

ESTIMATION OF THE EFFICIENCY OF POLICY MEASURES TARGETING A MORE INTEGRATED GAS MARKET

Olivier Massol, Center for Economics and Management, IFP School, Phone +33 1 47 52 68 26, olivier.massol@ifpen.fr
François Lévêque, Centre for industrial economics, Mines ParisTech, Phone +33 1 40 51 91 73, francois.leveque@mines-paristech.fr
Ekaterina Dukhanina, Chair on the Economics of Natural Gas, Phone +33 1 40 51 91 26, ekaterina.dukhanina@mines-paristech.fr

Overview

The liberalization of the European gas market, being a prerequisite for the integration, is ongoing and policy makers need to find efficient measures aiming at an increase in liquidity on gas trading hubs.

Currently there are two gas trading regions in France, the Northern one, benefiting mostly from pipeline supply and historically more liquid, and the Southern region, recently extended by a merger of two southern gas hubs, dependent on relatively more expensive liquefied natural gas (LNG) imports. Large price differentials have been observed during periods of insufficient LNG supply. The decision to merge two southern zones has been taken in order to equilibrate Northern and Southern markets, bringing the prices in the South down until additional infrastructure will be built. We consider this merger of two trading zones as an example of the policy targeting a more integrated gas market and study the market evolution using gas prices, capacities and flows data.

We apply an empirical then a theoretical approaches to study the degree of gas market integration before and after policy measures. The empirical method gives us important insights about market behaviour and provides the results according to an empirical notion of market integration. The second method relies on a theoretical notion of integration and confirms the results of the empirical analysis. The spatial equilibrium theory has not been applied yet to the research dealing with gas market integration. Following this methodology we estimate the probabilities of observing a particular trade regime with positive, negative or zero arbitrage rent. We analyse the change in these probabilities after the policy implementation. After that, we study the relation between estimated probabilities and the infrastructure load.

The application of spatial equilibrium theory can open a new page in studying the market integration and in assessment of policies. This will be useful taking into account European initiatives to create an integrated and liquid gas market.

The paper is organised as follows: after the introduction, we overview the French gas market evolution and explain the policy decision to merge two gas trading zones. The third section describes the data. The fourth part presents an econometric analysis. The section five deals with the spatial equilibrium theory. The sixth section concludes.

Methods

In order to understand the price behaviour and to verify the law of one price we test for a cointegration relation between Northern and Southern gas prices. Following Cuddington and Wang (2006), we study the market integration through stationarity analysis of the price spread and compare the results before and after policy measures. Then, we rely on the theory of spatial arbitrage regimes of Sexton et al. (1991) and extended parity bounds model of Barrett and Li (2002), based on maximum likelihood estimation. According to Negassa and Myers (2007), we introduce a dummy variable for the policy and test the hypothesis of a change in probability to observe a particular trade regime after the merger of trading zones. In addition, we integrate a Bayesian approach of Kleit (2001) that consists in a correction for serial correlation in order to deal with inter-period linkages existing on the gas market.

Results

Thanks to econometric modelling we detected changes in price behaviour and found that the market became more integrated after the extension of the South trading region. We discovered that the price spread depended on its previous value and the values of past shocks. Our estimates show that the North and the South prices are

cointegrated, their spread is stationary and the market absorbs eventual shocks quicker after the policy implementation. The parity bounds model confirmed increased market integration after the zone extension showing a higher probability to observe the spatial equilibrium regime. Analysing the relation between the infrastructure use and the regime probability, we detected an improvement in market efficiency and in the efficiency of the infrastructure use after the merging of the Southern gas trading zones. We also found indices of increase in liquidity in the South trading zone after the policy implementation.

Conclusions

The French example allowed us to infer about market integration and market efficiency analysing the situation before and after a merger of two Southern gas trading zones. We studied the market integration regarding its empirical and theoretical notions. Thanks to empirical approach we found that the market became more integrated after the policy implementation. A theory based spatial equilibrium model confirmed increased market integration after the zone merging showing a higher probability to observe the spatial equilibrium regime. Analysing the relation between estimated arbitrage regimes and the infrastructure load rate we found an improvement in market efficiency and in the efficiency of the infrastructure use after the merging of the Southern gas trading zones.

If the first econometric method gave us an empirical estimation of the market integration before and after policy measures, the second method, which has not been applied yet to the research dealing with gas market integration, confirmed the results thanks to a theory based spatial equilibrium model. Such application of spatial equilibrium theory can open a new page in the assessment of policies and will be useful taking into account European initiatives to create an integrated and liquid gas market.

References

- Barrett, C.B., Li, J.R. (2002). "Distinguishing between Equilibrium and Integration in Spatial Price Analysis." *American Journal of Agricultural Economics* 84(2): 292–307.
- Cuddington, J.T., Wang, Z. (2006). "Assessing the degree of spot market integration for US natural gas: evidence from daily price data." *Journal of Regulatory Economics* 29(2): 195–210.
- Kleit, A.N. (2001). "Are Regional Oil Markets Growing Closer Together? An Arbitrage Cost Approach." *The Energy Journal* 22(2): 1–15.
- Massol, O., Banal-Estañol, A. (2016). *Market Power and Spatial Arbitrage between Interconnected Gas Hubs*. Working Paper
- Massol, O., Hache, W. (2016). *Sanctions against Iran: An assessment of their global impact through the lens of international methanol prices*. Working Paper
- Negassa, A., Myers, R.J. (2007). "Estimating Policy Effects on Spatial Market Efficiency: An Extension to the Parity Bounds Model." *American Journal of Agricultural Economics* 89(2): 338–352.
- Neumann, A. (2009). "Linking Natural Gas Markets--Is LNG Doing its Job?" *Energy Journal*.
- Samuelson, P.A. (1952). "Spatial Price Equilibrium and Linear Programming." *The American Economic Review* 42(3): 283–303.
- Schultz, E., & Swieringa, J. (2013). "Price discovery in European natural gas markets". *Energy Policy*, 61, 628-634.
- Sexton, R., Kling, C., Carman, H. (1991). "Market Integration, Efficiency of Arbitrage and Imperfect Competition: Methodology and Application to U.S. Celery." *American Journal of Agricultural Economics* 73(3): 568–580.
- Spiller, P.T., Huang, C.J. (1986). "On the Extent of the Market: Wholesale Gasoline in the Northern United States." *Journal of Industrial Economics* 35(2): 131–145.
- Takayama, T., Judge, G.C. (1971). "Spatial and Temporal Price and Allocation Models." North- Holland: Amsterdam.