University of Basel

Exploring Possible Futures

Video Transcript

Equilibrium models

In this lecture, we want to get familiar with the second main type of economic models next to optimizations namely, equilibrium models. Now, before we have a look at the modelling details, what exactly is an equilibrium? Roughly speaking, an equilibrium defines a stage which is in balance, and nobody has an incentive to deviate from it. So you could say it's a stable point. There are different reasons why something can be in equilibrium. In economic modelling, the most common form of equilibrium is the competitive market equilibrium, namely, that supply and demand are in balance. But the same logic of balancing some input and output also has meaning beyond economic concepts for example, in cases of flow conservation constraints in networks.

What gets in also has to get out. Another famous economic equilibrium concept is the Nash equilibrium, when strategic actors enter the market framework. Basically, also the solution of an optimisation problem defines an equilibrium the point in which the defined objective is maximised or minimised. Let's again start with a simple example to get an idea what an equilibrium model is. Assume you're a firm deciding how much energy to supply with your power plant. You know your cost function, linking your output decision, q, with the resulting cost c. You also know the market price p. Now, your decision will be to produce as much energy with your plant such that the resulting marginal cost level is equal to the market price.

If you would produce more, you would make a loss, as the costs of those additional units would be higher than the market price you can obtain. If you would produce less, you actually forgo some possible profit, as your costs are lower than the market price, and you could still sell some more. The point where your output results in a cost level that matches the market price marks the equilibrium the perfect competitive equilibrium, to be more precise. In a more general setting, equilibrium models can be structured into two elements representing market interactions, termed complementarity conditions. First, we have to understand why a firm produces something or consumers are buying something.

Those are activities of the different market actors, and they correspond to the so-called zero-profit logic. If the costs of an activity are higher than the resulting revenue basically, the price one can get, the activity will not be carried out, as it would make a loss. Correspondingly, if the activity is carried out meaning it has a positive value costs and revenue have to be equal. The activity makes zero profit. The same logic applies to the demand side of a market. Consumers are only willing to buy a product if their buying costs, defined by the market price, are lower or equal to the benefit they obtain from buying the product.

The second type of complementarity constraints are market clearing conditions that correspond to prices. They bring the supply and demand side together. If the supply on the market exceeds demand, we don't face any scarcity, and prices should be zero. In turn, if prices are positive, supply and demand have to be in balance in other words, to produce a supply exactly as much as the consumers are willing to buy for the resulting price. If consumers are willing to pay more, producers will increase supply until the new market equilibrium is reached, and vice versa. Please note that both the costs and what can be understood as market is rather general and does not need to refer to pure production costs or observable markets.