608: Economics of Regulation

Lecture 9: Natural Monopoly Regulation, Part-III: Price Control Models

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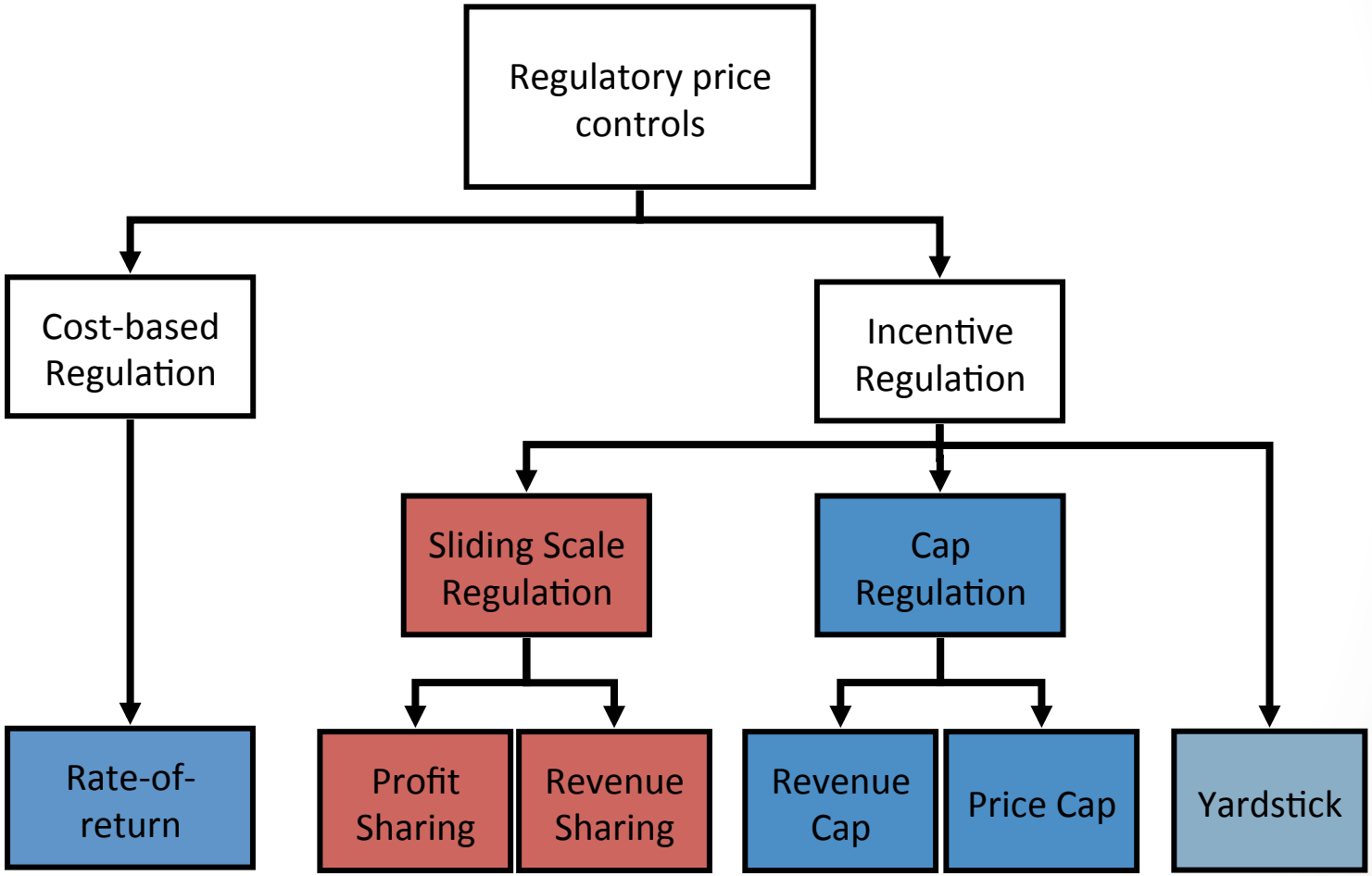
Outline

- Major Price Control Models
- Rate of return regulation (a review)
- Price cap regulation-Advantages-Disadvantages
- Differences between price cap (RPI-X) and rate of return regulation
- Estimating the X-factor (in RPI-X)
- Why should regulators be interested in efficiency?
- Yardstick Competition
- Comparing major price control models
- Regulating Quality

Major price control models, Overview



Price Control Models – justifications

- Even when the scope for competition is fully utilised, a significant part of value chain utility companies likely to remain monopolistic
- It is true even during the transition from monopoly

-- Regulator respond by introducing some form of price control

- Twin function of price controls –
  - 1. To protect customers from exploitation
  - 2. To provide investors with confidence to maintain and develop the infrastructure needed to provide service

Price Control Models – how

Overview – Theory vs. Practice

- Differences between regimes in practice less strong
- Depending on the details of the regulatory regime, differences might only exist in the name of the regime
- Hybrid forms (combinations of regimes) frequently applied in practice
- Almost all regimes require a calculation of the company's cost and price levels

- Company must get changes in rates (or regulated component of rates) approved by regulator.
- Company will initiate a rate hearing before the state Public Utilities Commission (PUC) if it wants to raise rates (on grounds of cost increases, e.g. due to inflation).
- Consumers and the Commission may initiate rate hearing to reduce rates if rate of return too high (due to cost falls, efficiency gains etc).
- FERC involved in regulation of interstate transmission and in national policy setting.

1. What is Rate of Return Regulation?

- Regulator sets limit on what monopoly company can earn from consumers.
  - Set allowed rate of return & select prices that generate that return.
- The underlying idea is the firm's revenues must just equal its costs so that economic profit is zero. Prices / revenues based on operating costs plus "fair" rate of return on capital (cost recovery principle)
- Company is allowed to recover the operating costs (OC) incurred and an agreed 'reasonable' return (s) on capital investment (rate base, B).

Required/Allowed revenue (R)= Operting Cost/ Expenses (E) + Fair Rate of Return

where,

Fair Return = Capital Inv/Rate Base (R_B) * Allowed return on Capital (s)

i.e. $\Sigma p_i q_i = E + sR_B$, i=1(1)n

- R_B: measure of the firm's investment **(**original cost of capital**)**
- ***E***: company submits detailed cost breakdown of regulated company business.
- ***s***: established in rate hearings and precedent (10.5%).

RoR - approach

- Traditional approach was that costs were recouped from customers shortly after incurred (e.g. by year-end).
- – 'Reasonable' return fixed by regulator in a legal rate hearing and would be adjusted if firm making loss or profit.
- – Aim is to recover total cost, no need for economically efficient product prices (e.g. Ramsey-type). (Obviously a flaw in mechanism) Firm pays no penalty for being inefficient

- Frequent regulatory reviews (avoid deviation between actual cost and allowed revenue)
- Regulation period either very short or not pre-determined
- Primary objective: limit profits, prevent companies from pricing above costs
- This is the traditional form of regulation in most countries.

What does the regulator need to do? [1]

- Have quasi-judicial hearings using range of evidence to determine rate
  - – Consider performance in recent historic
  - – Look to other sectors
  - – Consider views of investors potentially
  - – Consider views of other stakeholders, including consumer representatives

- Set allowed rate of return
  - – Aim is to ensure firm remains financially viable and can raise investment financing but otherwise set as low as possible

What does the regulator need to do? [2]

- Determine the the company's investment base
  - – Set value equal to what was paid for plant/ equipment of depreciation (original cost method). May be different from current marginal costs.
  - – Some investments not included if regulator decided they were unnecessary or inefficient.
  - – Traditionally based on information provided by company
- Identify set of allowed prices that will provide the allowed return
  - – For single product monopoly, need to predict demand and dd elasticity and have fixed price equal to average allowed cost.
  - – For multiproduct monopoly, have to choose from a range of price combinations.

When is the rate and prices changed?

- New rate review of rate-case needs to be triggred
  - – No fixed date for change
- Regulator or firm can initiate hearing
  - – More often than not it is the firm
  - – Regulator typically looking to reduce allowed RoR and the firm for a higher rate
  - – Firm may also argue to change rate base if, e.g., input prices have increased significantly or there has been big investment plan.
- The longer the regulatory lag between an actual change in cost/ required return and the new rate-case, the longer the period that the firm makes profit or potentially looses.
  - – Regulatory lag can allow firm to make profit for period of time.
  - –The more efficient the regulator is at adjusting prices to reflect actual costs the shorter the period a firm incurs profit or loss.

Where is the RoR regulation used?

