Rate Structure: Pricing Objectives and Options

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Session 19

What makes a price good or bad?

- Revenue adequacy and stability
- Stable prices
- Price signals encourage efficient use of services
- Recognize externalities
- Fairly apportion total cost

- Avoid undue discrimination
- Encourage innovation
- Be simple, convenient, understandable, and acceptable to customers

What would you do?

- Using rate of return regulation, in 1998 ANEEL (electricity regulator in Brazil) determined that ESCELSA (electricity distribution company) should decrease its overall price level 3.4%
- Following is ANEEL's comparison of marginal costs with existing revenues for each service class.

ESCELSA before repricing

Average Tariffs of ESCELSA and Tariff Costs				
Tariff Subgroup	Costs R$/MWh	Average Tariff R$/MWh	Difference R$/MWh	Difference %
A2 (138 kV)	40.22	43.95	3.73	9.28%
A3 (69 kV)	41.89	51.91	10.02	23.93%
A4 (15 kV)	46.24	75.21	28.97	62.65%
B1 (Resid.)	66.55	126.19	59.64	89.62%
B2 (Rural)	87.76	72.04	(15.72)	-17.91%
B3 (Ind/Com)	67.55	113.10	45.55	67.44%
B4 (I.Publ.)	65.58	75.94	10.36	15.80%
Total	59.40	78.38	18.98	31.96%

R$ = Brazilian Reals

ANEEL's approach

- Compared marginal costs with existing revenues for each service class.
- Based price reductions on existing contributions over marginal cost and on social considerations.

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B4 (I.Publ.)	65.58	75.94	10.36	15.80%
Total	59.40	78.38	18.98	31.96%

Shaded percent differences denote the groups paying the highest markup and that will be targeted for price decreases.

Repricing Decision

Tariff Repositioning of ESCELSA	
A4 (15 kV)	**-3.30%**
B1 (Resid.)	**-5.30%**
B2 (Rural)	**-2.00%**
B3 (Ind/Com)	**-3.24%**
Others	**-1.00%**
Total	**-3.40%**

Tariff levels after repricing

Average Tariffs Repositioned and Tariff Costs				
Tariff Subgroups	Tariff Costs R$/MWh	Average Tariff R$/MWh	Difference R$/MWh	Difference %
A2 (138 kV)	40.22	43.51	3.29	8.19%
A3 (69 kV)	41.89	51.40	9.51	22.69%
A4 (15 kV)	46.24	72.73	26.49	57.28%
B1 (Resid.)	66.55	119.50	52.95	79.57%
B2 (Rural)	87.76	70.60	(17.16)	-19.55%
B3 (Ind/Com)	67.55	109.44	41.89	62.01%
B4 (I.Publ.)	65.58	75.18	9.60	14.64%
Total	59.40	75.71	16.32	27.47%

Average tariffs decreased for all subgroups, but decreased the most for those that paid the highest prices relative to their marginal costs.

Before and after

Tariff Subgroup	% Above MC Before Reprice	% Above MC After Reprice
A2 (138 kV)	9.28	8.19
A3 (69 kV)	23.93	22.69
A4 (15 kV)	62.65	57.28
B1 (Resid.)	89.62	79.57
B2 (Rural)	-17.91	-19.55
B3 (Ind/Com)	67.44	62.01
B4 (I.Publ.)	15.80	14.64
Total	31.96	27.47

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Script Pages 1-2

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Efficient pricing

Script Pages 3-4

- Economic cost or accounting cost?
  - » Economic: called current, forward-looking
    - Used for price signals to customers and companies because affects decisions
    - Encourages efficient choices
  - » Accounting: called embedded, original, historic
    - Used for assessing returns to shareholders (determining the price level) or for ring fencing

Best practice

- Ofwat uses historical costs for assessing earnings, but forward-looking costs for pricing
- Australia is an exception. At least some Australian regulators use current costs for pricing and assessing earnings
  - » The likely effect is that investors adjust their earnings requirements, so that there is no net effect on customers in the long run

Incremental cost

Script Pages 11-12

- Incremental cost -- costs avoided or created by some difference in production
  - » If producing 100 MWhs cost US$X million and producing 150 MWhs cost US$Y million, the incremental cost of the 50 MWhs is US$(Y-X) million
- Long run used most often

