



# **Regulation of Natural Gas Pipeline Investments**

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## **An Experimental Evaluation**

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# Overview

- Introduction & Research Questions
- Economic Experiments
- Results & Conclusions

# Introduction & Research Questions

# Introduction

- The question how to induce an optimal level of investments in network infrastructure has raised the attention of both academia and policy makers
- Natural gas market in the EU: Investment in new interconnector capacity is required to establish a common market for gas

# Introduction

- Request of regulators & shippers:
  - Optimal level of investments in pipeline capacity
- “Obstacle” for the TSO / potential investor:
  - Risk of stranded assets / fear of insufficient return on investments
- Potential means to address these issues:
  - Regulatory holiday regulation
  - Long Term Financial Transportation Rights (LTFTR)

# Regulatory Holiday

- An Investor is temporarily exempted from regulation for the new pipeline capacity
- The additional revenues are intended to compensate an investor for an ex-ante risk of stranded assets
- EU Legislation (Directive 2003/55/EC) actually has provisions for exemptions similar to regulatory holidays

# LTFTTR

- LTFTTR are financial hedges
- Shippers can buy LTFTTR. LTFTTR entitle their holders to a share of the TSO's revenues from its sales of transportation capacity on the spot market
- Benefits for the TSO:
  - Information on future demand
  - Low volatility income stream
- Benefits for shippers:
  - Protection against not obtaining transportation capacity
  - Protection against “too high” spot market prices

# Research Questions

- What is the relative performance of regulatory holiday and rate of return regulation in achieving an optimal level of pipeline capacity investments?
- Does the inclusion of long term demand information by means of periodic LTFTR auctions enhance / interact with the performance of the two regulatory schemes?



# Economic Experiments

# Economic Experiments

- Real Humans (subjects) are put into a **controlled laboratory environment**
- The subjects interact according to a set of rules (institutions) specified by the experimenter
- Subjects are paid in real currency, their **payment is performance-depedent**

# General Advantages

- Ex-ante evaluation of regulatory schemes
- Comparison with theoretical benchmarks possible
- Detection of opportunities for efficiency decreasing strategic behavior in regulatory schemes

# Our Environment

- 1 TSO, 4 shippers
- 30 spot market periods
- Spot market auction for transportation capacity in every period (uniform price lowest accepted bid)
- Shippers learn their individual transport capacity demands in periods 1, 7, 13, 19 and 25 for the current and next five periods with certainty
- Aggregate demand grows between periods 1-12, stagnates between periods 13-15, decreases between periods 16-18 and then continues to increase again
- TSO can invest in pipeline capacity every third period (1, 4, 7, ...)

