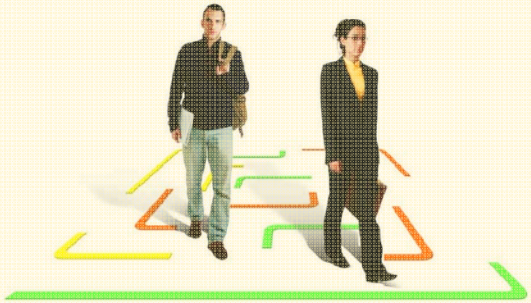

Regulation: from Theory to Practice

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Why regulate?

- **Kinds of market failures**:
- Market power (leading to inefficiently high prices):
  - Economies of scale and scope
  - Anticompetitive behaviour
  - Externalities
  - Government limits to competition (e.g. patents)
- Externalities (leading to inappropriate prices)
- Information problems on service quality and/or costs
- **Main target**: cost oriented prices … to mimic perfect competition!

Price regulation in practive: Rate of return regulation

- The method consists in defining a limit level to the rate of retun on investments.
- Using accounting terms, the rate of return is given by the fraction between net profits and investment level (i.e. the stock of capital, net of depreciation)
- In a monoproduct setting, *R* is total revenues, *k* is capital factor, *l* is the labour factor, and *r* and *w* the unit cost of input factors, we have:

$$ROR = \frac{R - wl}{k} \leq \rho$$

Rate of return regulation

- Empirically, the regulator sets the Total Revenues of the firm (TR) as:

$$TR = \rho * k + \mathrm{VC}$$

- Where VC = variable costs (or opex)
- Then, indicating with Q the total quantities of the goods/services (minutes, kWh …)

$$P = TR / Q$$

- *Hearing* process: when the ex post rate of return is higher than ρ, regulator reduces prices; if it is lower than ρ, regulator increases prices.

Rate of return regulation

- Pros of ROR:
  - Financial integrity of regulated firm is always guaranteed;
  - Monitoring of profits
  - No incentive to reduce service quality
- Cons of ROR:
  - No incentive to reduce costs (no productive efficiency) $\Rightarrow$ *cost plus mechanism*
  - Incentive to overinvest (inefficiently) if $\rho > r$ (Averch – Johnson effect)
  - Risk of accounting manipulation
  - Information demanded method and so high administrative costs

Price cap regulation

- Regulator defines, for a certain period of time, a limit to the growth of price(s) of a (single or a weight average) set of goods or services:

$$P_t = (1 + RPI_t - X)\, P_{t-1}$$

- RPI_t = *retail price index*
- X = (estimated) growth in productivity $\Rightarrow$ reduction that regulator wants to pass to consumers

Price Cap regulation

- The regulator should define the *X* factor and, in a multiproduct setting how to evaluate the average level of price (i.e. the weight to apply to every services).
- Given the general rule, the regulated firm is free to set single prices with respect only to the imposed contraint on their average level
- In addition, regulator sets the time period in which the constraint is valid (*regulatory lag*). In Italy it lasts (almost) three years.

Setting the X Factor

- Same problem than for initial prices:
  - *If X set too low*: too much profit for the regulated firm
  - *If set too high*: risk of financial distress
- General principle
  - In a competitive economy, firms pass on to customers the cost increases (due to higher input prices), but also the cost decreases (due to increases in productivity)
  - Therefore, the prices rise at a rate equal to the to the difference between the rate at which input prices rise and the rate at which productivity increases

Setting the X Factor: In Practice

- Using historic growth rates to predict future growth rates
  - Adjustment might need to be made if in the past low incentives for cost reduction (e.g., due to ROR regulation)
  - etc.
- In some countries, the data might not be available
  - Using historical changes in the prices of regulated services
  - Benchmarking with other countries
- Whatever the method, the regulator may also base the X on projections of future revenues and costs (in a manner similar to ROR regulation)

Incentive Regulation

- "Incentive regulation" refers to alternative regulations which aim at providing incentives for efficiency
- Examples of incentive regulation:
  - Earnings sharing
  - Revenue sharing
  - Price freezes
  - Rate case moratoriums
  - Price caps

Earnings Sharing Regulation

- It explicits sharing of realized earnings between the regulated firm and consumers
- For instance,
  - the target rate of return is 12 percent
  - the firm can keep all earnings between 10 and 14 percent
  - 50% of earnings between 14 and 16 percent
  - 0% of earnings in excess of 16 percent
- Employed in the US and Europe (energy, airport, …)
- In particular as a component of initial price cap plans

Revenue Sharing Regulation

- Requires the regulated firm to share its revenues with consumers over a pre-defined threshold

- More recently, implemented in many Electric regulators in Europe

Trends in Incentive Regulation in US Telecoms

Year	ROR regulation	Rate case mor.	Earnings shrg.	PC regulation	Other
1985	50	0	0	0	0
1986	45	5	0	0	0
1987	36	10	3	0	1
1988	35	10	4	0	1
1989	29	10	8	0	3
1990	23	9	14	1	3
1991	19	8	19	1	3
1992	18	6	20	3	3
1993	17	5	22	3	3
1994	20	2	19	6	3
1995	18	3	17	9	3
1996	14	4	5	24	3
1997	12	4	4	28	2
1998	13	3	2	30	2
1999	11	1	1	36	2
2000	7	1	1	40	2

Source: Sappington (2002).

Advantages of Price Cap

- Incentives for cost-minimization
  - Link between prices and costs severed
- No input bias (A-J effect)
  - No connection between profit and rate base
- Smaller administrative costs
- However,
  - In practice, cost and profit monitoring during reviews => some of the distortions associated to ROR regulation can appear

Potential Drawbacks

- Prices may diverge significantly from realized costs
  - May reduce allocative efficiency and welfare
  - Problem more pronounced when
    - There is considerable variation in possible costs
    - Regulator values consumer surplus sufficiently more than profit
    - Positive production levels are always desirable
  - ROR regulation can outperform price cap when these three effects prevail
- Risk shifts to the regulated firm => higher cost of capital
- Strong incentives to reduce costs… can imply strong incentives to reduce quality
  - Reducing repair and customer assistance, etc.
  - Postponing innovations in quality
  - => service quality regulation

Potential Drawbacks

- Price flexibility to the firm
  - It can undo some cross-subsidies that the regulator wanted to set. For instance, choose not to serve high-cost or low willingness to pay consumers
  - Incentives for predatory pricing may persist if both competitive and regulated services are subject to the same price cap
- The regulator is not obliged rates of return, and hence has greater discretion; increases risk of capture
- Implementation can be complex
  - Uncertainties about cost variations

Rate-of-Return versus Price-Caps

	Rate of Return	Price Cap
Prevent exercice of market power	Yes	Yes
Productive efficiency	No	Yes
Allocative efficiency	No	Yes
Dynamic efficiency	No (!)	Yes (!)
Ensures high quality of service	Yes	No

Price Cap regulation

- Empirical evidence on PC (Sappington, 2003) using data from US Telecommunications Industry:
  - Incentive to renew some type of equipments (digital commutator, digital transmission) but not to increase aggregate investment
  - Incentive to increase total factor productivity
  - Decrease in retail prices … but not consistently
  - Increase in net profits … even if no clear evidence for reductions in *operative costs*
  - No clear incentive to reduce services' quality
- Alexander et al. (1996) examine the evidence on the cost of capital for regulated industries and find that, as expected, firms facing incentive regulation have higher systematic risk than firms subject to rate-of-return regulation.

Incentive regulation in Energy Sectors

- Incentive regulation increases productivity and service quality in UK electric regional distribution (Jamasb and Pollitt 2007; Domah and Pollit, 2004; Newbery and Pollit, 1998)
- Quality impact is ambiguous: Not negative impact of incentive regulation in quality provision in Norway (Growitsch *et al.* 2010); negative effect of IR on quality in the US (Ter Martirosyan and Kwoka, 2010) without MQS.
- Incentive regulation increases labour productivity in electric distribution in developing countries (Pollit, 2004; Rudnik and Zolezzi, 2001)
- Incentive regulation increases firms' investments, but only in cost-reducing activities (Cambini and Rondi, 2010).
- Surveys on IR in Energy: Joskow 2008, Vogelsang 2006

Yardstick Competition (Shleifer, 1985 BJEcon)

- Presence of multiple local monopolies.
- *Intuition*: using information of other to regulate a firm

$$p_i = \bar{c}_i \equiv \frac{1}{n-1} \sum_{j \neq i} c_j$$

- Also known as benchmarking (parametric and non parametric methods)
- *Critics*: a) different firms and heterogeneity; b) potential collusion among regulated firms; c) not credible treat from regulator

How to use benchmarking?
ART's intervention

- With Deliberation n. 1/2016 ART started a public consultation for the definition of the optimal dimensions (i.e. extension in km) of a motorway concessionary.

