



Gas transportation, geopolitics and future market structure

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ABSTRACT

Recent studies have shown the important role of geography, politics and technology for the evolution of markets for natural gas. Gas market differs from other markets due to high share of transport and infrastructure costs. Since investment is location specific, it involves also geopolitical aspects as a consequence. Future market structure becomes path dependent on the investment decisions, particularly in gas infrastructure (pipelines and LNG). Another important aspect that shapes future gas market is heterogeneity in reserve-production ratios across gas producing countries that will eventually lead to the emergence of narrow oligopoly formed by countries with the largest reserves: Russia, Iran and Qatar. The goal of this paper is to analyse a long run gas game. There exist several time scales, and by backward induction we arrive at the conclusion that some time during the 21st century (we name it long run) there will be an oligopoly consisting of only three major gas reserve holders: Russia (26%), Iran (15%) and Qatar (14%). They will face the demand from three major gas importers: EU, USA and Core Asia. While the development paths and market structures are highly uncertain in the middle run (when temporal competition with rivals having 3% or less of gas reserves is feasible), the cloud of uncertainty shrinks in the long run. But investment strategies of major players in the middle run will determine the topology of gas infrastructure in the long run. All the players have a vector of strategic choices where geography, politics and technology set their limitations. Putting it in a simple formal framework, we can say that players choose: intensity of exploitation and shares of investment in transport infrastructure (LNG and location-specific pipelines). Geographical analysis of gas fields of Russia shows that it has moderate flexibility, but still can control the future share of LNG and pipeline flows to Europe and Asia. Pipelines to EU are slightly preferred to pipelines to Asia but political aspects may play crucial role. Qatar is likely to invest only in LNG, but has the flexibility in the speed of its field exploitation (it may be lower than for Russia). Iran has the highest technological and geographical freedom in choices. Future market structures for gas can vary from oligopolistic to monopolistic–monopsonistic relationship, with possibly different prices.

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1. Introduction. Factors influencing future natural gas market

This article is devoted to an analytical forecast of the development of future market for natural gas, and the role of geopolitics and transportation technology in particular. Natural gas differs from other energies by its relatively high cost of transportation, exceeding one for oil by factor 8. This highlights the role of costly infrastructure. Its development will depend on many highly uncertain factors, where direct investment costs play important but not overwhelmingly important role.

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Therefore path dependency characterizes future market structure on the basis of particular infrastructure plans, and this selection is defined not only by cost, but to high extent by geopolitics. While gas prices are still regional (there is some price convergence, but we cannot talk about unique world price), the world energy market is globalized, and events in some continents also influence other continents. Here it is important to highlight one of important uncertainties: how fast the US demand for natural gas imports will grow.

The big other uncertainty facing energy markets – global warming – will not decrease demand for natural gas substantially since any reduction in carbon emissions will lower aggregate energy demand but increase the share of natural gas mostly at the expense of coal. In short, an active policy against global warming is going to be rather favourable than harmful for the use of natural gas.

Gas is an interesting example in which the market structure cannot be derived from pure economic aspects. Due to huge required investments, substantial transport costs and large heterogeneity in gas deposits and major consumption areas geography is very important. Politics also plays an important role possibly constraining the economically optimal development. As a consequence, land locked countries (like Central Asian) have very few choices of transport routes, and geopolitics more than economics governs the choice of pipelines including projects. Therefore, any analysis of the gas markets should include not only economic theory, but also geography and politics. Besides that, it is important to remember principles of economics of non-renewable resources.

There exists several case studies that show how geography and politics perturb otherwise optimal economic decisions. The case study of Turkmenistan (see Olcott [15]) is a good example since it presents the case when geopolitics becomes more important than economics. While Turkmenistan has substantial gas reserves, it is a land locked country, for long time having the only pipeline via Russia, thus giving Russia monopoly power over its gas transmission. The pipeline to Turkey via Iran was proposed by US State Secretary A. Haig in 1993. It was never implemented, and US sanctions over Iran at present is the main problem here.

There is explosive growth of economic literature on natural gas in the last years. One of the reasons is that gas market became hot topic among journalists, especially after the recent gas transit conflict between Ukraine and Russia. But there might be another reason for that: understanding that gas sector is a complex system that cannot be described by purely economic tools (that often give wrong policy arguments) and requires the development of interdisciplinary science. These ideas have been first summarized in the book about geopolitics of gas [18]. There also exists policy driven literature (that also shows partial superiority of politics over economics for gas markets) that sets some political objective and uses economics for its implementation. Here we can refer to a dissertation of V. Putin (mentioned also in (Ericson [4])) that shows the role of state that can make Russia an energy superpower with rising control over other countries, the argument that is successfully implemented into practice. Clearly, it gave rise to completely opposite trend of literature trying to show how Russia is bad and how to reduce its energy power. European agenda on Energy Security was partly implementation of this agenda; see [5].

The recent articles in “Energy Policy” (Bilgin [1]) and “Eurasian Geography and Economics” (Ericson [4]) show the growing role of interdisciplinary approach in the description of markets for natural gas. Ericson [4] has the focus on the political economy of network interdependence. He highlights Gazprom’s role both as a supplier of natural gas to Europe and as the core of a monopoly controlling exports of natural gas from Russia and Central Asia by expropriating and/or blocking foreign ownership of natural gas reserves as well as production and transportation facilities in Russia. A mutual dependence, with political overtones, exists, raising “security issues” for both sides of this tied “market.” Bilgin [1] analyses the influence of geopolitics that can perturb optimal economics plan to bring Caspian gas to Europe. In particular, he shows the vulnerability of Nabucco project, focusing on potential suppliers and associated risks.

It is also important to consider the future of natural gas in its interplay with other energies. Bilgin [2] develops the principles of new energy order and sustainable energy security. He suggests the shift to new energy mix with lower share of oil and higher share of nuclear energy and renewable. Devezas et al. [3] reconsider dynamics of primary energy sources, showing the shift from logistic substitution of energies to energy saving, and suggest that renewable and nuclear energy can reach 30% of energy portfolio by 2050.

Robert and Lennert [16] consider the consequences of oil peak for Europe. They consider two scenarios; the first (optimistic) assumes that oil peak will not take place before 2030 (and Europe has to adjust slowly to growing oil prices), the second (pessimistic) considers the case of oil peaking about 2015, with plateau phase till 2020. Authors discuss both macroeconomic consequences for Europe (less competitive energy-intensive industries, relocation outside EU) and the measures to use more renewable energy (thermal insulation, windmill parks, solar, hydrogen, nuclear energy). European peripheral regions strongly depend on transportation (using oil), which will be under shock from high oil prices. Low-cost air transport will not be maintained. The share of transport cost (and thus the price) will increase more for peripheral regions, making them less competitive. There will be general trend away from suburbanization and towards more compact cities. The 2nd scenario (oil peak around 2015) will lead not only to extremely high oil prices, but also to oil scarcity at world level. The change will be too rapid and chaotic, not allowing for planned substitution for renewable energies and new technologies (like fission). Industrial economy based on cheap oil will become obsolete. Substitution of oil for gas will be rapid (where technically available). Transportation (especially by air) will be less substitutable (in the short run there are no technologies on table). Production systems will be re-optimized accounting for increased transport cost.

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