# Results & Conclusions

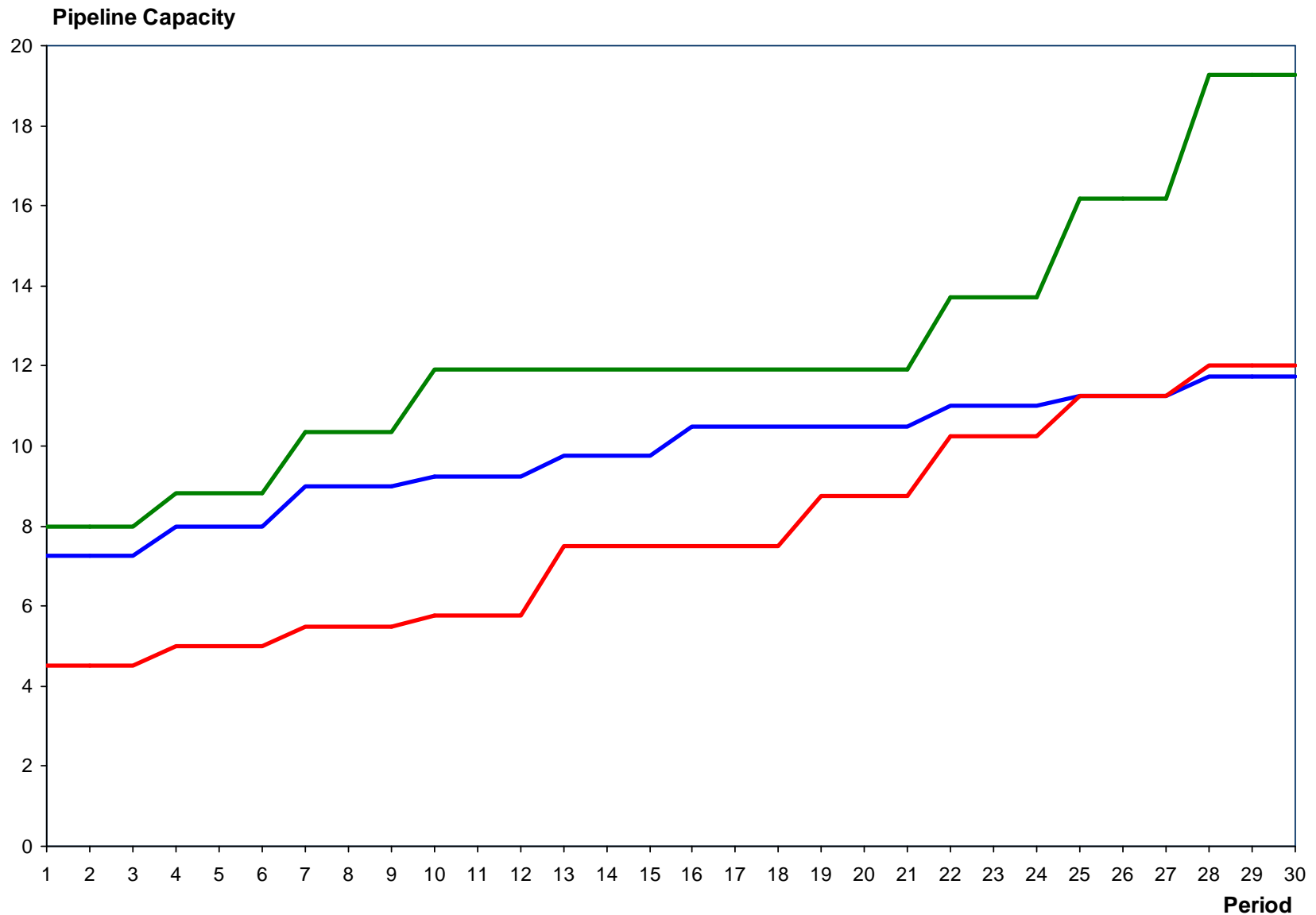
# Data

- So far, we have conducted the RoR / No LTFTR and Regulatory Holiday / LTFTR treatments
- 4 sessions with different subjects for each treatment

# Results

	$K_{it} - K_{it}^{comp}$			$P_{it}^{spot} - P_{it}^{spot-comp}$			$\Pi_{it} / \Pi_{it}^{comp}$		
	Coef.	Std. Err.	$p >  z $	Coef.	Std. Err.	$p >  z $	Coef.	Std. Err.	$p >  z $
$\alpha(cons)$	<b>-2.575</b>	<b>0.455</b>	<b>0.000</b>	<b>14.758</b>	<b>4.191</b>	<b>0.000</b>	<b>0.945</b>	<b>0.017</b>	<b>0.000</b>
$\beta$	<b>-2.025</b>	<b>0.644</b>	<b>0.002</b>	<b>30.717</b>	<b>5.926</b>	<b>0.000</b>	<b>-0.176</b>	<b>0.024</b>	<b>0.000</b>