Peak and off-peak pricing

Script Page 12

- Peak pricing reflects usage costs and capacity costs
  - » e.g., generator capacity and fuel
  - » e.g., switch capacity
- Off-peak pricing reflects usage costs
  - » e.g., fuel
  - » Essentially zero for telecoms

EDF in France

Script Pages 12-13

- Structure
  - » Days designated as Blue (normal), White (cold), or Red (very cold) at end previous day.
  - » Two periods per day.
  - » Prices highest on Red days
- Results
  - » Customers in temperate areas benefit most
  - » 50% of customers in colder areas benefited

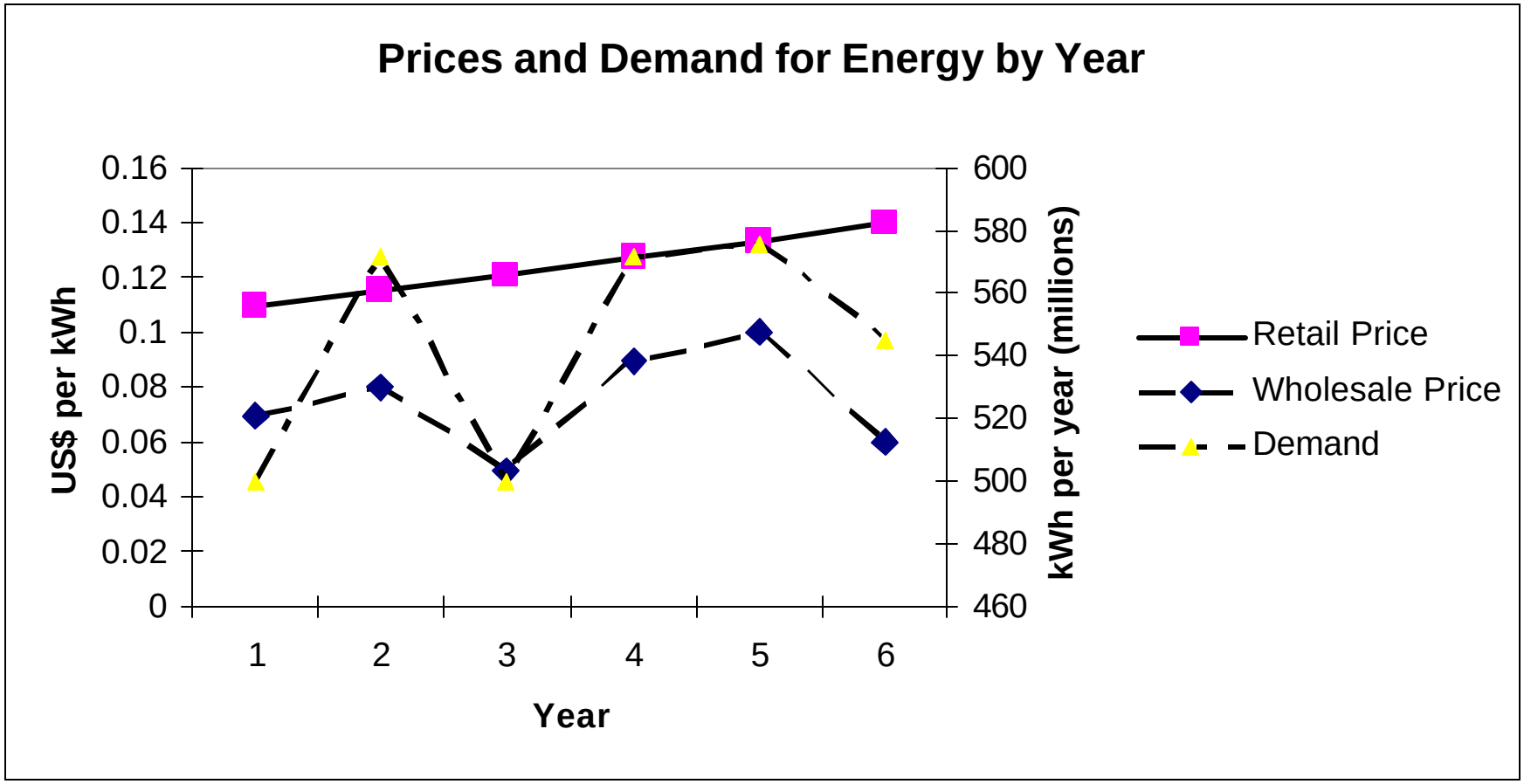
Evaluate this price structure

- Example Pricing Problem 1
- Electricity distribution company that buys kwhs in a competitive market
- Charges a linear tariff set in Year 1 so that the operator receives just its WACC in profits
  - » Tariff starts at \$0.11 / kwh and increases with a price cap of $I - 5$ per year

