BATModel

better agri-food trade modelling for policy analysis

Agricultural trade and the importance of small and zero trade flows

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In the recent years, agricultural markets have experienced several large shocks such as the war in Ukraine, the consequences of covid-19, the US-China trade war, and important meteorological events in key producing regions. With the consequences of climate change that are likely to increase in the coming decades, large shocks could become even more frequent. Understanding what the trade consequences of such large shocks are matters a lot for food security, because it helps prepare the most vulnerable countries to cope with the shocks.

Unfortunately, the existing economic toolbox is inadequate to properly answer this question because our models tend to be too conservative. For theoretical and computational reasons, existing models are designed to predict smooth changes. It means, for example, that trade flows that are initially zero stay at zero and small trade flows tend to stay small. This is good to simulate the consequences of small shocks that do not drive the market far from its initial equilibrium. However, this could be inappropriate to simulate big shocks that could lead to completely different equilibria. The examples mentioned above are typical of this: they have led to quick reorganization of agricultural trade flows of quite large scale. For example, following the start of the war, important quantities of cereals have been exported from Ukraine not through the Black Sea, as commonly done, but through Eastern European countries and, in the case of the US-China trade war, global soybeans trade flows were very different once China no longer imported soybeans from the US.

The Working Package 2 of the BATModel project aims at providing solutions to this problem. The work resolves around two dimensions. Firstly, the gathering of the data relative to prohibitive trade costs. Trade costs in the agricultural sector tend to be very high and much higher than in other sectors, because of the higher prevalence of trade policies, the heavy regulatory oversight related to the fact that these products are consumed as food, their perishability, and their high weight-to-value ratio. To understand the current structure of agricultural trade flows, a good map of these costs is needed. Some of these costs can evolve quickly during periods of crisis (for example, trade policies and trade costs) and lead to radically different trade structure.

Secondly, the developing of modeling approaches that allows initial zero trade flows to become positive and large after some big shocks. This work presents various challenges. One is that accounting in a model for currently zero flows leads to a problem of dimensionality: there are many more zero flows than positive ones, so considering them all as potential trade flows considerably increases model's sizes. Another is that it is important for models to represent well how markets could behave. In order to do this, models are usually brought to the data to make sure they represent the behaviors of

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interest. One difficulty, here, is that there have been a limited number of large-scale events on agricultural markets. So, it is difficult to make sure that models respond properly.

Overall, the work done in this working package will allow modelers to be better prepared to help policy makers in times of crisis in sectors which are highly sensitive and crucial for food security.

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