



Cross-border constraints, institutional changes and integration of the Dutch–German gas market



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ABSTRACT

We evaluate the contribution of nine institutional changes to the integration of the Dutch and German gas markets. We analyse this contribution through the impact of bottlenecks in the cross-border infrastructure on the absolute value of cross-border price differences. In the period 2007–2013, the absolute value of the differences in price levels between the Dutch and the German NCG market decreased, indicating more integration. We find evidence that the improved connections within the German networks as well as between the Dutch and the German network contributed to this. The strengthening of the connections with the UK market and the Russian supply, however, had a negative effect on market integration between the Dutch and the German NCG market. The liquidity-enhancing changes within the Dutch market had a negligible effect.

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1. Introduction

Since the liberalisation of European gas markets in the 1990s, market places in various European countries have been developed, such as the National Balancing Point (NBP) in the United Kingdom, the Title Transfer Facility (TTF) in the Netherlands, and NetConnectGermany (NCG) in Germany. The liquidity of in particular NBP and TTF has grown significantly over the past years (Heather, 2012). For the creation of a European gas market, the national market places need to be connected, enabling traders to engage in international price arbitrage. The available transport capacity, however, frequently formed a constraint for international trade (Neumann, Rosellón and Weigt, 2011). In addition, access to the transport infrastructure was limited as long-term access rights were granted to the existing firms on the basis of non-market mechanisms as FCFS and pro-rata,¹ resulting in an inefficient use of cross-border capacity (EC, 2007; LECG, 2011; NMa, 2007).

We estimate the impact of cross-border infrastructure barriers on cross-border price differences, and we analyse to which extent this impact changed under the influence of institutional changes affecting

the liquidity of separate market places. Our paper is related to papers like Siliverstovs, L'Hégaret, Neumann and von Hirschhausen (2005), Cuddington and Wang (2006), Marmer et al. (2007) and Growitsch et al. (2013) who also analyse the integration of regional gas markets. The contribution of our paper is that we not only use data on prices, but also data on the utilisation of infrastructure. Also, unlike earlier literature, we make a distinction between low calorific gas (L-gas) and high calorific gas (H-gas) for which different supply grids exist in the Netherlands, Belgium, Northern France and Northern Germany. H-gas is mainly used by industrial consumers. Furthermore, we assess the contribution of institutional changes in national market places to the integration of markets, comparable to the analysis of Kleit (1998) who analyses the effect of deregulation on integration of the US gas markets.

We focus on the Dutch market, as here a large domestic supply and demand coincide with a high degree of connection with its neighbouring countries (Germany, Belgium and the United Kingdom), while a number of institutional changes occurred in the recent past.² In the period 2007–2013, three major changes in the Dutch gas market affected the liquidity of the TTF (Heather, 2012). In 2009, the obligation of market parties to

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¹ FCFS stands for First Come First Served; “pro rata” is an allocation on the basis of relative demand.

² Within countries also bottlenecks might exist, as was the case between the different German networks, but these do hardly play a role in the Dutch market which consists of one integrated network. Only barriers between the L-gas and the H-gas infrastructures occurred now and then until July 2009, when the obligation to book quality-conversion capacity was abolished.

