

# Public Ownership, Environmental Regulation and Environmental Quality: Evidence from the European Energy Industry

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# EU Energy industry: policy reforms

- ❑ Pricing and investment crucial for social well-being, competitiveness and growth
- ❑ After WWII, Public Monopoly main paradigm for economic and political reason
  - Natural monopoly → sub-optimal investments under competition
  - Risks associated to Private monopoly and short-term profit-max goal
    - Pricing detrimental to social welfare
    - Sub-optimal capital-intensive investments with long-term returns
  - With State Owned Enterprises (SOEs), departure from short-term profits
    - Investments according to political priorities(universal service)
    - Pricing below average costs to achieve redistributive social goals: cross-subsidization and economic losses covered by public finance
- ❑ Public Monopoly paradigm under crisis during the '80s
  - Lack of **internal incentives**: agency costs, inefficient governance
  - Lack of **external incentives** due to monopolistic setting

# EU Energy industry: policy reforms

Policy reforms: the new paradigm

## ❑ Privatization

- internal incentives for productive efficiency
- reduce public debt to comply with the EU stability pact
- Attracting private equity and promoting new cycles of investments

## ❑ Liberalization

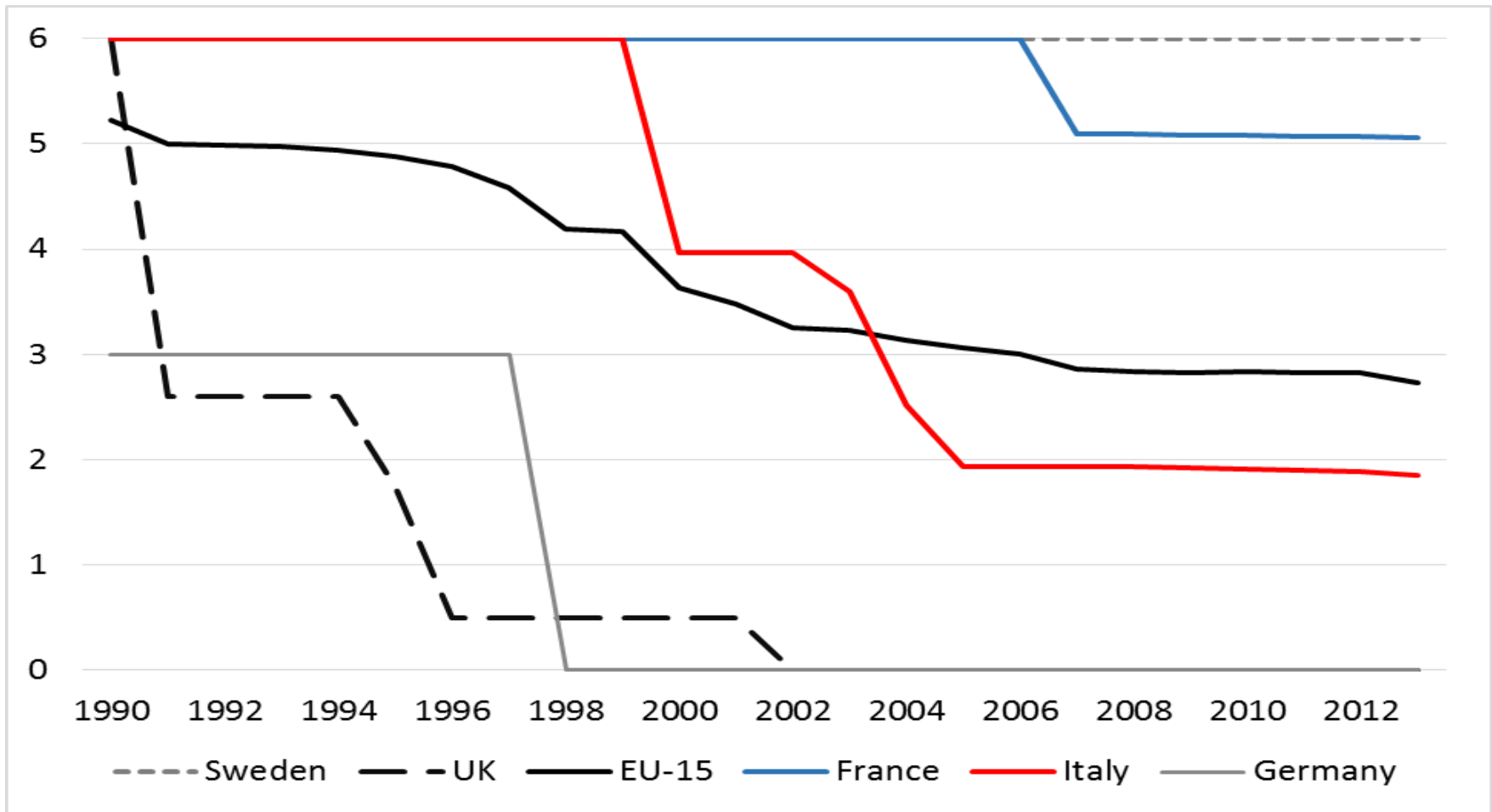
- external incentives for improving efficiency
- Transferring improvements to consumers in terms of lower prices
- Promoting market integration at European level