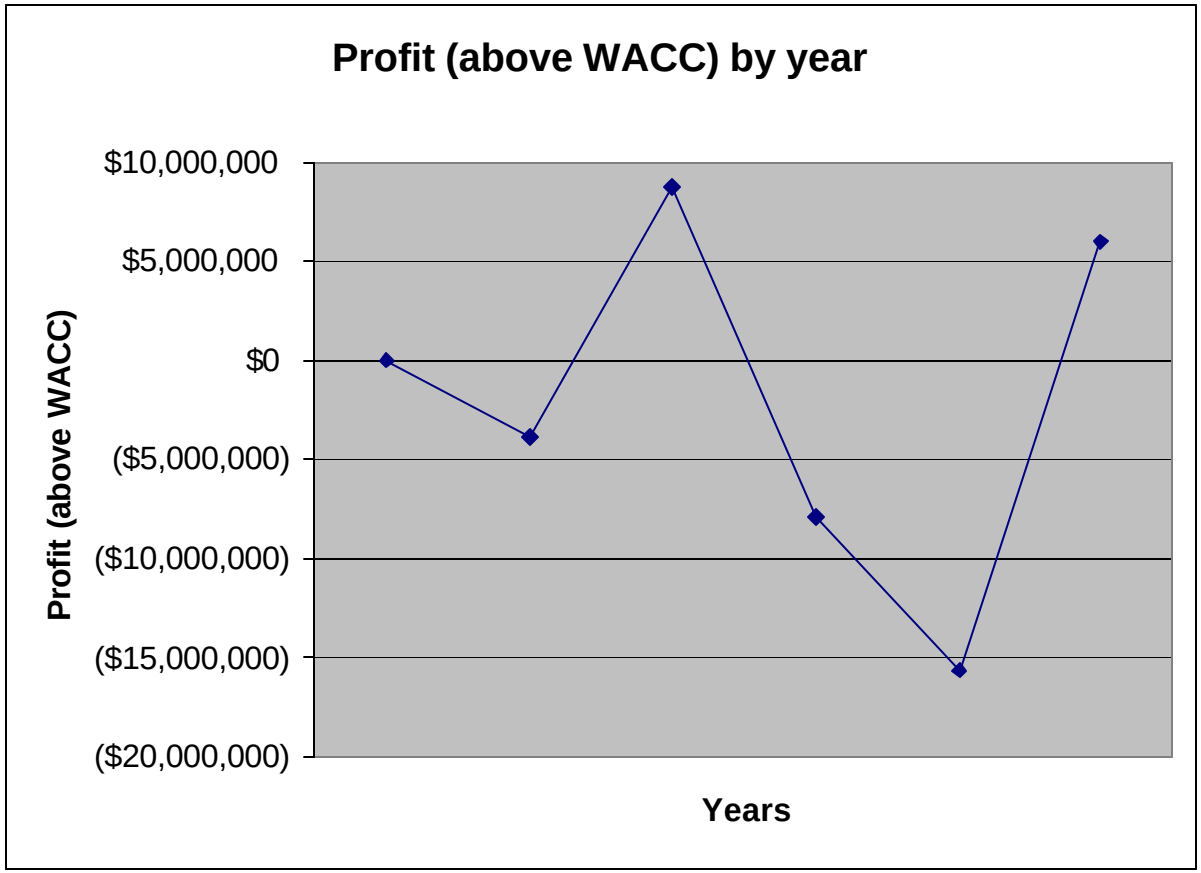
Evaluate this price structure

	Year					
	1	2	3	4	5	6
Operating Statistics						
Customers	100,000	110,000	111,000	110,000	120,000	121,000
kHz per Customer	5000	5200	4500	5200	4800	4500
Total kHz	500,000,000	572,000,000	499,500,000	572,000,000	576,000,000	544,500,000
Cost (including WACC)						
Connection per customer	$ 200.00	$ 220.00	$ 242.00	$ 266.00	$ 292.00	$ 312.00
Cost to buy kHz	$ 0.07	$ 0.08	$ 0.05	$ 0.09	$ 0.10	$ 0.06
Total Customer Cost	$20,000,000	$24,200,000	$26,862,000	$29,260,000	$35,040,000	$37,752,000
Total kWh Cost	$35,000,000	$45,760,000	$24,975,000	$51,480,000	$57,600,000	$32,670,000
Total Cost	$55,000,000	$69,960,000	$51,837,000	$80,740,000	$92,640,000	$70,422,000
Revenue						
Price per kHz	$0.1100	$0.1155	$0.1213	$0.1273	$0.1337	$0.1404
Total Revenue	$55,000,000	$66,066,000	$60,576,863	$72,837,765	$77,014,476	$76,442,884
Profit (above WACC)	$0	($3,894,000)	$8,739,863	($7,902,235)	($15,625,524)	$6,020,884

Chart


Prices and Demand for Energy by Year
US$ per kWh
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
kWh per year (millions)
600
580
560
540
520
500
480
460
1
2
3
4
5
6
Year
Retail Price
Wholesale Price
Demand

Chart


Profit (above WACC) by year
$10,000,000
$5,000,000
$0
($5,000,000)
($10,000,000)
($15,000,000)
($20,000,000)
Profit (above WACC)
Years

Lessons from this structure

- Revenue unstable relative to costs
  - » Need prices to match how costs are incurred
- Revenue inadequate to cover costs in some years

What makes a price good or bad?

Script Pages 1-2

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Summary of benefits of using incremental cost

Script Pages 15, 29

- Each service covers costs it causes
- Efficient allocation of resources
  - » Is the service worth what it costs to provide?
  - » Would a different mix of services be more valuable to customers?
  - » Would another company be more efficient at providing this service?
- Reflect current operations

Efficiency effects of prices

Script Pages 32-33

- In US, rebalancing of line rentals and long distance calling improved consumer welfare by US$7.5 billion, or US$4.20 per subscriber
  - » lower long distance prices created 90% of this benefit
  - » more long distance calling created the other 10%

Problems with incremental cost

Script Pages 15

- Do not cover total cost when there are economies of scale (only one product) or joint production
- MC is hard to estimate
- Doesn’t say who will pay common costs