- Primarily in regulation of Gas and Electricity networks in many countries (started with UK, then in US and others)
  - – Regulation is at the state level
  - – Long history of rate case
- Also prevalent in European regulatory framework
  - – Often referred to as cost of service
  - – Often implicit rather than explicit as came with government owners deciding pricing rather than formal regulatory framework

RoR: Fair and Reasonable Rates

Regulator sets rate of return so that the company will have appropriate level of earnings on its investment (or asset base)

- Two problems:
  - **Rate level** (i.e. the allowed revenue)
  - **Rate structure** (i.e. permissible price discrimination which achieves rate level)

RoR: North Carolina Natural Gas Corporation

	Year Ended Dec.31 19xx (GBP)	Adjustments for Rate Increase (GBP)	After Adjustments for rate Increase (GBP)
1. Revenues	29,572,747	2,832,332	32,405,079
2. Expenses			
Purchased gas	19,411,430		19,411,430
Labor	2,968,387		2,968,387
Depreciation	1,234,798		1,234,798
Taxes	4,338,300	358,500	4,696,800
Total Expenses	27,952,915	358,500	28,311,415
3. Net Operating Income	**1,619,832**		**4,093,664**
Rate Base			
Plant less depreciation	41,871,387		41,871,387
Working Capital	1,002,989		1,002,989
5. Total	**42,874,376**		**42,874,376**
Rate of return (3/5)	**3.77%**		**9.54%**

RoR: Rate Level/Base

Different ways of calculating the rate base are possible:

- **Original cost**, problematic if there is inflation, as current costs do not reflect LRMC, this gives incentives to over-consume.
- **Reproduction cost**: estimating the current cost of reproducinng the yr old plant
- **Replacement cost**: modern equivalent asset values.
- **Fair value cost**: weighted value of the above.
- **Market value**: however this reflects past regulatory decisions and you are wanting to set rates going forward.

Rate of Return

What are the legitimate expenses of the firm and its required return on investment?

Expenses

- Operating costs, eg. fuel costs, wages and salaries
- Depreciation
- Taxes
- Regulator may question expenses, eg. advertising expenses, expenses on inputs from a wholly owned subsidiary, salaries of top management

Some times regulator takes a tough approach on whether to allow certain investments to become part of the asset base

RoR: Rate Structure ... 1

- How should prices vary across different classes of customer and product.
- This is essentially an issue about how the fixed costs of a monopoly should be recovered.
- **Fully Distributed Cost** (FDC) Pricing applied.
- For example:

  $C_x = 700 + 20X$,

  $C_y = 600 + 20Y$,

  $C_{xy} = 1050 + 20X + 20Y$
- Joint production is preferable. How should the fixed cost be allocated?
- Ramsey pricing would be desirable.

RoR: Rate Structure … 2

- Allocate costs 75:25, x:y

$$AC_x = \frac{(1050 * 0.75)}{x} + 20; \quad AC_y = \frac{(1050 * 0.25)}{y} + 20$$

- Demands are

  P_x=100 - x, P_y=60 - 0.5y,

  P=AC in each market.

- Using FDC, if we split the total fixed as 70% to X and 30% to Y then
- Prices and quantities would be P_x=31.5, P_y=23.6, x=68.5, y=72.8
- However **Ramsey** prices are x=y=70, P_x=30, P_y=25 (solved by equating outputs and by breaking even).
- Two part pricing would solve the problem with per unit price=20 and fixed charge to cover fixed cost.

RoR: Rate Structure … 3

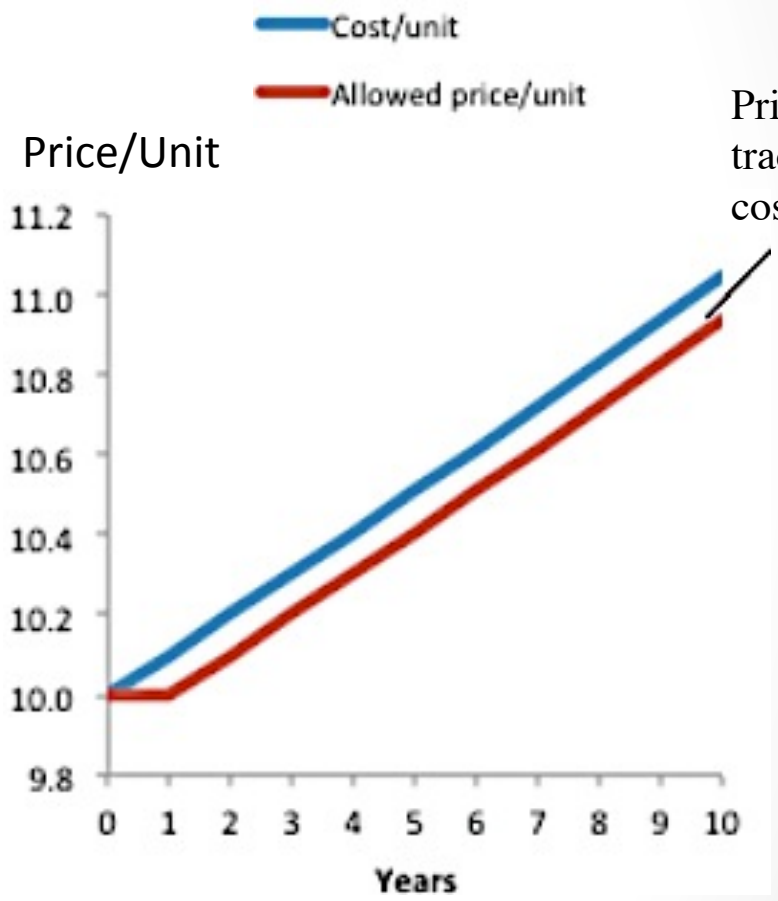
- **Undue discrimination**, are we subsiding one group from another? UD is not exactly an efficiency issue rather fairness argument arises here.
- **Stand alone average cost** (SAAC) test: calculate average cost of producing x or y alone, price should be below this for each, otherwise consumers of one good would go it alone (subsidy-free test).
- **Average incremental cost** (AIC) test: Here, we compute the AIC of producing X in joint production with Y. Thus, subtract the cost of producing Y alone from the cost of jointly producing X & Y to get the incremental cost of X. The AIC of X is, 20 + 450/X, or $26.4 for X = 70. Similarly, the AIC for Y at Y = 70is $25.
  - Price of x must be greater or equal to this (same as SAAC).
  - Logic: if each product contributes to total revenue an amount that at least covers the extra costs it causes (when added to the production of the other products), then it should be viewed as a beneficial addition. To the extent that its incremental revenues exceed its incremental costs, the revenues required from the other products are reduced.

Problems with Rate of Return Regulation (RoR)

- Accounting for risk not clear, incentives to over-invest and to not pursue cost reductions.
- In practice firms usually only bring rate cases if prices are to go up, thus there is a regulatory lag.
- Inefficiency exists:
  - Output inefficiency
  - Input choice inefficiency
  - X inefficiency in input quantities
  - Rate of productivity growth of utilities over the time is low.
- However not clear what the incentives of the companies are to agree to better incentivised regulation.

RoR: Does it maximise welfare … 1

- Good for allocative efficiency
- The idea is that revenue equal to costs and profit zero.
- Not MC pricing though – AC at best.
- Firm may make profit if costs lower than allowed in rate base and/or regulator view of 'reasonable' return is higher than cost of financing investment.
- Scale of deadweight loss depends on length of time between firm making profit and allowed profit being adjusted.



RoR: Does it maximise welfare … 2

- Provides incentive to invest
  - – Firm knows investment costs actually incurred will be recovered
  - – This is primary reason why it was used for large infrastructure industries
- Provides incentive to deliver quality of service
  - – Because of the incentive to invest firms will spend what is needed and deliver quality of service

RoR: Does it maximise welfare … 3

Averch-Johnson (A-J) Effect

- 1962 A-J showed that RoR regulated firms choose too much capital relative other inputs and thus have an incentive over-capitalise
  - Reason: allowed profit varies directly with the rate base (capital)
- Firm chooses, amount of capital *K*, and labour L

  Prodn fn: $Q=F(K, L)=f(k)$ *where,* $k=K/L$

  Revenue fn: $R(q)=R(K,L)=R(f(K))$

– Firm chooses labour and capital to maximise profit subject to the rate of return constraint:

$$\max \pi = R(K,L) - wL - rk$$

$$s.t.$$

$$s = \frac{R(K,L) - wL}{K}$$

Assuming no lag – always equal

– The actual cost of capital is assumed to be lower than the allowed return.

RoR: Does it maximise welfare … 4

- For cost minimisation the firm should operate where ratio of marginal product of inputs is equal to the ratio of input prices (or lowest isocost line tangent to isoquant for given level of output).
- Absent regulation the firm would cost minimise where ratio of marginal products is equal to ratio of r/w (point E on picture).
- With regulation the firm would cost minimise where ratio of marginal products is equal to ratio of $(r - \alpha/w)$ (point F on picture), where α is a positive number that is a function of the lagrange multiplier of the constrained optimisation, the allowed return and the actual return.