## ❑ Timing and intensity of market reforms monitored by the OECD:

- ETCR indicators range from 0 to 6, where 0 points to the maximum reforms

# Evolution of Public ownership

## OECD Public Ownership Index in Energy Sector



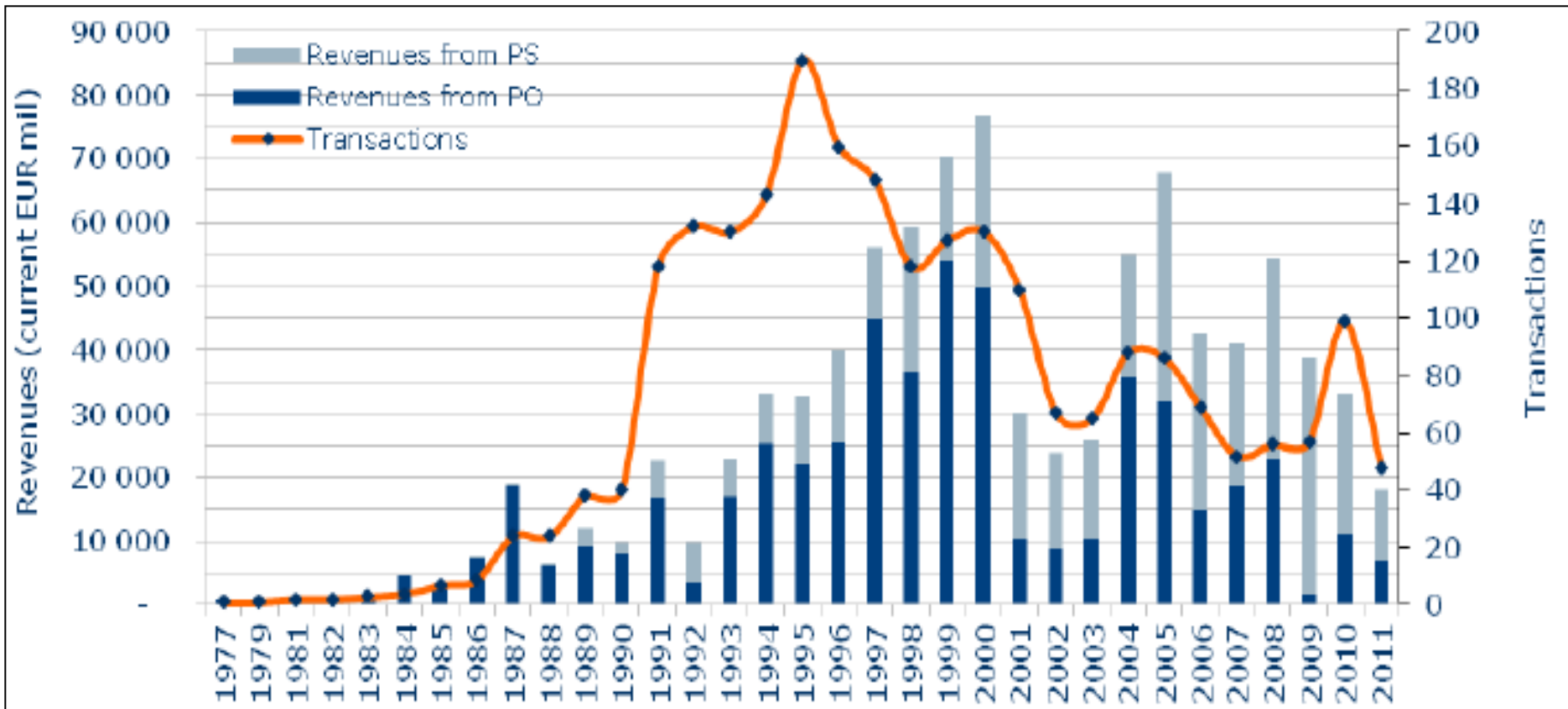
- Intensity and timing of privatization strongly heterogeneous across countries

# Evolution of Public ownership

Privatization slowdown during the new Millenium (before financial crisis)

*“for both political and economic reasons, the state will remain a major owner of productive assets in a number of economies for years to come”* (World Bank 2006).

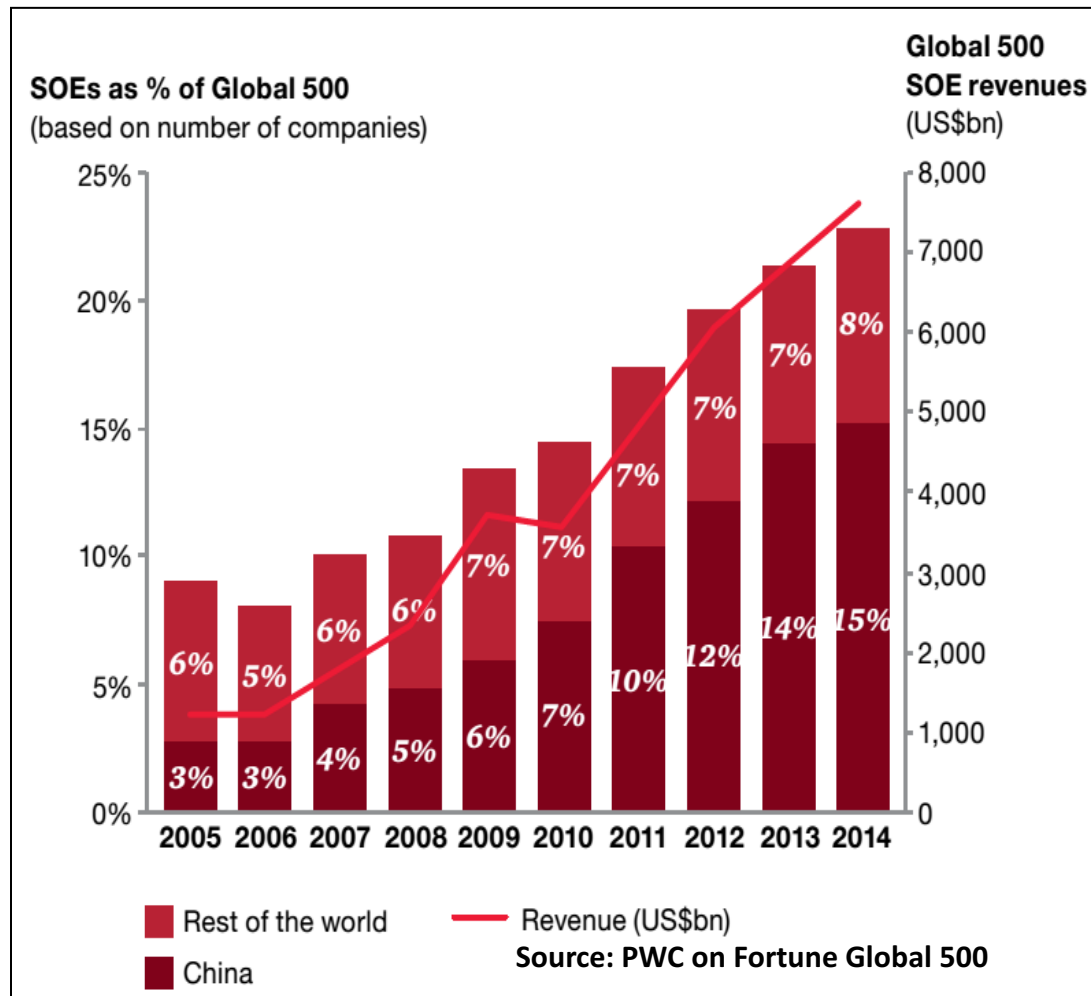
**Privatizations:** Transaction and values of operations (Source: Privatization Barometer)