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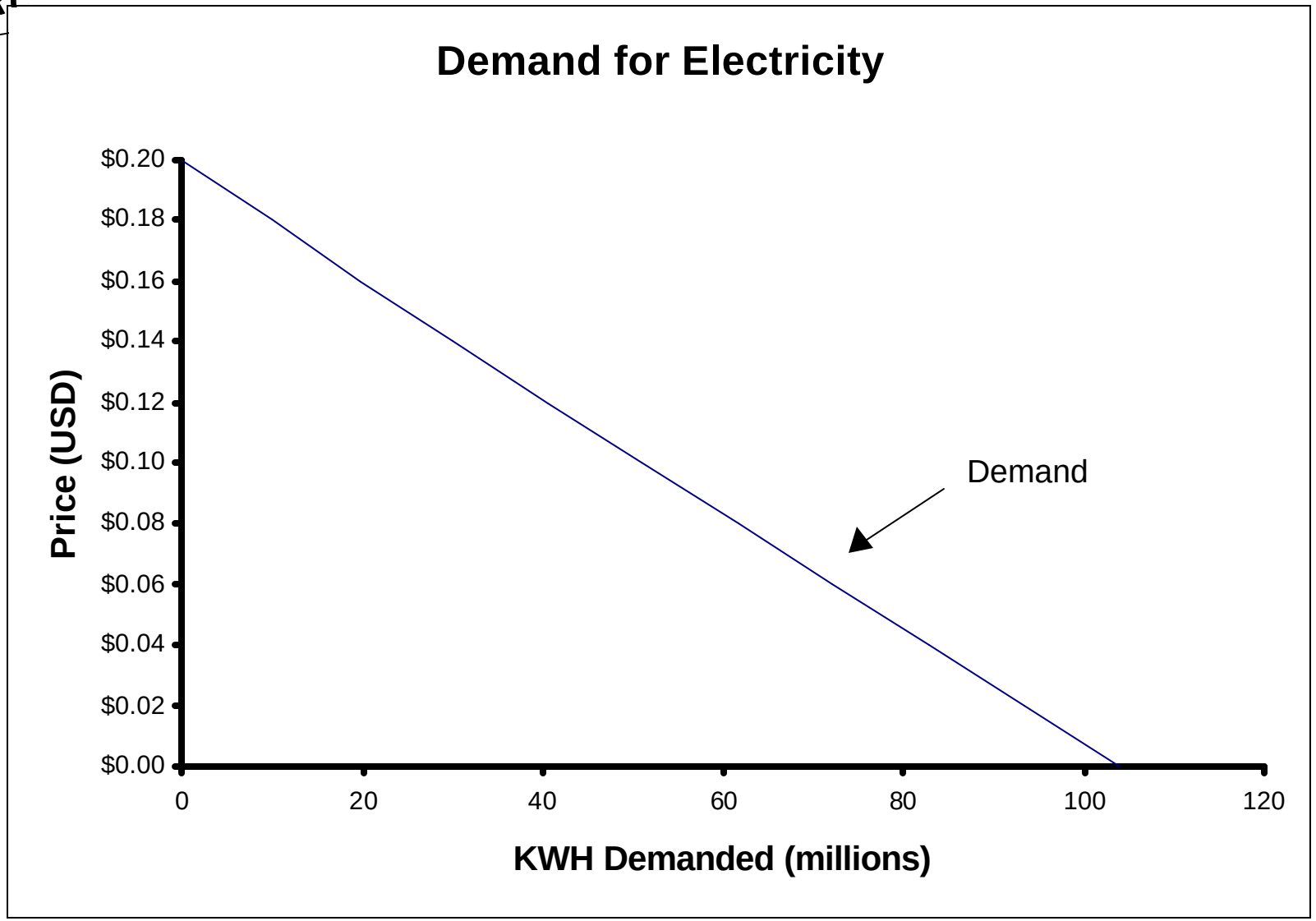
Problem

- Electric distribution company
  - » Given demand, costs, and three tariff proposals
  - » As the regulator of this company, choose the tariff proposal you prefer
  - » Details are in notebook


Demand for Electricity
$0.20
$0.18
$0.16
$0.14
$0.12
$0.10
$0.08
$0.06
$0.04
$0.02
$0.00
Price (USD)
Demand
0
20
40
60
80
100
120
KWH Demanded (millions)

Tariff Proposals

	Tariff Proposals					
		Uniform	Multi-Part	Menu Tariff		
		Tariff	Tariff	Option 1	Option 2	
Tariff	Fixed Fee	None	$ 315.00	$ 310.00		$ 0.70
	Usage Fee	$ 0.044	$ 0.04	$ 0.04	<1000 kwh	$ 0.04
					>1000 kwh	$ 0.20
Results	Demand (kwh)	80,680,000	80,000,000		82,800,000	
	Marginal Cost	$ 0.040	$ 0.040		$ 0.040	
	Fixed Cost	$ 315,000	$ 315,000		$ 315,000	
	Revenue	$ 3,549,920	$ 3,515,000		$3,636,000	
	Total Cost	$ 3,542,200	$ 3,515,000		$3,627,000	
	Profits	$ 7,720	$ -		$ 9,000	

What's the right price structure?

- Assume a situation where a wireless operator offers two pricing plans: Prepaid and Post-paid
- The operator wants low-use customers to choose prepaid and high-use customers to choose post-paid.
- Using data from the next slide, decide a pricing structure for the operator.

What's the right price structure?