Cost min :

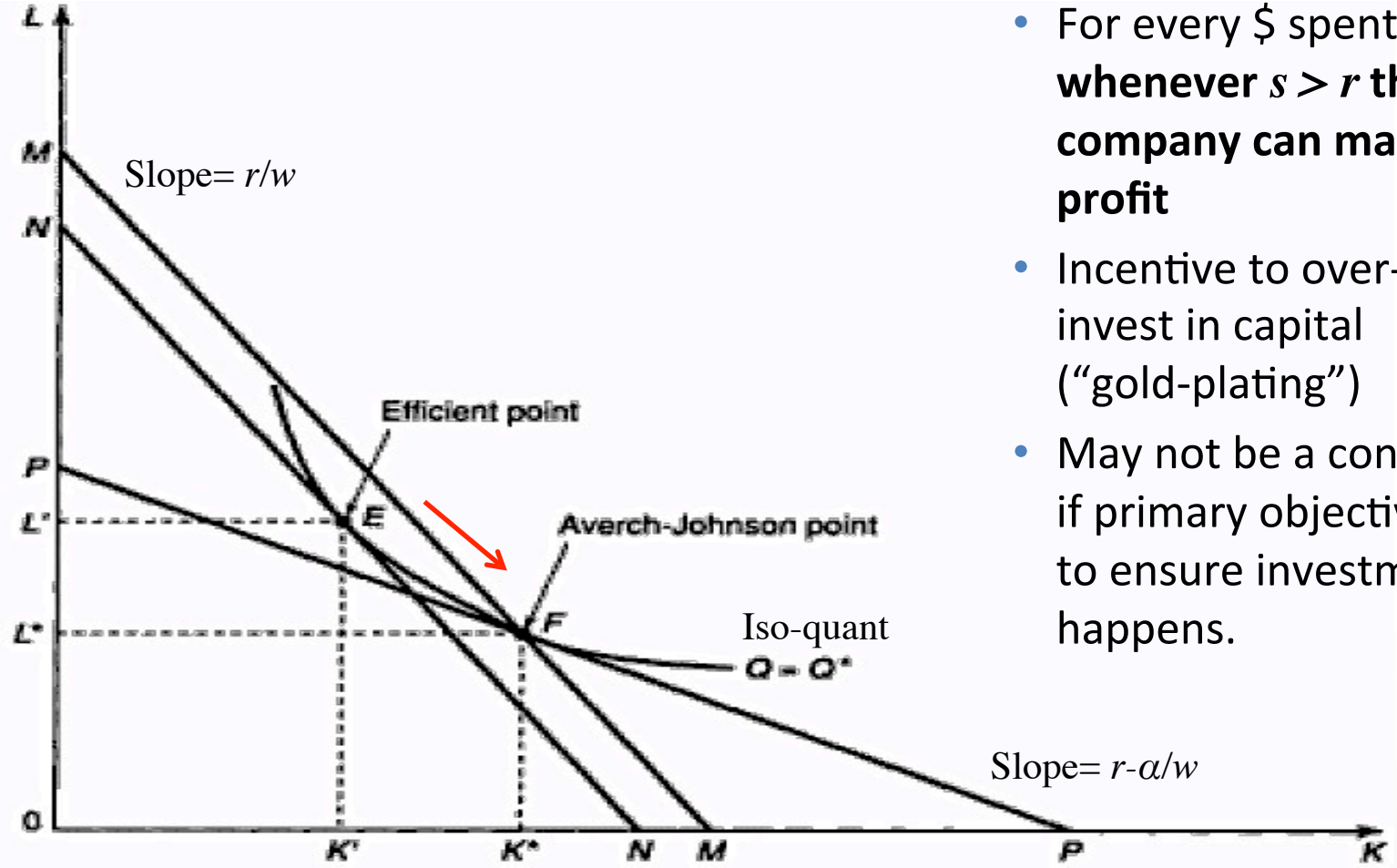
$$\frac{MP_K}{MP_L} = \frac{r}{w}$$

Constrained cost min with rate of return:

$$\frac{MP_K}{MP_L} = \frac{r-\alpha}{w}; \alpha = \frac{\lambda(s-r)}{1-\lambda} > 0 \ (0 < \lambda < 1)$$

[should be $=P_k/P_L$ if $\alpha=0$]

RoR: Does it maximise welfare … 5



- For every $ spent, **whenever $s > r$ the company can make profit**
- Incentive to over-invest in capital ("gold-plating")
- May not be a concern if primary objective is to ensure investment happens.

RoR: Does it maximise welfare … 6

- No clear incentive to minimise costs (encourage technical efficiency)
  - – Firm may reduce costs if regulatory lag sufficiently long to enable firm to benefit from difference between allowed rate base and expenses and actual.
  - – Traditional view is that no incentive but US regulators have adapted rate of return to provide cost efficiency incentive by allowing proportion of profits to be retained by firm
- Impact on innovation and hence dynamic efficiency less clear cut
  - – Weak incentives for similar reasons to technical efficiency
  - – But strong incentive to invest may encourage investment in new technologies (substitute labour Or new capital).

RoR regulation - summary

- Set price to recover costs including allowed return on investment base.
- Close to allocative efficiency as price reflective of average cost.
  - – Longer lag between change in costs and change in allowed return further away from allocative efficiency.
- Limited incentive to minimise costs or innovate.
- But strong incentive to invest (overinvest), potentially in new technologies.
- US regulators have adapted to try to provide strong efficiency incentives.
- UK regulatory framework decided not to use this framework when introducing regulation with privatisation - incentive based price control instead.

Alternatives to RoR …. [I]

- ***(Earnings Sharing) Sliding scale*** plan, shares risk and rewards between shareholders and consumers.
  - r^*, target rate of return; r_t , return at original prices; r_a , actual RoR
- $r_a = r_t + h(r^* - r_t)$ where h is in interval $[0,1]$
  - $h=1$ is RoR (***cost plus kind regulation***), $h=0$ is ***fixed price regulation***
  - $0<h<1$ involves risk sharing.
- Example: Pacific Bell in 1990s in California, Directive:
  - PB can keep all profits if its RoR < 13%;
  - if 13%<RoR<16.5% then share 50% of profit with customersin excess of 13% return;
  - all profits excess of 16.5% return were to be rebated
  - So the formula be –

$$r = \begin{cases} r, & \text{if } r \le \underline{r} \\ r + h(r - \underline{r}), & \text{if } \underline{r} \le r \le \overline{r} \\ r + h(\overline{r} - \underline{r}), & \text{if } \overline{r} \le r \end{cases}$$

Alternatives to RoR …. [II]

- **Yardstick regulation (Shleifer, 1985)**
  - Set price equal to average cost of comparable utilities.
  - Problem is hard to find comparable utilities e.g. local electricity distribution companies.
  - X equals average cost reduction of comparable firms
  - not related to firm's actual costs in unlinked benchmarking.
- Linking X to actual costs gives rise to perverse incentives and gaming.
- Shleifer's model requires other comparable firms, Otherwise regulator needs to analyse actual costs.
- Therefore regulator must examine firm-specific factors and efficiency differences
- UK's system 'represents an acceptable compromise between information intensity and the scope for gaming' (Bos, 2001).