# Evolution of Public ownership

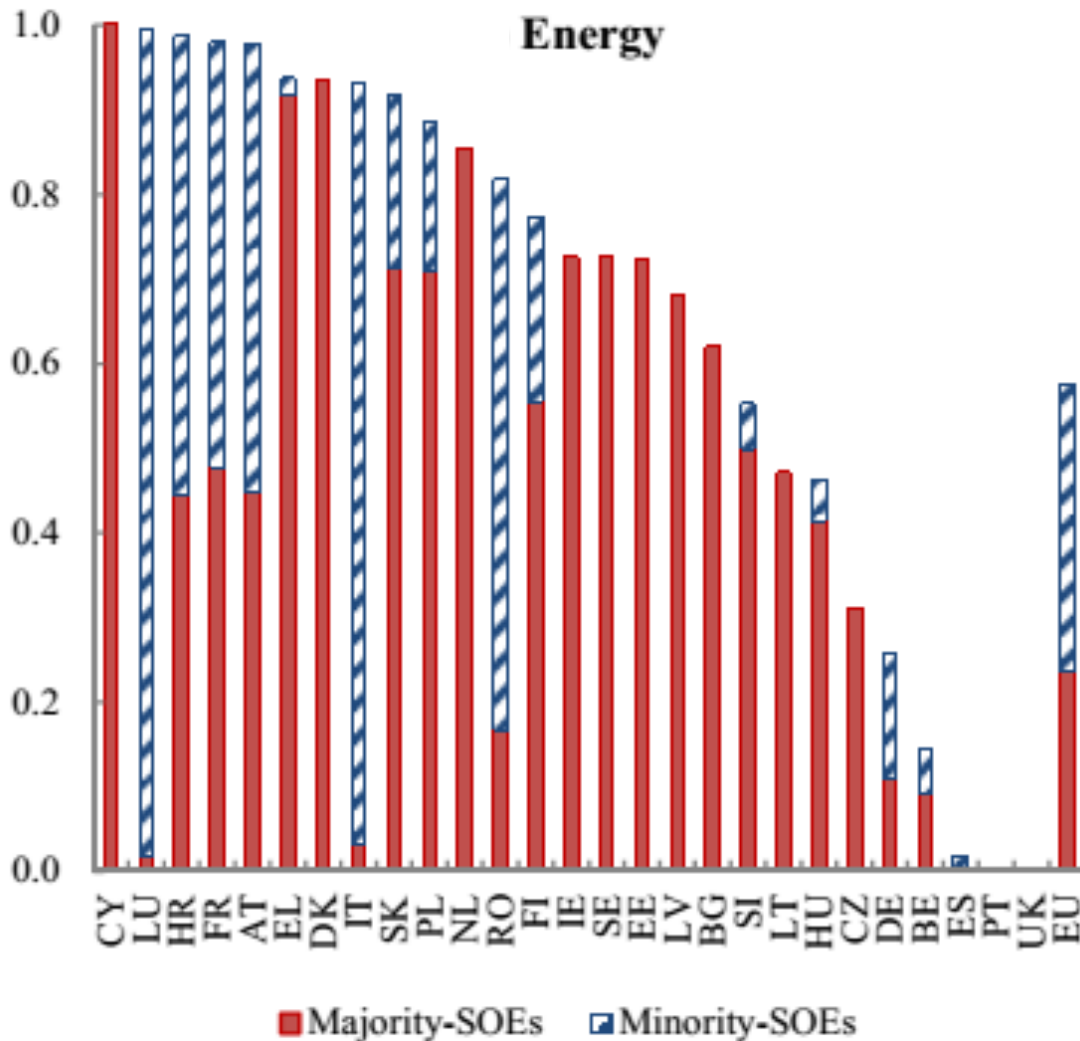
Fortune top 500 listed companies: SOEs increased from 10% in 2005 to 23% in 2014

Largest SOEs in the telecom, power generation and railway sectors



# Evolution of Public ownership

- In Europe, Share of SOEs' turnover in total energy turnover almost 60% in the EU
- High heterogeneity across country



Breakdown by  
ownership structure  
of total turnover,  
2008-2013

# Evolution of Public ownership

- ❑ Variety of contemporary SOEs, depending on the intensity of reforms
- ❑ **New set of external incentives:** SOEs brought to compete in liberalized markets
- ❑ **New set of internal incentives:** major internal reforms
  - Corporatization under private law (private enterprises with public control)
  - Degree of public control: mixed ownership and listed on stock market
  - Type of control: indirect through intermediary bodies or pyramidal organizational structures (government ultimate owner)
- Do previous findings still hold for contemporary SOEs after decades of reforms?
- Have market opening and SOEs' corporate re-organization created room for expanding business and improving performance?
- Are new SOEs managed like private companies or do they still preserve some features of traditional SOEs in terms of public mission?