Types of Customers	Number	Willingness to Pay	
		Prepaid 30 min.	Post-paid 500 min.
Low-use	100	$30	$40
High-use	200	$35	$60

Answer

- Identify WTP
  - » Capture 100% of the value of the low-use customer
  - » Give high-use customer her low-end surplus
- $P_{pre\text{-}paid}$ = Low-use wtp (prepaid)
  - $P_{pre\text{-}paid}$ = \$30
- $P_{post\text{-}paid}$ = High-use wtp (post-paid) - [High-use wtp (pre-paid) – $P_{pre\text{-}paid}$]
  - $P_{post\text{-}paid}$= \$60 - [\$35 - \$30] = \$55

Answer

- With $P_{\text{pre-paid}} = \$30$ and $P_{\text{post-paid}} = \$55$, the low-use customer choose pre-paid and the high-use customer chooses post-paid

Another approach to fairness

- Ramsey Pricing
  - » A form of price discrimination that tries to keep quantities purchased close to the amounts that would be purchased if prices were equal to marginal cost
- Is all price discrimination bad?
  - » No. Some price discrimination can benefit customers and companies

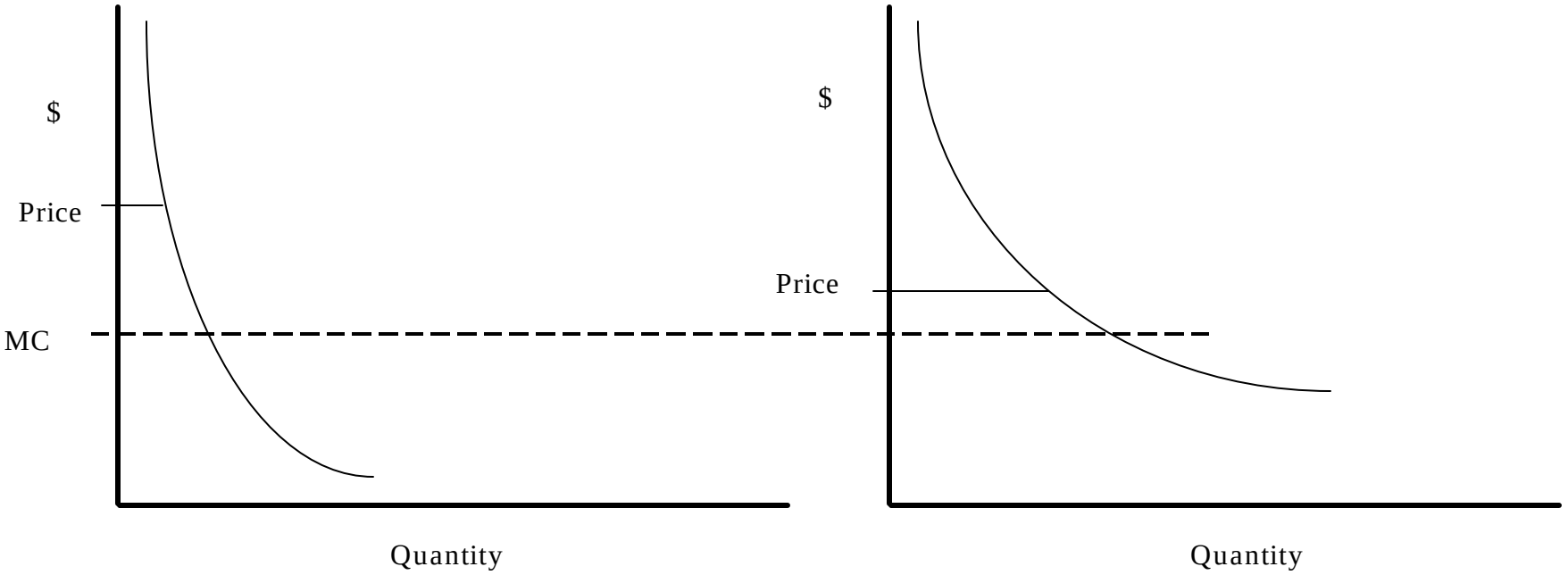
Ramsey pricing

Script Pages 19-20

- Prices based on demand (elasticity) and company breaks even (zero economic profits)
  - » inelastic (low elasticity) customers pay higher mark-ups above incremental cost
    - captive customers
    - highly valued services
- Objective -- deviate as little as possible from marginal cost pricing

