

General Aspects and Regulatory Approach

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1. BNetzA's objective and proposal

Objectives

- Improvement of efficiency
- Transfer of productivity improvement to the customer
 - Through a system that should be
 - Appropriate
 - Dependable
 - Robust
 - Negotiation and individual audit free (or almost free)
 - The system should also provide
 - A long term perspective spanning multiple regulatory periods

The means

- Revenue cap during two regulatory periods
 - where the revenue cap is implemented through a hybrid set of instruments
 - computation of single prices follow existing rules
 - With a recommendation for some allocation of difference between the revenue cap and the internally computed costs
 - Followed by periods of yardstick competition
- Particular points (hybrid system)
 - Adaptation of the cap to take long lasting change into account (when enlarging the network)
 - Regulatory account for short term variations of volume

2. My task and how I will proceed

The task: Comment on the concept in general terms

How I will proceed

- Follow “Timetable for Bundesnetzagentur’s upcoming conference: Incentive regulation in the German electricity and gas sector-efficiency and reliability to set the yardstick” hereafter “BnetzA”.
- And extensively refer to Joskow “Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks” (February 2006), hereafter “Joskow”.
- And some own comments

My overall conclusion

- This is fine
- But some details are puzzling
 - The hybrid approach should be clarified
 - Because there is a danger of lack of robustness

3. The basic concept: revenue cap

Question b) in Joskow

- Should the regulator offer the regulated firm a menu of contracts or a specific contract with a single set of values for “ a ” and “ b ” as discussed above (footnote 1)”.
- A reference to Schmalensee 1989 “a pure price cap without cost sharing (a sliding scale mechanism) is not likely to be optimal given asymmetric information and uncertainty about future productivity opportunities”

(footnote 1: “ a ” and “ b ” refer to the allowed revenue $R=a+(1-b)C$ where C is the measured cost. The case $b=1$ is a high power incentive scheme.

As well as question d) “What should be the power of the incentive scheme?”

BNetzA’s response: use a revenue cap

- Arguments
 - Reduce the regulatory need for information
 - Well accepted by the industry provided one also introduces regulatory accounts for accommodating load variability

4. Discussion: structuring the problem

Refer to the general efficiency objective

- Production efficiency: minimize the costs
- Allocative efficiency : price efficiently

Where does the revenue cap stand with respect to these objectives ?

- Close to the average price cap that
 - If properly turned, can mimic Ramsey Boiteux pricing and hence allocative efficiency to cover known costs (the old regulation theory)
 - And is also a very high power incentive scheme to induce management to reduce costs (the new regulation theory)
- With the additional property that it does not induce more consumption
 - One can show that this does not destroy the analogy with Ramsey Boiteux
- This looks quite perfect
 - But there is Schmalensee's remark

5. Discussion: the old theory of regulation

The limitations of the aggregate price cap are well known

- The allocative efficiency of the price cap only holds if the weights are well chosen, something that requires full information on demand and costs
- There is no free lunch: without the information the revenue cap is bound to be non optimal
 - But non optimality is often a minor phenomenon when optimizing welfare
- Moreover, asymmetric of information is a general phenomenon
 - That led the new theory of regulation
 - With, as main result, that giving up some information rent to the companies is unavoidable
- One can thus agree that the average price cap is better than the price cap (because it allows the firm to reoptimize)

However

- Is the revenue cap better than the average price cap
 - *Suppose we were in a period of declining energy prices (we are not!)*
 - *Is the revenue cap sustainable given that other agents fix gas and electricity prices ?*
 - In principle, this is solved by the hybrid system
 - But the hybrid system is not clearly explained
- (9) of BNetzA refers to some internal allocation rules
 - *Which are difficult to assess without additional information*

6. Discussion: the new theory of regulation

- One is now well aware of this issue of asymmetry of information
- The reference remedy: a menu of contracts
 - Suppose
 - Costs are not observable but their probability distribution is public knowledge
 - Efforts of managers to reduce costs are not observable
 - Offering a menu of different contracts of different incentive powers (mix of fixed revenue and cost indexed revenue) is optimal
 - The firm selects the contract that suits it best and reveals its position
 - The inefficient company selects the contract indexed on cost (low incentive power)
 - The efficient companies select the fixed (but also low) revenue high power incentive contract
 - In particular a firm will not select a contract that imposes a revenue target that will not cover its costs (the participation constraint)
 - BNetzA does not propose to apply this remedy