Clò S., Fiorio C. V., Florio M., (2017) The targets of state capitalism: evidence from M&A deals, [\*European Journal of Political Economy\*](#)

- SOEs' expansion via M&As; targeting strategies depending on ownership structure

Clò S., Di Giulio M., Galanti T., Sorrentino M. (2016), Italian State-Owned Enterprises After Decades of Reforms: still public?, [\*the Italian Journal of Public Economics\*](#)

- SOEs Cover 40% of market capitalization; well performing and profitable firms
- Different objective function depending on the intensity of reforms

Borghi et al. (2016), Institutions and Firms' Productivity: Evidence from Electricity Distribution in the EU, [\*OXFORD BULLETIN OF ECONOMICS AND STATISTICS\*](#)

- Public ownership shows higher productivity in high institutional countries

Fiorio C. and Florio M. (2016), Electricity prices and public ownership: Evidence from the EU15 over thirty years, [\*Energy Economics\*](#)

- ❑ Public ownership is associated with lower residential net-of-tax electricity prices
- ❑ Ongoing research on the role of SOEs and governments to stimulate innovation

## Is there any relation between public ownership and environmental performance?

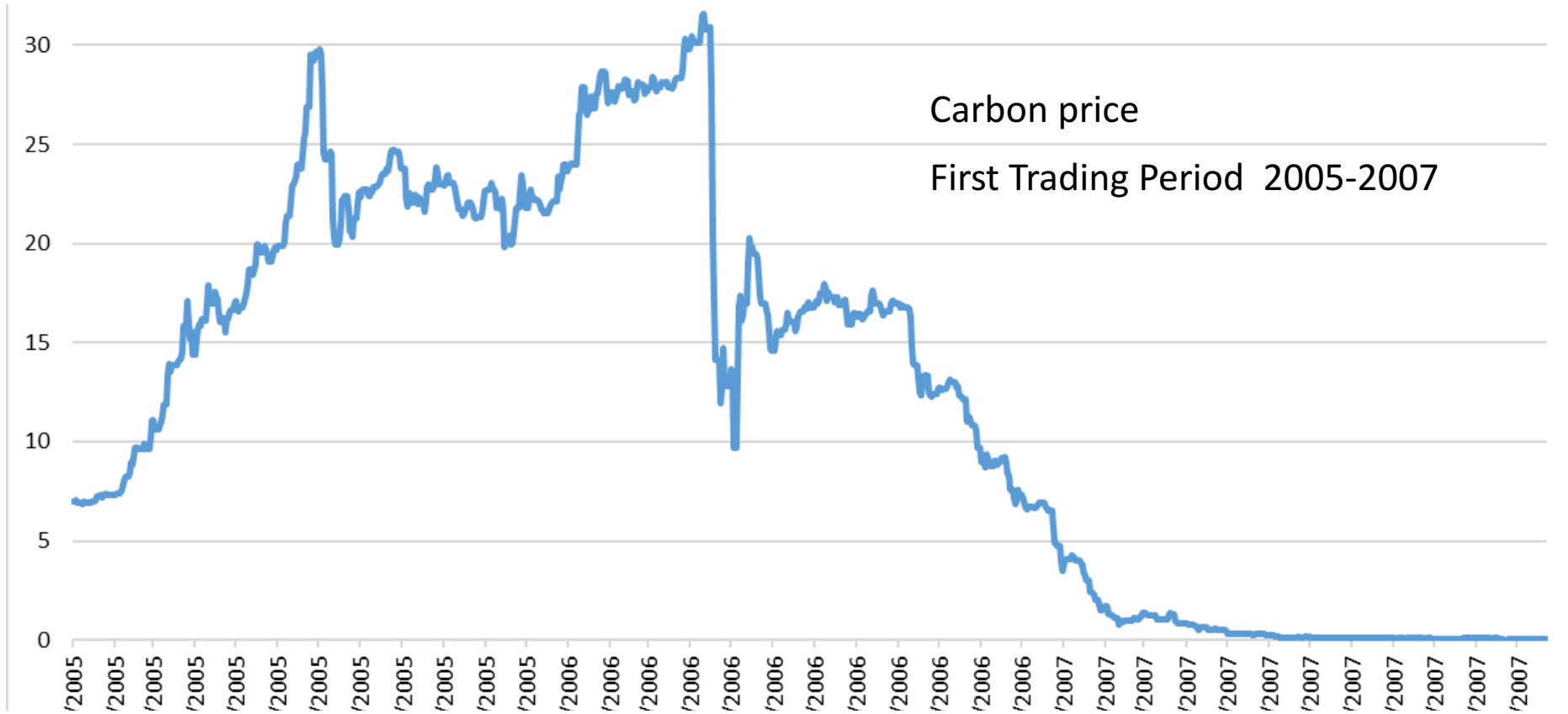
- ❑ Social demand for environmental protection since the '90s, when major reforms have driven out governments from direct and exclusive energy provision
- ❑ Private enterprises competing in liberalized markets plan their investments to max profit (when, where, how much, which tech) without accounting for externalities
  - ❑ renewable technologies not competitive, why should privates adopt them?
  - ❑ Reducing carbon emissions is costly, why should privates abate emissions?
- ❑ Indirect public intervention into energy markets to achieve environmental goals
  - ❑ Subscription of binding targets and implementation of market-based instruments to give economic agents the proper incentives to achieve them
  - ❑ EU adopts a cap and trade scheme: the **European Emissions Trading Scheme**