- The analysis is aimed at assessing, through the use of quantitative methods, the scale and cost efficiency of the Italian motorway concessionaires for the purpose of determining the optimal size of the sector on the basis of its characteristics.

- The cost structure is a very important factor for policy makers, both to define a proper benchmarking and evaluate the effect of competition *for* the sector (**yardstick competition**).

Deliberation n. 70/2016 (July)

- By applying different methodologies (stochastic frontier and regression analysis) and considering different cost functions (Cobb-Douglas and Translog), the scope is to determine the key factors that best explain the changes in production costs for small- and medium-large motorway concessionaires.

Methodology: cost function

- The cost function is the following:

$$C = f(V, LKm, P_i, H)$$

- *V* is the total number of km travelled (output), *LKm* is the lenght in KM of the concessionary, P_i are the input prices and *H* are additional firm-level and structural control variables
- Different measures of costs (*C*):
  a) Operating expenditures (labor, third-party services and other costs)
  b) Maintenance costs
  c) Amortization
  d) Financial expenses
- Hence *total cost* is the sum of all components, while the sum of a) and b) are the *total variable costs*

Methodoloy: variables definition/1

- Input prices (P_i):

Labor price - ***PL*** = Labor costs/Average number of employees

Maintenance price - ***PM***= Maintenance costs/ Number of km travelled

Other service price - ***PS*** = Cost for third partyservices +other costs/Network Lenght

Capital price - ***PK*** = (Amortization + financial expenses) / Network Lenght

Methodoloy: variables definition/2

- Control variables *(H)*:

Structural control

- ***Stoneworks /Km*** = Lenght of viaducts, bridges, tunnels in Km/ Network Lenght
- ***High lanes/Km*** = (3-lanes and 4 lanes km) / Network Lenght
- ***Quality*** = IPAV index – quality pavement indicator

Firm-level control

- ***Residual period/lenght of concession*** = Years at the end of the concession/Lenght of the concession in year
- ***Debt/Equity***= Debt to Equity ratio
- ***Group dummies*** = Dummy for controlling for large groups (SIAS, Atlantia, others)
- ***Tariff dummies*** = Dummy for controlling for the specific regulatory scheme (i = 1, …, 6)

Time and firm dummies

Methodology: econometric models/1

- The **Cobb-Douglas function** has the following form:

$$C = \alpha \, \Pi_i \, x_i^{\beta i},$$

where C is the cost (**total cost** or **opex** only), x_i are the input prices or other control variables, β_i represents the cost elasticity of the variable x_i.

- The pros of the Cobb-Douglas function is that cost can be linearized in the logarithm:
-

$$ln\ C = \alpha + \beta_1\ ln\ x_1 + \beta_2\ ln\ x_2.$$

- The **Translog function** is the following:

$$lnC = \alpha + \sum_i \beta_i \, ln\, x_i + \sum_i \sum_j \gamma_{ij} ln\, x_i \, ln\, x_j,$$

- That in case of two variables takes the form:

$$lnC = \alpha + \beta_1 \, ln\, x_1 + \beta_2 \, ln\, x_2 + \beta_3 \, (ln\, x_1)^2 + \beta_4 \, (ln\, x_2)^2 + \gamma_{12} \, ln\, x_1 \, ln\, x_2 \, .$$

- The pros is that it is more flexible and permits to evaluate the degree of economy of scale as the volume and the extension fot eh concession change.

Methodology: economies of scale

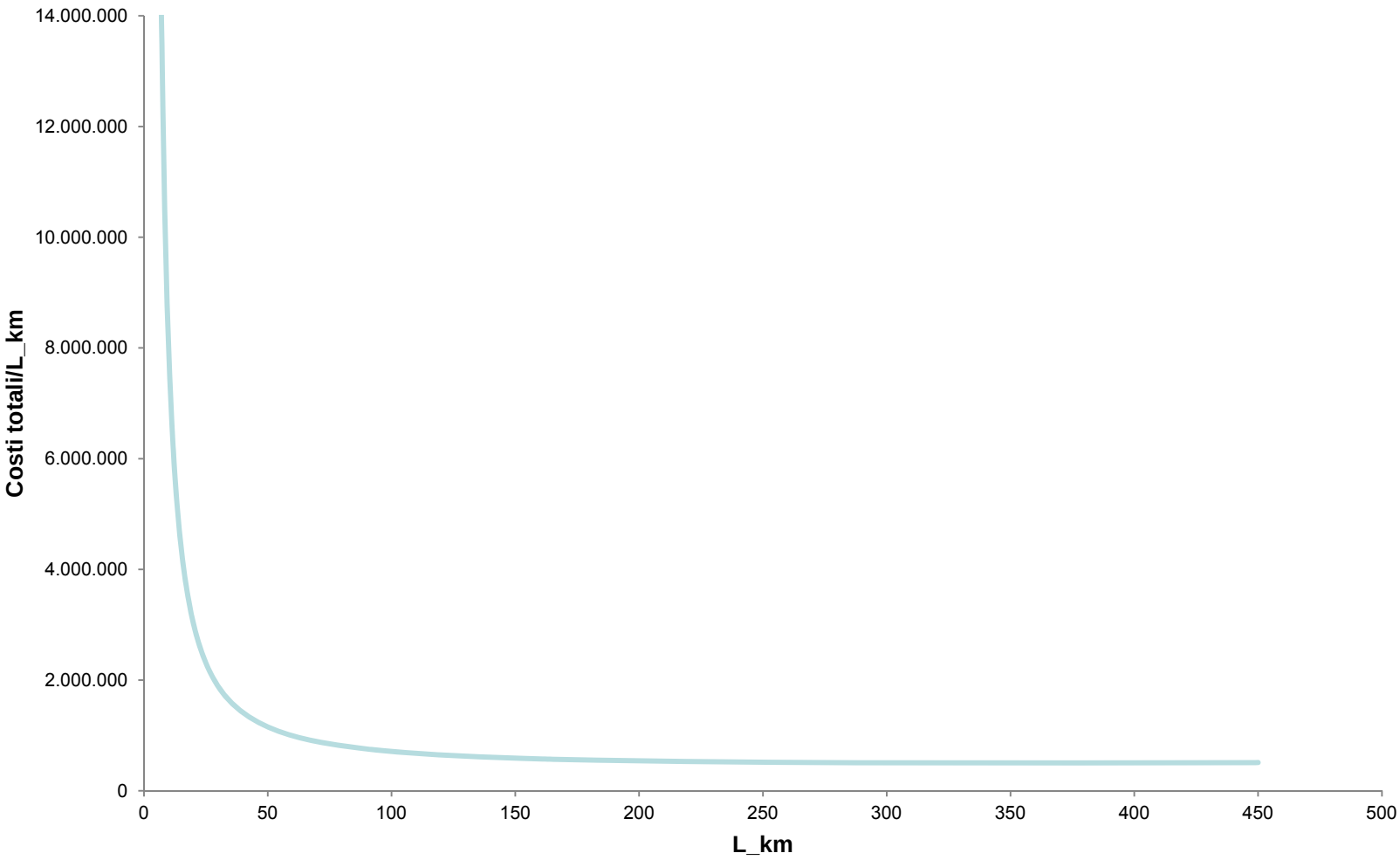
- We adopt the approach by Caves, Christensen e Tretheway (1984, *RAND*); the degree of economy of scale is determimed by the following ratio (for a Cobb-Douglas functional form):

$$ES = 1/(\alpha_1 + \alpha_2)$$

- There exists economy of scale iff ES > 1 and diseconomy of scale iff ES < 1

- **Main results**: optimal dimension close to 180 km … up to 315 km.

