

Experimental Energy Economics

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Presenting results of Van Koten, S. and Ortman, A., 2011. “Structural versus Behavioral Remedies in the Deregulation of Electricity Markets: An Experimental Investigation Guided by Theory and Policy Concerns.”

The job of economists

Analyze markets

Design markets

Design markets (Roth, Econometrica, 2002)

Highly practical advice

Institutional details

Bounded rationality

Theoretical economics

Engineering approach

1. Theoretical Physics

$$\begin{aligned} F &= \int_{\infty}^{r_0} \frac{Gm_1m_2}{r^2} dr \\ &= -Gm_1m_2 \int_{\infty}^{r_0} \frac{1}{r^2} dr \\ &= -Gm_1m_2 \left(-\frac{1}{r} \right) \Big|_{\infty}^{r_0} \\ &= -Gm_1m_2 \left(-\frac{1}{r_0} - 0 \right) \\ &= -Gm_1m_2 \left(-\frac{1}{r_0} \right) \\ P &= \frac{Gm_1m_2}{r_0} \end{aligned}$$

2. Bridge model experimentation





3. Bridge

1. Theory

Theoretical Physics

$$\begin{aligned}
 P &= \int_{\infty}^{r_0} g \, dr = \int_{\infty}^{r_0} -\frac{Gm_1m_2}{r^2} \, dr \\
 &= -Gm_1m_2 \int_{\infty}^{r_0} \frac{1}{r^2} \, dr \\
 &= -Gm_1m_2 \left(-\frac{1}{r} \right) \Big|_{\infty}^{r_0} \\
 &= -Gm_1m_2 \left(-\frac{1}{r_0} - 0 \right) \\
 &= -Gm_1m_2 \left(-\frac{1}{r_0} \right) \\
 P &= \frac{Gm_1m_2}{r_0}
 \end{aligned}$$

Theoretical Economics

$$\begin{aligned}
 v &= \lim_{h \rightarrow 0} \frac{f(t+h) - f(t)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[490(t+h)^2] - [490t^2]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[490(t^2 + 2ht + h^2)] - [490t^2]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{[490(2ht + h^2)]}{h} \\
 &= \lim_{h \rightarrow 0} [490(2t + h)] \\
 &= 980t
 \end{aligned}$$

