

*The complex set of storage usages in liberalized markets calls for a renewed theoretical framework (Anna Creti, The economics of natural gas storage)*

In evolving global markets for natural gas and restructuring efforts in the EU, storage :

- 1) provides flexibility,
- 2) promotes competition, and
- 3) enhances security of supply

## In the European Union

- There is no working market for commercial storage (except UK)
- Several countries are characterized by a lack of storage capacity
- Directives let member Countries opt between rTPA or nTPA as storage is not a natural monopoly and competition is feasible in principle.
- Security of gas supply raises serious concerns and strategies against disruption are becoming of crucial importance.

03/05/2009

IEFE - Bocconi University

3

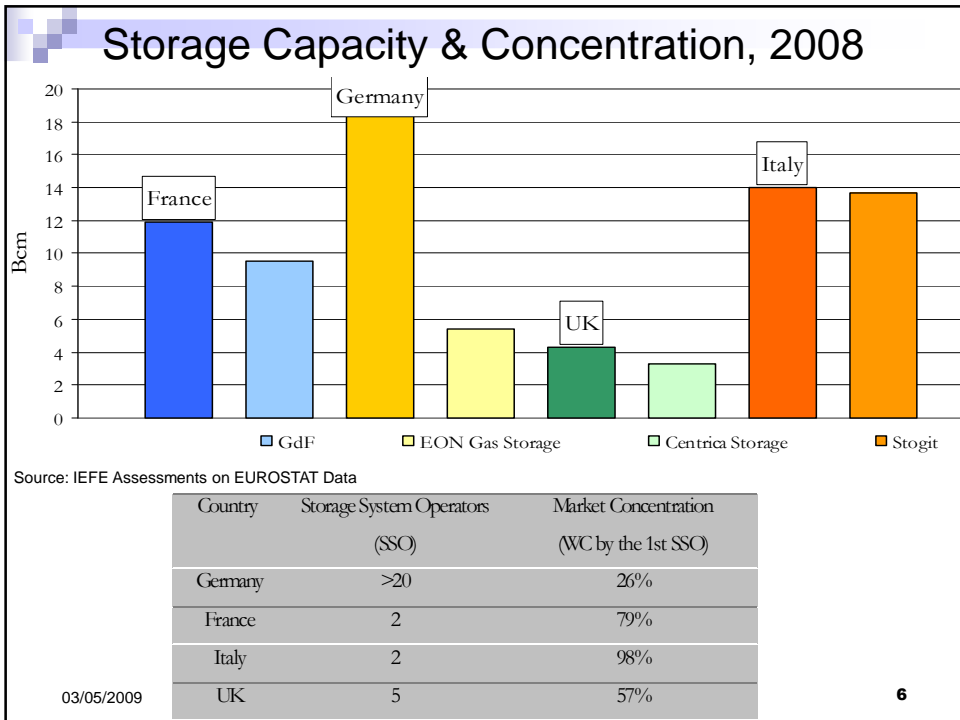
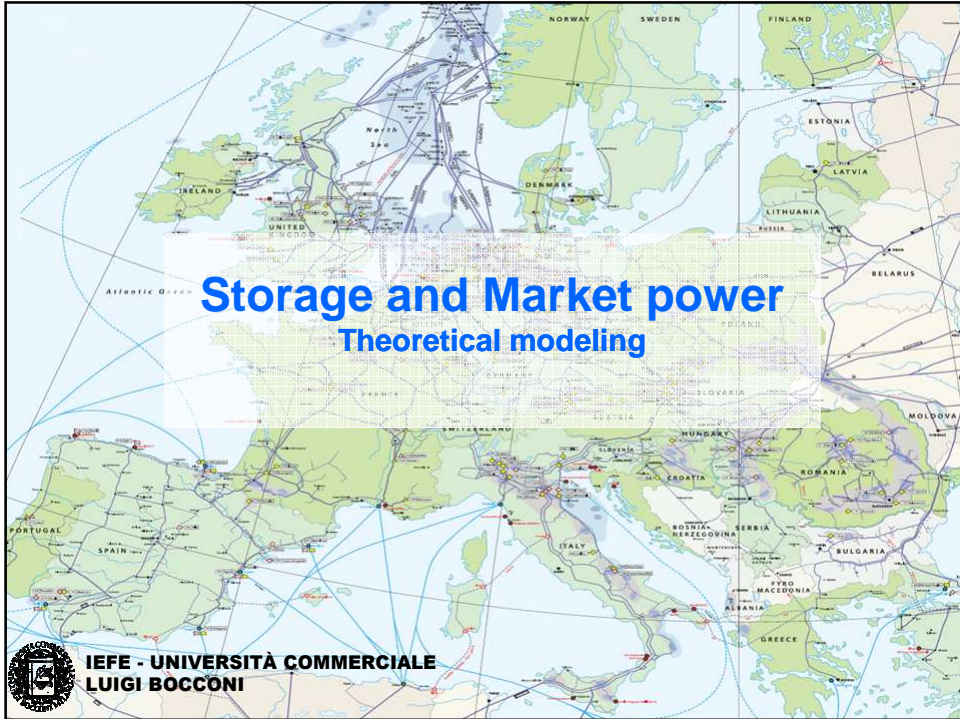
## Outline of the presentation

