REKK Regional Centre for Energy Policy Research

Incentive price regulation

introduction

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ERRA Price Regulation and Tariffs Course

Budapest, March 5-8, 2013

Requirements for price regulation

- Cost coverage
- Economically efficient production and consumption structure
- Motivation for improvements in operation
- Social fairness
- Transparency, stability and reliability
- Minimum required regulatory intervention
- …

Progress of presentation

- **Information and incentives**
  - information asymmetries, fixed vs. variable price contracts, productive vs. allocative efficiency
- Overview of incentive schemes in regulation
  - general features, price and revenue caps, profit sharing, yardstick competition
- Price cap regulation
  - regulatory lag, cost reviews, pricing flexibility, cost pass-through, service quality, benefit sharing
- Yardstick competition
  - general features, benchmarking techniques

Informational asymmetry

- So far, we have assumed that regulators and regulated firms are equally well-informed about market conditions
  - this is quite unrealistic!
- In reality, firms have an informational advantage over regulators regarding
  - current production cost level and structure
  - demand characteristics
  - profitable investment opportunities and returns
  - potential efficiency improvements in the production process and company management, etc

Also different objectives and incentives

- Regulator
  - **maximize welfare** (decrease prices) without endangering the long-term viability of the industry
  - decision-making based on accurate information
- Regulated company
  - **maximize profits** (increase prices)
  - withhold information from the regulator
  - distort information to serve profitability (shareholders)
    - overstate costs
    - understate demand
    - overstate asset value, …

Regulatory problem

- As soon as regulators are at an informational disadvantage relative to the firm, the direct applicability of the discussed price regulation methods becomes questionable
- How do we design an efficient tariff scheme if we don't know how high marginal costs are, and what options the monopolist has in reducing these costs over time?
- Conflicting objectives in pursuing productive efficiency and allocative afficiency

Productive efficiency

- Production costs can be influenced by the company over time
  - technological improvements, managerial and organizational skills
- We would like the company to produce with a **productively efficient** cost structure at all times
  - if production costs are lower, the „pie to share" between the consumers and producers becomes larger
- Cost reduction requires „effort" from the firm, which must have its rewards, otherwise it will not be undertaken
  - e.g. why should the company undertake a painful restructuring of its workforce, if regulated profits will be the same afterwards?

Striving towards productive efficiency

- Productive efficiency cannot be mandated
  - because of informational asymmetry, the regulator is unaware of the cost-reducing capabilities of the monopolist
- Productive efficiency can be encouraged by letting the firm keep the additional profits that result from the cost-savings
  - this is accomplished by setting a fixed regulated price for an extended (and fixed!) period of time
    - long and exogenous regulatory lag
  - „high-powered" incentives to reduce costs

Allocative efficiency (reminder)

- We would like to set the price of the service equal to its (marginal) cost for efficient allocation of the total surplus between the producer and the consumers
- This is related to not allowing the firm to earn abnormally high returns on its investment
- High profits are usually the sign of allocative inefficiency

Striving towards allocative efficiency

- Allocative efficiency is easier to mandate
  - the actual cost level might be determined by a cost review (informational asymmetry is less serious)
  - to reach allocative efficiency, prices should be set equal to costs on a regular (frequent) basis („cost-plus” contracts)
    - short and endogenous regulatory lag
  - „low-powered” incentives to reduce costs

Example: The business trip (A)

- Poor, low-paid (civil servant) regulator goes abroad…
- … and gets a **fixed daily allowance**, all costs inclusive; no ex-post accounting is required (savings can be retained by him/her).

Result?

- Our regulator…
  - uses public transportation,
  - eats sandwiches (in a park),
  - stays at an inexpensive hotel,
- …and…
  - keeps the rest of the daily allowance, or
  - spends it on his or her family in a gift shop.

Example: The business trip (B)

- Poor, low-paid (civil servant) regulator goes abroad…
- … and gets all his/her **expenses refunded** ex-post.

Result?

- Our regulator…
  - uses takes a taxi,
  - eats in nice restaurants (close to parks),
  - stays at an expensive hotel,
- …and…
  - keeps very little money in the end,
- …but…
  - his/her trip will be a lot more costly to the taxpayers.