Yardstick Competition Regulatory

$$AC_i = \sum (AC_j) / (n-1), \quad j \neq i$$

Average costs of company i

Average costs of company j

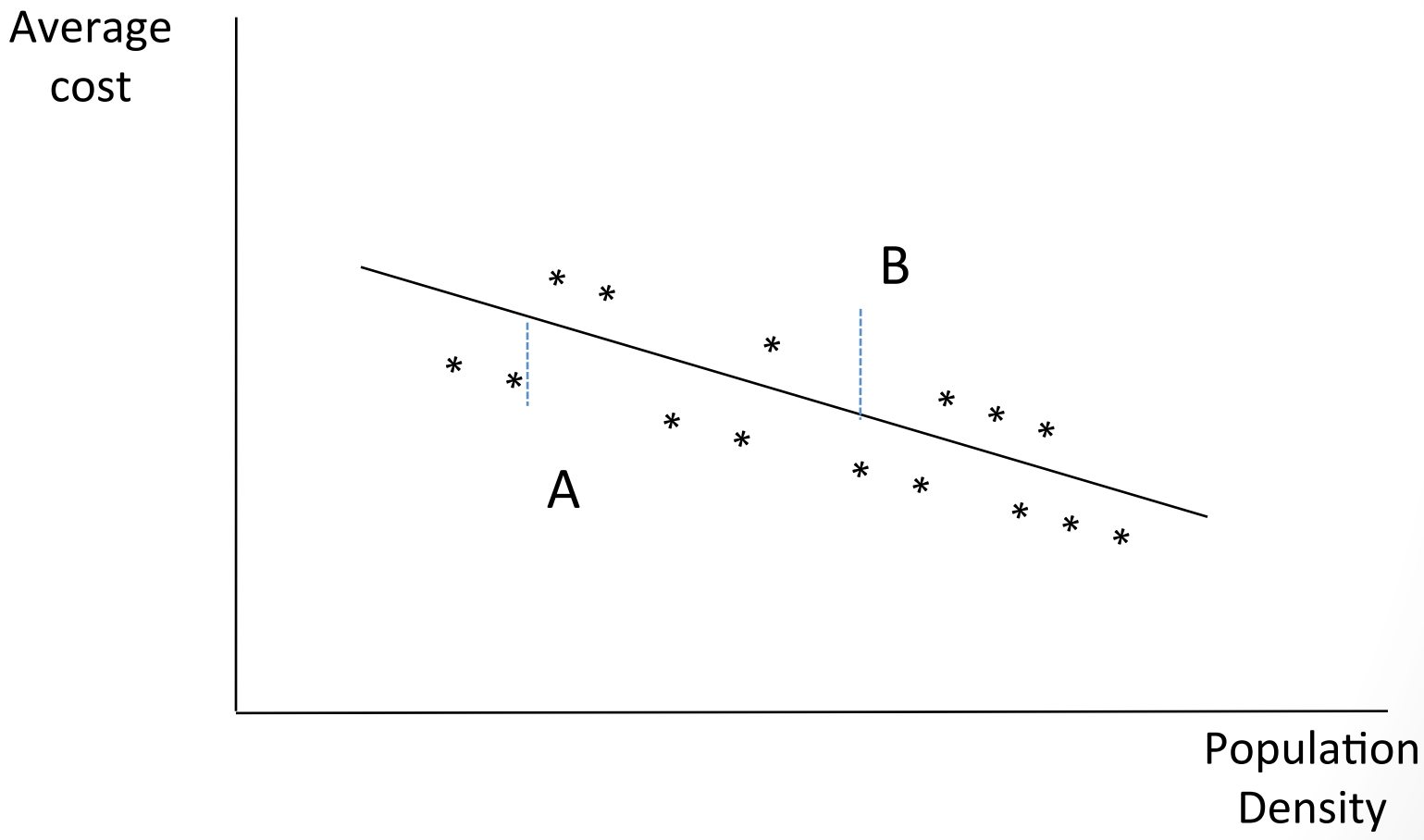
Number of all companies in the market – 1 (ith firm)

- Prices or revenues linked to the costs of a peer group of companies
- Companies not allowed to charge higher prices than the mean of the costs of peer group
- often yardstick based on the avg industry productivity improvement
- Few cases of practical application, no pure model applied

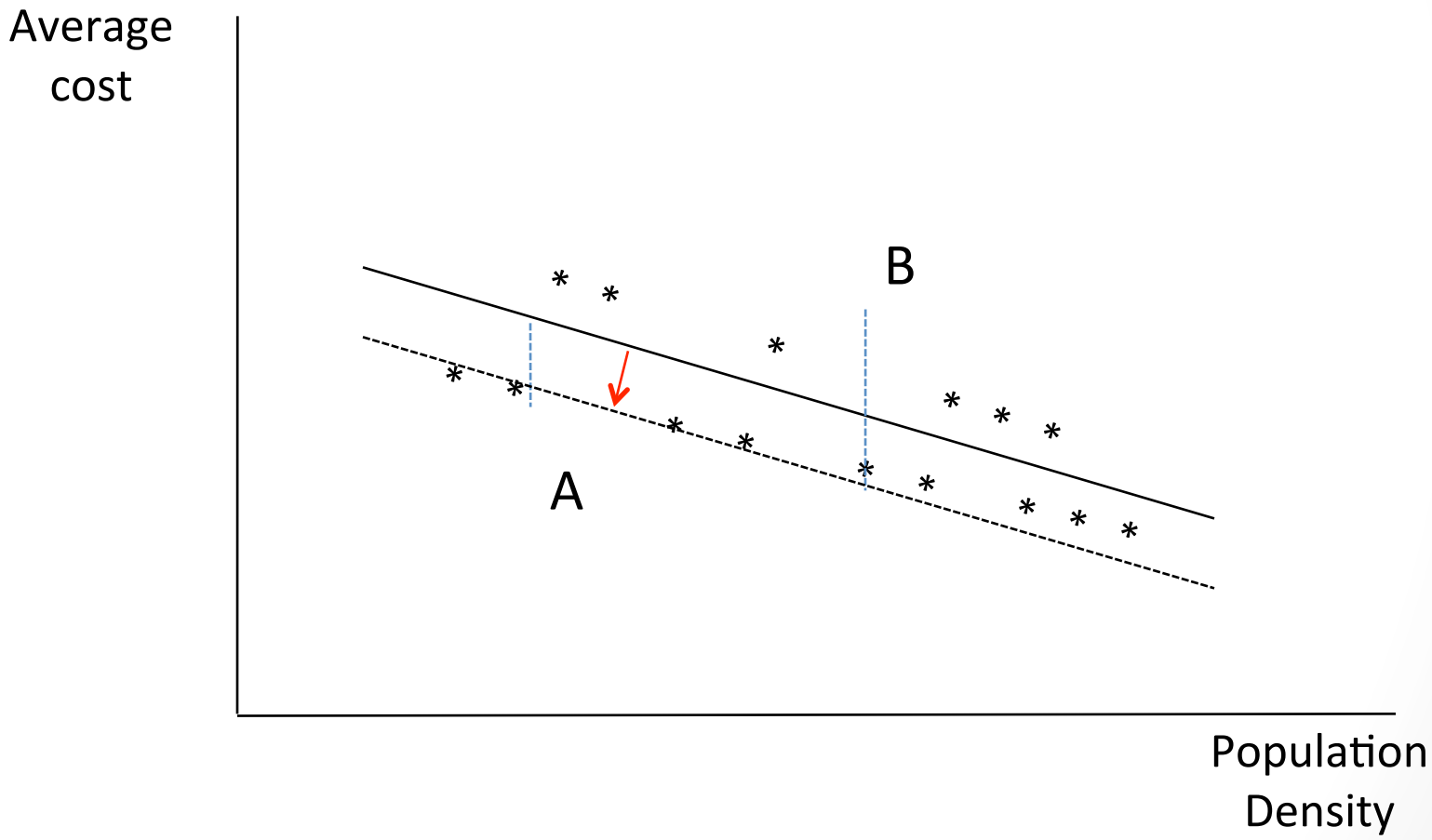
Difficulties in implementing yardstick competition

1. Prices normally have to be set before cost observations are made
2. Risk of collusion
3. Regulated firms typically do not provide their services in identical circumstances (difficult to find truly comparable utilities)

Yardstick Regulation:
unit cost and population density, sample companies



Yardstick Regulation: alternative cost targets



Alternatives to RoR …. [II]

- **Price Cap regulation (Stephen Littlechild, 1983)**

{**Idea**: the price firm can charge is independent of any cost reduction – a temporary measure until 'competition arrived'}

- For pre-specified period of 4-5 years the company can make any changes it wishes to prices, provided that the average price of a specified basket of each its services/goods does not increase faster than R/CPI-X.

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

P_t	RPI	X	P_{t-1}
Price in year t	Retail Price Index (Inflation)	Productivity growth	Price in previous year

- R/CPI-X formula, rise of prices (rather than profit) is allowed by inflation minus some productivity adjustment formula. Sets an upper limit on prices
- Usually the formula is fixed for a period (the regulatory lag)
- Setting X usually involves some form of benchmarking of costs to assess scope for future productivity gains.

Price Cap regulation

- Cap set for individual price(s) or set on weighted avg price (tariff basket)
- Requires explicit productivity increase via price formula (X-factor, company specific)
  - Adjustment factor for inflation (consumer price index, retail price index…)
  - X-factor: Other adjustment factors (changes in input prices, industry-wide productivity growth, network development costs, quality targets)
  - Y-factor: allows pass through of costs not controlled by the regulated firm.
  - Allows retention of efficiency gains
- **Primary objective:** limit prices, not profits
- **Caution:** Incentive to increase profits by saving costs may deteriorate quality → regulation of quality necessary, (may be separately)
- Instances: First applied in the UK, now widely applied elsewhere, particularly for telecommunication and electricity networks

Evidence on Price Caps Vs. RoR

- Price caps seem to encourage faster rates of cost reduction than conventional RoR schemes.
- European, South American and Australasian regulators have selected price cap regulation over RoR and seen sharp reductions in costs.
- Many US regulators (including MA) accept the superiority of price cap regulation and encourage companies to adopt performance based rate making regimes or simple price caps at times of rate review.
- However as inflation is low there have effectively been few rate cases over the last few years at which companies have requested rate changes.

Differences: Price cap Vs. RoR regulation

- R/CPI-X embodies an exogenously determined risk period between appraisals of prices, whereas RoR regulation makes the duration of this period endogenous.
- R/CPI-X is more forward looking than rate of return regulation
- There are more degrees of freedom in setting X (resetting framework may be modified) than are involved in rate of return regulation
- In setting X the UK regulator has more discretion and less need to reveal the basis of his decisions than does his US counterpart. Neither governments nor regulator have given detailed reasons for their decisions on X ; this reduces the basis for challenge (by company, competitors, or customers) the US tradition is to place all evidence and reasoning in the public domain

Price cap regulation - Advantages

- The company has the right to keep whatever profits it can earn during the specified period which means that there are increased incentives to **productive efficiency** associated with uncontained profits maximization.