Cost simulation in Italian Highways



Regulation and investment

- The literature suggests that regulatory policies affect utilities' investment decisions differently, depending on which type of investment – in cost reducing or infrastructure - the firm undertakes (Armstrong and Sappington, 2006).
- In contrast, if firm's allowed revenues do not depend on realized cost savings (like in a price- or revenue- cap mechanism), the incentive to invest in cost reducing activities is predicted to be more pronounced (Cabral and Riordan, 1989)
- A complicating factor, however, is that incentives work differently for infrastructure and for cost reducing investment.
  - Rate of return regulation is thought to provide strong incentives for developing new infrastructure since the rate of return on the asset base is guaranteed and the risk faced by the firm considerably reduced.
  - Price cap mechanism may weaken the incentive to invest in infrastructure, especially when the regulatory lags are shorter than the life of the assets, due to regulatory opportunism (Guthrie, 2006)

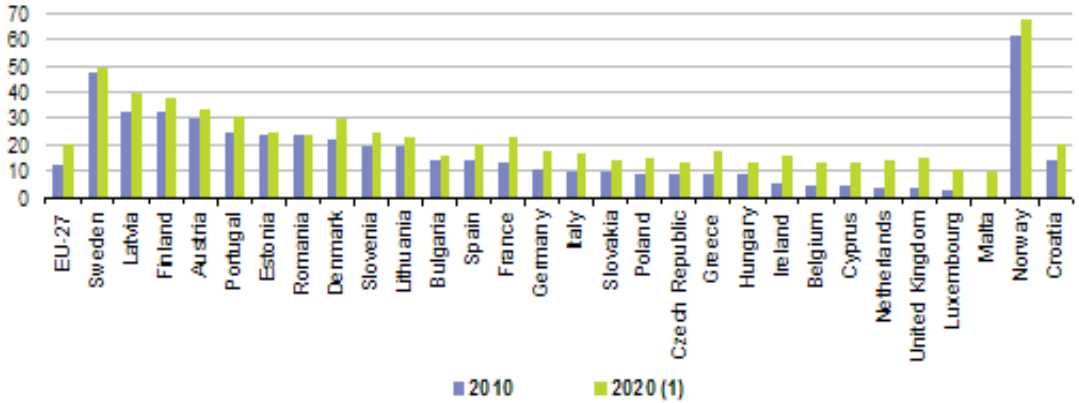
New Incentives Scheme for Innovation & Investment

- The rapid change in generation capacity towards a massive adoption of renewable resources, together with the launch of technological innovation in the electricity distribution networks – smart grid projects – has prompted a lively debate in Europe on how incentive regulation in electricity distribution should evolve.
- Price caps focused almost exclusively on the use of inputs – operational and capital expenditures.
- Need of incentives that focus on outputs measures of companies' performance – measures of network reliability, environmental impact, customer satisfaction, ability to meet social obligations, etc..

New Incentives Scheme for Innovation & Investment

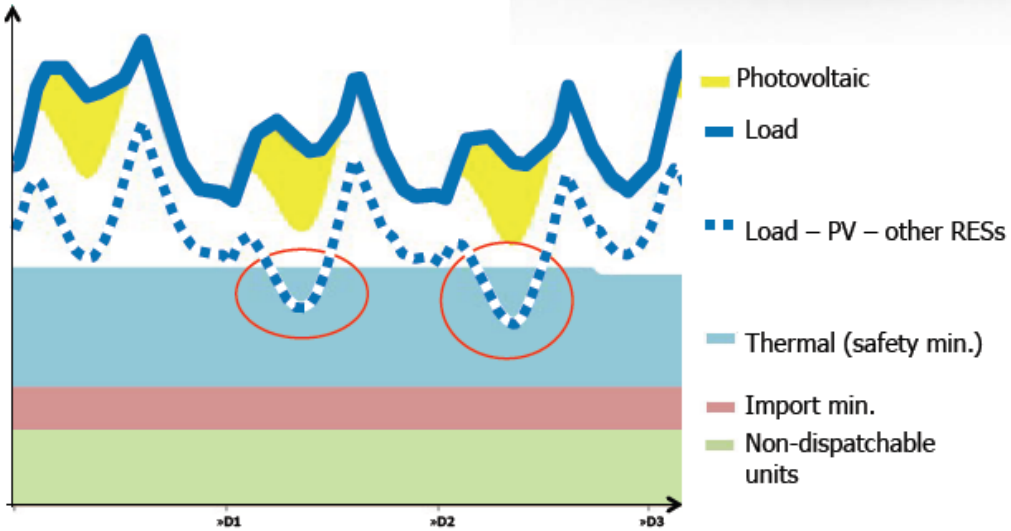
- The best-known example in this regard is the new regulatory scheme recently adopted by Ofgem, the *Revenue, Innovation, Incentives and Output* (RIIO) model (Ofgem, 2010).
- The Italian Regulatory Authority is also planning to address the challenge of delivering smarter networks by means of regulating output measures of technological innovation and other regulatory agencies, for instance the Australian energy regulator, are taking similar decisions as well (AEEG, 2011a; ACCC/AER, 2012).

Grid Evolution



Problems created by RES

- Forecast of energy produced because strongly affected by the wheater;
- Dispersed generation;
- Bi-directionality of the grid;
- Traditional energy generators produce at fixed power and cannot be stopped.
- *"Sunny Summer Sundays"* when the curtailment risk is higher.