Ramsey pricing illustrated

Script Pages 19-20



Ramsey pricing

Script Pages 19-20

- Benefits
  - » Prices reflect MC and "maximize welfare," and company covers total cost
- Problems
  - » Difficult to implement
  - » Customers and politicians may oppose
    - primarily for basic service levels
  - » Competition distorts elasticities

Multi-part prices

Script Pages 23

- Customers pay access fee plus usage
- Customers can select price option that benefits them most
- Company profits increase and customer benefit increases
  - » Price on margin is lower than average (and above marginal cost), so customer buys more

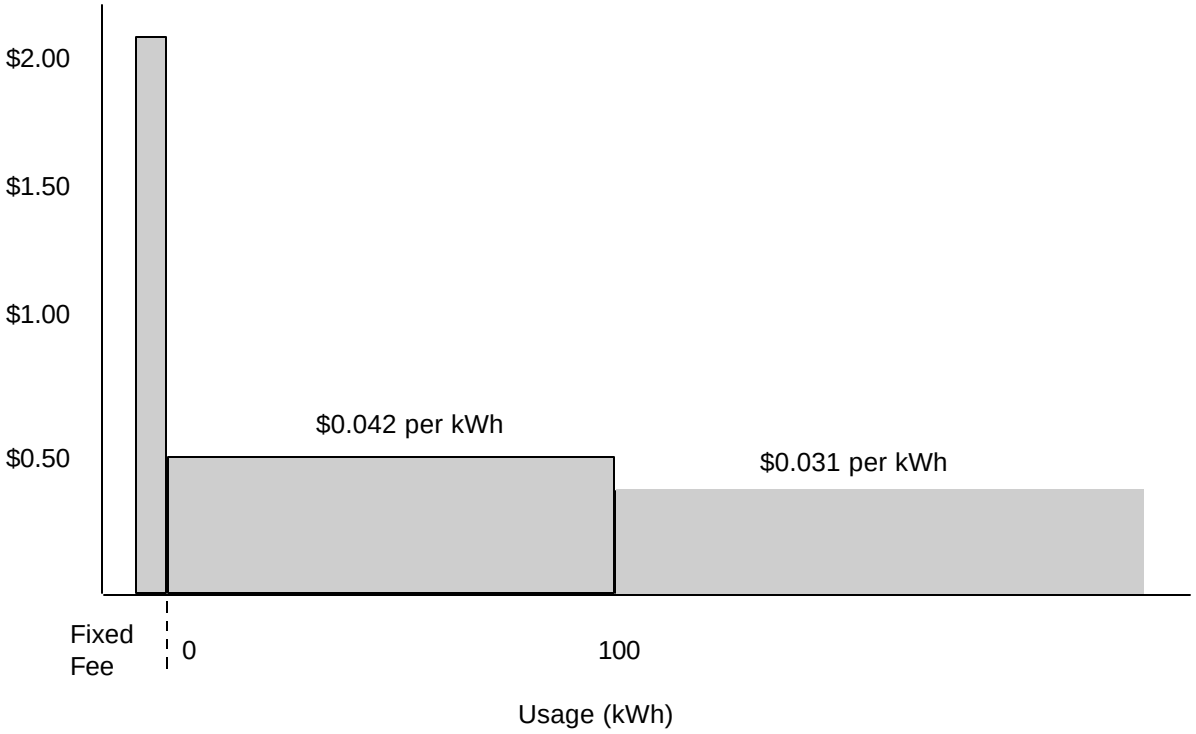
Another Approach: non-linear prices

Script Pages 20-21

- Linear prices equal average cost
  - » simple to implement and understand
  - » rarely efficient
- Non-linear -- prices change with volume
  - » incremental or decremental tariffs
  - » can use MC while covering total cost
  - » customers may arbitrage

Declining Block Tariff

Script Pages 21



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An alternative: Accounting Approach