Lessons from the example

- Fixed price contracts provide strong incentives to reduce operating costs and increase productive efficiency
  - high-powered incentive scheme
- Fixed price contracts might result in „too high” profits and distributive concerns may arise
  - might hurt allocative efficiency and fair welfare distribution
- Cost-plus contract provides no incentive to improve productive efficiency
  - low-powered incenctive scheme
- The profit provided by the cost plus contract will not be „too high” (if the accounting is in order)
  - does not hurt allocative efficiency

Rate of return vs incentive regulation

Rate of return regulation

- Determining the revenue requirement
- Frequent cost review and price adjustments
- Cost review can be requested by either party
- All prices controlled by regulation
- Tightly controlled profits
- Weak incentives for cost reduction

Incentive regulation

- Determining the revenue requirement
- Infrequent cost reviews, automatic price paths in between
- Interim cost review requests not possible
- Limited pricing flexibility for the company
- Loosely controlled profits
- Strong incentives for cost reduction

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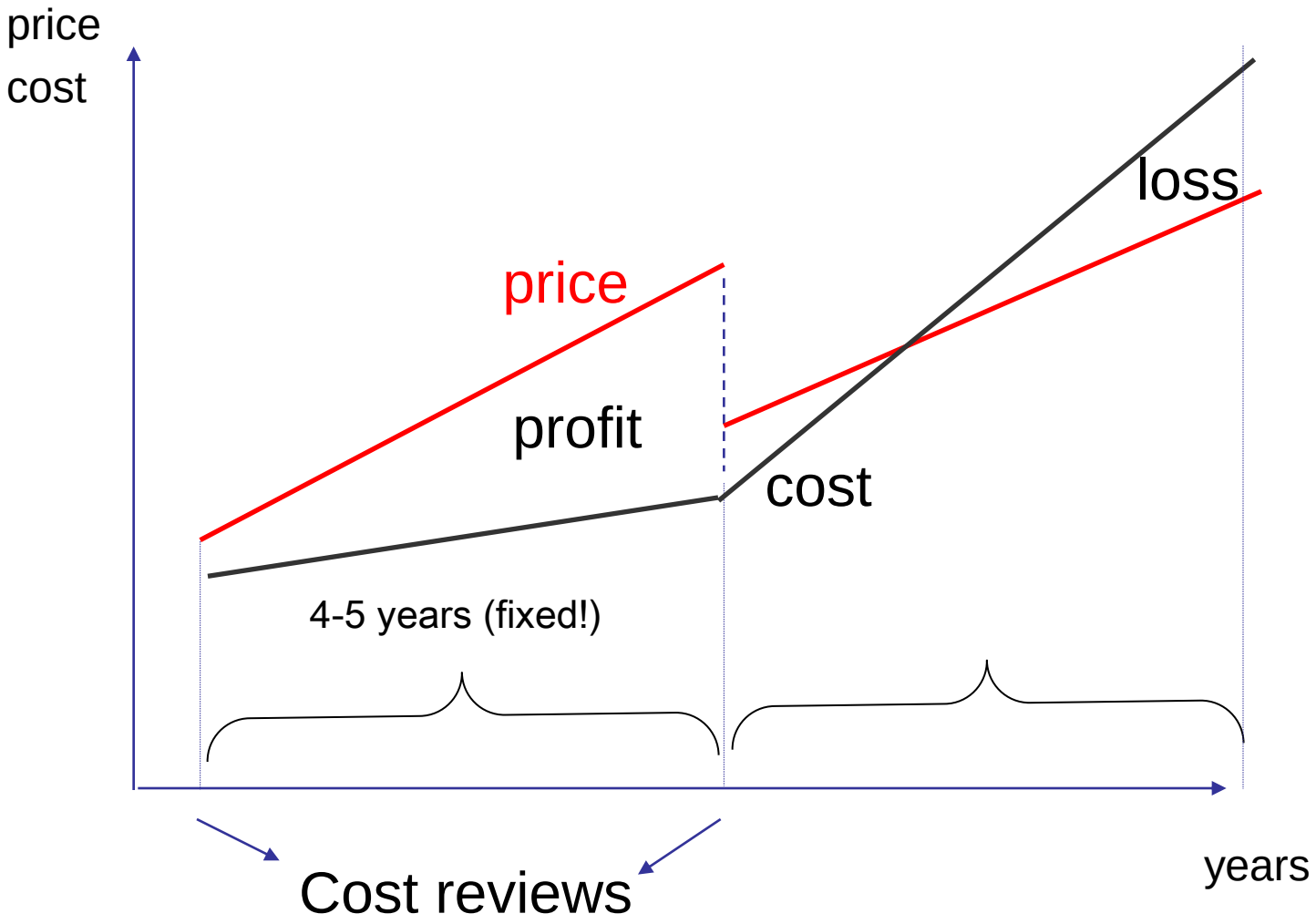
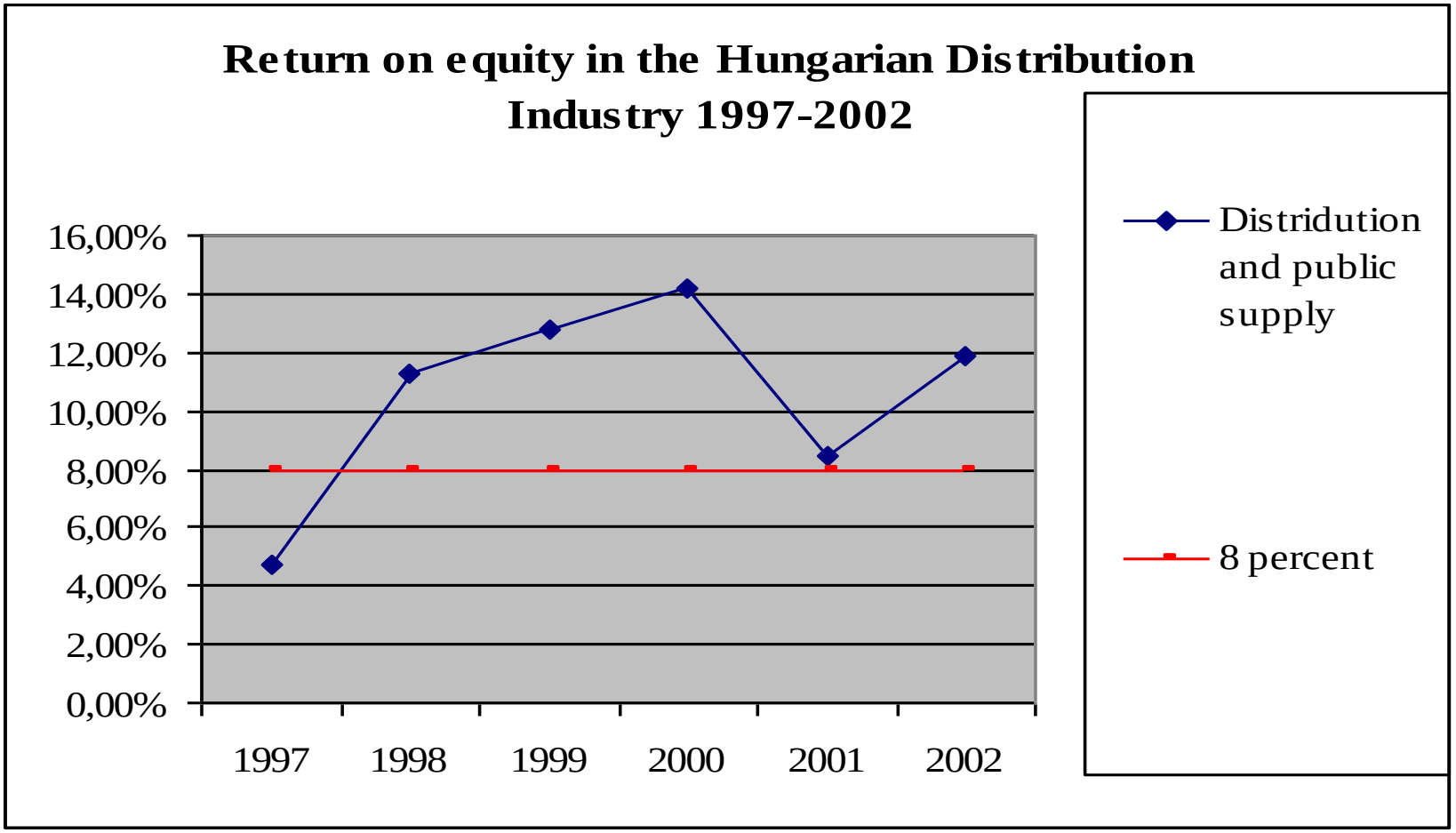
Incentive regulation: general features