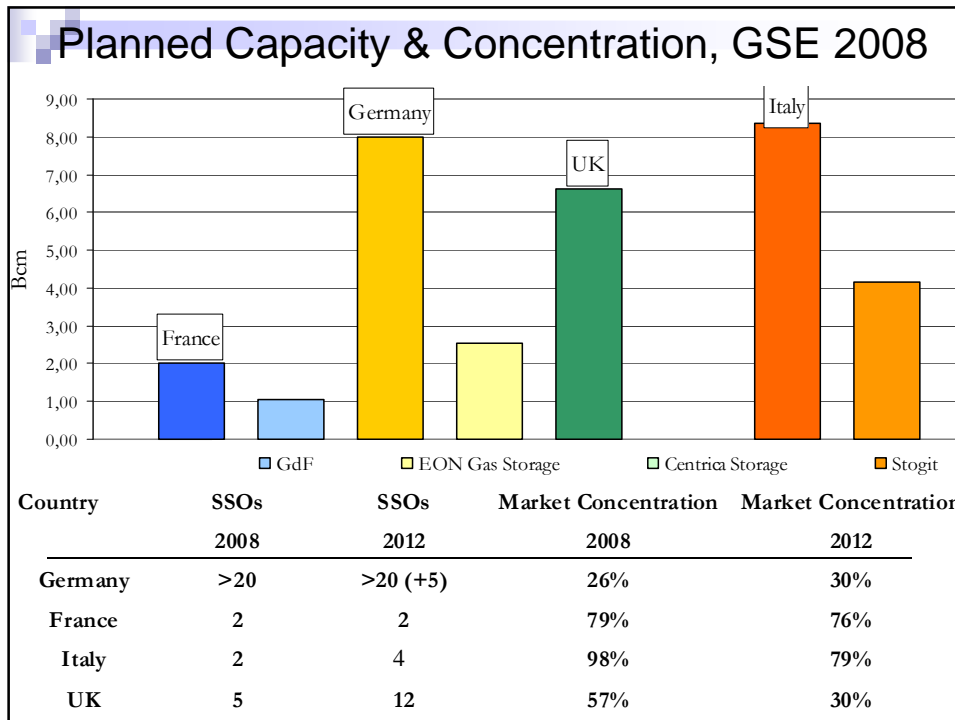
- Two main topics:
  - Storage and Market Power
  - Storage and Security of Supply
- *Main figures in Europe, literature, recent models*

03/05/2009

IEFE - Bocconi University

4





### Literature

**Strategic role** of storage: it can influence the future decisions of rival firms.  
 An oligopolistic firm may invest in storage capacities to try to preempt the future production of its competitors  
*Arvan (1985), Saloner (1987) and Pal (1996), Poddar and Sasaki (2001), Mitraille and Moreaux (2007) and Durand-Viel (2007).*

Effects of **vertical integration** or the effects of storage on the **strategic decisions** of upstream and downstream firms  
*Salinger (1988), Schrader (1994), Gaudet and Van Long (1996), Poudou (2005)*

Importance of storage for **intertemporal price discrimination**  
*Kirman and Sobel (1974) and Philips and Richard (1989)*

03/05/2009 IEFE - Bocconi University 8

**Baranes et al. Naturagl Gas Storage and Market Power,  
Chapter 3 in Creti (ed) The Economics of Natural Gas  
Storage, 2009**

**BACKGROUND:** Gas hubs and TPA to storage services should increase the liquidity of the supply and enable operators to discriminate between gas supply sources: market power issues

**ANALYTICAL FRAMEWORK:** Public service obligations & strategic dimensions of storage services.

Very intuitive model of gas markets focusing on the incentives for firms to strategically use natural gas storage facilities.