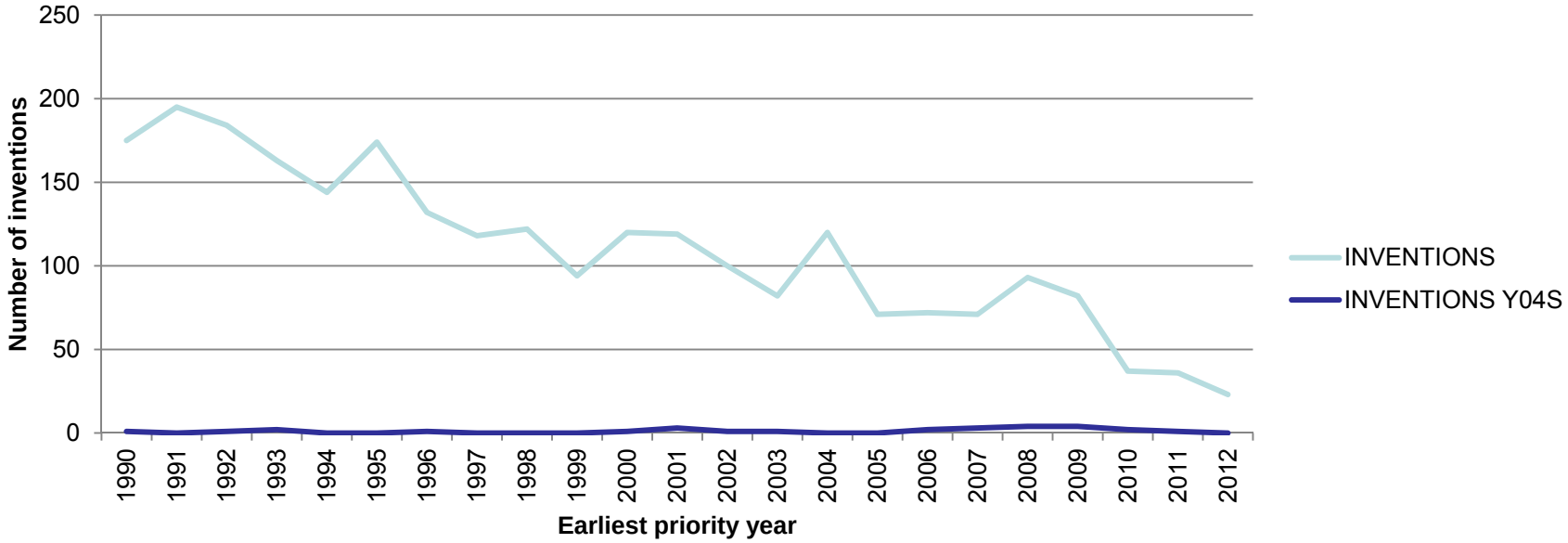


Network Operators

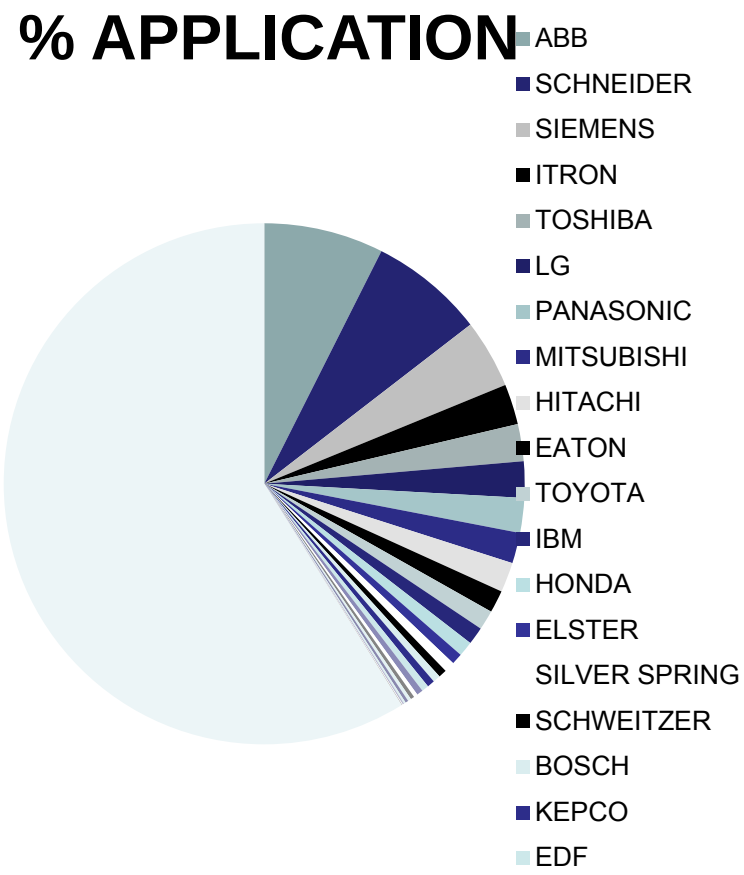
Network operators' patents were analysed: the IP activity is decreasing accordingly to a regulation framework focused on cost reduction and efficiency improvements.

BRITISH ENERGY | CENTRICA | E.ON | EDF | EDISON | ENBW | ENDESA | ENEL | ENI | GDF | IBERDROLA

IREN | NGET | NUON VATTENFALL | REE | RTF | RWE | SCOTTISH POWER | SSE | TENNET | TERNA



Market Players

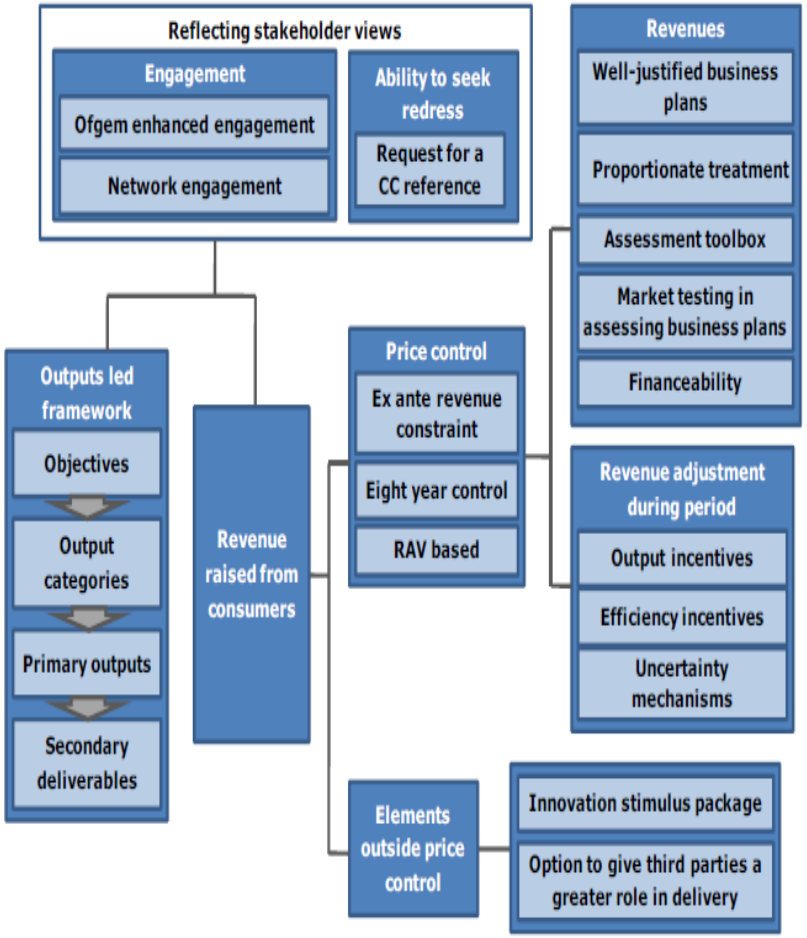


POS.		Patents	%	Cumul%
1	ABB	513	7,4%	7,4%
2	SCHNEIDER	491	7,1%	14,5%
3	SIEMENS	295	4,3%	18,8%
4	ITRON	173	2,5%	21,3%
5	TOSHIBA	159	2,3%	23,6%
6	LG	156	2,3%	25,9%
7	PANASONIC	149	2,2%	28,0%
8	MITSUBISHI	131	1,9%	29,9%
9	HITACHI	128	1,9%	31,8%
10	EATON	96	1,4%	33,2%
11	TOYOTA	84	1,2%	34,4%
12	IBM	75	1,1%	35,5%
13	HONDA	64	0,9%	36,4%
14	ELSTER	48	0,7%	37,1%
15	SILVER SPRING	45	0,7%	37,7%
16	SCHWEITZER	35	0,5%	38,3%
17	BOSCH	32	0,5%	38,7%
18	KEPCO	32	0,5%	39,2%
19	EDF	30	0,4%	39,6%
20	ACCENTURE	27	0,4%	40,0%
21	ENEL	17	0,2%	40,2%
22	SONY	16	0,2%	40,5%
23	PEUGEOT	14	0,2%	40,7%
24	SAMSUNG	13	0,2%	40,9%
25	MOTOROLA	8	0,1%	41,0%
26	GE	6	0,1%	41,1%
27	BOSCH & SIEMENS	3	0,0%	41,1%
28	GOOGLE	3	0,0%	41,2%
	OTHERS		58,8%	100,0%

The OFGEM's RIIO

Born from the comprehensive review RPI-X@20 to take a new step in regulations:

- Well-justified long-term context of business plans;
- Keeping options open in business plans for unexpected evolutions;
- Long-term primary outputs to be delivered in the price control period;
- Secondary deliverables linked to delivery of primary outputs in future;
- Commitment to principles of Sustainable Network Regulation;
- Option of role for third parties in delivery;
- Time-limited innovation stimulus package;
- RAV based control (Regulatory Asset Value);
- Longer price control period (8 years);
- Proportionate assessment;
- Enhanced engagement.