- Objective: rewarding (penalizing) regulated firms for better-than-expected (worse-than-expected) (economic) performance
  - to provide ex ante motivation for better performance
- Method:
  - Regulated prices are decoupled from the firm's own costs for a given length of time - price/revenue cap regulation
  - „Peer-determined" prices, regardless of costs - yardstick competition/benchmarking

Rewarding performance in a price cap scheme

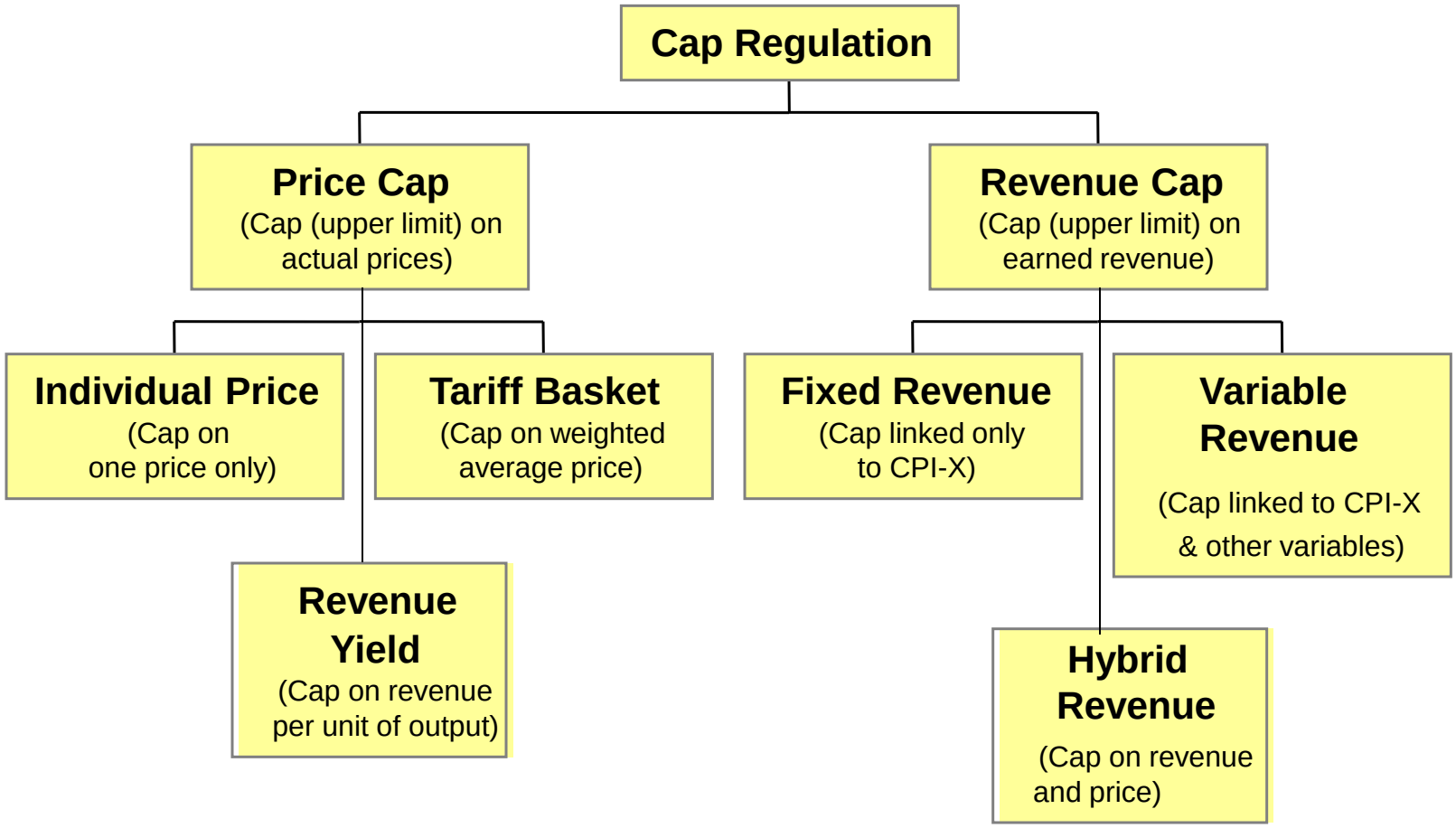


Regulated vs. actual rate of return



Problem: how to explain the return in 2000 to consumers (politicians)

Cap-based regulation: Overview



Source: Borotea (2005)

Profit sharing

- Incentive (performance-based) regulation may cause excessive profits (or losses)
  - if done badly
  - but also if done well
- Serious concerns about allocative efficiency and distributional fairness may arise
- Profit sharing mitigates the adverse consequences of the incentive scheme
  - by returning a portion of profits (or losses) to consumers
- But profit sharing also blunts the incentive power
- One version: sliding scale regulation

Sliding scale regulation

- A system that shares the difference between proposed and actual return among producers and consumers:

$$s_a = s_t + h \times (s^* - s_t)$$

- s_a : rate of return built into the regulated price
- s^* : proposed (regulated) rate of return
- s_t : actual rate of return produced by the company before rate adjustment by the regulator
- The value of h falls between 0 and 1
- $h = 0$: no profit adjustment, powerful incentive regulation
- $h = 1$: full profit adjustment, cost-plus regulation

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Price cap regulation: features

- Infrequent cost reviews
- Pre-determined prices between cost reviews
- Pass-through of uncontrollable costs
- On-the-run sharing of productivity improvements
- Pricing flexibility „under the cap”
- Quality assurances

Cost reviews