7. Discussion: Is the new theory applied ?

Joskow explains that menu of contracts are unusual:

- He quotes two cases
- But he explains that contract negotiation can possibly be assimilated to offering a menu of contracts
 - But (5) in BNetzA explains that individual negotiation and audits are excluded for Germany (because of the large number of companies)

- Is this a serious difficulty ?
 - Schmalensee explains that offering a single contract is unlikely to be an optimal solution
 - What is the extreme case of a non-optimal solution ?
 - *An infeasible solution*
 - What can an infeasible solution be in BNetzA concept ?
 - *A revenue cap that does not allow the firm to cover its cost*
 - But non optimality is also possible
 - *A too low revenue cap may induce the firm into postponing capital expenditures for operational expenditures*

- Where do infeasibility and non optimality come from
 - *There is a participation constraint in the theory. Following Joskow and linking negotiation and menu of contracts (though the discussion that comes with it), negotiation allows one to enforce the participation constraints.*
 - *Is a surrogate participation constraint possible in BNetzA concept ?*
Maybe yes but I do not see it

8. Discussion: does this have implications ?

- Setting the revenue cap at the wrong level has an impact on the profit of the firm
 - If set at a too high level, the firm retains important information rent
 - If set too low the firm might be at risks in extreme cases.
- BNetzA can set the cost of capital of the firm
 - This should take account of the risk of the firm. Not sure of the impact.
- This raises the question: can one evaluate the risk of setting the target at a wrong level ?
 - This is a question to address to the benchmarking process
 - Can one assess the possible errors in benchmarking methods ?
 - So as to simulate their impact in functional models

9. Conclusion on the choice of the revenue cap

The concept is in line with practice

- Even if it does not follow the theory
 - Which is difficult to implement anyway
- But there is a risk
 - The targets need to be carefully chosen in a process that does not allow for case by case negotiation and audits
- This raises some interesting questions of computation of the WACC
 - But we do not discuss this matter here

- But the main issue is
 - Whether one can reduce the asymmetry of information so as to adequately select that target
 - *In other words, a high power incentive scheme may be risky if there is considerable asymmetry of information.*
 - And if one cannot reduce the asymmetry of information, maybe one can try to assess its impact by answering the following question
 - *Suppose I believe that this is a reasonable target: what can happen if I am wrong by ... %.*

10. Are these reasons to believe that the theory might not be robust (one of BNetzA objective ?)

- A general principle in the economic approach
 - Simplify the model in order to get insight
 - Fine but what is often missing is to
 - Validate the insight obtained by making simplification
 - Using numerical simulation that rely on fewer simplifications
- The discussion of the hybrid model reveals that BNetzA is well aware of the danger
 - It complements its main benchmarking method by other models: the hybrid approach
 - But “hybrid” should be carefully structured in order to avoid becoming arbitrary spreadsheet handicraft

- Trying to develop some structure
 - Consider the economic models of the old and new regulatory theories:
there is a problem of dimensionality
- Models are often (not always)
 - Static
 - Single product
 - Single cost

- While the real situation maybe multidimensional in several respects
 - Time: cost efficiency in a TSO or DSO is often a multiperiod question
 - Because of long term investments, with the result that
 - Costs is not a single parameter but requires a distinction between capital and operational expenditures
 - This distinction may need to be refined if equipments have different life time (compressor vs pipeline) or refer to the different upfront expenditures
 - Products are multidimensional
 - Electricity and gas are measured in Twh and sometimes the responsibility of the same firm. But these Twh should not be added

- With a very natural finding: we apply the theory by casting the real world in that theory
- And construct figures that fit with the theory
 - Like unit costs
- And an equally natural question
 - Can this increase the risk of specifying an inadequate revenue target ?

11. The revenue cap should cover the cost for the target but should not be too high

- This is at the core of the asymmetry of information: What are the cost ?
- Question a) in Joskow: “where does the regulator’s information about the firm’s actual costs and distribution of cost opportunities come from ?”
- What are the costs in the theory ?
 - Take Laffont and Tirole’s new regulation
 - Cost of firm: one parameter
 - That the regulator knows the probability distribution of
 - And that satisfies a particular mathematical property (one can rank companies by cost and the distribution satisfied a given property)

- Can one make those assumptions for a firm that
 - Transport gas and electricity
 - Incurs capacity and operational costs, each of them consisting of several sub costs
 - And that is subject to different “environmental variables” ?