- Part of this expected increase in efficiency can be **passed on customers**, via the level of X. Prices are therefore lower than they would be under rate of return control, without producers being worse off.

- RPI-X is **simpler** to operate by the regulator and the company. It is more transparent and better focused on the parameters of greatest concern to consumers, hence providing them with greater reassurance

Price cap regulation - Disadvantages

- The level of X must in practice be set and repeatedly adjusted to secure a reasonable rate of return. If not, allocative inefficiencies will arise (from prices being out of line with costs) and there will be political pressures from company or consumers.

- If the criteria for revising X are left unclear, this will increase the cost of capital and/or discourage investment

Estimating X -factor

Selection of the X-factor is usually based on two pieces of information –

1. What has the rate of productivity growth been in this industry in recent years?
2. To what extent is this firm operating below best practice in this industry?

Example: a case of electricity distribution

If we define productivity as volume of electricity supplied in kWh/Rs

Suppose:

Industry's kWh/Rs has improved by 2% over the past 5 years

Firm A's kWh/Rs is 20% below that of the best firm in the industry

then:

The regulator could set X-factor at 6% per year for firm A

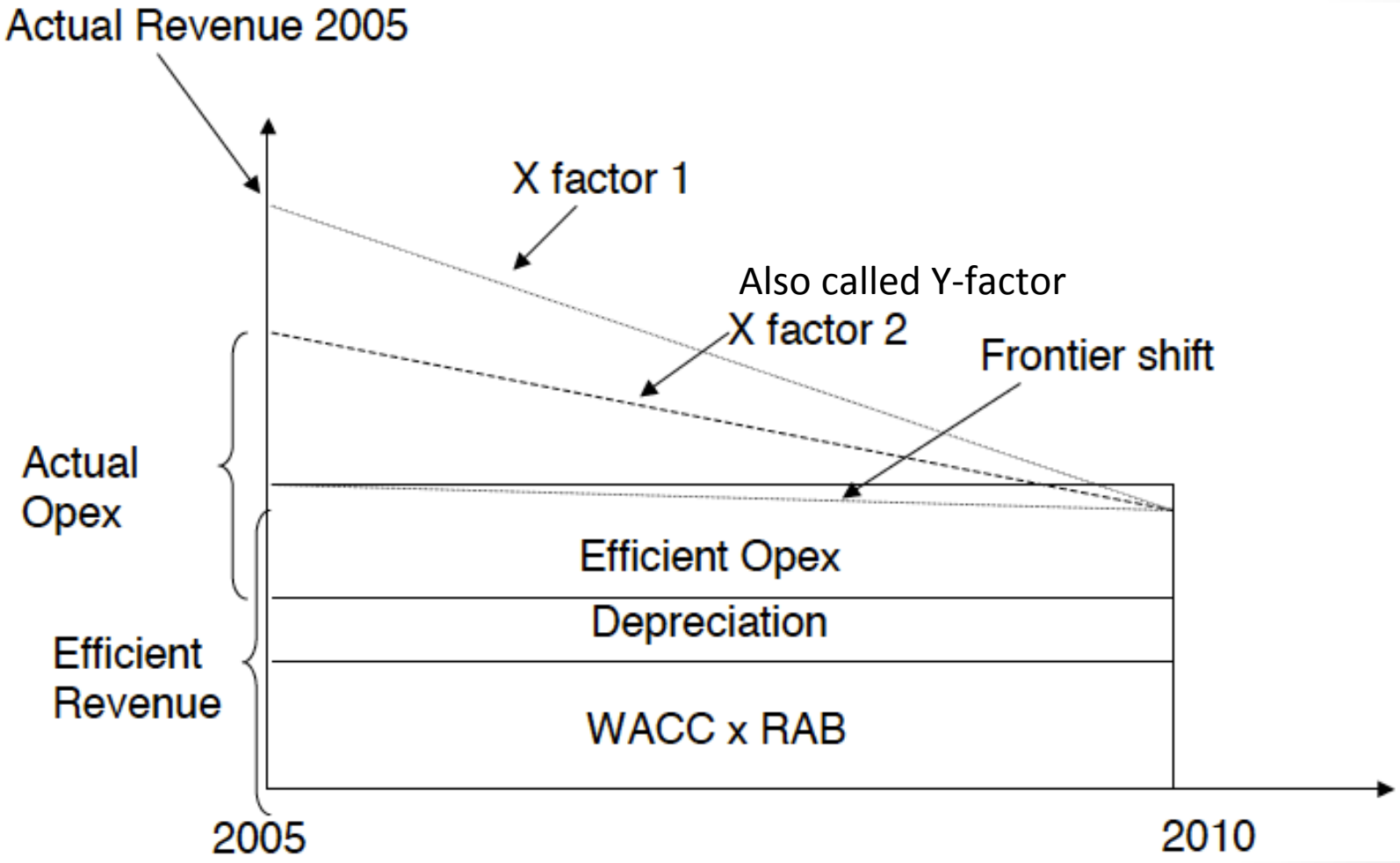
i.e. 2% *(for all firms)* + 20% / 5 *(catch up)* = 6%

Is this fair?

How is X calculated in the UK? Issues & Solution

- UK use the building block approach
  - – Capex and Opex costs are analysed separately
  - – Capex must be audited ex ante and ex post
  - – Opex separated: controllable vs. uncontrollable.
  - – Reasonable WACC calculated.
- Only part of measured inefficiency eliminated.
- **Risks and limitations of UK RPI-X approach**
  - – Weak incentives at end of period
  - – Investment incentives weak
  - – Regulation introduces risk
  - – Process viewed as burdensome
- **Solutions:**
  - – Standardise efficiency recovery period
  - – Clear guidelines for assessment of investment
  - – Develop consistency in cost of capital projections
  - – Review process ex post (as OFWAT, 2000)

Allowed revenue and X factor



Regulator should consider the following 5 issues when setting X-factor

- Do the firms differ in terms of average customer sizes?
- Are some firms larger than others and therefore able to achieve scale economies?
- Do input prices differ across years or across firms?
- Have the last five years been “typical”? For example, has the regulatory system changed recently?
- To what extend are all firms able to achieve the industry average level of productivity growth?

Total factor productivity (TFPC) change

TFPC=Technical Efficiency change (TEC) * Technological Change/Progress (TC) * Scale Efficiency change (SEC)

Total factor productivity: is the ratio of output over (multiple) input

Technical Efficiency: is a firm's ability to achieve maximum output given its set of inputs; TE scores vary between 0 and 1.

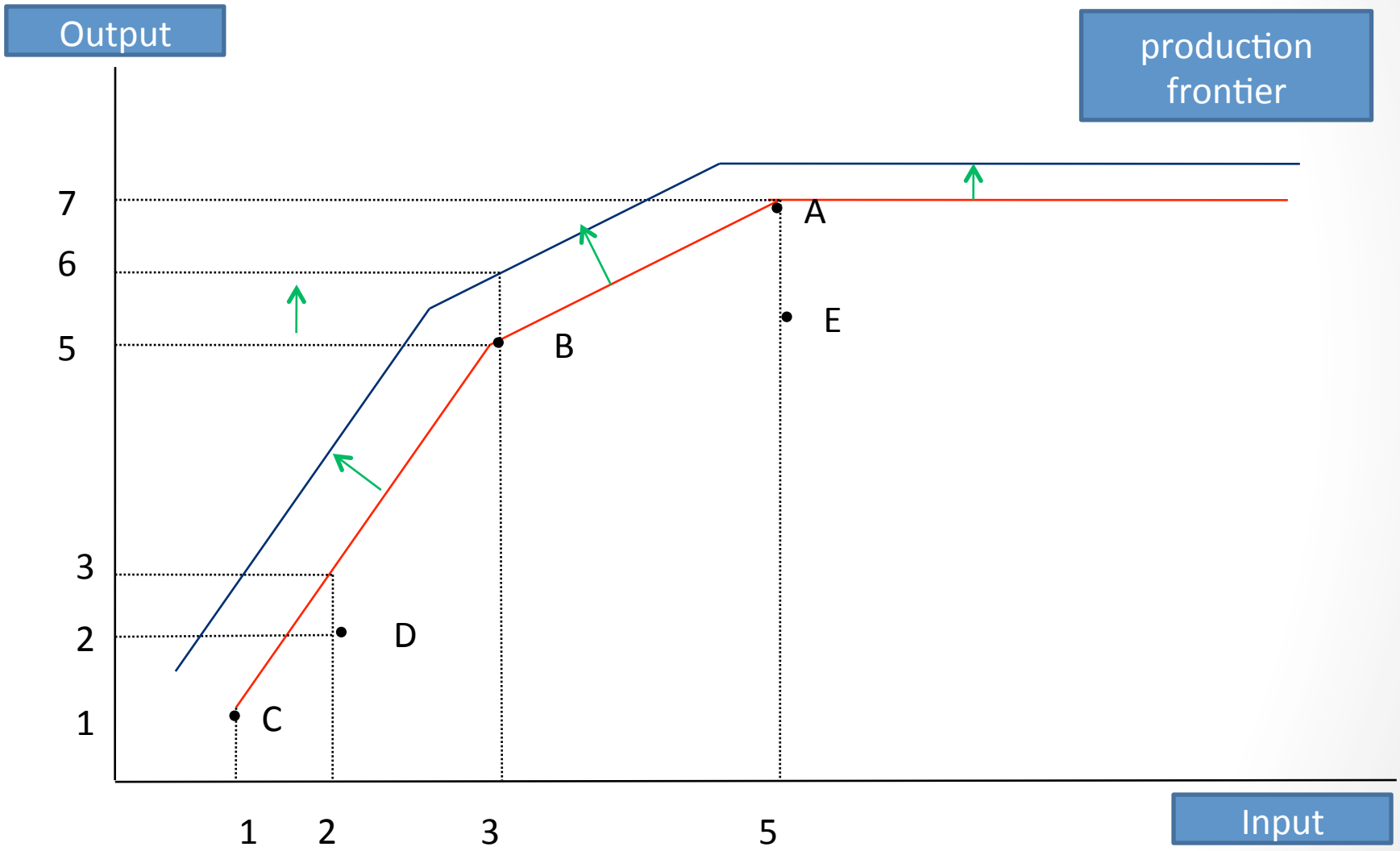
A value of 1 indicates full efficiency and operations are on the productn frontier. A value of less than 1 reflects operations below the frontier