## EU ETS: Cap and Trade Mechanisms

- ❑ Regulates more than 11,000 installations from energy and industrial sectors
- ❑ Cover almost 50% of EU GHG emissions
  
- ❑ Regulator fixes ex-ante a cap to emissions
- ❑ Equivalent n° of emissions permits created and allocated among regulated agents
- ❑ Installations must deliver an amount of permits equal to the produced emissions
- ❑ Agents free to decide how to comply with regulation “make or buy”
  
- ❑ Free bargaining of allowances brings to an efficient equilibrium where emissions abated at lowest costs and price equals the lowest marginal abatement cost
  
- ❑ Carbon emissions are priced making fossil fuel less convenient, but ETS is an artificial market, scarcity of allowances required to support price

# Ownership, Regulation and environmental quality

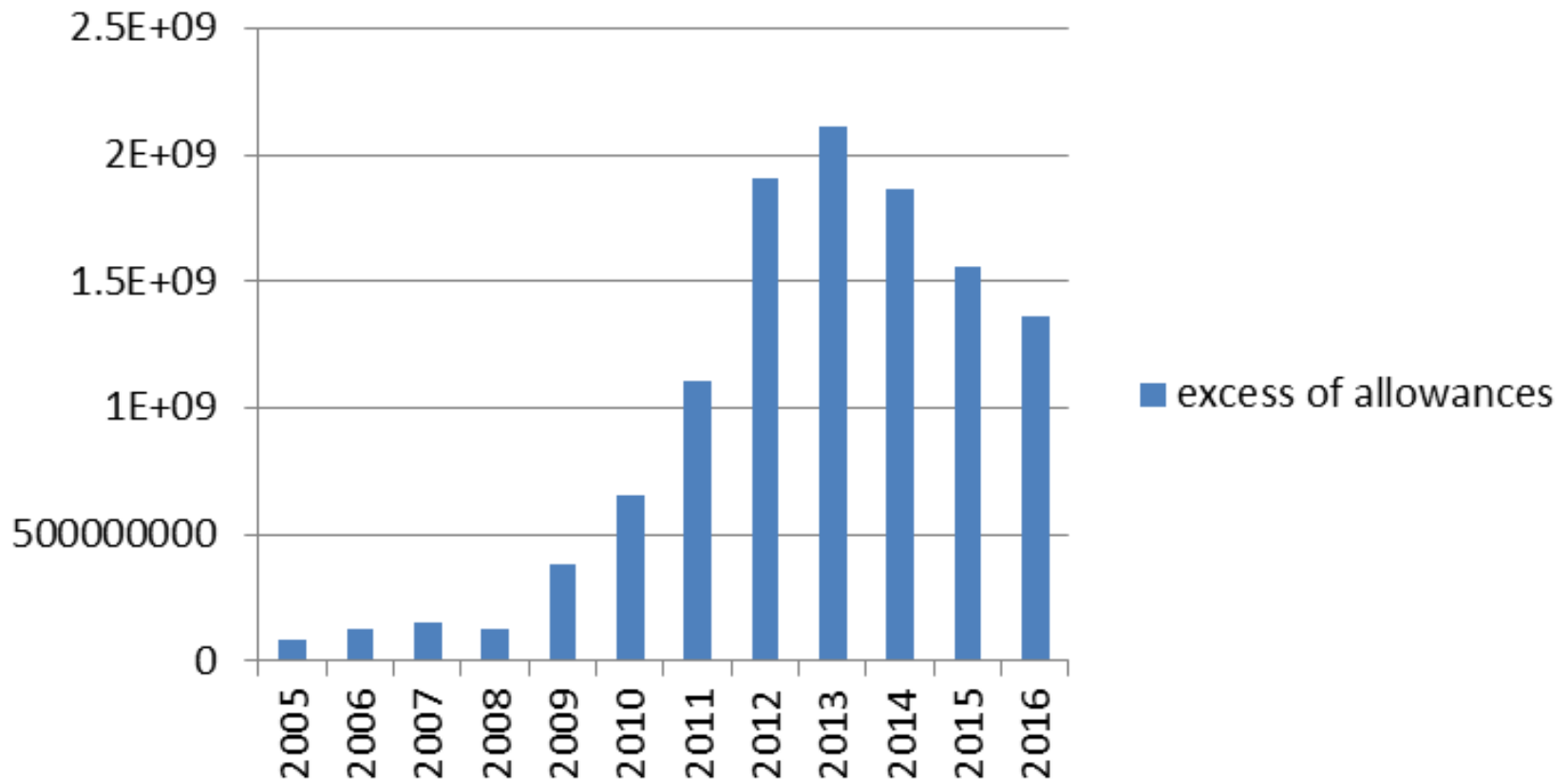
- ❑ 04/2006: Data on verified emissions reveal oversupply of non-bankable allowances
- ❑ Carbon price towards zero → no incentive to invest in low-carbon tech
- ❑ Surplus of Allowances caused by Decentralized National Allocation Plan
  - Stricter national caps rise environmental costs
  - Lenient caps to protect national industry