12. The nature of the costs

- Take a TSO or a DSO: it needs to accommodate demand while satisfying some reliability/safety criterion
 - This is a long term (hence multiperiod) problem with indivisibilities
 - Which makes annual capital expenditures quite volatile
 - This does not fit with the theory but one tries to make it fit
- How does one make it fit ?
 - By computing annual or unit costs
- Through some accounting rules
 - That allow to compute costs
 - But possibly come up with figures that may not mean much
 - And hence may make the setting of the target a very difficult problem

- In short
 - One may think that one is applying the theory
 - But the reality maybe that
 - One is only applying some very important principle emerging from the theory
 - Here the search for high power incentive contract
 - The detail of the theory is not applicable
 - Here a single number revenue cap for some regulatory period
*because the assumptions are too far from the real world
and the calculation reflect more accounting rules than economic reality*

13. What does BNetzA's concept do ?

- First: the discussion of the hybrid approach reflects that it is well aware of the problem
 - It does not plan to apply the theory as such: it wants to complement it with the hybrid approach
- Now what does it do ?
 - There is a data base of costs
 - That I do not know anything of (but this is not important for the discussion)
 - There is currently no data base on reliability
 - This is an issue
 - The data base on cost will be used to feed
 - DEA and SFA analysis
 - Particular models
 - In order to continue the discussion, I note
 - There is a paper on DEA and SFA (these are benchmarking methods)
 - And examples of possible uses of particular functional models (accounting for the number of connection points to account for long lasting changes of load)

13. On benchmarking

- Question c) in Joskow: “what benchmarking are to be used to arrive at starting values for the regulated firm’s costs, revenue and other performance and how are these benchmarking adjusted over time ?
- BNetzA’s response
 - Use DEA and SFA to define the base level
 - Define efficiency targets (X factors) using various indices to represent global productivity efficiency
 - Construct individual efficiency targets on the basis of efficiency measurements of the benchmarking methods.
 - Adapt with functional models
 - And go to yardstick competition after two regulatory periods

- A key instrument of the whole approach: benchmarking methods
 - These methods have sometimes been criticized (including by those who use them)
 - Their goal : compute the production frontier of the technology and assess how far some firms are from the frontier.
 - This gives both the starting values and indicate how to come closer to the frontier
 - In two regulatory periods in BNetzA plan

15. General remarks on benchmarking

- Benchmarking methods start with the definition of a relevant space: the space of the input and output of the activity.
- The real world is one of multiple inputs and outputs. Economic theory works with very few inputs and outputs
 - How does one go from one to the other ? This is my problem of multidimensionality
- A general note: benchmarking never works directly on the frontier and the production set but only on a subset. The resulting frontier is only an estimate of the real frontier
 - Does the result depend on how one chooses the criteria ?
- As an illustration: a production set constructed with many input and output will have many firms on the frontier. When using only a subspace of the input and output factors, some of the firms that are on the frontier (efficient firms) come inside (and hence become inefficient?)

16. Illustration

- Assessing a starting situation and defining targets is simple in a single input and output problem (the usual economic model)
- It might be something much more difficult where there are many inputs and outputs. Consider the following set of studies on electricity distributions

| | Input | Output |
|--|---|---|
| <p>A Dutch study Cherchye L. And T. Post (2001). <i>Methodological Advances in DEA: A survey and an application of the Dutch electricity sector.</i> Available from http://ideas.repec.org.</p> | Controllable operational costs | Energy delivered Number of large customers Number of small customers Peak Demand > 100 kW Peak Demand < 100 kW Length of network Number of transformerd |
| <p>UK Fernarndes P. (1004). <i>When assumptions go unquestioned.</i> Reckon LLP consultancy report, available from http://www.reckon.co.uk/freepub.htm</p> | Normalized Controllable costs | Composite variable of Energy delivered Number of customers Network Length |
| <p>Finland Korhonen P., M. Syrjänen and M. Tötterström (2000). <i>Assessment of cost efficiency in Finnish Electricity Distribution using DEA</i>, Energy Market Authority, available from http://www.energiamarkkinavirasto.fi</p> | Operating costs | Energy delivered Reliability |
| <p>Norway Honkapuro S., J. Lassila, S. Vikainen, K.Tahvanainen and J. Partanen (2004). <i>Effects of Benchmarking of Electricity Distribution in Nordic Countries - Comparison between Different Benchmarking Methods.</i> Lappeenranta University of Technology, available from http://powersystems.tkk.fi/nordac2004/papers</p> | Operating costs Network assets Number of man-labor years Interruption time Network losses | Energy delivered Number of customers |