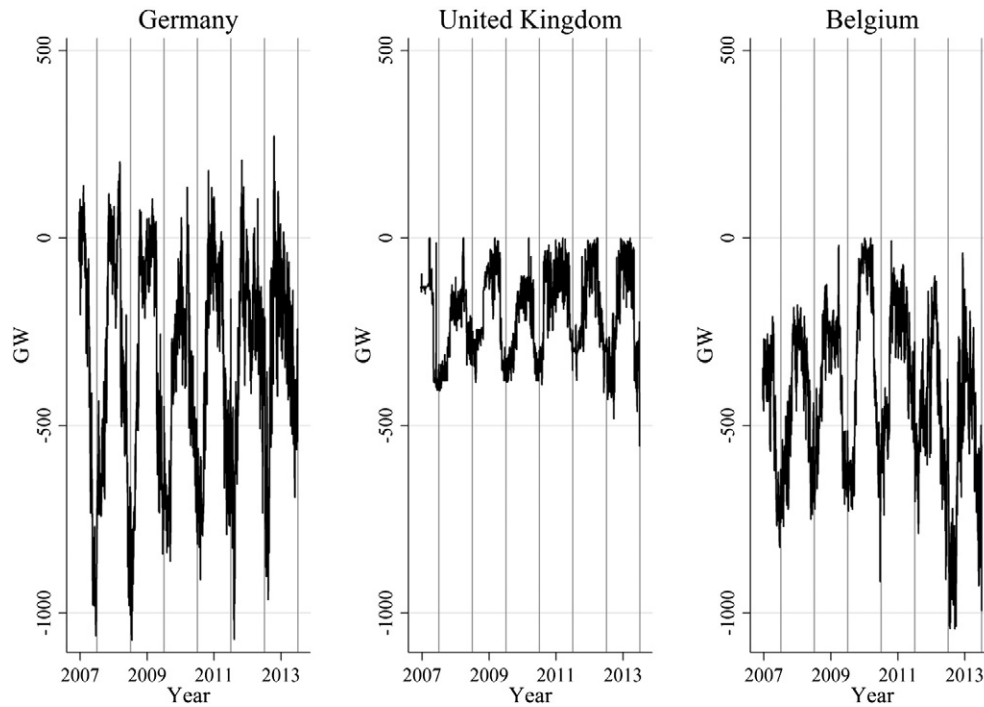


Fig. 1. Net flows between the Dutch market and the markets in Germany, the United Kingdom and Belgium, 2007–2013 (Source: GTS; net flows = Dutch import–Dutch export).

book quality-conversion capacity was abolished, actually removing the distinction between H-gas and L-gas in gas trade. In April 2011, two other changes were implemented: the introduction of a market-based balancing regime, and the new policy of the Dutch incumbent gas trader GasTerra to supply all gas for the domestic market on the TTF instead of factory gates or city gates. Moreover, the Dutch market became stronger connected to the UK market in 2010.

We further focus on the connection with Germany as most of the Dutch imports and exports pass this border.³ Although Germany has two major gas market areas NetConnect Germany (NCG) and GASPOOL Balancing Services (GPL), we analyse in particular the connection with NCG as this hub was more a trading hub than GPL which was until recently primarily used for balancing purposes (Heather, 2012). In the NCG market a number of merging activities took place during the period of analysis. Note that Growitsch et al. (2013) found that the NCG and GPL markets were reasonably well economically integrated, although capacity constraints hindered perfect arbitrage from time to time. In addition, the German network became directly connected to the Russian gas fields by completing the Nord Stream project in 2012. Finally, the Dutch and the German networks became more connected through the acquisition of the part of the German network by the Dutch TSO (Gasunie) in 2008 and the introduction of new mechanisms to allocate capacity on the Dutch–German border in 2013.

Our analysis is directed at the influence of the aforementioned institutional changes on the integration of the TTF and the NCG market. All these changes were supposed to make the gas markets more liquid. As an increase in liquidity enlarges the flexibility of a market to respond to exogenous shocks, we expect that these measures also have reduced the impact of cross-border constraints on price differences between the Dutch and German markets. In an integrated market, price levels converge

(Stigler and Sherwin, 1985). Because daily changes in cross-border utilisation in particular affect short term prices, we use day-ahead prices.

Since daily gas prices are very volatile, we apply GARCH (1,1) models to the absolute value of the differences in daily gas prices on the TTF and NCG over the period June 2007–December 2013.⁴ We use a mean equation in which the key explanatory variables are the daily utilisation rates of the L- and H-gas export infrastructure and dummies for the institutional changes with interaction terms. We control for the influence of annual and seasonal patterns, outside temperature and the Ukraine gas crisis in 2009.

The utilisation rates are used as a measure of the cross-border constraints, using daily data on transport flows and capacity (GTS, 2012). We measure the constraint as a continuous variable because traders can be expected to face more difficulties in acquiring additional capacity if the level of transport flows approaches the capacity levels. This general relationship holds even more in the gas industry where most of the capacity is booked in advance through long-term contracts, leading to situations in which some traders face capacity restrictions where others still have unused capacity (CEER, 2011). This means that utilisation rates below 100% may restrict international price arbitrage.

This paper proceeds as follows. Section 2 gives the theoretical background. Section 3 describes the Dutch gas market and its connection to the German market. This section also introduces various institutional changes in the Dutch and German gas markets. Section 4 presents the empirical model, while Section 5 gives the results of the econometric analysis, and Section 6 concludes.

2. Infrastructure constraints and gas prices

We measure the integration of gas markets by how price differences evolve over time. This analysis is based on the idea that in a fully integrated market, price differences quickly disappear as a result of traders using arbitrage opportunities (Stigler and Sherwin, 1985). In such a market, price differences between countries do not exceed the actual costs of transportation. If, however, constraints between regional markets do

³ The highest hourly export flow of L-gas to Germany in 2013 was 39 GW, which was about twice as big as the highest export flow to Belgium (19 GW). For H-gas the respective amounts are 32 (Germany) and 26 (Belgium) GW, while the export of H-gas to the United Kingdom peaked at 20 GW in 2013. For the import of H-gas, the Dutch–German is even more important: the highest hourly import in 2013 was 40 GW, while through the Dutch–Belgium border no more than 9 GW was imported. Source: GTS.

⁴ The price data are obtained from Bloomberg. These data are to a large extent similar to the data from ICIS Heren, although some small differences exist.

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