CHOOSING BETWEEN GAS TRANSPORT ROUTES: IS THE BOOKING BEHAVIOUR OF NETWORK USERS EFFICIENT?

Jann T. Keller, Faculty of Economics and Business, University of Groningen
and Regulatory Affairs, Gastransport Nord GmbH,+49 441 20980 314, j.keller@rug.nl
Gerard H. Kuper, Faculty of Economics and Business, University of Groningen, +31 50 363 7018, g.h.kuper@rug.nl
Machiel Mulder, Faculty of Economics and Business, University of Groningen, +31 6 3103 5729, machiel.mulder@rug.nl

Overview

Transmission networks are crucial for gas wholesale markets and the European internal gas market. They connect the key players of the value chain as well as the different, mostly national, gas markets to allow for cross-border flows and trading of natural gas. They are operated by regulated transmission system operators (TSOs). In the past, market areas were determined by the individual TSO networks. However, driven by the prospect of higher liquidity in the wholesale market, welfare gains for society and completion of the internal energy market in Europe, market areas are merged. Prior to a merger, a market area was equal to the physical network of a TSO. After a merger, a market area combines a number of physical networks of different TSOs. Furthermore, TSOs' gas transportation services are standardised by regulation and, thus, are in principle interchangeable. This offers the choice to customers to book capacities for trading between market areas at different TSOs. Compared to other EU countries, Germany has by far experienced the most significant reduction from 41 market areas in 2006 to two market areas today while the number of TSOs amounts to 16. Thus, the network users' ability to choose between capacities from different TSOs is particularly pronounced at the border of the German market areas. By drawing inferences from the experiences in the German market areas, one can learn how to further improve the design of the European regulatory regime for gas markets.

As network users have the choice to book capacity at different TSOs, the question arises if their booking behaviour is economically efficient. Secondly, if it is inefficient, what are the explanations for this? Thirdly, if inefficiencies are observed and the underlying factors are understood, to what extent should the tariff scheme and the allocation mechanisms be redesigned to improve the allocation of transport capacity?

Initial results show that network users' booking behaviour seems not to be efficient. This is defined by a booking behaviour that is not in every case leading to the lowest costs possible; a more expensive alternative is preferred over a cheaper alternative. This inefficient booking behaviour can be explained to a very large extent by further distinguishing between different capacity types that are offered. Hence, traders appear to be prepared to choose a more expensive route because of the conditions associated with that route compared to the conditions associated with routes that are at lower tariffs. This finding also means that the TSOs do not operate as pure natural monopolist anymore, but that they face competitive pressure from other TSOs, which may allow for changes to the regulation.

Methods

To analyse the booking behaviour of network users, this paper utilises publicly available auction data provided by the leading platform for gas transport capacities in Europe named 'PRISMA' (https://platform.prisma-capacity.eu/). The data used covers auctions for firm capacities to and from the German market areas in 2016.

All auctions of the data set are assigned to 'homogeneous groups' which are definded by certain attributes. This will ensure that capacities within the same homogeneous group connect the same markets and are assumed to be interchangeable. A homogeneous group is defined based on the equality of the following attributes: product runtime, time of auction start, start of the product runtime, exit and entry market area and the gas quality[1].

For each homogeneous group of auctions, we create a merit order based on total transport costs. The actual and the optimal allocations are determined and compared in order to calculate the inefficiencies. We define and measure the level of inefficiency of a group of auctions - or an aggregation of these - by a ratio *IER*. *IER* is calculated as the ratio of actual transport costs (per unit) observed and the optimal transport costs (per unit) according to the merit order. A hypothesis to explain the inefficiencies is formulated and tested.

[1] Natural gas may be either high- or low-calorific which needs to be distinguished.

Results

Determining the difference between actual and optimal capacity bookings
According to the data set used, capacity was booked only in a small fraction of all homogeneous groups of auctions. The number of homogeneous groups varies between 2 and 949 per border and flow direction to and from the German market areas. The overall inefficiency, i.e. the loss in consumer welfare, amounts to €4m for 2016. In terms of the flow direction of capacity to and from the two German market areas, the capacity weighted inefficiency varies between approximately 2 % and 31 % (see Table 1). Connections within the EU show higher inefficiencies (7 %) compared to connections to and from adjacent third countries (5 %). The overall inefficiency is approximately 6 %.

Explaining the difference between actual and optimal capacity bookings
Costs of observed bookings that exceed the optimal costs according to the merit order of a homogeneous group are considered to be inefficient. However, a merit order assumes that all auctions are adequate alternatives, i.e. all auctions of a group are interchangeable. Firm capacity defined and introduced by European legislation is further specified in Germany. Thus, there are different qualities of firm capacity offered, called 'capacity types'.

We hypothesize that the quality of firm capacity products matters to network users and has an impact on their booking behaviour. Only capacity products of the same capacity type are adequate alternatives. Therefore, the definition of homogeneous groups of auctions needs to be extended by the 'capacity type' for entry and exit.

As Table 1 summarises, the distinction of the quality of capacity types explains nearly all the inefficiencies initially measured. The hypothesis is validated. The inefficiency decreased varying now between approximately 2 % and 9 %. The inefficiency of connections within the EU as well as to third countries amounts to approximately 1 %. The same applies to the overall inefficiency. The loss in consumer welfare can be explained by approximately 93 % leading to an unexplained amount of approximately €0.3m left.

Table 1: Summary of results without and with distinguishing capacity types

group of connections	capacity weighted IER[2] (without distinguishing between capacity typesl)	calculated loss in consumer welfare	capacity weighted IER (distinguishing between capacity types)	explained loss in consumer welfare
GASPOOL Entry	1.20	731,407 €	1.09	78.59 %
GASPOOL Exit	1.02	48,135 €	1.02	11.57 %
total GASPOOL	**1.15**	**779,542 €**	**1.06**	**74.45 %**
NCG Entry	1.03	2,389,129 €	1.00	97.65 %
NCG Exit	1.31	894,158 €	1.04	92.75 %
total NCG	**1.05**	**3,283,287 €**	**1.00**	**96.31 %**
EU	1.07	3,002,234 €	1.01	95.37 %
non-EU	1.05	1,027,738 €	1.01	84.86 %
overall	**1.06**	**4,029,972 €**	**1.01**	**92.69 %**

Conclusion

As the results show, in our data analysis we can explain approximately 93 % of all inefficiencies measured in monetary terms. However, there are still some inefficiencies left unexplained. This will require a deeper analysis.

The research question asks whether the booking behaviour of network users is efficient. According to our results, it seems that the booking behaviour is efficient. Additionally, there is also an indication for a competition amongst TSOs. These two findings may allow or even require changes to the regulatory framework.

References

European Parliament and Council of the European Union: Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005. OJ 2009 L 211/36-54, 2009.

Frontier Economics Ltd.: Research into gas flexibility services, 2008.

Kooperationsvereinbarung Gas: Kooperationsvereinbarung zwischen den Betreibern von in Deutschland gelegenen Gasversorgungsnetzen IX: Anlage 1 Geschäftsbedingungen für den Ein- und Ausspeisevertrag (entry-exit-System), 2016.

[2] These values are 1.00 + *x* whereby *x* expresses the inefficiency measured in percent. The weight also considers the runtime of a capacity product. The capacity of all durations is harmonised to a day-ahead aquivalent.