

# "Triangulating the flow of goods and knowledge"

## Abstract

I develop a model with multinational production and trade, which allows an arbitrary unbundling of knowledge creation, production, and consumption. The model highlights the lack of exact data to pin down the flow of knowledge and goods. This insufficiency of information impedes pinning down the outcome of counterfactual experiments. In the model, classical models of foreign direct investment such as horizontal foreign direct investment (HFDI), vertical foreign direct investment (VFDI) work as measures to pin down the model and the outcomes of counterfactual experiments. Instead of assuming a particular model of foreign direct investment, I triangulate the model using the data on bilateral trade and multinational production, and bound the outcomes in counterfactual experiments. I show that these classical models not only work as assumptions to pin down the flow, but also bound gains from openness: the gains from openness calculated from the HFDI model and the VFDI model are the upper bound and the lower bound for the gains from openness, respectively. For further analysis, I introduce a branch and bound approach to calculate the bounds on the outcome of various counterfactual experiments. I show that both qualitatively and quantitatively, there is a wide indeterminacy in the outcome of policy involving multinational production