2. Engineering

Bridge Experimentation



Market Experimentation Experimental & Computational Economics



3. Implementation

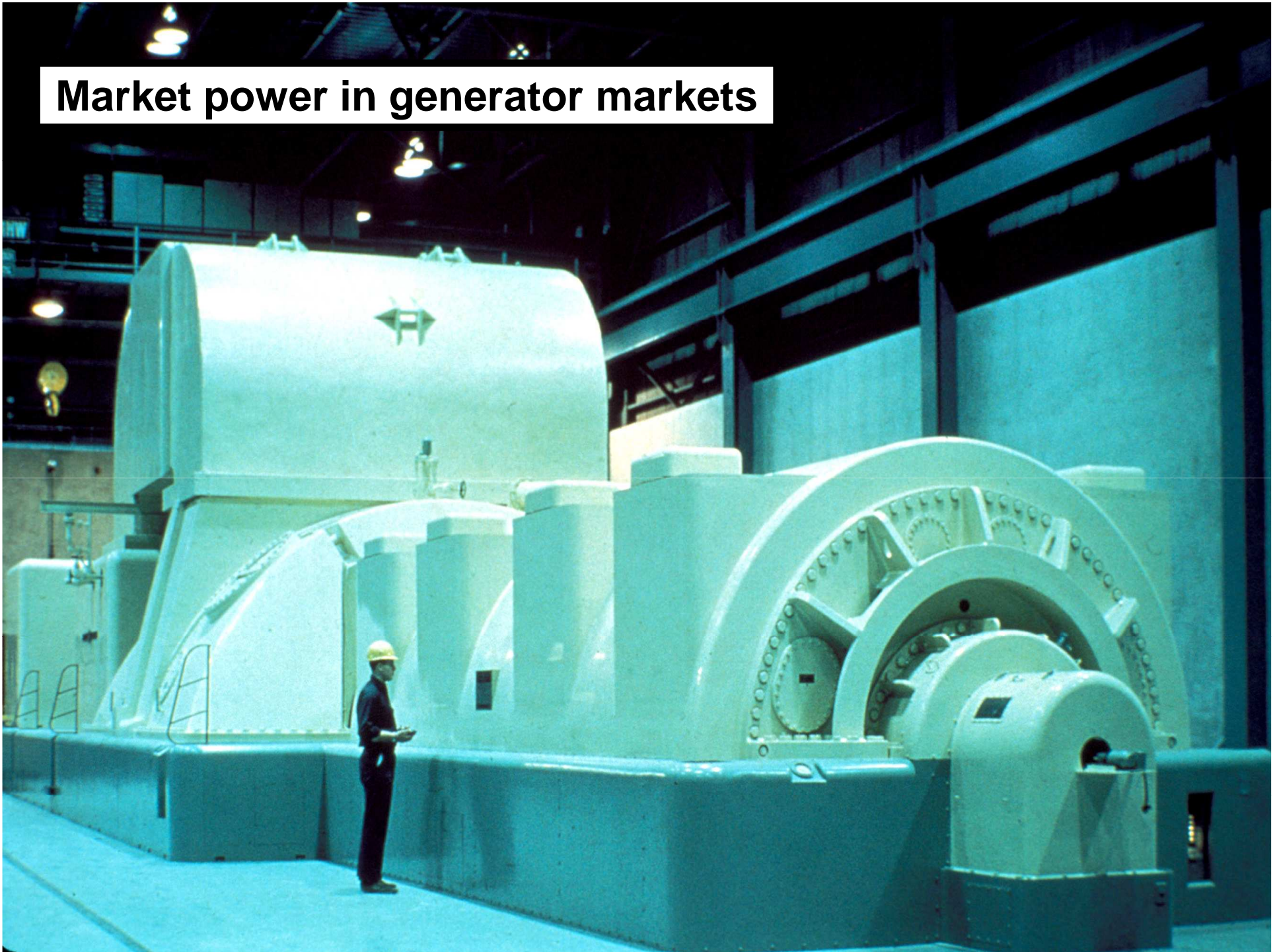
Bridge



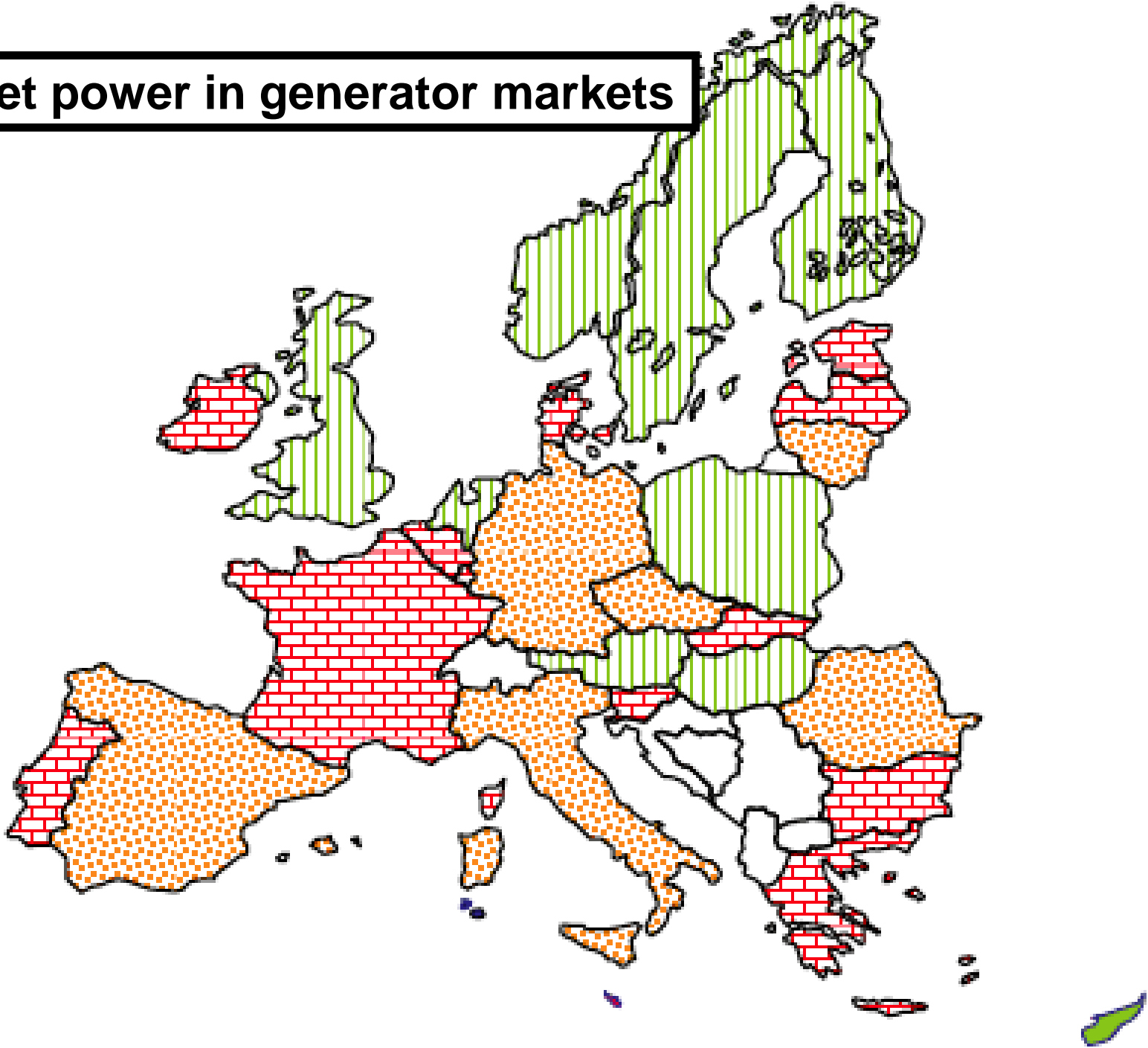
Competitive Market E.g., Energy Market



Market power in generator markets



Market power in generator markets



Remedies

**Structural measure of
divestiture**

More competitors

**Behavioral measure
of forward market**

More supply of each
competitor

1. Theory

Cournot

More competitors ->
more supply & lower
prices

Allaz & Villa (1993)

Forward market ->
more supply & lower
prices

Theoretical predictions (following Allaz & Vila, 1993)

	3 Firms	4 Firms
Without Forward Market	M3 43	M4 44
With Forward Market	M3F 45	—

Remedies

**Structural measure of
divestiture**

More competitors

**Behavioral measure
of forward market**

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1. Theory

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2. “Engineering”

“Engineering” Economics Experiment



“Engineering” Economics Experiment



**“Engineering”
Economics Experiment
The new state-of-the-art LEE
Laboratory (www.vse-lee.cz)**



Remaining time [sec]: 41

the quantity you want to produce in the right upper box and press OK

Total Production	Price/Unit
0	2000
1	1973
2	1946
3	1919
4	1892
5	1865
6	1838
7	1811
8	1784
9	1757
10	1730
11	1703

Produce Units	Marginal Cost	Total Cost
0	0	0
1	2	2
2	8	10
3	18	28
4	32	60
5	50	110
6	70	180
7	100	280
8	130	410
9	160	570