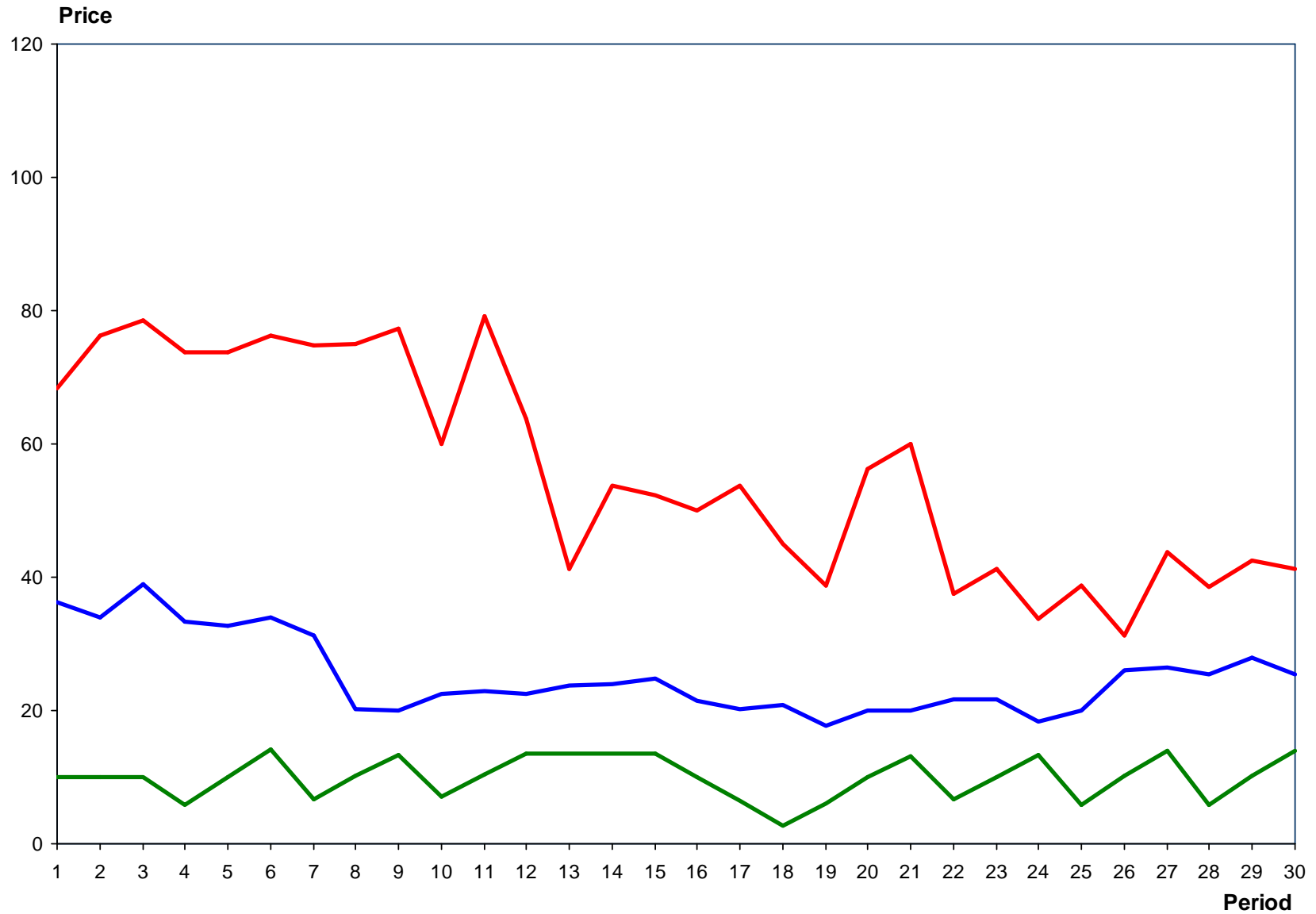
# Pipeline Capacity Development with Experienced Subjects



— Optimum — Rate of Return — Regulatory Holiday / LTFTR



# Transportation Capacity Spot Market Prices with Experienced Subjects



— Optimum — Rate of Return — Regulatory Holiday / LTFTR

# Preliminary Conclusions

- Regulatory holiday regulation does not provide incentives for optimal pipeline capacity expansion
- Periodic LTFTR auctions seem to deliver useable information on future demand from the shippers to the TSO
  - In combination with regulatory holiday regulation, this permits the TSO to behave anti-competitively



**Thank You Very Much!**