Quality, Efficiency and Welfare

Dynamic Comparisons of Allocative Efficiency before and after the Introduction of Quality Regulation for Norwegian Electricity Distributors

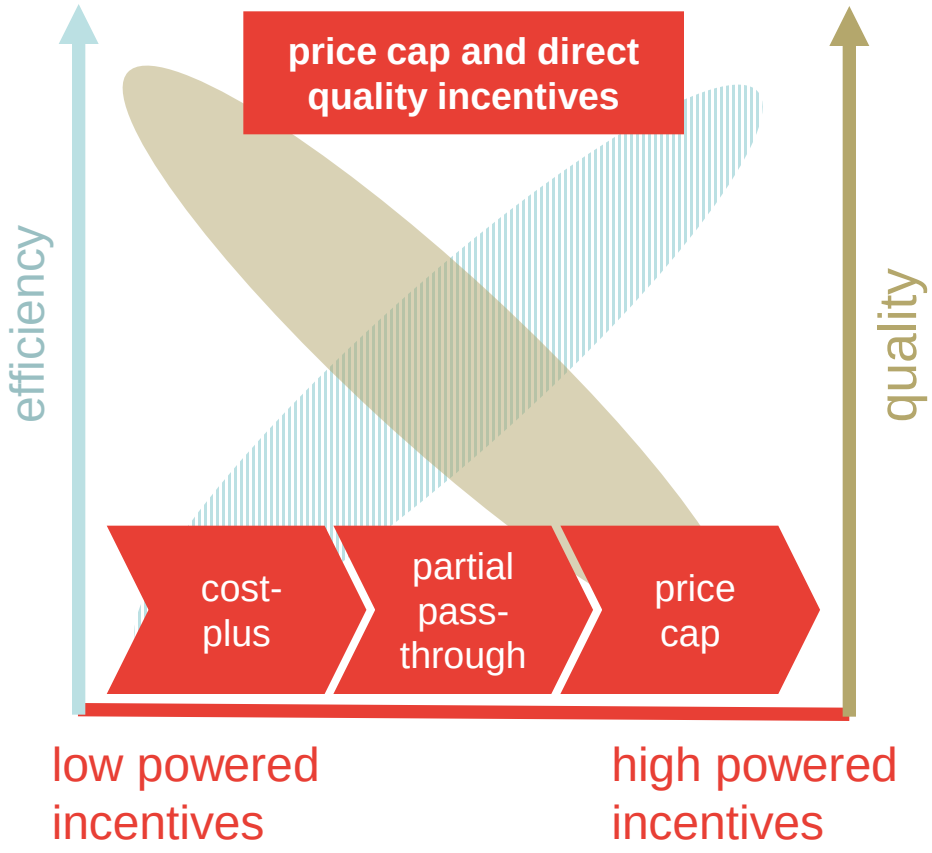
09. October 2009

Anton Burger

- Introduction and Motivation
- Methodology
- Results
- Conclusion

Introduction

Regulation, efficiency and quality



- cost plus regulation leads to low efficiencies, but reasonable quality
- high powered schemes lead to more efficiency
- but the incentives to cut costs lead to quality problems in the long run
- more quality can be achieved by:
  - back to cost-plus elements
  - **direct quality incentives**
- Sappington 2005:

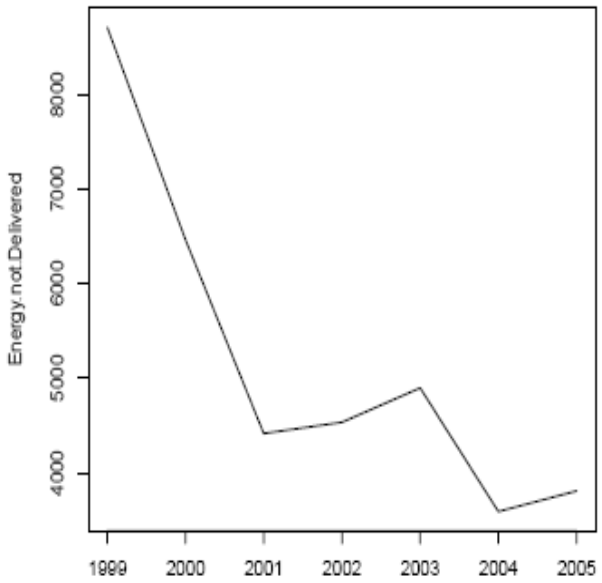
  "By specifying service quality targets and associated penalties and bonuses, a regulator can induce the regulated firm to employ its superior cost information to achieve desirable levels of service quality"

Introduction

Why this study and why in Norway?