# Ownership, Regulation and environmental quality

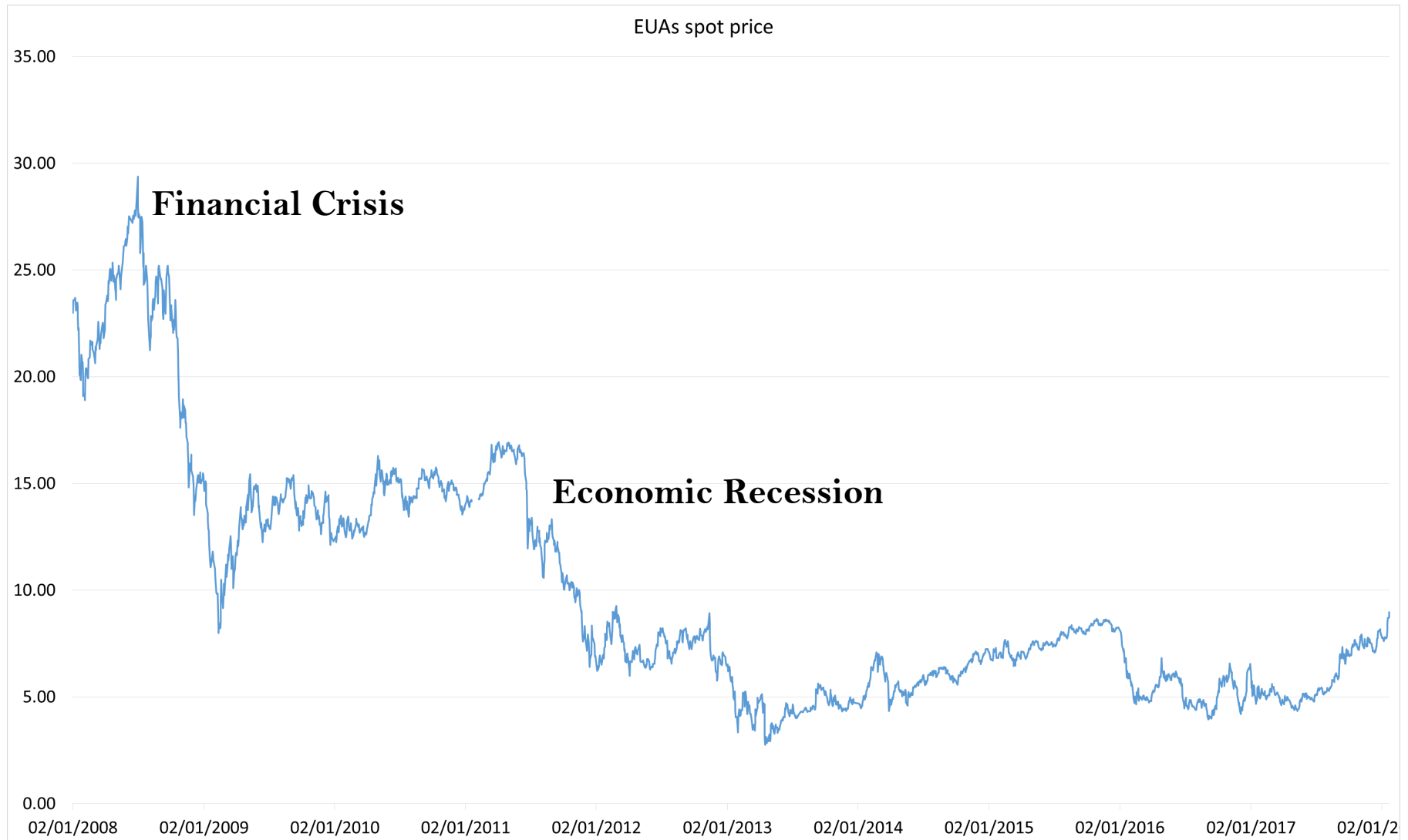
## Climate Package and ETS reform (Directive 29/2009/EC)

- ❑ Centralized ETS cap setting: decreasing lower than historical emissions
- ❑ Exogenous Demand shock driven by Financial crisis and economic recession
  - Lower industrial production and electricity consumption bring down emissions
  - Surplus of allowances driven by collapse on the demand side



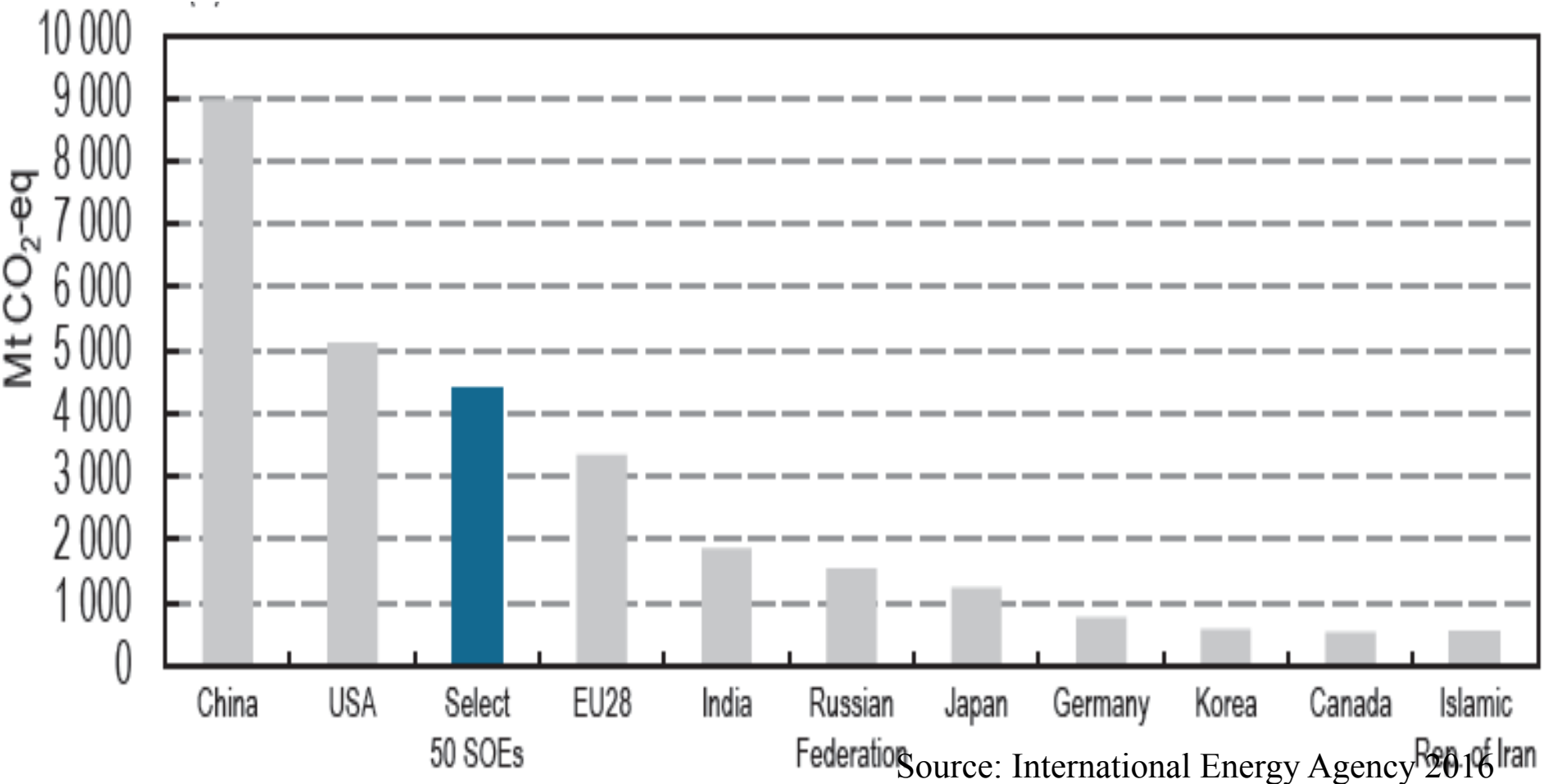
# Ownership, Regulation and environmental quality