Technical Change: is an increase in the maximum output that can be produced given an input vector, z, and is reflected in a shift in the production frontier over time.

Slow for utilities and transport with an exception of telecoms

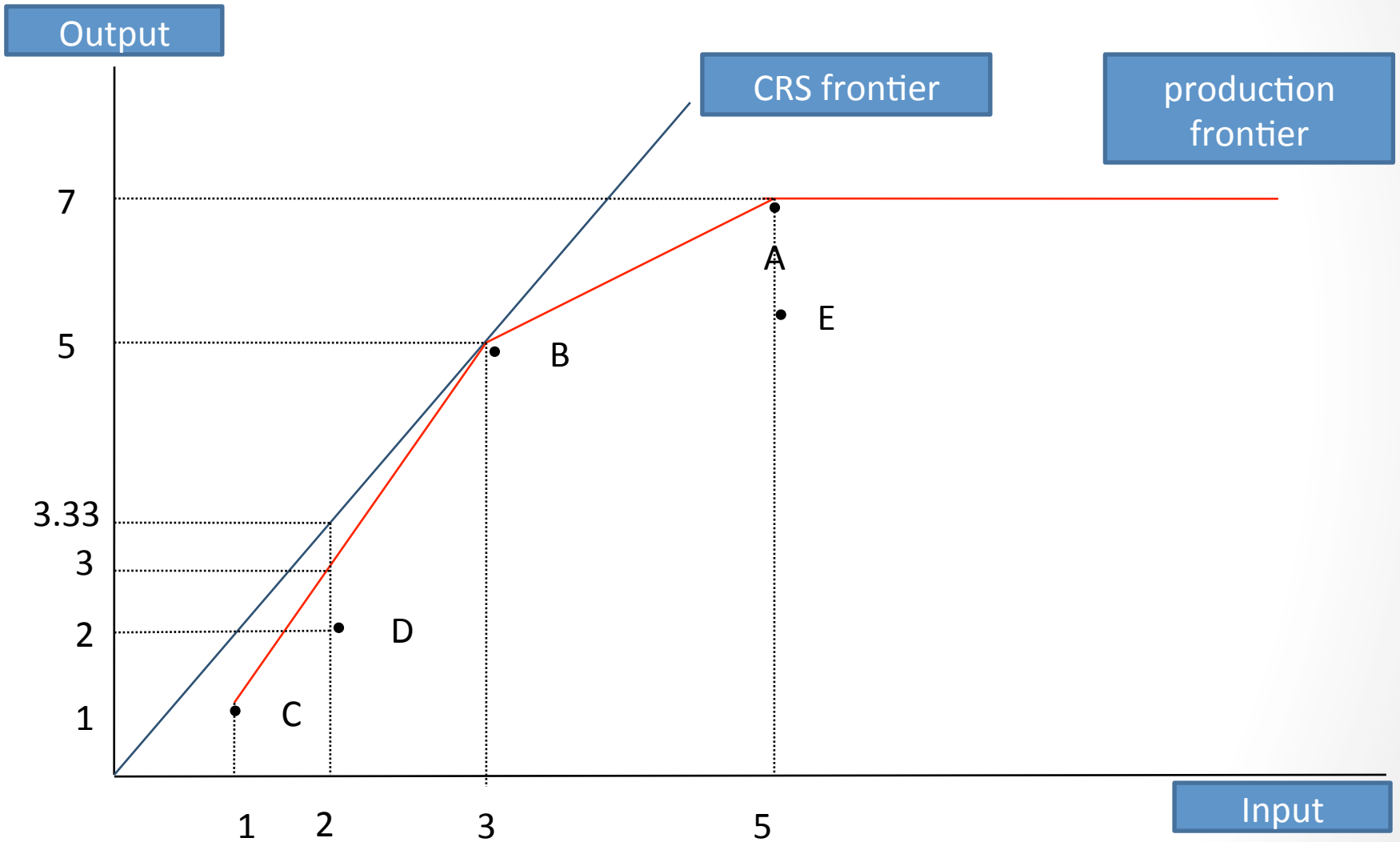
Scale Efficiency: is a measure of the degree to which a firms is optimizing the size of its operation

The production frontier



The distance between the data point and the frontier determines the TE of the firm

The production frontier



Arithmetic Example: data for water-carting companies

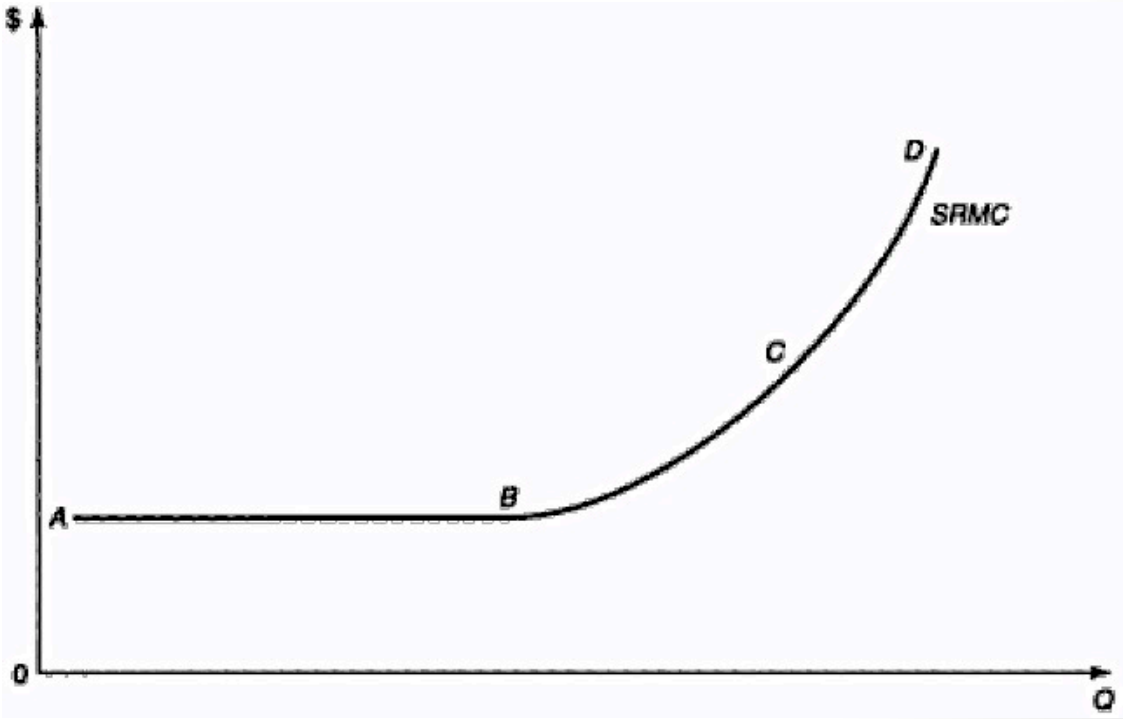
Firm	Input (X)	Output (Y)	Productivity (Y/X)
A	5	7	1.40
B	3	5	1.67
C	1	1	1.00
D	2	2	1.00
E	5	6	1.20