- no empirical evidence so far that considers cost and quality in conjunction

- Norway serves as a policy experiment
- since 1997 price cap regulation
- since 2001 explicit quality incentives

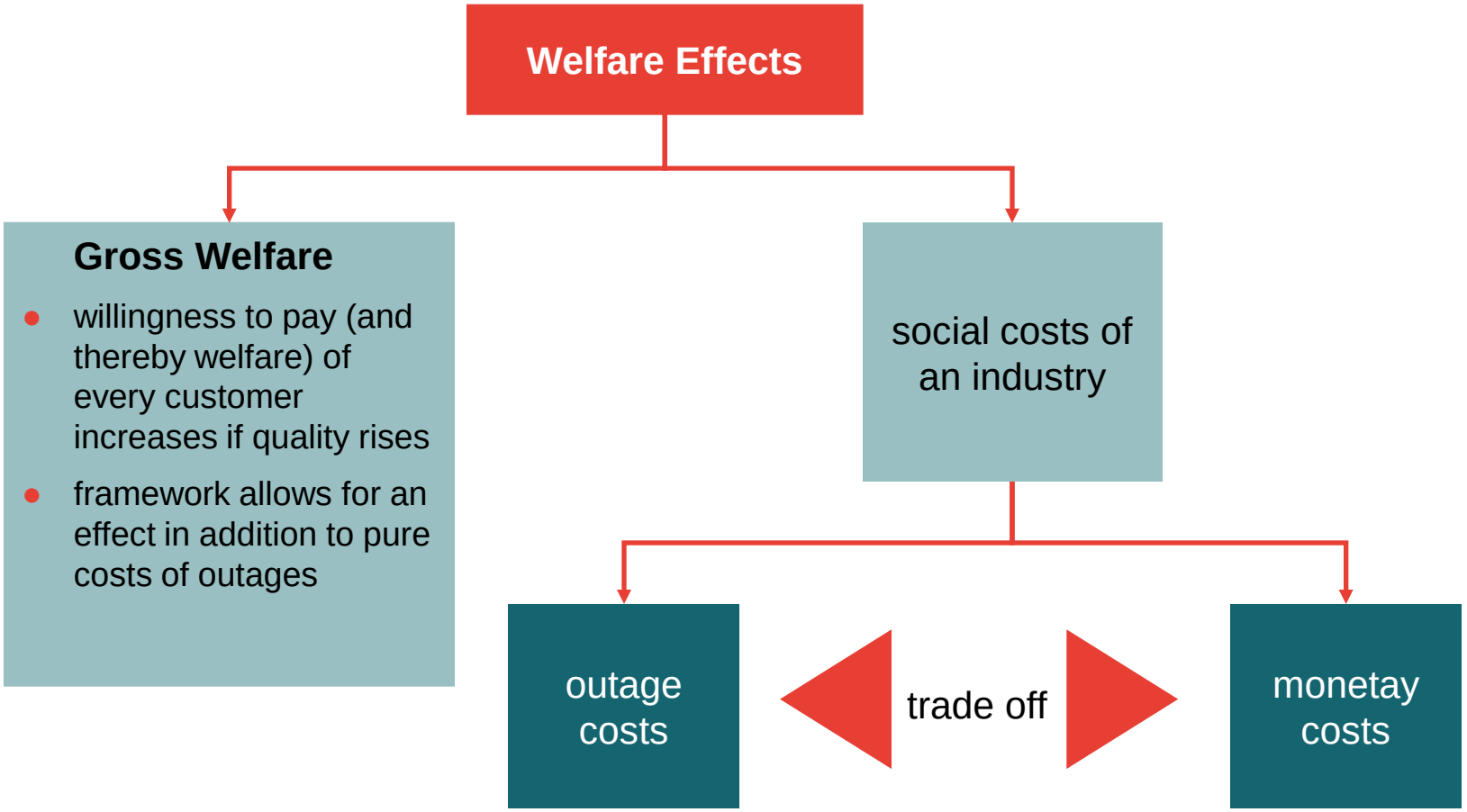


Quelle: NVA, in MWh

…outages were indeed reduced, but was it worth it?

