EXPORT OF RUSSIAN NATURAL GAS TO EUROPE

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Overview

The conflict between Ukraine and Russia may have powerful implications in the European natural gas market: whereas Russia may build gas pipes to circumvent transport through Ukraine, the EU may want to reduce its import dependency of Russian gas. A new EU policy may trigger increased exports of natural gas from Russia to Asia, for example, to China. We examine how the transport capacity of Russian gas to Europe, the EU energy and climate policy, and sales of Russian gas to China may have impact on export of Russian gas to Europe, and hence affect the European energy markets.

Methods

To study the impacts on Russian gas export, we use LIBEMOD, a numerical multi-good equilibrium model of the European energy markets (LIBEMOD, 2014; Aune et al., 2008, 2016). It covers the 27 EU member countries in the base year of the model (2009), plus Iceland, Norway and Switzerland, henceforth termed EU-30, and Russia.

The model focuses on decisions taken by investors, producers, traders and consumers, thereby truly endogenizing energy investments in production capacities and international transmission capacities, extraction of fossil fuels, production of electricity, trade in energy between countries and consumption of energy. The model specifies eight energy goods; three types of coal (coking coal, steam coal, lignite), natural gas, oil, two types of bioenergy (biomass, biofuel) and electricity. These quantities are determined simultaneously with the market-clearing prices of all energy goods as well as the market-clearing prices of transmission services.

There are European markets for natural gas, biomass and electricity in LIBEMOD – these goods are traded between pairs of countries under the restriction that trade cannot exceed the transmission capacity. In contrast, coal, oil and biofuel are traded in global markets. Each country is represented by a node, and within each country there is transport of all types of energy to all types of users of energy (households, services, industry, transportation and electricity generation). Whereas demand from each group of end users is derived from a nested CES utility function, demand from electricity generation follows from the optimization problems of electricity suppliers.

The Russian model block differs from the modeling of the other European countries along some dimensions. First, Russia is the largest country in the world. Whereas a majority of its population lives in the western part of the country, most of its natural gas reserves are found in the northern part of Siberia. In addition, there are reserves in the eastern parts of Siberia and in the Far East. Currently, these latter gas reserves are used primarily for LNG export, but have the potential for export to China through pipes. To allow a more detailed modeling of Russia, we have divided Russia into three auxiliary units; West-, Mid- and East-Russia. Each of these is modelled as a separate country with respect to investment, extraction, production, trade and consumption of energy.

Second, because Russia is the major exporter of natural gas to Europe, and Gazprom has exclusive rights to export Russian gas to Europe, we assume that Russia (through Gazprom) exercises market power in the European natural gas market. This is in contrast to the modelling of the other countries, where we assume competitive arbitrage traders.

Domestic Russian gas prices, in particular to households, have been far below the total marginal cost of delivering the gas, that is, the sum of marginal cost of extraction, transport and distribution. We take this fact into account by introducing a subsidy that reflects the difference in the data year 2009 between the (estimated) total marginal cost of delivering natural gas to a group of gas users (in one of the three auxiliary Russian regions) and the corresponding (partly observed, partly calculated) user price of natural gas.

Finally, in EU-30 we assume that all profitable investments in international gas pipes are undertaken. In Russia, however, there are also other concerns than profitability that are of key importance in determining gas pipe investments. Therefore, in most scenarios the capacity of gas pipes from Russia is given, and is either equal to the present situation or adjusted by an exogenous investment in pipes, for example between Russia and Turkey or between Russia and China.

Results

We run the numerical model LIBEMOD for the year 2020. In the reference scenario, export of Russian gas to Ukraine and Belarus is 70 mtoe, and a substantial share of this gas is re-exported to EU-30. In addition, Russia exports 44 mtoe directly to EU-30, and 19 mtoe to other countries. We then consider the impacts if Russia does not transport any natural gas through Ukraine and Belarus. Because there is almost no idle transport capacity (directly) to EU-30 in the reference scenario, the decline in Russian export is close to 70 mtoe, and natural gas consumption in EU-30 declines by 10 percent. In contrast, more gas is available for Russian consumers.

Given that Russia circumvents Ukraine and Belarus, we explore if there are profitable investments in gas pipes from Russia towards the European market. We find that the amount of profitable investment is rather small, reflecting high costs of investment in gas pipes. The low investment also reflects the fact that by 2009 Russia had much more transport capacity towards the European market than standard profitability concerns would suggest.

Next, we study the effect of building a gas pipe to Turkey with a connection to Greek – the Turkish Stream project– when the gas transport facilities in Ukraine and Belarus are used. We find that total Russian exports of gas increases slightly (relative to the reference scenario), whereas total exports to Europe decline marginally.

In 2014 Russia and China signed an agreement stating that by 2030 Russia should export 30 mtoe to China. Because the parties have not agreed upon which gas fields should supply China, we have analyzed the effect of increased export from Russia to China under three alternative location assumptions. In general we find that the impact of the China agreement on the European natural gas market is minor.

Turning to EU policy, we have explored the impact on the natural gas markets if the EU cuts its emissions of GHGs by more than its 2020 goal of 20 percent (relative to 1990). To be more specific, whereas we assume that emissions in the EU ETS sector is reduced by 21 percent relative to 2005 in the reference scenario, we explore the impact of a 30 percent cut in this alternative scenario. We find that this policy has significant impact on both coal power production and renewable electricity supply, whereas the impact on gas power production is minor. Thus, the effects on Russian gas export to the EU are minor.

Finally, we have examined the impact if more countries do like Germany and Belgium; phase out nuclear power. We find that if 50 percent of the nuclear capacity is phased out in EU-30, consumption of natural gas in EU-30 increases by only 4 percent. Most of the increase is imported from Russia.

Conclusions

A main result in this study is that circumventing transport of gas through Ukraine and Belarus will radically decrease imports of Russian natural gas in Europe; the gas can only to a minor extent be rerouted because there is not much idle transport capacity. Therefore, to sustain the Russian export activity investments in gas pipes are required, for example, a gas pipe to Turkey/Greece. Such a project may, however, not be profitable.

References

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