An application of Quality Regulation: the Electricity in Italy

- In 2009 Italy had 135 Distribution Network Operators (DNO)
- Total energy delivered was almost 280 TWh
- Enel Distribuzione was responsible for 86.2% of distributed energy
  - A2A Reti Elettriche (4.1%), ACEA Distribuzione (3.6%); other DNO less than 1% of distributed energy
- Enel is present in all regions of Italy and it is organized in 115 Zones (11 Territorial Units and 4 macro Areas)
- DNOs are regulated by the Italian Regulatory Authority for Electricity and Gas (Autorità per l'energia elettrica e il gas – AEEG)

- Electricity distribution tariff is unique across Italy
- It is composed of several building blocks:
  - Hybrid incentive mechanism: price cap on opex + WACC on capex
  - input-based elements (+2% WACC for 8-12 years)
    - Innovation (also smart grid demostration projects)
  - output-based quality-specific incentives
    - SAIDI (since 2000) and SAIFI+MAIFI (since 2008)
- Now in the fourth tariff period (2012-15)

Aims of Quality Regulation

- Italian regulator is keen on considering a more unified approach to tariff schemes, based to a greater extent on output regulation
  - [AEEG Consultation Document n. 34/11; Benedettini et al., 2011; Lo Schiavo et al., 2013]
- Recent regulatory schemes (f.i., Ofgem RIIO model) include additional output measures that focus on sustainability and innovation
  - [Baucknecht, 2011; Muller, 2011; Meeus et al., 2011]

The mechanism

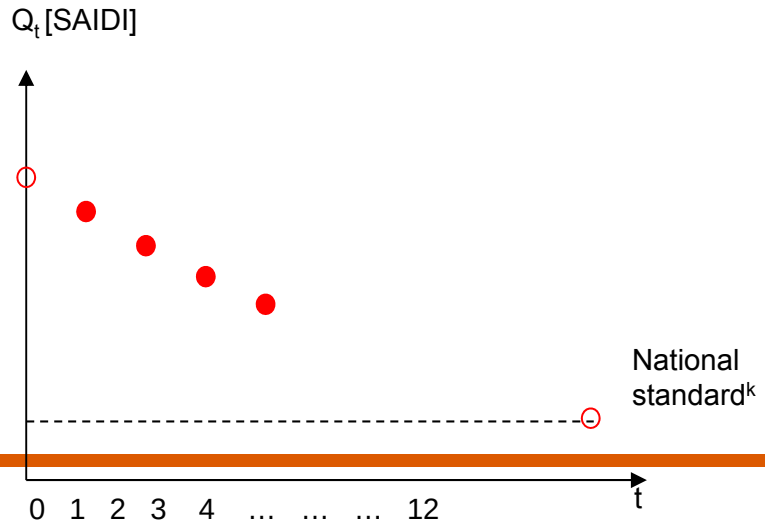
- Reward and penalty scheme for quality, introduced in 2000
- Average duration of interruptions per consumer – SAIDI - for long (longer than 3 minutes), unplanned interruptions (net of exclusions for Force Majeure)
- SAIDI is measured separately in more than 300 territorial districts (homogeneous population density)

$$p_t = p_{t-1} \cdot (1 + RPI - X + Q)$$

- Yearly values of Q are calculated, ex post, on the basis of companies' performances
- SAIFI and MAIFI indicators regulated from in 2008

The regulatory framework

- Distribution tariff is adjusted yearly on the basis of quality performance
  - Tariff increases when rewards earned by all districts in the country are greater than total penalties paid and vice versa
- Target-SAIDI
  - Convergence in performance of all districts with equal population density to the same quality level (the national standard) in the medium term (12 years)
  - National standard defined for 3 levels of density: better continuity is expected in more densely populated areas
- Penalties and rewards
  - WTP of residential and non-residential customers
  - Rewards (and penalties) are larger for districts that are more distant from the national standards



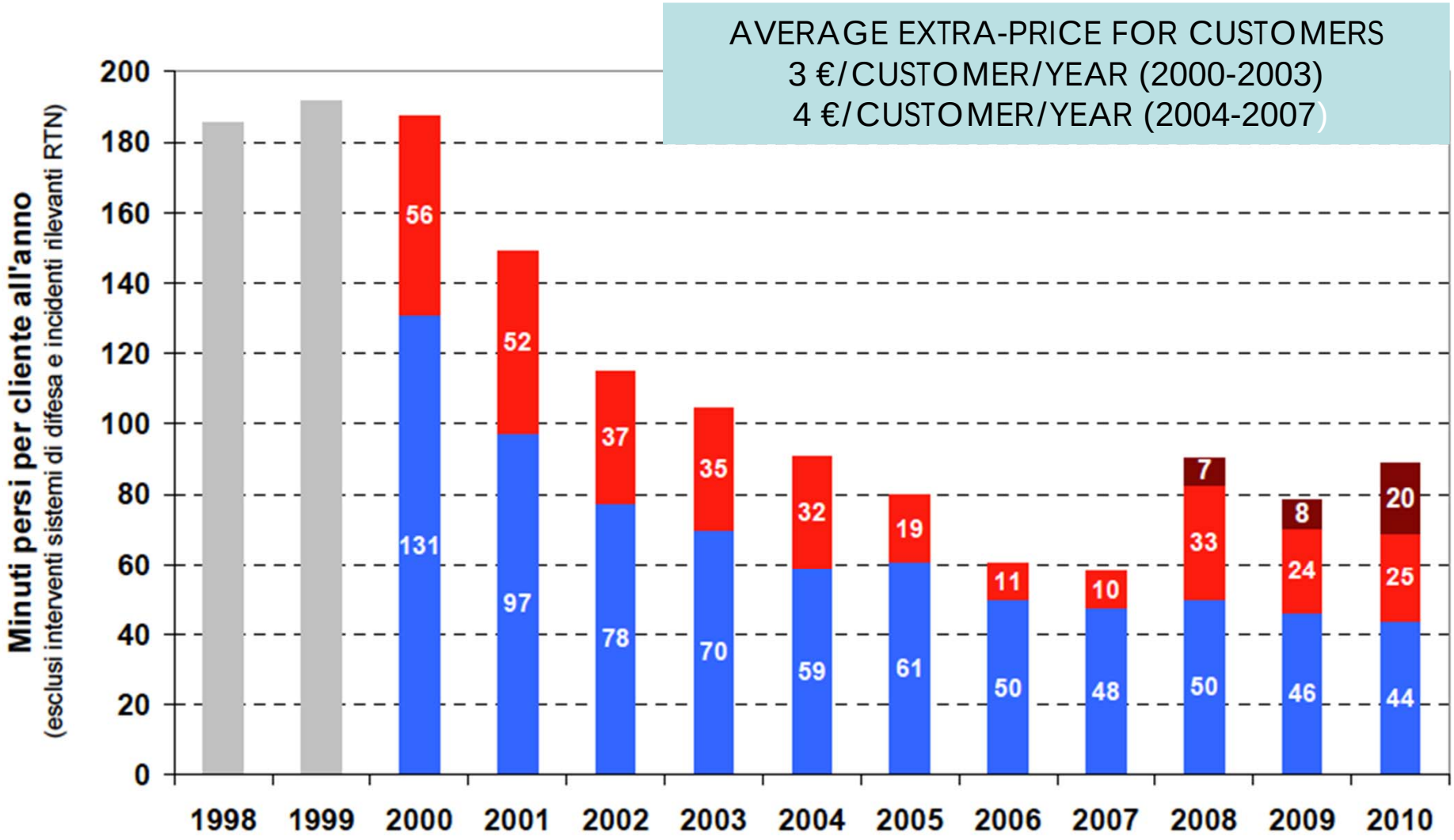
Dataset

- Dataset built the support of AEEG (dedicated data collection)
- Comprehensive and balanced panel for 115 Zones of *Enel Distribuzione*, tracked from 2004 to 2009
- For each Zone and year: technical and accounting data, quality-related data, including rewards and penalties
- Technical data
  - Number of LV consumers
  - Energy consumption for LV residential load, LV non-residential load and MV load (in MWh)
  - Area served (in $km^{2)}$
  - Transformer capacities of primary and secondary substations (in MVA)
  - Network length for LV and MV feeders (in km)

Dataset

- Accounting data (in €)
  - Revenues from tariffs and new connections
  - Gross asset value and depreciation for primary and secondary substations, MV and LV feeders and points of connections
  - Operating costs for labor, services, materials and other costs
- Quality data (per district)
  - Number of long and short interruptions (cause and origin)
  - Duration of long interruption (cause and origin)
  - Rewards and penalties (RP)

