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DESERTEC PROJECT AND GEOPOLITICAL GAMES

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Overview

This paper addresses modeling of competition and decisions about investment in infrastructure in an uncertain environment coming both economics and geopolitics. Similar consideration of geopolitical games has been presented by Yegorov and Wirl (2010b), but for the case of natural gas. Geopolitical uncertainty suppresses investment in new infrastructure. DESERTEC plan was developed by Trans-Mediterranean Renewable Energy Corporation. In the report Desert Power 2050 (published by Dii GmbH in June 2012) it is suggested that the volume of exported energy can reach 60 billion Euro, bringing to Europe the savings of 30 Euro/MWh. The technical solution is related to construction of high voltage direct current (HVDC) lines across Mediterranean sea. In the corresponding map we see the links between Algeria and Tunisia, on African side, with Spain and Italy, on European side. Some geopolitical obstacles are already discussed. Not only cooperation between EU and Northern Africa is required for successful implementation, but also cooperation between African countries. Given very high value of annual electricity production by DESERTEC and thus its high fraction in both exports MENA countries and imports of EU, we have here a kind of monopsonistic-monopolistic problem. Since the price of solar power expects to drop, the project is expected to create some profits, and thus there is some room for geopolitical games, including transit games (Yegorov and Wirl, 2010a).

Methods

First, we derive the potential games from the spatial structure of the model. Here we can have two types of games. The first is transit game, where transit country has a monopoly over supply of electricity from its producer to consumer. There is a danger of temporal supply interruption to gain some rent. Similar problem for natural gas transit game was modeled by Yegorov and Wirl (2009), and we apply similar methodology here.

The second type is a global game between the group of producing (MENA) and consuming (EU) countries. Here we use the concept of geopolitical power and apply it for asymmetric dynamic game between producer and consumer. The method of deriving and solving such game was suggested by Dockner et al (2000), while the set up for the bargaining geopolitical game was suggested by Yegorov and Wirl (2010b). There are two states (capital in the project and geopolitical power of MENA countries) that influence the split of the produced surplus, or the difference between production cost and the value of produced electricity. We study both open and close loop equilibria.

Results

The first general result is in the fact that, despite its potential profitability, the project DESERTEC has to be evaluated also from its contribution to European energy secutrity. Here we have self-organized problem. From the perspective of scale economies, the economic profitability of this project grows with its size. But if the scale of such production becomes so high, that it represents a significant share of EU demand in electricity, then the question about security of supply becomes an important issue.

This supply security can work two ways. First, there is a danger of any transit country to exploit its monopolistic power over transmission (either by bargaining too high transmission fee or by temporal cut of supply to reach some political objectives). The only solution to this problem is maximal diversification of supply routes.

The second problem is overall clash of interest between monopolistic producer and monopsonistic consumer. This situation is similar to EU-Russia relations in natural gas, and those debates can be also applied here. Our model suggests a possibility of some equilibrium point that will split benefits from this project between both sides.

Conclusions

The models of this paper have important application for the analysis of future bargaining problems between EU and MENA over split of the surplus obtained from solar energy production in Sahara desert. Dynamic optimization problem shows that sometimes it is optimal to increase geopolitical power before investment in new costly infrastructure. Consider the project DESERTEC as an example. EU might think about creating such legal framework and initial geopolitical power to minimize negative consequences from potential renegotiation over the surplus once investment is done already. Another strategy might be to share physical investment between all participants. This will make the game more symmetric. It is also important to consider the danger of emergence of transit games. Both aspects have to be considered in the framework of EU energy security. The major problem here is linked to scale economies: the larger is the project size, the higher will be its profitability, but also the higher will be the problem with supply security.

Literature

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