OK

Outcomes for Period 1

My Production ---

Price ---

My Return ---

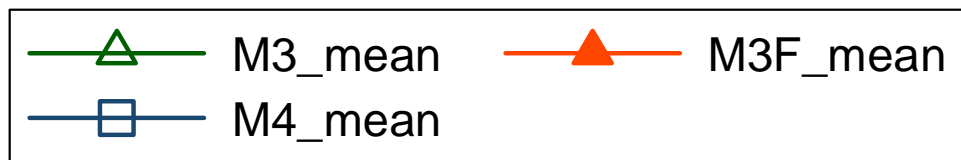
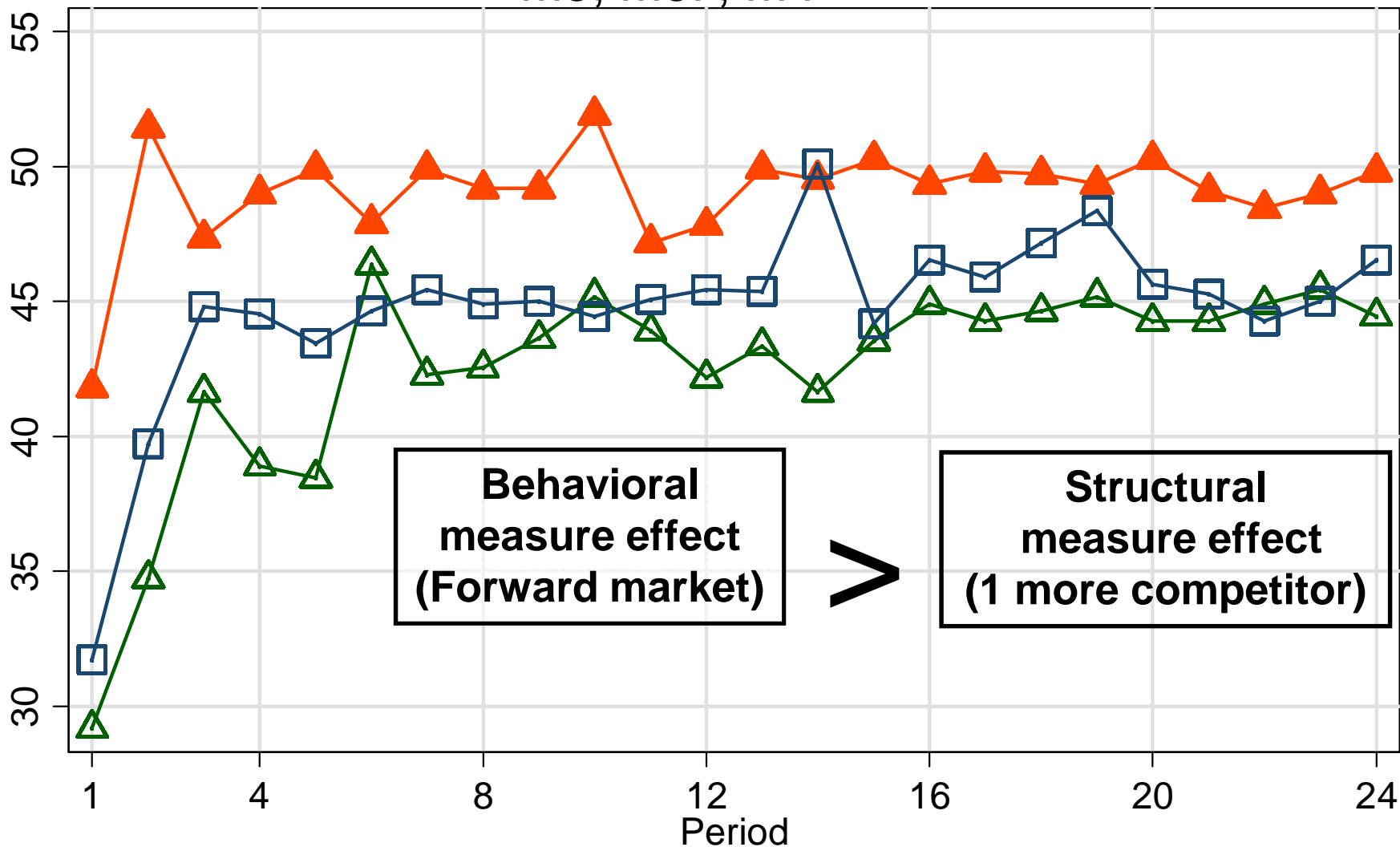
My Production ---

Cost of the last unit (Marginal Cost) ---

My Total Cost ---

My Profit (My Return - My Total Cost) ---

M3, M3F, M4



Both measures have pro-competitive effects:

- Behavioral: Introducing a forward market
- Structural: Adding one more competitor