Firm	Technical Efficiency(TE)	Scale Efficiency (SE)	TE_{CRS}
A	1.00	0.84	0.84
B	1.00	1.00	1.00
C	1.00	0.60	0.60
D	0.67	0.90	0.60
E	0.86	0.84	0.72

Peak Load Pricing

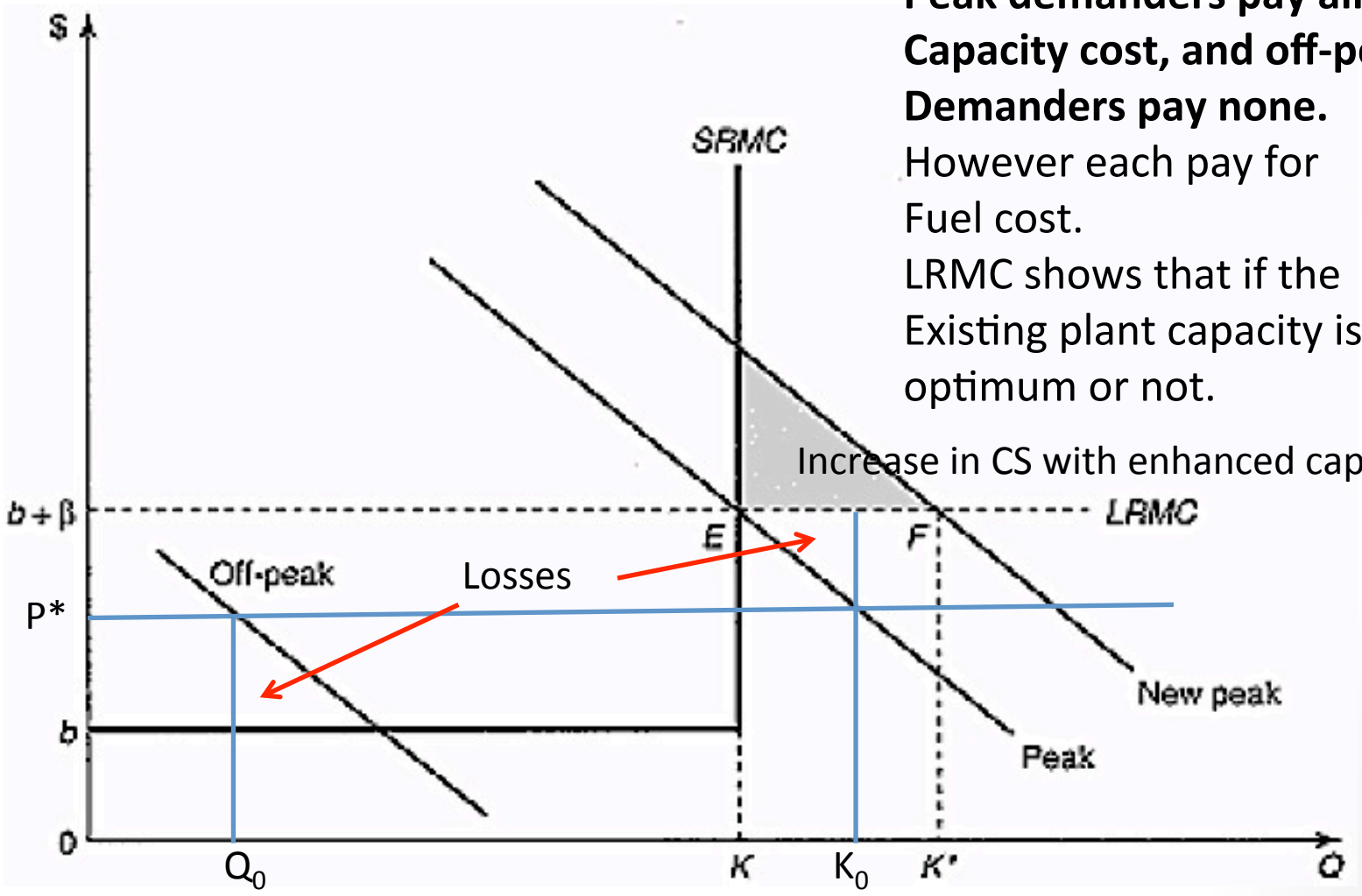
- Demand changes by hour, day, season.
- Storage is costly, sufficient capacity required to meet dd.
- Costs are independent between periods.
- Efficient way to deal with this is through peak load pricing (pioneered by French utility, EdF in 1940s).

Mixer of plants for ss -
AB= base load plant's running cost
BC = coal fired plant's Running cost
CD= cost of the peaking up plants



Peak-load Pricing: Rigid plant case,

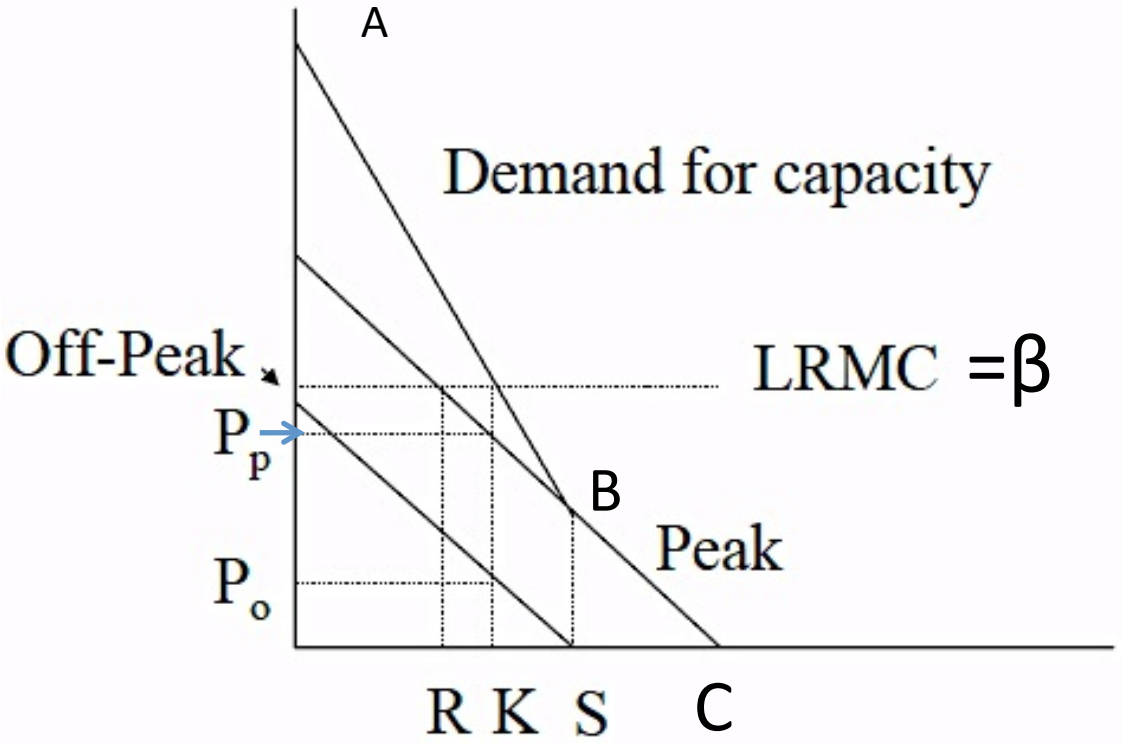
b= marginal running cost at base load, β = marginal cost of capacity addition,
K= socially optimal plant size for the dd



Peak demanders pay all Capacity cost, and off-peak Demanders pay none.
However each pay for Fuel cost.
LRMC shows that if the Existing plant capacity is optimum or not.

Increase in CS with enhanced capacity

Peak Load Pricing: Shifting Peak – dd's are closer together , Both groups share capacity cost



- MC running costs assumed to be zero. The MC of capacity assumed to be LRMC.
- Thus if off-peak users charged zero, they will necessitate over-expansion of the system related to the combined capacity requirement. Efficient pricing means that off-peak pays some of the LRMC, increasing the demand of the peak consumers.

