Chapter 6

Conclusion

6.1 Introduction

This dissertation focusses on the general research question: What is the impact of gas market mergers on the potential for inter-TSO competition within the EU? The chapters dealing with this general research question are summarised in Section 6.2. Based on these findings, this chapter is also dedicated to reflect on the research and its contribution, to discuss caveats, and to formulate research recommendation as well as policy recommendations.

6.2 Results of research

6.2.1 Mergers of Germany’s natural gas market areas: is transmission capacity booked efficiently? (Chapter 2)

As a side-effect of gas market mergers, network users can obtain transport alternatives. However, only in case network users make efficient choices in booking transport capacity, an effective inter-TSO competition could be possible. If network users would not show an efficient booking behaviour, this means there are obstacles, which could relate to, for example, high lock-in effects and high switching costs, or could mean there are regulatory barriers. The latter one could, for example, mean unbundling rules were not strict enough such that network user have a preference to book capacity at an affiliate TSO, rather than booking at the TSO offering capacity at least costs.
A booking behaviour is considered efficient if network users choose amongst transport alternatives the one with the lowest tariff. Therefore, the chapter’s empirical analysis compares the optimal costs of booking to the costs observed. The optimal costs of booking are determined based on a merit order of transport alternatives, ranked by the price of a unit of capacity. The alternatives are determined based on homogenous characteristics of transport capacity as defined by the European regulation, including, inter alia, the source and destination of gas transport, and time aspects. Noting that there may be some deviations between the EU regulation and the national one, potential inefficiencies may be related to these differences.

The analysis uses auction data from the capacity booking platform PRISMA to determine the efficiency of network users’ booking behaviour. The data covers the two German gas markets, GASPOOL and NetConnect Germany, in calendar year 2016. The focus on the German gas markets is motivated by the number of market mergers that have taken place within Germany. Noting that Germany had a high number of smaller, regional markets, for historical reasons, this EU Member State has seen by far the highest market integration activity within the EU.

For both German gas markets, the results show a fairly efficient booking behaviour of network users. Considering the differences between the national and the EU regulation, which relates to quality aspects of transport capacity, network users show an efficient booking behaviour in almost all cases. Additionally, network users appear to be sensitive to these quality differences, which explains why in some cases apparently more expensive alternatives are preferred over less expensive ones.

These results do neither directly mean that inter-TSO competition exists, nor that it is possible. However, they confirm that there are no restrictions in capacity bookings, which is an essential condition for inter-TSO competition.

6.2.2 Competition under revenue-cap regulation with efficiency benchmarking: tariff related incentives for gas transmission system operators in merged markets (Chapter 3)

Price-sensitive booking behaviour, as found by Chapter 2, is a prerequisite for inter-TSO competition. However, it is not a sufficient condition. Therefore, after Chapter 2 has analysed the demand side for transport capacities, Chapter 3 focusses on the supply side.
Since TSOs are regulated entities, the possibilities, and the incentives to engage in tariff competition, are determined by the regulatory regime applied. Therefore, it is necessary to analyse how TSOs in merged market areas set tariffs assuming efficient booking behaviour on the demand side, and considering the regulatory regime applied. Therefore, Chapter 3 investigates tariff related incentives for TSOs that are regulated by a revenue-cap regime, which is the most common regulatory regime applied in European gas markets.

A theoretical analysis reveals that TSOs under revenue-cap regulation have an incentive to change tariffs once a market merger has created transport alternatives to network users. This incentive is based on an efficiency benchmarking, which compares a ratio of TSO’s output (i.e., capacity bookings) with input (costs) within a peer group. This result of benchmarking affects the revenues and profits of these TSOs. Thus, the chapter hypothesises that tariffs are lower at network points at borders where different TSOs offer capacity compared to borders where only one TSO offers capacity.

The empirical analysis of this chapter uses data concerning the German gas markets to test the hypothesis. The applied panel data analysis is based on data covering tariffs charged between 2015 and 2018 at German border points by German TSOs. It confirms the hypothesis: tariffs at a particular border are up to 52% lower in case more than one TSO offers capacity at that border, i.e., when a TSO faces competition from other TSO(s). An additional sensitivity analysis shows that this result is robust to structural differences in the size and complexity of TSO networks.