17. A first issue: selecting the input and output

- How does one select the set of input and output ?
- Does BNetzA foresee that question ?
Yes. It explains (points 17 and 18) that they will use functional models to assess the question.
- But the illustrative case studies also shows the strange role of reliability
 - Taken as input on some studies
 - Taken as output another
 - This is no longer a matter of choosing which criteria to include
 - This is really a matter of understanding the process itself
 - The standard engineering practice is to consider reliability through some criterion as un-served energy (here un-served transport). But with a much higher weight
 - There is a paper on the issue
 - But the current database does not contain reliability data yet
 - This raises a first and obvious question:
 - Could it be that firms with a relatively lower reliability set the frontier ?

18. On input and output again

- How can one get an insight from functional models
- Take a planning model of the distribution or transportation firm
 - It starts with a prognosis of energy form to transport
 - And reliability constraints or reliability valorization
 - It considers a set of different (technologically obvious) inputs
 - Equipment; lines, pipes, compressors, transformers
 - Variable costs
 - Losses
 - And it optimizes

- Separate models can also help find the relevant “ environmental variables”
- And help validate the recommendation of Agrell and Bogetoft
 - Input is cost
 - Output are transportation work, capacity provision and customer service
- This raises a second question
 - Where does one stand on this point and on the determination of the environmental variables ?

19. But can one really validate cost as input ?

- Agrell and Bogetoft rightly point that one should work with aggregates
 - It allows the firm to re-optimize, which can only improve efficiency
 - This is also closer to the theory that often works with cost and a single output
 - And Agrell and Bogetoft argue that cost is the only relevant input.

- Note first that not all aggregates are the same
 - Some aggregates are unconstrained weighted sum and allow for the firm to re-optimize e.g. at the output
 - The inclusion of reliability at an output variable if firms exhibit different reliability level
 - The correct aggregation is via a penalty (which is what BNetzA is proposing)
 - Aggregation by a sum with economic weights is fine: it allows the firm to re-optimize

- Some aggregate are in fixed proportions; they do not allow firm to re-optimize and make the benchmarking awkward
 - Consider Joskow’s question “should the incentive mechanism be comprehensive or partial”
 - Suppose a comprehensive treatment: does one fix the proportion of gas and electricity
 - (and in that case how does one compare two firms that have different proportions of gas and electricity ?)
 - Suppose a partial treatment: how does one allocate some fixed costs and take account of economies of scope ?

- Some aggregate are not aggregates at all: they amount to disaggregating. This applies to costs
 - At the input level
 - Capex and opex should not be aggregated as long as one work with short regulatory periods: a capex related to an indivisible plant whose life extend over twenty years should not be decomposed into short term capex and aggregated with the opex of the same period.
 - But capex raises questions of their own in benchmarking
(e.g. the Finish study dropped the capex because it was too volatile)

- In other words
 - Aggregating the outputs in fixed proportion into a single or a few products is not natural
 - Aggregating outputs as a weighted sum in free proportion and using an economic valuation is fine
 - Decomposing the investment cost of a long-term investment in an annual cost for benchmarking purposes is not an aggregation: it is a disaggregation

20. Last but possibly not least

- Is the accounting system sufficiently standardized
 - Standardisation in allocation methods does not solve all problems
 - But lack of standardization increases them

Conclusion

- Can the theory be implemented

- An old example: Ramsey Boiteux

- Is designed to tell what to do
- Or to explain what one was already doing

My position: one tries to apply the theory or at least tries to benchmark what one is doing with respect to the theory

- Apply the same question to incentive regulation

- The menu of contracts is a difficult theory to extend to realistic assumptions

- Whatever these difficulties, it tells us essential things on the targets
- One should be careful not to

- Depart too much from the optimality objective that underlies that theory

By imposing a revenue cap that the firm cannot match

Or that will distort its incentive to properly optimize its mix of short and long term expenditures

- The hybrid approach of BNetzA has the potential to avoid these pitfalls
 - But the available presentation is not structured enough.
- In short
 - The concept is probably the only feasible one available to BnetzA and hence should be applied
 - But the difficult work will begin with the implementation of the concept. This should be foreseen right away.