- ❑ Compliance with ETS cap, but do carbon price support low carbon technologies?
- ❑ Crisis more effective than climate policies in reducing emissions



# Ownership, Regulation and environmental quality

- ❑ SOEs key actors in the energy transition: own over 40% of fossil fuel power generation; own 60% of renewable and nuclear capacity (Figure a).
- ❑ 50 large SOEs generate over 4.4 GtCO<sub>2</sub> annually in energy sector, more than any country's emissions other than those of China or USA (Figure b).



Clò S., Ferraris M. Florio M. (2017), **Ownership and environmental regulation: Evidence from the European electricity industry**, [\*Energy Economics\*](#)

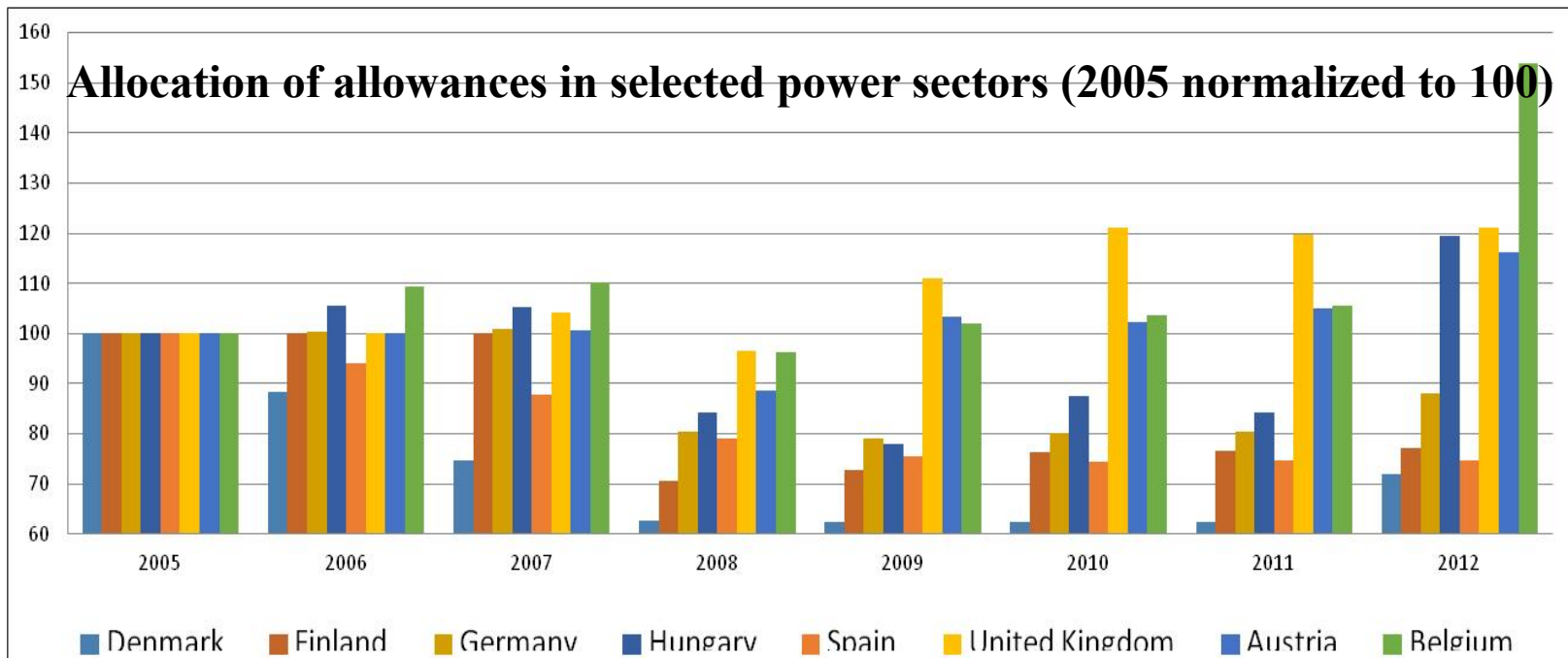
- ❑ Can the government involvement in the provision of carbon-intensive goods promote emissions reduction?
- ❑ **Empirical literature** Asian countries with no regulation or C&C (World Bank 1995).
  - ❑ Environment performance worse under public control due to inefficient plants and preferential relations (Pargal and Wheeler 1995; Hettige et al. 1996)
  - ❑ Improve environment via privatization, as developing countries lack effective regulation (Hartman et al. 1997; Wang and Jin 2012).
- ❑ **Theoretical Analysis:** mixed vs private oligopoly with different objective functions
  - ❑ Output (and emissions) higher under mixed oligopoly when government has other priorities than environmental protection
  - ❑ (e.g. India opposed to coal phase-out: a cheap form of energy essential to lower energy poverty and make electricity accessible at a low price)