The chapter concludes that German TSOs that are operating in merged markets under a revenue-cap regime with efficiency benchmarking reduce tariffs at competitive borders.

6.2.3 Challenging natural monopolies: assessing market power of gas transmission system operators for cross-border capacity (Chapter 4)

Even if network users make efficient bookings, and TSOs have incentives to adapt tariffs, this does not directly imply that inter-TSO competition is possible. The need for TSO regulation, and hence the possibility for competition, depends on their market power. Gas TSOs are assumed to have significant market power, which is why they are regulated by default. Motivated by Chapters 2 and 3, Chapter 4 challenges this general belief.
In line with general competition policy, Chapter 4 develops a two-step approach to assess market power of gas TSOs in Europe. First, so-called relevant markets are defined. Hereby, a relevant market covers all substitutes a customer could choose from, in case a supplier increases the price of a good. As a second step, the market power of each supplier within each relevant market is determined. Noting that there are different measures to perform these two steps, the chapter’s approach to assess market power of TSOs relies on the so-called residual supply index, which is commonly used particularly in electricity wholesale markets. The residual supply index measures (in-)dispensability. Related to gas transport capacity, it indicates whether a certain route of gas transport is needed to supply a market, or whether the volume can be shifted to other routes. This allows for determining relevant markets. The same index can be used to determine the market power of TSOs in a relevant market. In case a TSO is found to be indispensible, the firm has a dominant position having so-called significant market power, which may require market intervention.

The empirical analysis of Chapter 4 already anticipates a planned market merger between the two current markets towards a single German gas market. Thus, the analysis directly contributes to shaping the regulatory framework for this new market. It assesses the market power of TSOs for cross-border capacity in this single market. The data used for the analysis covers the period from 2014 to 2018.

As a result, the chapter identifies seven relevant markets for cross-border capacities involving German TSOs. In 15% of the cases, TSOs had significant market power, in 85% of the cases, TSOs had no significant market power.

Based on these results, inter-TSO competition in merged gas markets seems to be possible in the majority of cases since the risk of an abuse of market power is low given the TSOs are dispensable. Furthermore, the current regulatory constraints imposed on gas TSOs, such as tariff regulation, may be relaxed when market mergers lead to effective inter-TSO competition for cross-border capacity.

### 6.2.4 Conditions for inter-TSO competition (Chapter 5)

The results of Chapters 2 to 4 suggest that inter-TSO competition in merged gas markets may be possible: there are no restrictions in capacity bookings, TSOs respond to the presence of competing TSOs offering transport alternatives, and TSOs are found to have no significant market power anymore in the majority of cases. If TSOs are found to have no significant market power (anymore), regulation is economically not justified, and authorities should consider abandoning sector-specific

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1. At the time of writing, the merger is expected to take place in October 2021.
regulation, or reducing its intensity. Although the results are based on data covering the German gas markets only, it should allow for being generalised at least for EU markets noting that Germany applies the same EU-wide regulatory principles as all other Member States.²

Chapter 5 discusses the intensity of inter-TSO competition that can be expected once regulation is abandoned. Thereby, it reveals a number of risks to effective inter-TSO competition, and provides appropriate measures to mitigate these risks. Ultimately, the chapter provides policy recommendations, which, if implemented, allow for inter-TSO competition under regulation. The proposed measures are detailed ones, which taken together, aim at allowing TSOs to compete on tariffs by relaxing the regulatory rules on tariff setting. This enhanced freedom in setting tariffs allows for inter-TSO competition on tariffs in merged gas markets. This is supposed to positively impact welfare. Particularly, increases in allocative and productive efficiency can be expected provided some specific regulatory measures are applied.

6.3 Contribution to the literature

This dissertation contributes to different aspects in the literature. It provides new insights related to market integration. Opposed to most of other literature on energy markets, the focus of this research is not on the impact of market integration on wholesale markets, but on the impact of market integration on regulated infrastructure operators and the need for regulation.