**APPLICATION:** France

03/05/2009

IEFE - Bocconi University

9

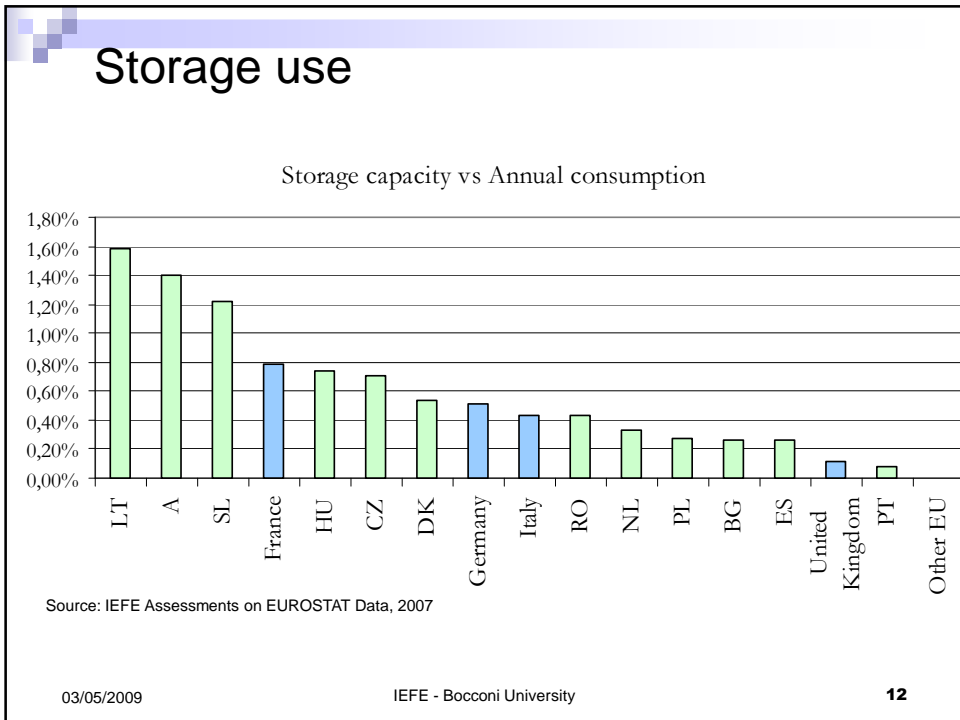
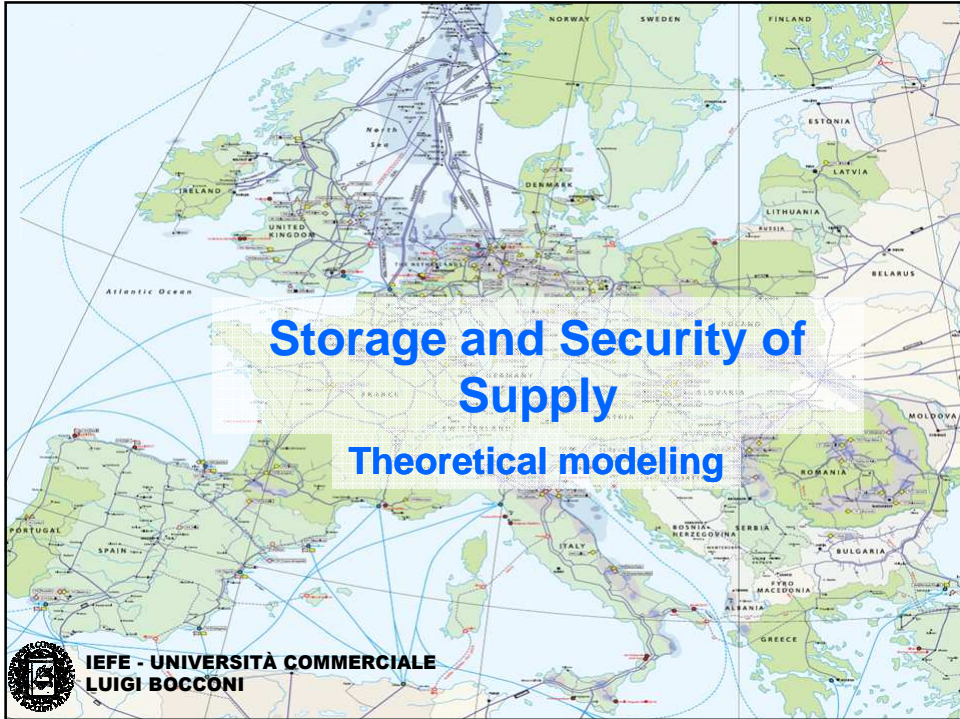
- Storage, as an intermediate good, can influence vertical relationships between upstream operators and suppliers through the spot market.
- Access to facilities allows rival firms to adjust strategically the gas price on downstream market (when competitive suppliers are integrated with an upstream oil&gas company).

