

# ***Competition under revenue cap regulation with efficiency benchmarking: tariff related incentives for gas transmission system operators in merged markets***

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## **Overview**

In Europe, gas market mergers aim at reducing restrictions on gas wholesale markets. Market mergers also allow network users to book transport capacity at different gas transmission system operators (TSOs), which may give rise to inter-TSO competition. Our theoretical analysis reveals the incentive for TSOs, operating under a revenue-cap regulation in merged markets, to charge lower tariffs at borders where different TSOs offer capacity, compared to borders where only one TSO offers capacity. This incentive does not directly result from revenue-cap regulation but is due to efficiency benchmarking. We test this hypothesis by applying a panel data analysis to tariffs charged at German border points between 2015 and 2018. In line with our hypothesis, we find lower tariffs at those border points where network users have a choice between different TSOs. An additional sensitivity analysis differentiating between transit and meshed networks confirms this result. We conclude that German TSOs, operating in merged markets and under a revenue-cap regime with efficiency benchmarking, compete for demand at borders at which different TSOs offer capacity.

Our paper extends the literature on (de-)regulation of natural monopolists. It has a different view as compared to other work, as the potential competition arises from merging markets with regulated monopolists, and does not arise from unregulated new entrants in the market (see, for example, Cave 2004, 2014). In contributing to the future of tariff regulation in European gas markets, our focus differs from other studies and research, which do not take account of market mergers and their impact on the potential for inter-TSO competition.

## **Methods**

In our theoretical assessment, we determine the incentives for TSOs operating under a revenue-cap regime and in merged gas markets, in setting tariffs. We particularly focus on incentives associated with the presence of other TSOs. Based on this, we hypothesise TSOs operating under a revenue-cap regime in a merged gas market have an incentive to consider other TSOs, and adjust their tariffs accordingly to increase profits. We hypothesise lower tariffs at network points located at borders where different TSOs offer capacity, compared to borders where only one TSO offers capacity.

We test our hypothesis by applying a panel data analysis to tariffs charged between 2015 and 2018 at German border points by German TSOs that operate under a revenue-cap regulation with efficiency benchmarking. Our log-log models are given by:

$$\ln(T_{i,t}^s) = \beta_t^s + \beta_t^s + \beta_1^s dS_{i,t} + \beta_2^s dCD_{i,t} + \beta_3^s dCO_{i,t} + \beta_4^s \ln\left(\frac{\sum_{k=1}^m AR_{k,i,t}}{m_{i,t}}\right) + \beta_5^s \ln\left(\frac{\sum_{k=1}^m CB_{k,i,t}}{m_{i,t}}\right) + u_{i,t}^s,$$

whereby the selected sample  $s$  = minimum, maximum, and median tariffs.

The cross-section ( $i$ ) of our models cover borders between gas markets over time ( $t$ ). The dependent variable  $T_{i,t}^s$  denotes a tariff charged at a border. Since there are multiple tariffs charged at a certain border in case multiple TSO offer capacity at that border, an aggregation is required. For consistency reasons, we apply the model to the minimum, maximum, and the median tariff that is charged at a border; this is indicated by the superscript  $s$ . In terms of the hypotheses, we expect similar results in all three cases. The explanatory variables are:

- a dummy variable  $dS_{i,t} = 1$ , if the number of TSOs offering capacity at a border  $i$  in  $t$  exceeds 1, and 0 otherwise
- a dummy variable  $dCD_{i,t} = 1$ , if the number of TSOs offering capacity at a border  $i$  in  $t$  and having captive demand exceeds 0, and 0 otherwise
- a dummy variable  $dCO_{i,t} = 1$ , if the number of congested IPs at border  $i$  in  $t$  exceeds 0, and 0 otherwise
- $\frac{\sum_{k=1}^m AR_{k,i,t}}{m_{i,t}}$  being the average of allowed revenues of all TSOs  $k = 1, \dots, m$  at border  $i$  in  $t$
- $\frac{\sum_{k=1}^m CB_{k,i,t}}{m_{i,t}}$  being the average of capacity bookings of all TSOs  $k = 1, \dots, m$  at border  $i$  in  $t$

The data set used for the analysis covers borders between the two German gas markets and their adjacent markets, and represents a strongly balanced panel with four observations (2015 - 2018) for 35 cross-sections.

## Results

The theoretical analysis of this paper shows that TSOs operating under revenue-cap regulation have an incentive to change tariffs to maximise profits. However, the incentive is not based on capping the maximum revenues but is due to efficiency benchmarking. The result of efficiency benchmarking, i.e. the efficiency score, is influenced by a TSO's level of capacity bookings. As the efficiency score is considered by the regulator determining the allowed revenues, ultimately the level of capacity bookings impacts the TSO's revenues and profits. To obtain higher capacity bookings, a TSO has the incentive to charge lower tariffs. In an unmerged market, TSOs compete by reducing their costs per unit of output compared to their peer group. In a merged market, TSOs have an additional incentive as they also compete directly for the same demand at borders where more than one TSO offers capacity. Therefore, we expect lower tariffs at network points at borders where different TSOs offer capacity compared to borders where only one TSO offers capacity.

We test this hypothesis by applying a panel data analysis to tariffs charged between 2015 and 2018 at German border points by German TSOs that operate under a revenue-cap regulation with efficiency benchmarking. In line with our hypothesis, we find that the tariffs are up to 52% lower in case more than one TSO offers capacity at a border. An additional sensitivity analysis shows that this result is robust to a differentiation between transit and meshed networks.

## Conclusions

For Germany, where TSOs operate in merged markets and under a revenue-cap regime with efficiency benchmarking, we conclude that TSOs have an incentive to reduce tariffs at network points, where they compete for demand. Our empirical analysis confirms our expectations. Our results show that inter-TSO competition under revenue-cap regulation is possible if an efficiency benchmarking is applied. A merger of gas markets does not impact the physical structure of networks and even gas flows may remain unaffected. Nevertheless, a market merger has an impact on inter-TSO competition since it enhances the tariff related incentives that result from applying an efficiency benchmarking.

## References

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