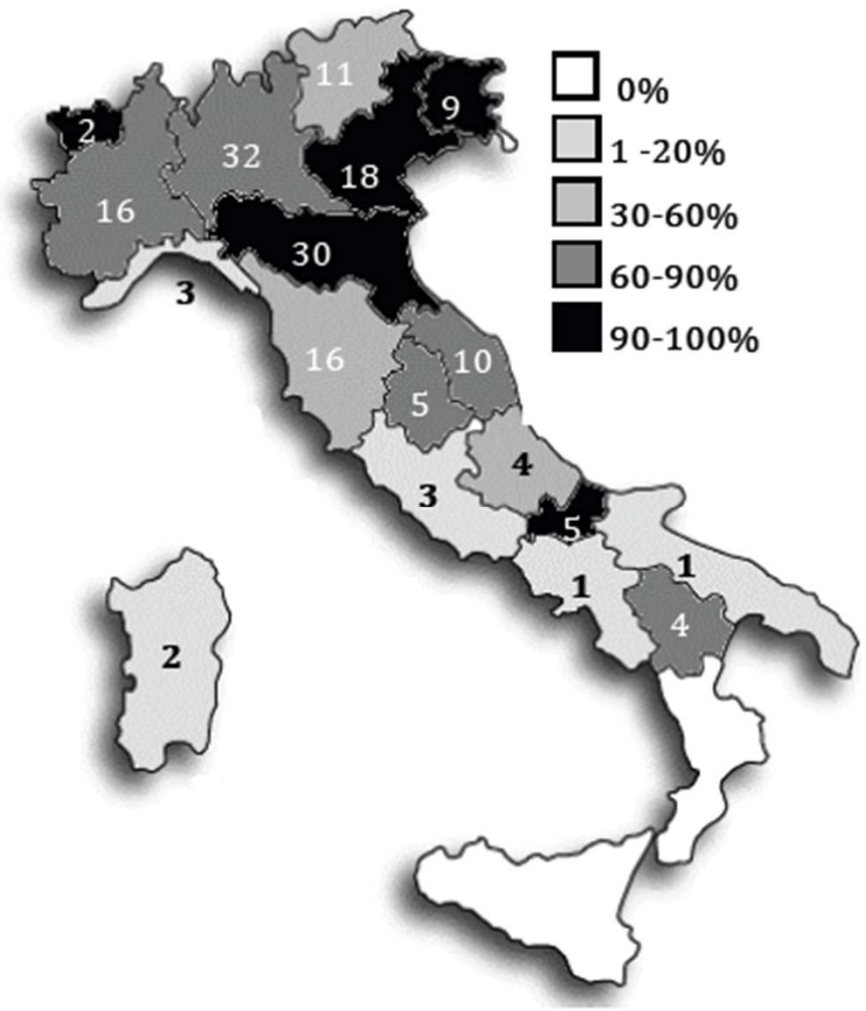
The mechanism



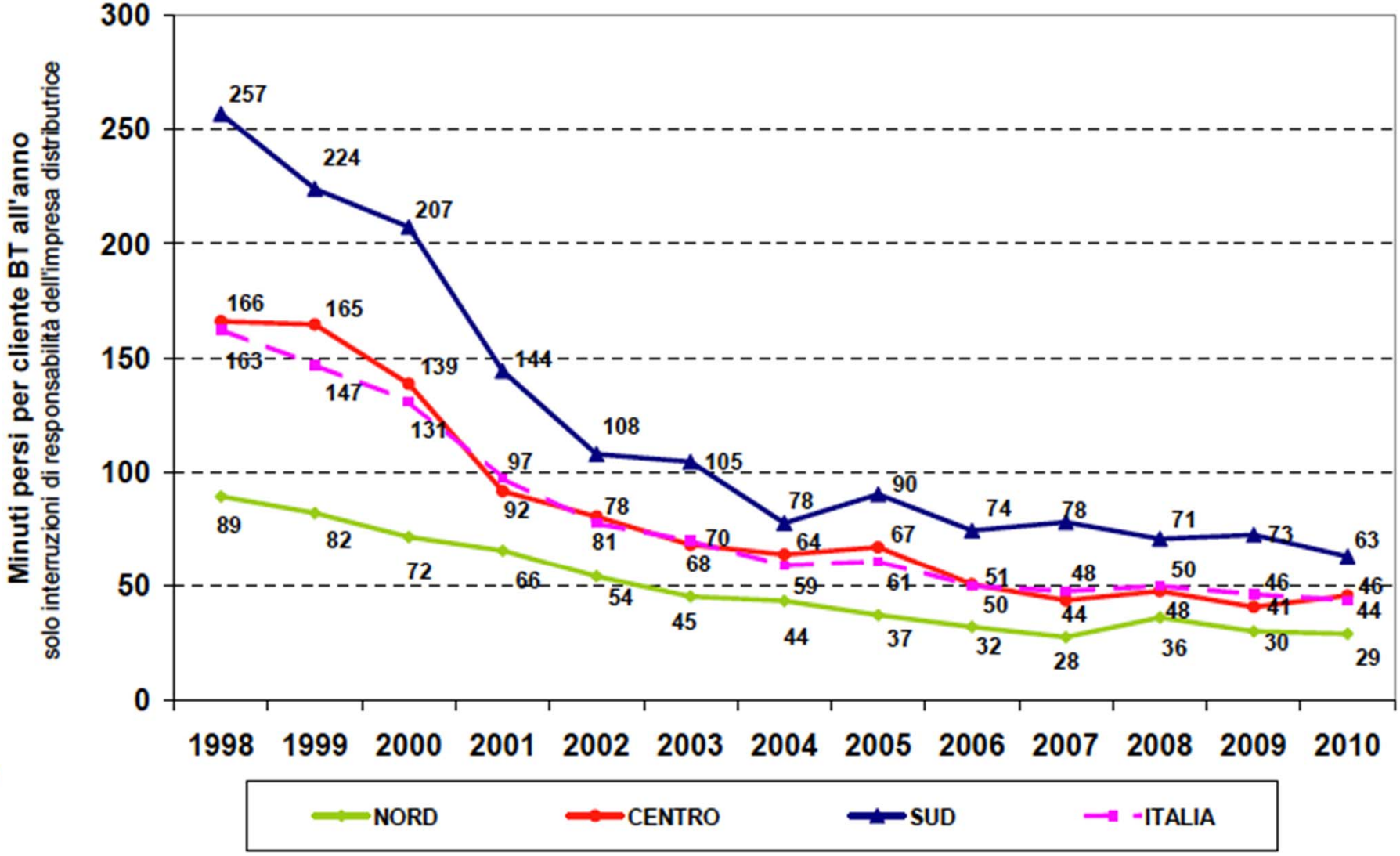
The regulatory setting

Regulated SAIDI

Number of districts per region that have already reached long term objectives



The effect of incentive mechanism



Policy options for quality

- Rewards preferentially assigned to better performers in 2004
- Rewards preferentially assigned to Cost-efficient Zones
- Regulatory incentives for quality were never meant as a compensation for quality-related expenditures
- Policy option (1)
  - Support quality improvements (where difficult to achieve) rather than reward good performance
  - AEEG Regulatory Order n. ARG/elt 198/11: since January 2012 rewards to high performing districts have been significantly reduced, while those to underperforming ones can increase if significant improvements in SAIDI are achieved

Policy options for quality

- Policy option (2)
  - Current national standards account for network density, but they disregard the composition of the load
  - Redefined in terms of costs of ENS, convergence might not require the same level of expenditures, by reducing the need to spend in areas where the composition of the load does not justify the expenses

Financial issues in Regulation

- Financial issues in Price Cap regulation:
- It is true that in price cap regulation Regulator does not *directly* set a return on investment …. But it has to do that almost *indirectly* in order to correctly take into account the cost of capital when evaluating a policy intervention.

