have seen that it is not straightforward to apply the results of a lab experiment or a randomized trial to a different setting, especially when human subjects are involved. Something that works in the lab may not work in real life. We will always have to argue that the important features of our experimental study are *close enough* to the new situation for us to disregard the differences and apply our results.

In the same way, we must argue that a model is *close enough* to a real-world situation for us to learn something about the latter by examining the former. Both experiments and models need to be extrapolated before they can be applied.

We already use models. Let's make them explicit

Economists and social scientists are hardly alone in using models. We have already talked about scale models in engineering, and in mapmaking. In previous segments, you will have seen examples of models in computing and in physics. Indeed, all of us use models, even if we are not aware of it.

We all carry mental pictures about how the world works, and we use these mental pictures to help us make predictions, interpret events, and make decisions. These mental pictures are also models. And they are necessarily simpler than the world itself, again because we all have limited mental capacities.

Thus, using models is not an alien activity, but something we do all the time. What the social scientist does is that he makes his model **explicit** rather than to keep it in his head. Write the model down, so that you can examine it more carefully. Work out its logic explicitly. See if there are inconsistencies that you may not have thought of. By putting your model down explicitly, you can become a more systematic thinker. And you will be in better position to communicate your model to someone else.

In the next video, we will use an example of a famous model in economics to show how economists use models to understand the world.