This dissertation also discusses the introduction of competition to regulated infrastructure monopolists, which is also discussed in the literature on regulation in the telecommunication sector (Cave, 2014). In telecommunication, the regulated monopolistic incumbents face competitive pressure by new firms entering the market using a new technology, i.e., fibre instead of copper networks, or mobile instead of fixed connections. The regulation in the telecommunication sector actively promotes new firms entering this growing market. However for gas TSOs, the situation is different. Here, potential competition does not arise from new firms entering the market with a new technology; it is because of gas market integration, which is a change in the institutional rules for the wholesale markets.

² See also Section 6.4.
Although the origin of infrastructure competition is different between telecommunication and gas, this dissertation uses a similar starting point for assessing the appropriate level of regulation of network operators that face competitive pressure. It is the question whether a firm has significant market power, which creates the need for regulation. In answering this question, this dissertation defines relevant markets and assesses market power based on the residual supply index. This approach and measure is widely used in the literature, such as in the wider sense of competition policy, as well as in analysing telecommunication and electricity markets (see, for example, Motta, 2004; Swinand et al., 2010; Mulder and Schoonbeek, 2013; Briglauer et al., 2017).

In addition, this dissertation also provides findings related to the behaviour of gas market participants considering the regulation applied. The empirical analysis of the booking behaviour of network users finds that this behaviour is efficient, which means there are no restrictions related to capacity bookings (see, for example, Jones et al., 2002). This is a necessary condition for inter-TSO competition.

As for the behaviour of TSOs, this research confirms that this behaviour is highly dependent on the regulatory regime applied. Hereby, the dissertation contributes particularly to the literature on revenue-cap regulation (see, for example, Crew and Kleindorfer, 1996; Arcos-Vargas et al., 2017). With reference to infrastructure competition, it highlights that this regulatory regime is inferior as compared to other regimes, such as price-cap regulation. This is due to the regulatory account, which is part of a revenue-cap regime, as it effectively shields a firm against losses, even if these result from competition. Nevertheless, elements allowing for a certain competitive pressure are found, such as an efficiency benchmarking.

Finally, in providing detailed policy recommendations on how to allow for competition amongst regulated entities, this dissertation also contributes to the literature on the (de-)regulation of infrastructure monopolists (Vogelsang, 2002; Cave, 2014). It highlights that inter-TSO competition is possible, and that competition amongst infrastructure operators can be obtained by market integration.
6.4 Limitations and research recommendations

The research carried out, and the conclusions and policy recommendations derived are subject to some limitations. The dissertation’s recommendations for future research are closely linked to these limitations. Furthermore, the implementation of changes to the regulatory framework as proposed will bring forward new relevant topics for future research.

The scope of research covers market mergers within the EU, hence, under the EU regulatory framework. In other regions, the regulatory principles may be different. For example, U.S. gas markets do not rely on entry-exit systems, which are at the core of EU gas markets (Hunt, 2008). Hence, future research may assess to what extent findings of this dissertation are transferable to other regions.

The empirical research of this dissertation makes use of data covering the German gas markets. This is based on the assumption that Germany can be considered as a proxy for all gas markets in the EU. The EU, as a supra-national body, prescribes a regulatory framework applicable to all Member States. However, this may not lead to fully equal regulatory regimes in all Member States. For example, Germany applies a revenue-cap regulation. Although being the most common one in the EU, there are also other forms in place (Economic Consulting Associates Ltd., 2018). Thus, future research may verify the results of this dissertation for different Member States, particularly focusing on the differences in the regulatory regime applied.

As the empirical research of this dissertation focuses on the German gas markets, it also means it focuses on a merged market that covers only one Member State, hence, only one regulatory authority. In the future, cross-border market mergers can be expected, such as between Spain and Portugal, Croatia and Hungary, Italy and Austria, and amongst the Baltic States (ACER and CEER, 2020). The question arises whether the results obtained may be fully transferable, and what potential issues may arise. For example, if two countries are involved in the merger, and so are two regulatory authorities, questions may arise related to the distribution of costs and benefits of the merger. Furthermore, there may be also different consequences for security of supply as countries may have different dependencies on gas imports.