- ❑ Do Previous results still hold when looking at developed countries where:
  - ❑ Markets have been deeply reformed and SOEs exposed to new incentives
  - ❑ There is social demand for environmental quality
  - ❑ Environmental regulation implemented via market-based instrument
- ❑ **Theoretical framework:** Previous results on mixed oligopoly change when SOEs maximize a social welfare function which internalizes environmental damage
- ❑ Without carbon price, SOE shows the lowest carbon intensity and emissions
- ❑ Introduction of carbon price lowers emissions and carbon intensity for both firms
- ❑ if carbon price too low, SOE reduces emissions more than private. SOEs goes beyond the incentives given by regulation to reach an optimal level of emissions
- ❑ Public ownership complements environmental regulation and can correct sub-optimal environmental policies

# Ownership, Regulation and environmental quality

**Empirical Analysis** Cross-country panel dataset: 30 power markets (27 EU Member States, plus Croatia, Norway and Turkey) from 1990 to 2012.

- ❑ Environmental performance: GHG and carbon intensity (Eurostat, EEA)
- ❑ Public ownership measured by the the OECD ETCR indicators
- ❑ Regulation: ETS implementation and national ETS caps (EEA)
- ❑ We exploit cross-country heterogeneity in public ownership and in the ETS cap stringency to assess their impact on environmental performance



1. impact of ownership on environment when controlling for confounding factors

$$Y_{i,t} = \alpha + \beta OWN_{i,t} + X'_{i,t}\delta + \zeta YEAR + \varepsilon_{i,t}$$

*OWN* = OECD ownership index (-) → more public ownership reduces GHG

*X'*: energy mix (coal, gas, oil), electricity demand, population, market reforms.

2. impact of ownership on environment when introducing a carbon price

*EU ETS* = dummy equal 1 in the years when sector subject to ETS. It accounts for the introduction of regulation (-)

*TOTAL EUAs* = power sector ETS cap accounts for the stringency of regulation (+)

3. *OWN<sub>i,t</sub> \* ETS<sub>i,t</sub>* = interaction between ownership and ETS dummy.

Does ownership affects the environment after the ETS is introduced? (-)

4. *OWN<sub>i,t</sub>TOT\_EUAs<sub>i,t</sub>* = interaction between ownership and ETS cap.

Does public ownership complement environmental regulation in reducing emissions when the latter is not stringent? (-)

# Ownership, Regulation and environmental quality

	(1)	(2)	(3)	(4)
Dependent Variable:				
GHG emissions				
Ownership index	-0.631** (0.259)	-0.787*** (0.258)	-0.559** (0.276)	-0.479** (0.233)
EU ETS		-4.385*** (1.267)	-1.682 (1.742)	-2.110* (1.153)
Total EUAs		0.026*** (0.006)	0.020*** (0.007)	0.051*** (0.006)
EU ETS*Ownership index			-0.594** (0.263)	
Total EUAs*Ownership index				-0.023*** (0.002)
Constant	0.369 (3.388)	2.674 (3.515)	2.178 (3.511)	0.359 (3.162)
Observations	690	690	690	690
Control Variable	YES	YES	YES	YES
Year dummy	YES	YES	YES	YES

- Environment worsen under public ownership in developing countries
- Things changes in countries with social demand for environmental protection, where policy reforms and environmental regulation are implemented
- Implementation of the ETS induced reduction of emissions, though lack of stringent cap mitigated incentives to improve environmental performance
- The presence of public ownership in a liberalized is associated with better environmental performance
- Public ownership associated with better environmental performance even after ETS is introduced and when regulation is not stringent enough
- Public ownership complements Environmental Regulation and favors emissions reduction when regulation is not stringent enough. It can correct errors in environmental regulation

# Ownership, Regulation and environmental quality

- ❑ Lowering carbon emissions comes at a cost that may reduce the SOEs' profitability compared to private enterprises, causing some financial distress.
- ❑ We analyse accounting data of 1,855 EU electricity generation companies, 293 of them (15.4%) are controlled by the government
- ❑ SOEs fewer in number but are significantly bigger than private companies.
- ❑ SOEs show positive profitability ratios, but lower than private enterprises
- ❑ Results suggest that SOEs deviate from a pure profit maximization goal, they internalize an environmental goal under a budget constraint

	Mean		Mean
<b>Total Assets (mln euros)</b>		<b>Retruns on Capital Employed (ROCE)</b>	
Public	1,484.18	Public	6.89
Private	173.31	Private	7.95
<b>Operating Revenues (mln euros)</b>		<b>EBIT Margin</b>	
Public	587.19	Public	13.61
Private	74.33	Private	21.53
<b>EBIT (mln euros)</b>		<b>Cash Flow/Operating Revenues ratio (CFOP)</b>	
Public	84.10	Public	18.31
Private	8.56	Private	24.47

Thanks for you patience and attention

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