- Once every 4-5 years
- Two important points
  - length of the regulatory period („lag”)
  - difficulty of initiating an interim cost review for firms **and** regulators
- Method is the same as with rate-of-return regulation
  - asset base
  - WACC
  - justified costs
  - …

Pre-determined prices

$$P_t = P_{t-1}$$

- Between cost reviews, prices should not change *by default*
- Unchanging prices provide high-powered incentives to reduce costs
  - remember the examples
- Strength of the incentives depend on time left until the next cost review
  - stronger incentives in the beginning of the period, weakening towards the end
  - reason: achieved productivity improvements will translate into lower prices after the next cost review

Cost pass-through

$$P_t = (1 + CPI_t) P_{t-1}$$

- The regulated company should only be rewarded or punished for its own performance
- Many cost elements are mainly outside the company's control
  - fuel prices, general price level, taxes, etc.
- These should largely be passed onto the consumers (through the regulated prices)
  - depends on risk tolerance as well
  - e.g. smoothing household gas prices over time
- Pass-through by pre-determined formulae, which the company cannot manipulate
  - e.g.: indexed by world oil prices or industry price index, instead of company procurement costs

Sharing the expected (not the actual!) benefits

$$P_t = (1 + CPI_t - X)P_{t-1}$$

- Productivity improvements can be forecast („expected of the company") to some extent
- Lower costs ⇒ higher profit ⇒ allocative inefficiency
- Expected productivity improvements can be built into the prices beforehand
  - X-factor
- Prices decrease **regardless** of whether the company improves its productivity
  - important difference from profit sharing!
- Incentive power is retained in full, while allocative inefficiency is mitigated
- Forecasts must be realistic, the firm cannot be squeezed too much (regulatory commitment is important!)