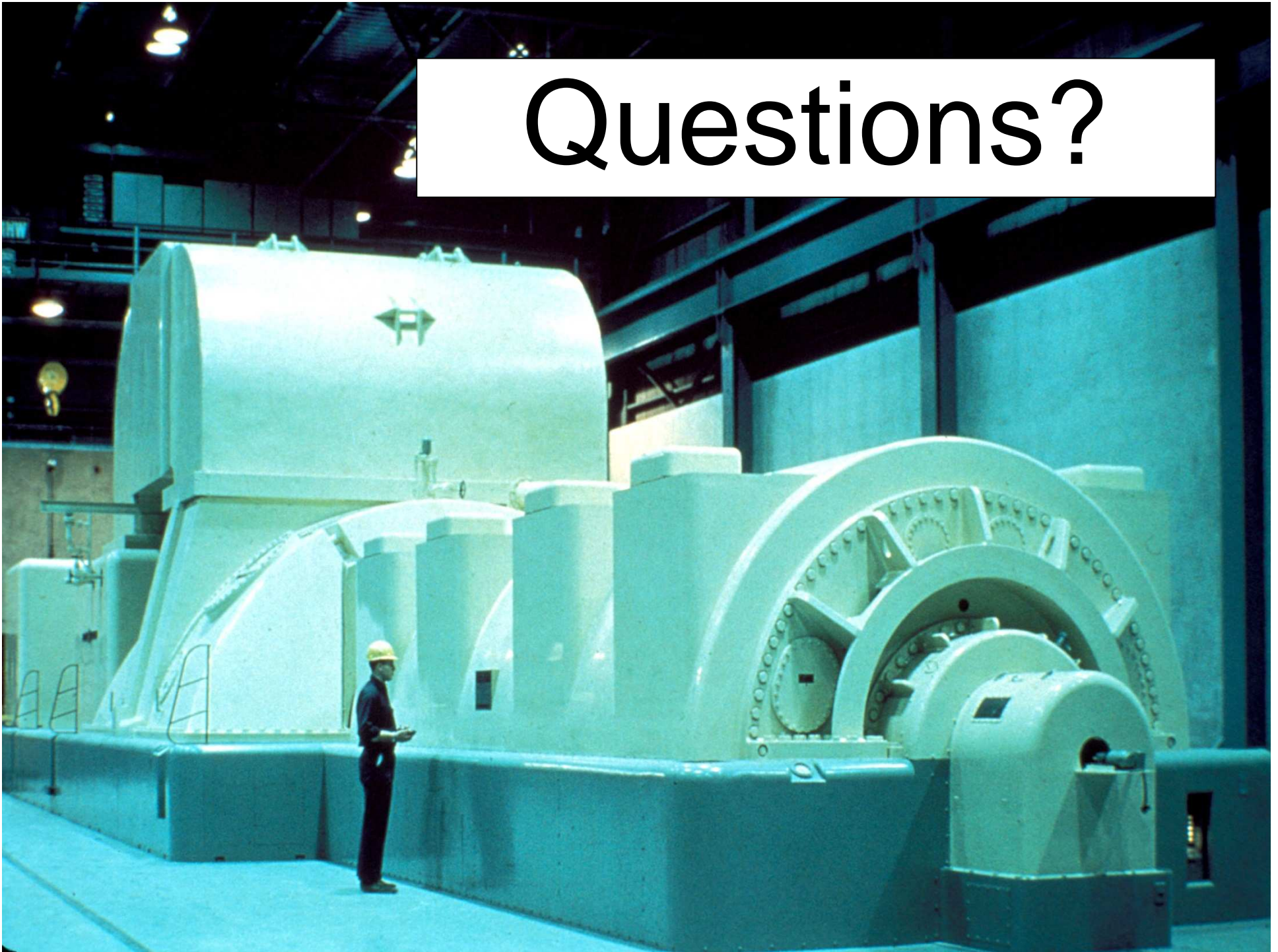
Design focus on BEHAVIORAL measure first


- **Behavioral measure MORE** effective than structural measure

Experimental Energy Economics

- **Forward market versus competition***
- **Abatement decisions under the Emission Trading Scheme in the EU.**
- **Self-Regulatory Organisations and Governmental Oversight**

Questions?





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