Estimation of the efficiency of policy measures targeting a more integrated gas market

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Introduction

- **Context:**
  - An integrated market improves possibility to forecast and can preserve the market from disturbances and reinforce the security of supply
  - In order to achieve an integrated gas market policy makers need to find efficient measures aiming at an increase in liquidity on gas trading hubs

- **Goal of the paper:**
  - To analyse the efficiency of a policy targeting a more integrated gas market

- **Motivation:**
  - French case offers an example of such policy
  - The efficiency of this policy has not been evaluated yet
  - According to European initiatives to create an integrated, efficient and liquid gas market further mergers of trading zones are proposed

- **Question:**
  - Whether the merger of two zones has helped to get a more integrated and efficient gas market?

French case: gas markets after liberalization

- **Gas balancing zones:**
- Entry-exit system for gas transmission tariffs based on division into balancing zones

- The number of zones has been gradually reduced after a series of mergers

- Currently 2 gas trading regions:
  - North: PEG Nord
  - South: TRS

- **North PEG:**
- Mostly pipeline supply
- Higher liquidity

- **TRS:**
- Mostly LNG supply
- Lower liquidity

Source: GRTGaz

Literature

- **Historical definition of integration:**
- Two geographical markets for a tradable good are integrated if the price difference between these two markets equals the unit transportation cost

- **Empirical approach:**
- Interrelations between prices in different locations:
  - co-movements, correlation, Granger causality (Doane & Spulber,1994),
  - cointegration (De Vany & Walls,1993; Serletis,1997; Asche et al., 2002, 2013 and Siliverstovs et al., 2005),
  - stationarity of pairwise price differentials (Cuddington & Wang, 2006),
  - short term and long term relations (Park et al., 2008; Brown & Yücel, 2008; Schultz & Swieringa, 2013; Olsen et al., 2015)
  - Kalman filter approach and time varying degree of price convergence (King & Cuc,1996; Neumann et al., 2006; Neumann, 2009 and Renou-Maissant 2012),

- **Spatial equilibrium approach:**
- Spatial efficiency of the market: in equilibrium all arbitrage opportunities are being exploited
  - Spatial equilibrium theory (Enke, 1951; Samuelson, 1952; Takayama & Judge, 1971 and Harker, 1986)
  - Parity bounds model with arbitrage equilibrium, autarchic and barriers to trade regimes (Spiller & Huang, 1985; Sexton, Kling & Carman, 1991; Barrett & Li, 2002; Negassa & Myers, 2007; Massol & Banal-Estañol, 2016)

Methods

- **Spatial equilibrium model :**

- Parity bounds model with policy dummies which estimates probabilities (by maximum likelihood method) to be in one of three trade regimes:
  - Spatial equilibrium with zero arbitrage rent (R = 0): $\Delta P_{ijt} - C_{ijt} = e_t$
  - Barriers to trade with positive arbitrage rent (R > 0): $\Delta P_{ijt} - C_{ijt} = e_t + u_t$
  - Autarchic with negative arbitrage rent (R < 0) : $\Delta P_{ijt} - C_{ijt} = e_t - u_t$

- Where $R_t = \Delta P_{ijt} - C_{ijt}$ represents marginal rent from arbitrage, e_t is a random shock, assumed to be normally distributed with zero mean and standard deviation σ_e and u_t is non-negatively valued random variable assumed to be half-normal and distributed independently from e_t with standard deviation σ_u

- Ex-post assignment of the regime for each observation in order to analyse the relation between the regimes and the infrastructure use

Results

- **Parity bounds model estimation:**

Period	Before zone merger			After zone merger		
Parameters	λ1	λ2	λ3	γ1	γ2	γ3
Regime	R=0	R>0	R<0	R=0	R>0	R<0
Probability	0,51	0,20	0,30	0,72	0,12	0,16
Z statistics	26,89	14,44	18,07	30,20	7,29	8,57

- Higher probability to observe the spatial equilibrium regime (market became more spatially efficient)

- Reduced probability of the regime “barriers to trade” (less unexploited arbitrage opportunities observed after the policy)

- Decrease in probability to be in the autarchic regime (decrease in trade when the trade is not profitable)