The introduction of inter-TSO competition also leads to some follow-up questions. Assuming effective inter-TSO competition, the distribution of risk changes. Particularly, risks may shift from network users to TSOs and their shareholders. Especially, the financial risk for TSOs will increase as more competition means less protection by the regulation. The risk of a business, in turn, has an impact on the firm’s costs of capital. This will also impact the behaviour and expectation of the
TSOs’ shareholders. It needs to be assessed, whether and to what extent this relationship and potential additional changes to the respective regulatory provisions, for example, a higher risk premium to offset the increased risk, may undermine the benefits associated with inter-TSO competition.

As a consequence of inter-TSO competition, there may be stranded assets (Simschauser and Akimov, 2019). TSOs have to take investment decisions, for example, on pipelines, having depreciation periods of 50 years and longer. Thus, a change in the regulation could mean that firms are not able to recover their investment costs, and are left with stranded assets. In this situation, TSOs and their shareholders may consider legal actions. This is particularly the case if the assets cannot be used for other purposes, such as a transport of renewable gases, and in case cross-border and domestic activities are effectively separated.

Finally, there is the EU transition to become carbon neutral (European Commission, 2019). This transition affects fossil gas as well as renewable gases (such as hydrogen), and their related infrastructure. To obtain integrated competitive markets for both fossil and renewable gases, future research should support this transition. Hereby, research should not disregard the role of regulation – for either market.

6.5 Policy recommendations

Looking at the current EU regulatory framework for gas TSOs, it appears that EU policy makers do not address the potential for inter-TSO competition. For example, current rules on tariff setting and its application to multi-TSO markets aim at full harmonisation, and restrict inter-TSO competition (European Commission, 2017a; 2017b). This suggests that the impact of market mergers on TSOs is not sufficiently addressed in the regulatory framework. However, this should be addressed, as regulating TSOs means regulating and designing gas markets. This dissertation shows that inter-TSO competition in merged gas market is possible given the appropriate regulatory framework to allow for it. On the basis of such competition, an increased allocative efficiency is expected. In practice, this means that transport costs between adjacent markets will decrease, which leads to an increased integration of these markets. For example, an increased price convergence of these markets can be expected to increase the liquidity of the (wholesale) markets. Ultimately, an increase in the competitiveness of wholesale markets is supposed to benefit final cus-
tomers with more stable gas prices. Besides that, the increased market integration based on inter-TSO competition positively impacts the security of supply within the EU. Therefore, policy makers should consider changes to the regulatory framework to allow for inter-TSO competition.

The results are also relevant in terms of the EU’s transition to carbon neutrality. If this transition means that, over the time, less fossil gas will be transported, this can lead to increased pressure on the infrastructure operators. With constant transport capacity and reduced demand, an inter-TSO competition, if allowed for by the regulatory framework, will become stronger, and less TSOs will be indispensable. This could mean TSOs consider decommissioning assets. However, the transition to carbon neutrality is linked to a ramp-up of markets for renewable gases, which require infrastructure as well. It may be economically efficient to repurpose existing gas pipelines to transport, for example, hydrogen instead of building new pipelines (ACER, 2021). As decommissioning is associated with a loss to the firm, a TSO can have an incentive to repurpose a pipeline for hydrogen transport rather sooner than later. This incentive depends on the regulatory regimes applied to both fossil gas and hydrogen transport. The stronger the competition related to fossil fuel pipelines, the higher the incentive for TSOs to escape the competitive pressure, for example, by repurposing the pipelines. This can even mean that, due to high competitive pressure, more pipelines than actually needed, at least more than currently needed, will be repurposed. This may contribute to the development of a hydrogen market, however, inefficiently, whilst competition related to pipelines transporting fossil gas is undermined. Therefore, the interaction of the regulatory frameworks applied to both fossil gas as well as to hydrogen transport, and the incentives for repurposing pipelines need to be considered.