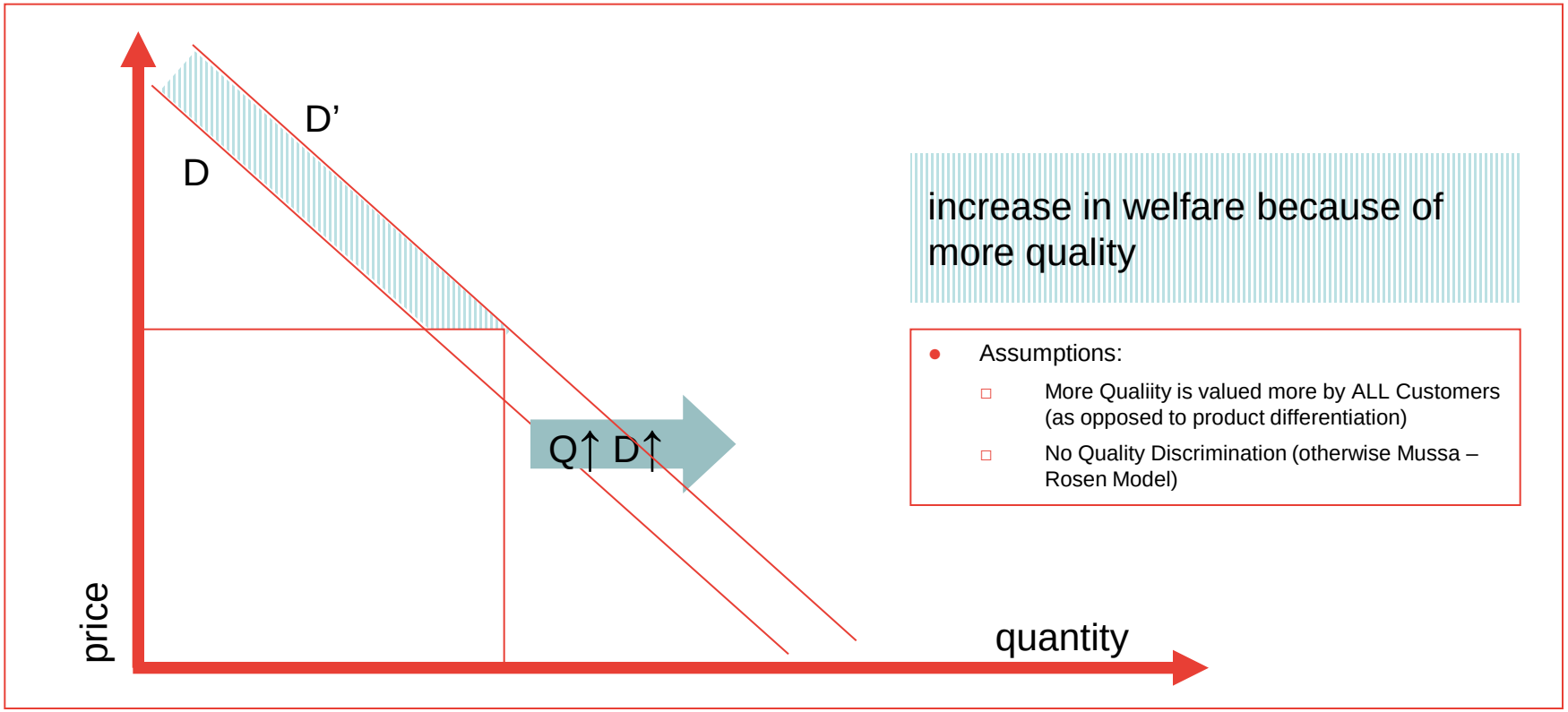
- Motivation
- Methodology
- Results
- Conclusion

Quality Increase has 2 Effects on Total Surplus



… can one verify that empirically?

