

Dynamic Optimization Models with Natural Gas

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Abstract:

This paper presents a survey of our several dynamic models related to market for natural gas. For this sector, link to the market is quite costly and also depends on transit via third countries. Thus, not only economics, but also geopolitics and technology are important for proper modeling.

The first model considers optimal growth for 2 sectors of gas infrastructure: pipeline and LNG. Depending on cost assumptions, the model can have either unique steady state (model 2) or multiplicity of equilibria (model 1). Further we introduce geopolitical power as a share in bargaining game of transit. In monopolistic set up (model 3), there are two controls: investment in capital and in geopolitical power. There is a possibility of unique equilibrium, no equilibrium and multiplicity (threshold phenomenon).

Finally, a symmetric dynamic game is considered. Here the profit of both countries depends on both capital stock and geopolitical power, but one of them can control only capital investments, and other controls only own geopolitical power that influences its bargaining share. The equation for steady state is 5th order polynomial, with possibility of multiple equilibria and thresholds.