Financial issue in Price Cap regulation

Setting a price cap *(X)* in a monopolistic market:

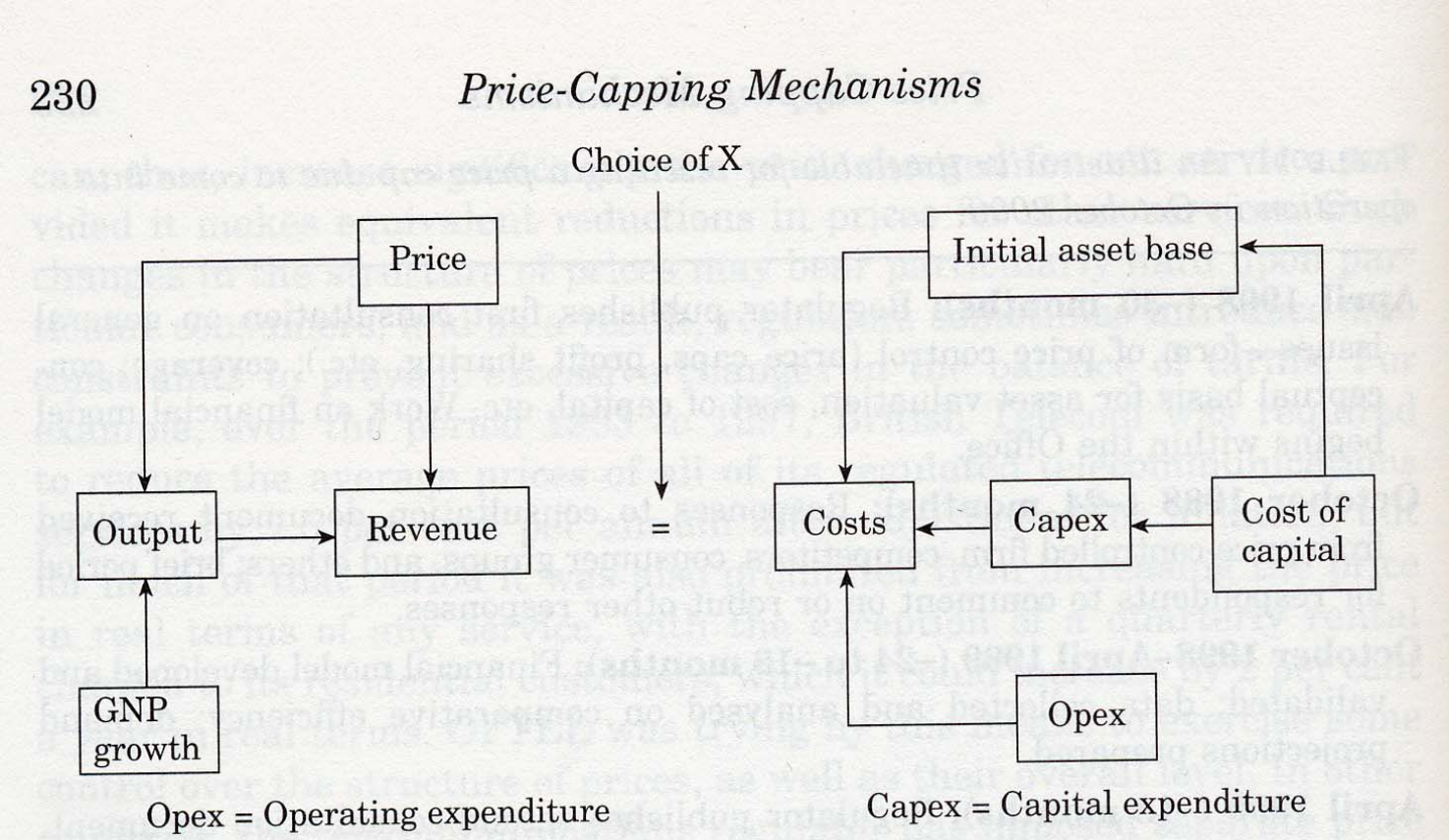


FIG. 5. *The financial model for setting the cap (monopoly)*

Financial issues in Price Cap regulation

- Measure and index to be used to evaluate capital expenditure :
- Cost of capital (r_{it}): *CAPM*

$$r_{it} = r_{ft} + \beta\left(r_{mt} - r_{ft}\right) \qquad \beta = \left[\sum_{t=1}^{T}(r_{it} - \bar{r}_i)(r_{mt} - \bar{r}_m)\right] \Big/ \sum_{t=1}^{T}(r_{mt} - \bar{r}_m)^2$$

where r_{ft} is the interest rate of free risk public bonds.

- *Weight Average cost of capital:*

$$WACC = [r_{it}\, E/(E+D)]/(1 - t) + rd\, D/(E+D)$$

- Where *E* level of Capital Invested by shareholders, *D* level of Debt, *rd* the cost of debt and *t* is the tax level (%).

Example: the WACC in italian telecoms

- *Free interest rate, rf* = 5% equal to average rate of BTP (public bonds from 10 to 30 years);
- Market premium $(r_m - r_f)$ equal to 4%
- *Risk coefficient* β = 1,05.
- *Thus,* $r_t = r_f + (r_m - r_f)\beta = 9{,}2\%$.
- Cost of Debt, *rd* = 5,35%, tax level *t* = 41%, *E* = 80%, *D* = 20%:
- $WACC = [r_{it}\, E/(E+D)]/(1 - t) + rd\, D/(E+D) = 13{,}5$

Financial aspects

- In italian electricity market, Regulator sets for Transmission β = 0,43 (less risky activity).
- International comparison (1999) in Transmission: National Grid (UK) β = 0,56, Electrabel (Belgium) β = 0,33;
- In Distribution and Retail Southern Electic (Uk) β = 0,66;
- For integrated firm: Endesa (Spain) β = 0,82, Iberdrola (Spain) β = 0,82, Scottish Power (Uk) β = 0,96.

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ON RAILWAYS ACCESS CHARGING

- international benchmarking: DB ML Group Infrastructure and ORR;
- national benchmarking: *Terna*, electricity network, and *Snam*, gas network

- $r_d = r_{fr} + p_d$
- $r_e = r_{fr} + \beta_e \cdot erp$

r_{fr} : risk free rate of return (10 years Italian Public Bonds)
p_d : debt risk premium (max 2%)
β_e : equity beta (0.70)
erp : equity risk premium (5%)
g : D/(D+E) (0.6)

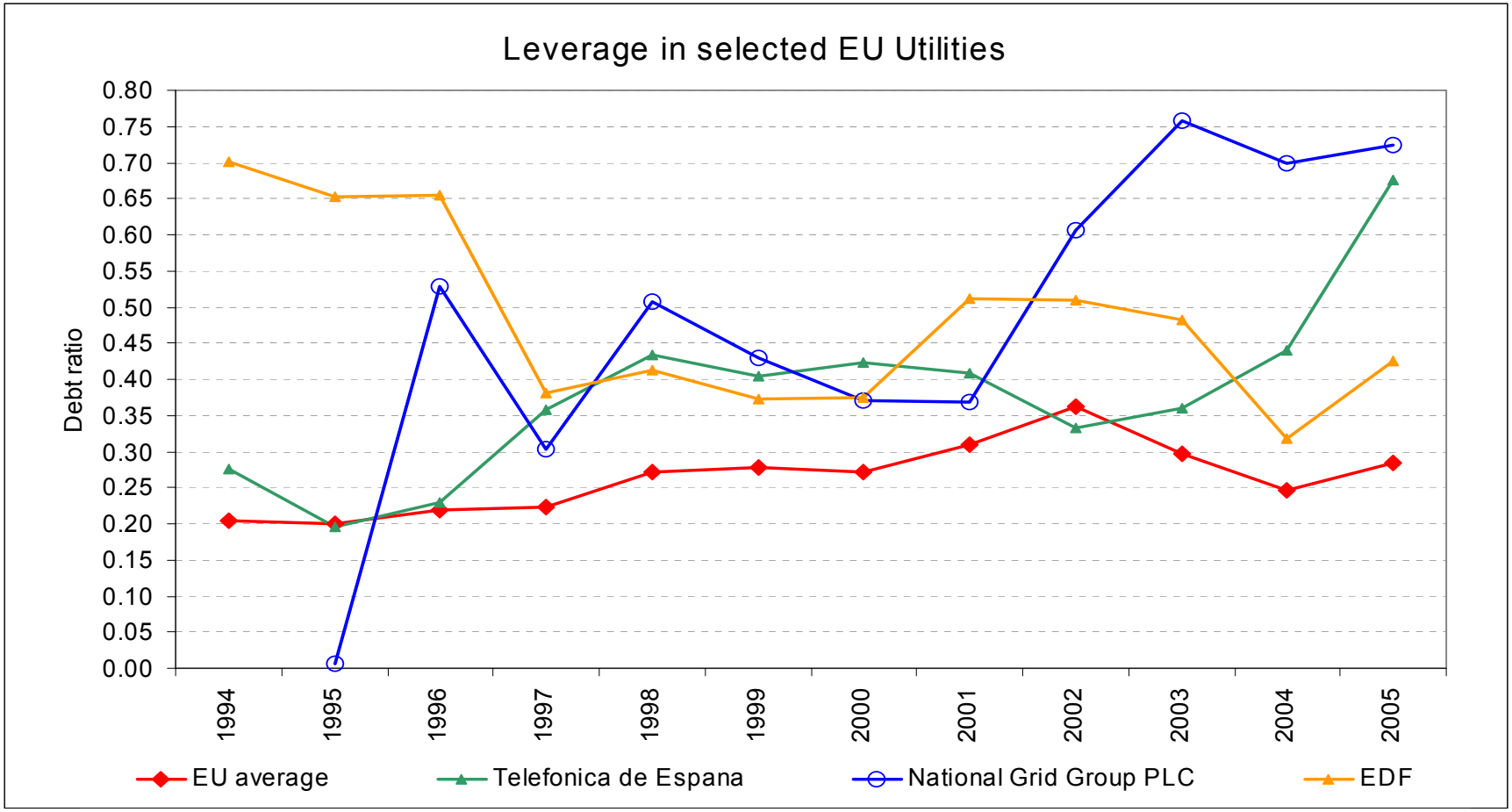
The “Dash for Debt”