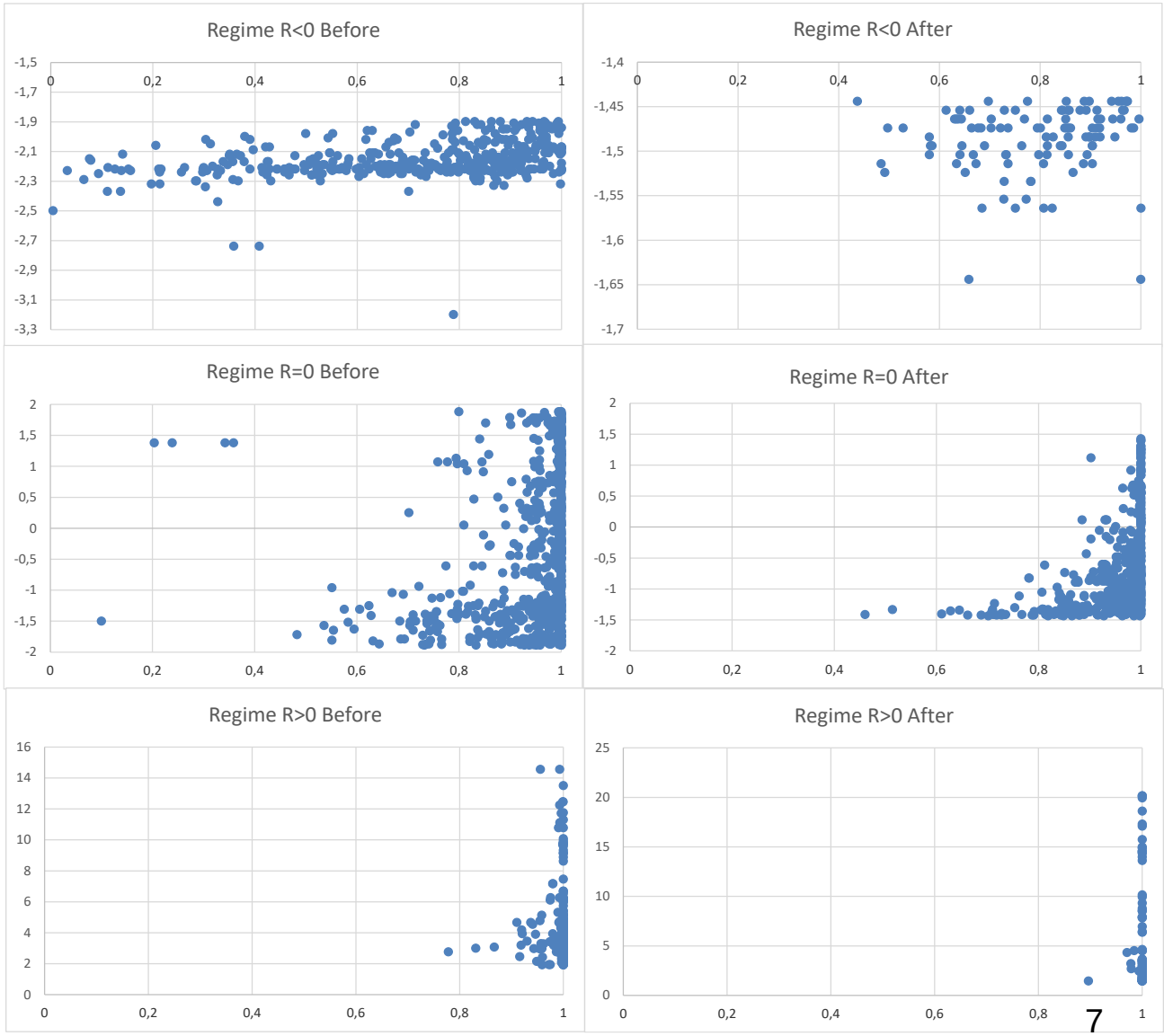
Arbitrage rent vs Load rate analysis

- **Before the policy:**

- Pipeline fully loaded in the autarchic regime
- Not fully loaded in barriers to trade and equilibrium regimes

- **After the policy:**

- Higher load in equilibrium, lower load in the autarchic regimes
- Signs of increased liquidity
- Fully loaded in the barriers to arbitrage regime
- Improvement in the efficiency of the infrastructure use



Conclusions

- The study allowed us to estimate the efficiency of a policy measure targeting a more integrated gas market using spatial equilibrium framework.
- A parity bounds model is applied to measure the impact on spatial efficiency of the market of a policy decision to merge two gas trading zones in the South of France.
- The model shows increased market integration and improved market efficiency after the policy implementation.
- The analysis of the infrastructure load rate indicates an increase in liquidity on the market and an improvement in the efficiency of the infrastructure use.

THANK YOU!