Comparing price control models: efficiency Incentives

Rate-of-Return	Low incentive No benefit of cost reductions as return is fixed Costs can be shifted to customers, incentive to increase costs
Revenue-Cap	Medium to strong incentives Profits can be increased by reducing costs as revenues are capped Possibility to increase profits by increased prices and decreased output Includes explicit factor for the anticipated efficiency increase (X-factor)
Price-Cap	Medium to strong incentives Profits can be increased by reducing costs as prices are capped Possibility to increase profits by increased output Requires explicit productivity increase via formula (X-factor)

Comparing price control models: efficiency Incentives

Revenue-Sharing / Profit-Sharing	Medium incentives Revenues / profits resulting from cost reductions shared with customers Large sharing rule → incentives close to Rate-of-Return regulation Small sharing rule → incentives close to Cap Regulation
Yardstick	Strong incentives Prices/revenues indexed to average cost/productivity improv. of industry Profits can be increased by reducing costs in relation to other companies

Comparing price control models: Practicability – Information Requirements

Rate-of-Return	Medium / high information requirements Requires monitoring of revenue and cost data High administration effort
Revenue-Sharing / Profit-Sharing	Medium information requirements Requires regular and reliable profit / revenue data
Cap	Information requirements vary with the form of cap regulation (low to medium) It may require explicit cost projections Reduced monitoring of costs
Yardstick	Comparably lower information requirements Does require a sufficient number of comparative firms whose data can be used to form the yardstick

Comparing price control models: Impact on Investment

Rate-of-Return	Potential of over-capitalisation inefficiently high capital-labour ratio
Revenue-Sharing / Profit-Sharing	Investment impact depends strongly on the design In general weaker (than rate-of-return regime) incentives for over-investment
Revenue-Cap	Potential of underinvestment Requires supplementary quality regulation
Price-Cap	Potential of underinvestment Requires supplementary quality regulation
Yardstick	Potential of underinvestment Requires supplementary quality regulation

Comparing price control models: Regulatory Risk

Rate-of-Return	Transparent, predictable, Intrusive Cost immunisation → customers bear risk → lower risk for the firm → likely lower cost of capital
Revenue-/ Profit-Sharing	Risk and revenues shared between company and customers
Revenue-Cap	Less transparent but less intrusive Decoupling between costs and revenue → owners bears higher risk → higher risk for the firm → likely higher cost of capital Risk of windfall profits
Price-Cap	Less transparent but less intrusive Decoupling between costs and revenue → owners bears higher risk → higher risk for the firm → likely higher cost of capital Risk of windfall profits
Yardstick	Theoretically more transparent, but in practice several complexities Non-intrusive Owners bear risk, process similar to competitive markets

Does regulation make a difference?

- Difficult to test this these days but evidence is that electricity rates substantially lower in US states with regulators than without in 1920s.
- Evidence that regulated rates substantially below monopoly levels (by up 30%) in 1970s.
- Demsetz (1968) argued that regulation is unnecessary because regulator could have an auction to run monopoly in advance (e.g. like defense contracting). This makes subsequent regulation of prices unnecessary.

Deregulation in Electricity Markets

- **[Read this paper] Paul Joskow (1997)** points out that keenness to deregulate strongest in US states with the highest electricity prices (e.g. CA, MA).
- However companies would only agree to deregulation if they could be guaranteed NPV of future profits. The transition to competitive generation revealed bad past investments and so called stranded costs which would not be recovered if prices fell in a competitive generation market. These costs are being recovered through Competitive Transition Charges (CTCs).
- These charges are being recovered at the moment from residential customers, through a mechanism which ensures little incentive to switch to competitive suppliers.
- In MA these have expired in 2004.
- The result of this is that in MA only 3% of residential customers have switched supplier since 1998. In the UK the comparable figure is 30%.

Regulating Quality

Guaranteed standards of performance in electricity supply in the UK (1997)		
Service	**Performance level**	**Penalty charge**
Restoring electricity supplies after fault	Must be restored within 24 hours	£40(domestic customers), £100(non domestic customers) plus £20 for each further 12 hours
Providing supply and meter	Appointment within 3 and 5 working days for domestic and non domestic customers, respectively.	£20- £100
Notice of planned supply interruptions	2 days notice	£20 domestic, £40 non domestic customers
Responding to meter problem	Reply within 10 working days	£20

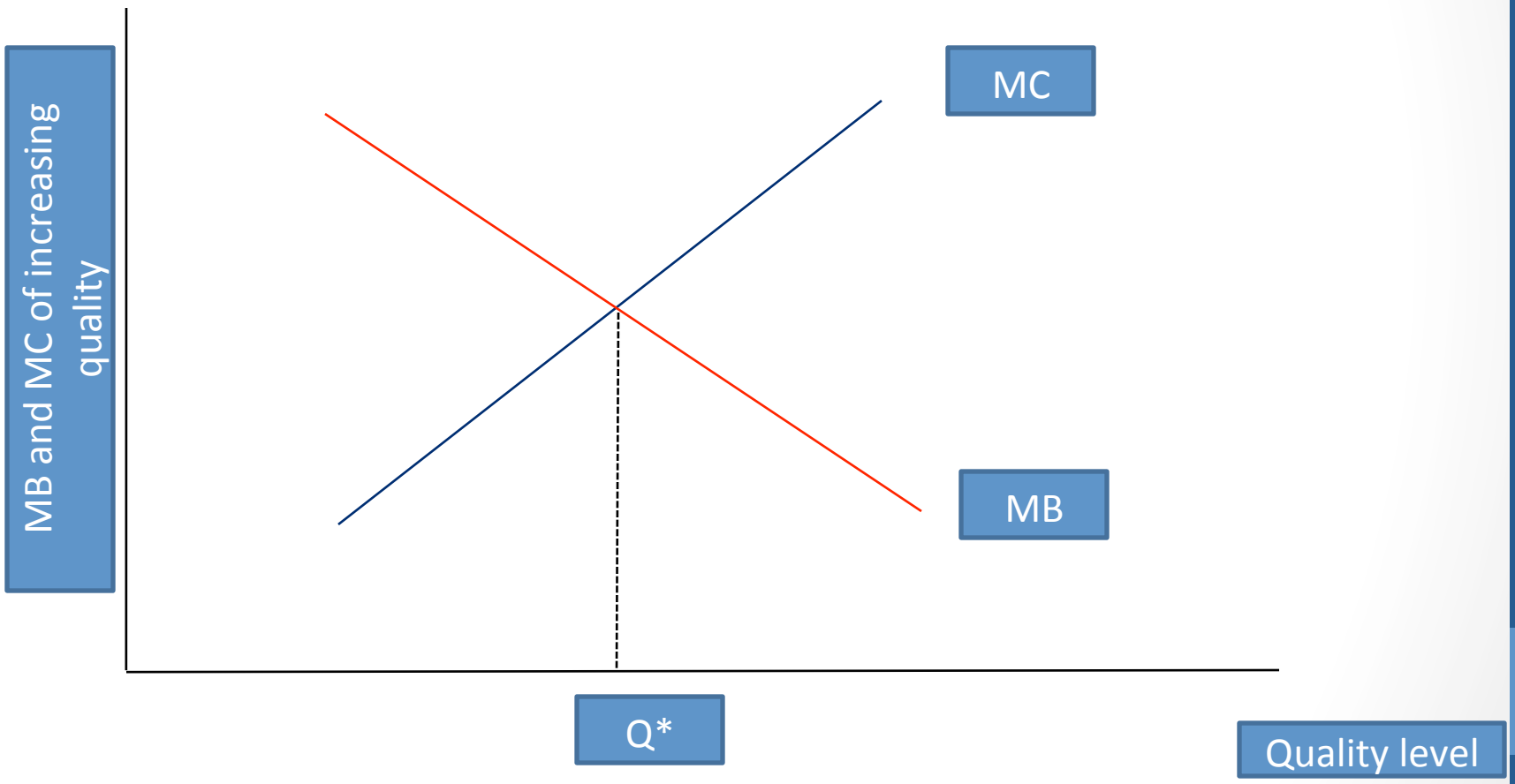
Quality under different price control models

Privatization may be replacing an earlier quality problem with a new one:

- The quality of product/service may rise if rate of return regulation is applied because such regulation encourages capital intensity; if capital is normally required to increase product/service quality the result may be excessive quality ,
  - *eg. an electricity generation network, may contain far more excess capacity to deal with the risk of supply interruptions than customers would ideally like to pay for*

- In the case of price cap regulation a firm will be able to make extra profits by degrading the quality of service

Determining the optimal level of quality



Individual and Overall Quality Standards

- Where quality of service can be differentiated across customers, a firm can offer customers a choice of tiered levels of service, and to require compensation to be paid for failure to deliver these as due to individual customers, eg. telecoms

- On compensation levels, damages should ideally equal losses borne by the representative consumer divided by the probability that compensation will be sought, i.e., if only half complain the payment will have to be twice the actual damage imposed, in order to give the operator a strong incentive to maintain service standards

- Where the quality attribute is public one means of combining price and quality regulation is to incorporate quality arrangements directly into the price-cap, eg., RPI-X+aQ

Individual and Overall Quality Standards

Quality of service has not been incorporated in the price cap of an of the regulated industries in the UK , why?

- A mis-estimate in either the marginal cost or marginal benefit of quality, leading to incorrect choice of the quality coefficient in the price cap, would have unfortunate consequences, leading to the considerable oversupply or undersupply of quality
- Multidimensional nature of quality
- Quality levels would have to be measurable by objective or agreed methods; the difficulty of making measurements would almost certainly mean that many quality attributes would not be covered in the formula

<u>However</u>

If long term reductions in quality of service are encountered within a control period an existing price cap may be revisit

Reference

- Armstrong, Cowan and Vickers, 1994, Regulatory Reform: Economic Analysis and British Experience, section 3.4
- VVH: chapter 12