**RESULTS:** Strategic use of storage sites may occur with: pre-emptive access to storage facilities (i.e. leadership), vertical integration (i.e. no unbundling) or low flexibility degree of storage facilities.

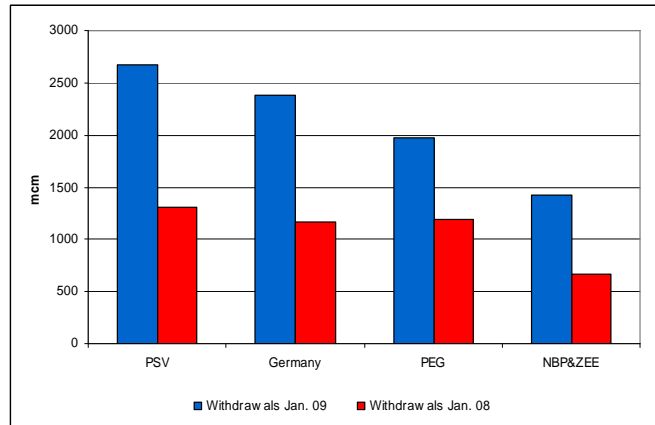
03/05/2009

IEFE - Bocconi University

10



## Gas withdrawn from storage...recently



Source: GSE database, 2009

03/05/2009

IEFE - Bocconi University

13

## Literature

### Price stabilization and buffer stocks

static models; stochastic shifts (jointly distributed random variables) in linear demand and supply; **no private storage**

*Waugh (1944), Oi (1961) and Massel (1969)*

### Theory of production with storage

dynamic programming models: **i.i.d supply shocks**; arbitrage equations; existence of a stationary rational expectation equilibrium

*Newbery and Stiglitz (1981, 1982); Williams and Wright (1991), Sheinkman and Schechtman (1983), Deaton and Laroque (1992, 1996); Routledge, Seppi and Spatt (2000)*

### Natural resources theory: strategic fuel reserve

Trade-off between **current and future security of supply**; extraction rates

*Teisberg, 1981, Hillman and Van Long, 1983, Lindsey, 1989 Nichols and Zeckhauser, 1977, Devarajan and Weiner, 1987, Ford, 2005*

03/05/2009

IEFE - Bocconi University

14

**Creti A. et al. "Storage and Security of Supply in the Medium Run", Resource and Energy Economics, 2008**

**BACKGROUND:** Precautionary storage ensures uninterrupted gas services in the short-medium term.

**ANALYTICAL FRAMEWORK:** Persistent shock: "low probability-high impact" event

Model in which a private sector has the incentive to store as it foresees the probability of a supply disruption.

Stockholding decisions balance the valorisation of gas in the event of a crisis with its carrying cost.

**APPLICATION:** The UK

03/05/2009

IEFE - Bocconi University

15

Original method to evaluate storage anti-speculative policies in a dynamic setting completes the theoretical analysis (cost of imperfect policies in a detailed example calibrated on UK data).

**RESULTS:** equilibrium prices, optimal stockpiling and drainage rules.

A rationale for accumulating strategic gas stocks does exist, thus casting some doubts on the current UK gas security policy.

03/05/2009

IEFE - Bocconi University

16



Clara Poletti  
Iefe – Università Bocconi  
[www.unibocconi.it](http://www.unibocconi.it)

03/05/2009

IEFE - Bocconi University

17