Service quality regulation

- Incentive regulation motivates companies to reduce operating costs
- One easy way of doing so is by degrading service quality
- Service quality regulation must be put in place along with incentives to reduce costs
  - minimum standards, with penalties for non-compliance
  - monetary incentives to set the optimal level of quality
  - monitor and publish results
- If quality is important and hard to enforce, then cost-cutting incentives should be weakened
- Instead of aiming for „perfect quality”, find the quality that consumers are willing to pay for

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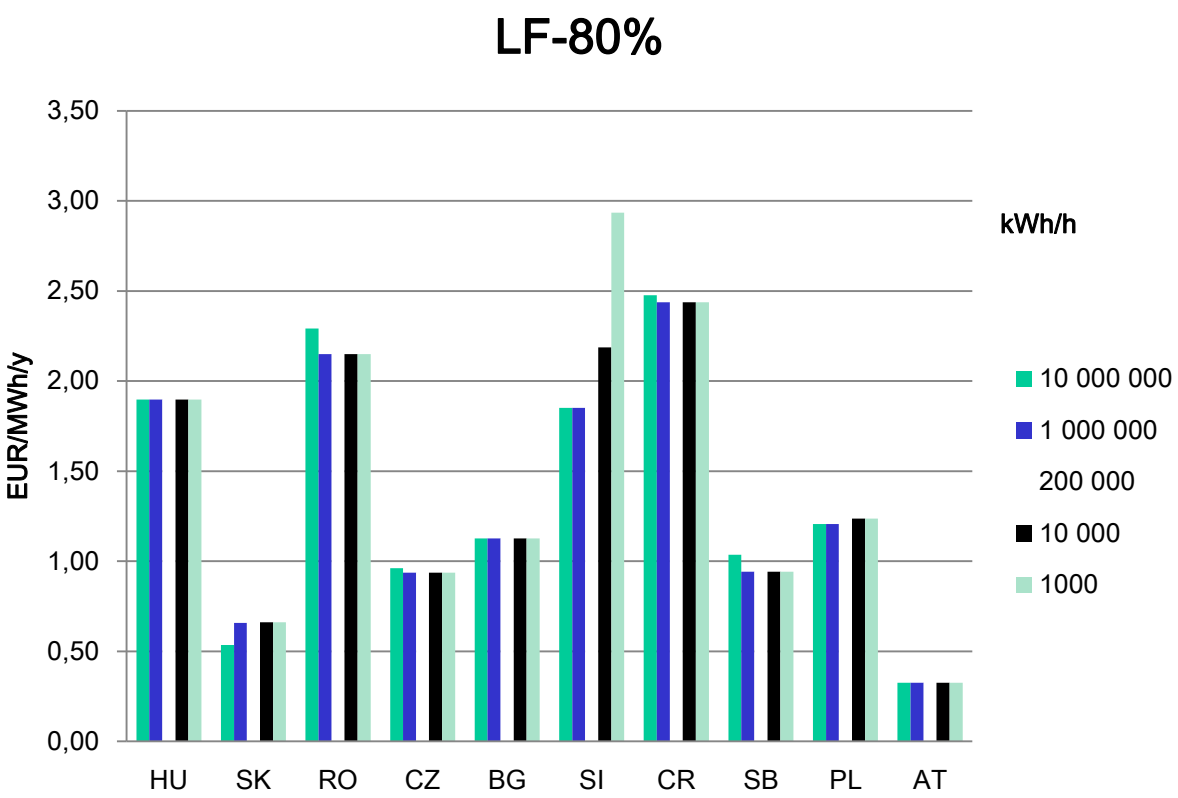
„Peer-determined" prices: benchmarking (yardstick competition)

- A regulator's best cost estimate might be whatever the company reports about its own cost
  - weak incentives for efficient operation
- If comparable regional monopolies exist, additional information is available
  - e.g. distribution utilities in separate regions of the same country
- A given monopoly's justified costs may be based on the (reported) average costs of other (non-competing) monopolies
  - **strong incentives for efficient operation**, since cost savings (relative to benchmark) are retained
- If all regional monopolies operate under the same benchmarking scheme, efficiency improvements result
  - thus, the benchmark automatically adjusts to redistribute efficiency gains to customers
  - a form of competition where real competition is infeasible

Comparison of gas transmission tariffs in CEE



Source: REKK calculations

Fees are expressed in a common measurement unit, and are based on the same transportation service:

- One year transmission contracts
- Firm capacities booked
- 10 000 000kWh (hour/year) used
- 80% load factor

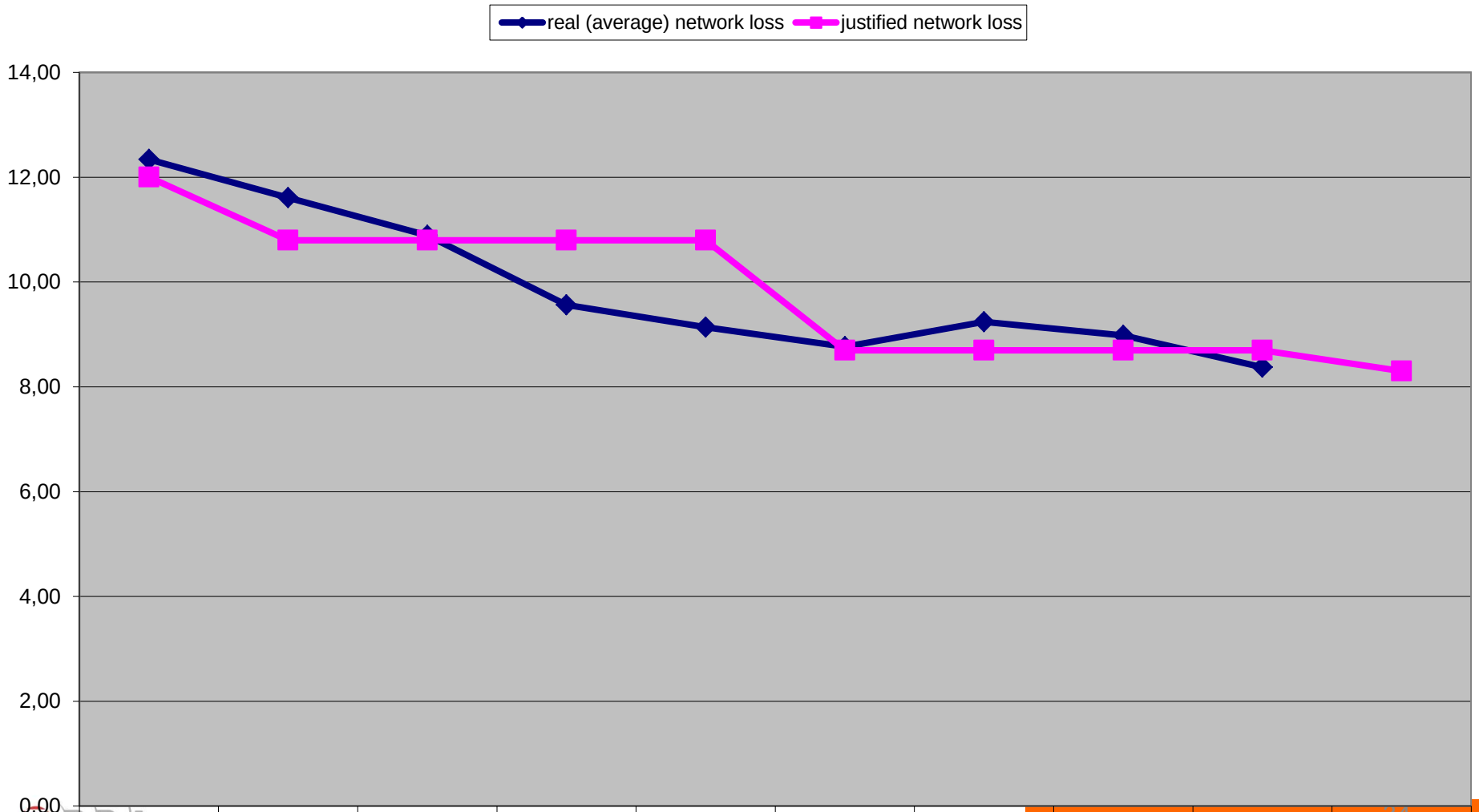
Benchmarking: general remarks

- Statistical methods to compare utilities
  - more data is better than less
- Depends on comparability and competing interests
- The bigger the sample of companies, the bigger the differences between the utilities
- The smaller the sample of companies, the bigger the chance of collusion between regulated firms
- Difficulty of defending the methods can limit the applicability of benchmarking