Gross Welfare – the easier Part



increase in welfare because of more quality

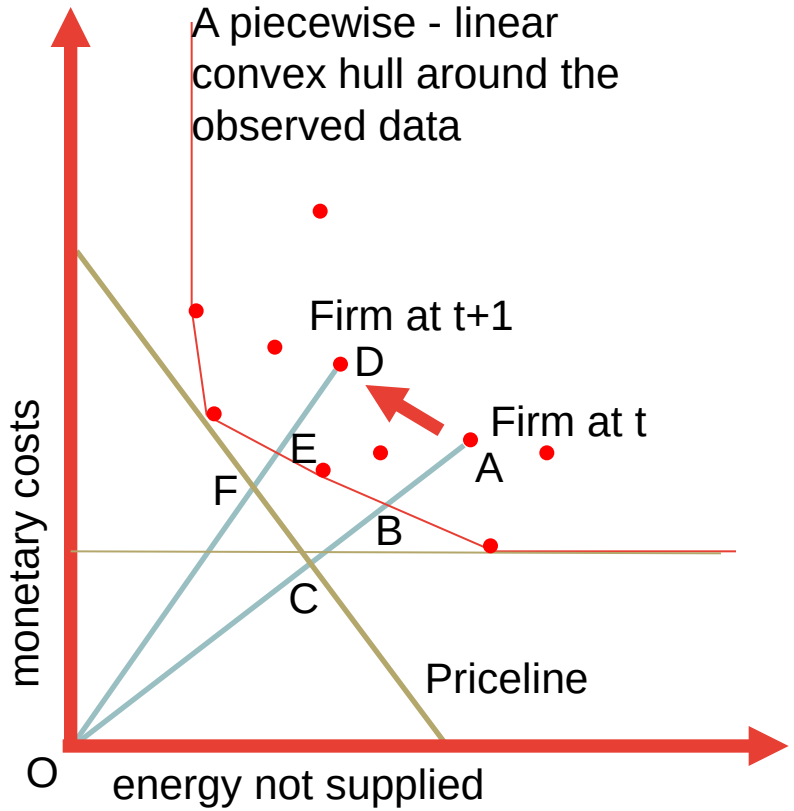
- Assumptions:
  - More Qualiity is valued more by ALL Customers (as opposed to product differentiation)
  - No Quality Discrimination (otherwise Mussa – Rosen Model)

more quality always increases gross Welfare

- If quantities stay constant or at least decrease in the right ratio to the increased quality, gross welfare at least did not decrease (in more detail in the Paper)

