

Does shipping market affect international iron ore trade?—An equilibrium analysis

Abstract

Whether shipping market affects international iron ore trade arouses a lot of discussions in recent years. To evaluate the impact of shipping, we build a mixed complementarity-based equilibrium model to understand the strategic behavior and interaction among major players, including importers, exporters, and carriers. Different from models found in other resource trades, this one considers the heterogeneity of iron ores and the production capacity allocation of exporters. In this three-party equilibrium model, importers and exporters compete in a Cournot fashion, incorporating the endogenous freight rate derived from a carrier module. This model is an instance of Discretely Constrained Mixed Complementarity Problem (DC-MCP), for which we provide a solution procedure based on Mixed Integer Nonlinear Program (MINLP) reformulation and convexification techniques. Our model performs better compared with those with given shipping cost and production capacity constraint. In addition, we apply the model to analyze the impact of shipping on the iron ore international trade through a numerical study. The results show that shipping can slightly dampen the negative impact on iron ore trade volume from an unexpected reduction in importer budget. For different exporters, this dampening effect varies by freight rate.