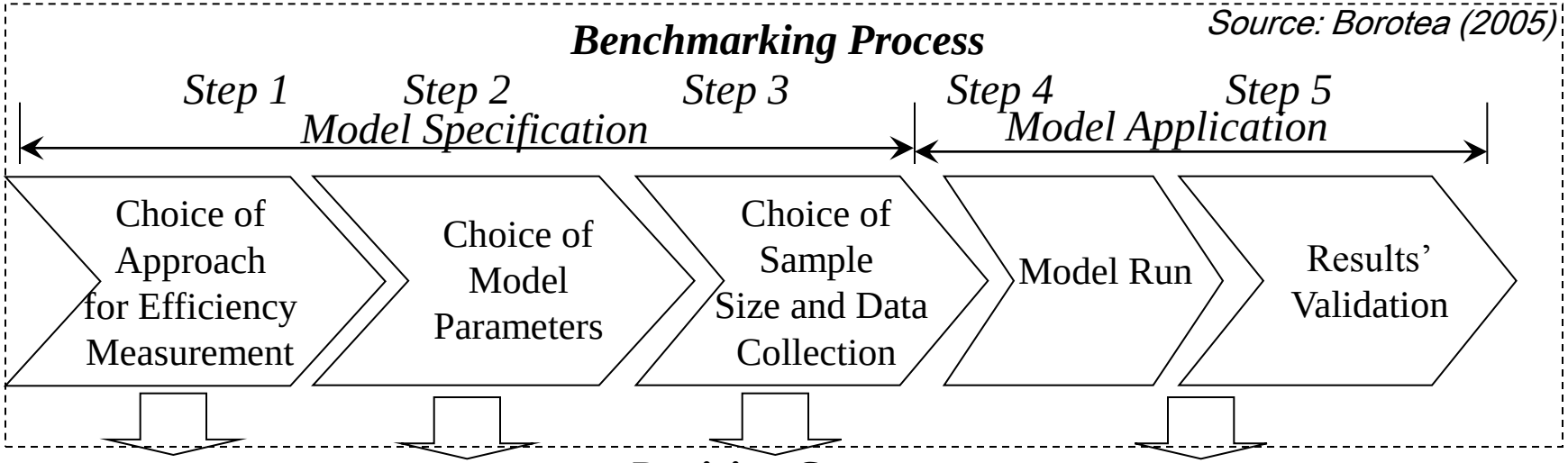
Benchmarking techniques

- The comparison of single items is already useful (labour cost of providing 1kWh of supply, network loss levels)
- More sophisticated techniques to estimate an „efficient company”, based on a larger sample of company data
  - Stochastic Frontier Analysis
  - Data Envelopment Analysis
- Based on the distance from the ideal state, individual efficiency improvement factors (X-factors) can be defined for the individual regulated companies
- Legal background may not permit such comparisons

Simple benchmarking: justified cost of distribution network losses (HU)



Steps in benchmarking analysis



Decision Sequence

1) DEA 2) SFA 3) OLS 4) COLS 5) Partial	1) Efficiency Yardsticks 2) Definition of Inputs/ Outputs 3) Constant or Variable Returns to Scale	1)National versus International 2) Comparison Criteria 3) Data Validation	1) Application of Alternative Approaches 2) Sensitivity Analysis Related to Input and Output Parameters 3) Check for Outliers

REKK Regional Centre for Energy Policy Research

THANK YOU FOR YOUR ATTENTION!

REKK was established at the Corvinus University of Budapest in December, 2003. The mission of REKK is to contribute to the creation of working energy markets and the establishment of efficient regulation by carrying out applied research, training and quality consultancy activities for all those interested persons and organizations that are active in the field.

We think that the experiences that Hungary and some other Central and Eastern European countries have gained through the restructuring and re-regulation of their energy markets are valuable and relevant for all transition economies. This is why the Centre intends to put a special emphasis on the research and dissemination of the regional experience and intends to become a regional research and training centre.

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