Social Costs of an Industry

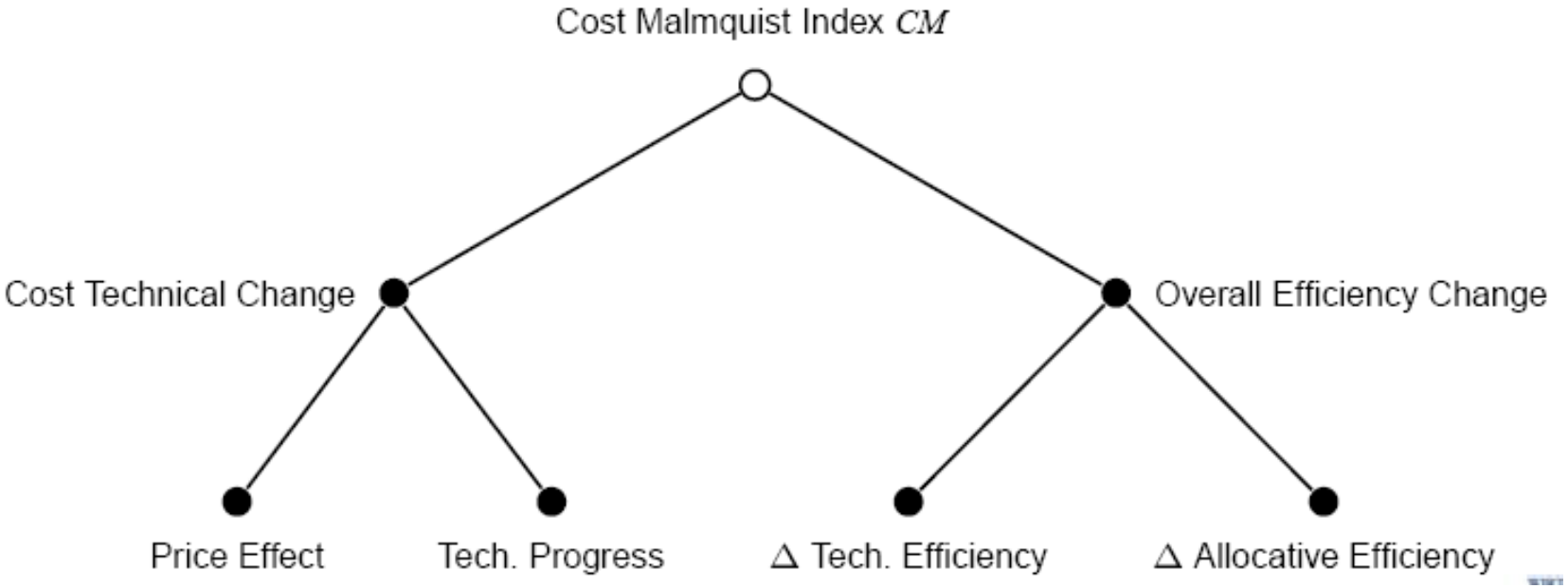
A standard cost minimization problem



Social costs of an industry

- OC/OA – overall efficiency
- OB/OA – technical efficiency
- OC/OB – allocative efficiency
- (OD/OF) / (OA/OC) – Cost Malmquist Index – the relative change in overall costs between two points in time

Intertemporal Comparisons with Malmquist Indices



The change in Overall Efficiency is disentangled into all four possible reasons.
(Maniadakis und Thanassoulis (2004))

3 Hypothesis

Hypothesis 1	• After the introduction of quality regulation, the social cost of electricity distribution decreased. By referring to our welfare framework, this means that welfare increased. • tested by ⇒ **Cost Malmquist Index**
Hypothesis 2	• The decrease of the social costs and the increase in quality are due to the new regulation regime in that, firms were induced to substitute costs for outages in a socially more favourable manner. • tested by ⇒ **Δ Allocative Efficiency**
Hypothesis 3 Corollary	• Quality was too low from a welfare point of view before the introduction of quality regulation as the improvement in quality had a positive welfare effect.

- Motivation
- Methodology
- Results
- Conclusion

Results

Model Setup

- three outputs
  - number of clients
  - MWh transmitted
  - network length
- two inputs
  - TOTEX = OPEX + CAPEX (we would measure no Averch Johnson Effect)
  - energy not delivered – ENS
- price data
  - price of one unit of money = 1
  - price of ENS = app. 4-6 EURO per KWh
- 50 DSOs, 31 had data from 1999 to 2005

Unwanted outputs can be used as inputs.

The price of one unit of money is one

Results

			CM (Cost Malmquist Index)			
			Overall Effi. Change		*CTC*	
	CM	*IM*	Δ Tech. Effi.	Δ Alloc. Effi.	T. Progress	Price Eff.
1999 - 2001						
Geometric av.	**0.9595**	1.0343	**0.9538**	**0.9527**	1.0844	0.9738
Standard dev.	0.2076	0.1523	0.1147	0.1568	0.0588	0.0632
Min	0.5292	0.6628	0.7228	0.6148	0.8625	0.8738
Max	1.5619	1.3030	1.2002	1.3625	1.1561	1.1991
2001 - 2005						
Geometric ave.	**0.9669**	0.9673	**1.0180**	**0.9805**	0.9502	1.0163
Standard dev.	0.1940	0.2186	0.2295	0.0681	0.1218	0.0664
Min	0.6560	0.6637	0.7032	0.8351	0.6637	0.8657
Max	1.4807	1.4797	1.5613	1.1615	1.1246	1.2413
1999 - 2005						
Geometric av.	**0.9266**	0.9989	**0.9710**	**0.9370**	**1.0287**	0.9900
Standard dev.	0.2739	0.2789	0.2480	0.1506	0.1367	0.0945
Min	0.4841	0.4930	0.5718	0.5580	0.7447	0.7519
Max	1.6352	1.6263	1.5613	1.4049	1.2247	1.3439

- Motivation
- Methodology
- Results
- Conclusion

Conclusion

What we did:

- We derived sufficient conditions for a welfare increase and tested them empirically
  - Social costs of providing electricity distribution were decreased
- Our Malmquist analysis filtered out the main reason for the decrease in social costs ⇒ better input mix

What can you learn from that when it comes to regulation?

- The product quality in the pure price cap regime was apparently too low
  - Otherwise we would not have seen an increase in welfare
- Direct incentives can not only increase quality, but also welfare and this can be tested.
- Methodology: DEA analysis in a welfare context; dynamic comparisons of technical **AND** allocative efficiency

FRONTIER ECONOMICS EUROPE LTD.
BRUSSELS | COLOGNE | LONDON | MADRID

Frontier Economics Ltd, 71 High Holborn, London, WC1V 6DA
Tel. +44 (0)20 7031 7000 Fax. +44 (0)20 7031 7001 www.frontier-economics.com