- Ten years after the beginning of privatization and liberalization in network industries in Europe, regulated utilities have substantially increased their financial leverage

- In the U.K., DTI and HM Treasury (2004) have expressed a concern about the “*dash for debt*” *“flight of equity”* within the U.K. utilities sector from the mid-late 1990’s

- They argue that high leverage “could imply greater risks of financial distress, transferring risk to consumers and taxpayers and threatening the future financeability of investment requirements”

The “Dash for debt”



The relevance of capital structure for regulated firms

- In the U.S., regulated rates are set so as to ensure the firm a "fair" rate of return on its capital
- In Europe, regulators often use *RPI-X* regulation, that ensure that the firm will earn a return on its capital which will induce it to enhance and maintain its network

⇒ The determination of regulated rates depends to a large extent on the firm's capital structure

⇒ By properly choosing its capital structure, a regulated firm can affect its rates and hence its profitability

Europe and the U.S.

- It is well-documented that U.S. regulated utilities (which were always private and subject to rate regulation by state and by federal commissions since the 1910's) are highly leveraged (Bowen, Daly and Huber (*FM*, 1982), Bradley, Jarrell, and Kim (*JF*, 1984) and Barclay, Marx, and Smith (*JCF*, 2003))

- The European situation is different because:
  - Private ownership and control of utilities is still the exception rather than the rule (Bortolotti and Faccio, 2008 *RFE*)
  - The degree of liberalization varies considerably across countries, and is still incomplete in most sectors
  - Not all European utilities are regulated by an independent regulatory agency (IRA): in some sectors regulation is performed directly by ministries, governmental committees, or local governments

A Strategic Explanation of Leverage 1/2

- In Public Utilities, regulatory choices (and political stance) change over time
- Typical problems are regulators' lack of committment leading to firms' underinvestment (Armstrong and Sappington, 2006 *JEL*; Guthrie, 2006 *JEL*)
- To provide investment incentives, regulators choose the "fair" rate of return
- But firms fear that the regulator will reduce the price after the investment is sunk

A Strategic Explanation of Leverage 2/2

- May firms "use" capital structure to influence the regulators' decisions? … and may regulators "use" capital structure to *tie their own hands* and discipline their own opportunism?
- A welfare maximizing regulator has the incentive to set a high regulated price so as to reduce the probability that the firm will become financially distressed (Spiegel and Spulber, 1994 *RAND*)
- The firm's leverage mitigates regulatory opportunism
- The regulator allows the firm to choose its leverage in order to commit not to engage in opportunistic behaviour

Bortolotti, Cambini, Rondi and Spiegel (2011, JEMS)

- Unbalanced panel of virtually all 92 publicly traded utilities and transportation infrastructure operators during 1994-2005 (927 firm-year observations) in 14 EU member states:
  - 44 firms in electricity and gas distribution
  - 13 water supply companies
  - 15 telecoms (mainly vertically integrated operators)
  - 8 freight roads concessionaires
  - 12 transportation infrastructure operators

- We excluded airlines, oil and refinery companies, wireless telecoms, and electricity generators because typically their prices are not regulated

- 67 firms in our sample have been privatized by 2005. Of these firms 24 have been privatized during 1994-2005 period. 25 firms in our sample are still state-controlled in 2005.

- Privatization is still incomplete: the state's UCR in the firms in our sample are 37% on av.

- Evidence that utilities increase their leverage following the introduction of price regulation, provided they are privately controlled holds after controlling for:
  - Alternative measures of leverage: book leverage
  - Heterogeneity across sectors
    - Sector-country clustering for common sectoral shocks from IRA
    - Tests on sub-samples: Energy, Electricity, TLC
  - Privatization effects: Privatized vs. Non-privatized; Golden Share
  - Exogenous changes in equity markets: Stock market indexes and Investor protection indexes

Leverage and prices

- Leverage Granger-causes Regulated Prices
  - The full sample
  - When the IRA is in place
  - Firms in industries regulated by an IRA
  - Privately-controlled firms (under 50% and restricted def.)
  - Firms that were and remained private (never privatized)
- Regulated Prices *do not* Granger-cause Leverage in all above cases
  - Leverage does not Granger-cause regulated prices for the sub-sample of State-controlled firms

“ Arrangements for responding in the event that a network company experiences deteriorating financial health “

Ofgem, 2008, n. 158, Position Paper

The Ofgem Proposal (1/3)

- The legislative and regulatory framework in place for Britain's energy networks is designed to reduce the risk of *financial distress* affecting network operators and to ensure that an acceptable level of service continues to be provided to consumers should *financial distress* occur.

- There are a number of potential causes of financial distress. In some cases financial distress may reflect the actions or strategies of the affected company, such as the failure of management to control expenditure or excessive gearing, where a company relies heavily on debt to finance its activities. It can also result from the actions of another party, such as the default or insolvency of a major trading partner. Finally, financial distress may result from the impact of exogenous factors that impose additional costs on a company or make it less attractive to investment. Financial distress may result from a combination of these or other factors.

The Ofgem Proposal (2/3)

- Regulatory remedy: ***financial ring-fence***

- "Financial ring fence" is the requirement for the companies to provide a statement signed by a director of the licensee and accompanied by a supporting statement from its auditors setting out that the company has adequate resources to properly and efficiently carry out its functions over the next financial year.
- Another provision of the „financial ring fence" provides for a cash lock-up in certain circumstances between the licensee and its affiliates. This prohibits a parent company from taking money out of a network company and thus out of the regulated GB networks in order to address financial concerns at a Group level.
- Collectively, the ring-fence conditions aim to protect the financial health of network companies, and enable us to monitor financial health and take action where necessary (including enforcement action) to seek to prevent a material deterioration in the financial health of a network company.

The Ofgem Proposal (3/3)

- Other arrangements:
  - Information on detailed cost and revenue reporting arrangements in place for the network companies
  - Control over Investment and its relation with service supply
  - Other financial informations (shares, credit ratings …..)

- However, OFGEM states that, even though not desiderable, it might also consider to re-open the negotiation process on price mechanism (*re-opening price control*)!!!!

Re-opening price control (1/2)

- "[…] the cause of financial distress is largely due to factors beyond the company"s control. These might include:

  (i) instances where additional workload has arisen from new legislation that was not anticipated at the time of the last review, or unanticipated consumer demand; or

  (ii) a material change in financial market conditions relative to those prevailing at the time a price control was set such that that an efficient company with an investment grade credit rating would no longer be able to finance its activities."

- "Re-opening the settlement could reasonably be expected to relieve the financial distress in a timely manner.

Re-opening price control (2/2)

- More generally, according to Ofgem (2008):

> "In no sense should the reopener process be viewed as a mechanism to bail out an inefficient, poorly managed network company or a network company that has excessive gearing".

- But these criteria are difficult to assess ….