Script Pages 4

- Fully Distributed Cost (FDC)
  - » Focuses on fairness
- Accounting based costing method that allocates accounts to services
- Used primarily when using rate of return tools

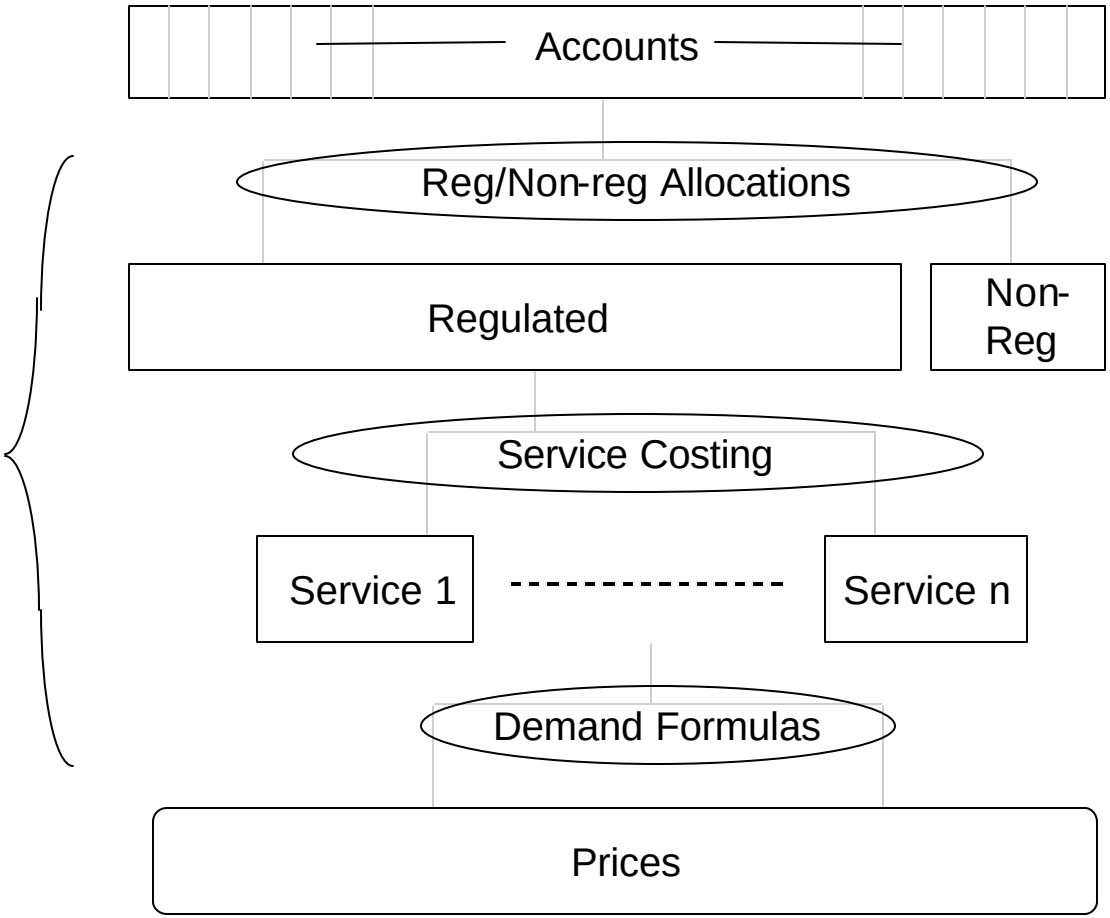
FDC illustrated

Script Page 5

Step 1: Accounting

Steps 2-3: Service Costing and Ring Fencing

Step 4: Pricing



Example of FDC

- US Jurisdictional Ring Fencing
  - » Separations (jurisdictional) and Cost Allocation Manuals (deregulated)

Cost Category	Allocator	State	Federal	Non-regulated
Local lines	Fixed percent	75%	25%	0%
Broadband lines	Line count	100-Y-X%	Y%	X%
Switches	Minutes	100-Y-X%	Y%	X%
Expenses	Follow relevant Investment	100-Y-X%	Y%	X%

Illustration of shared cost

Script Pages 4-7

Allocates all costs, not just shared or common costs

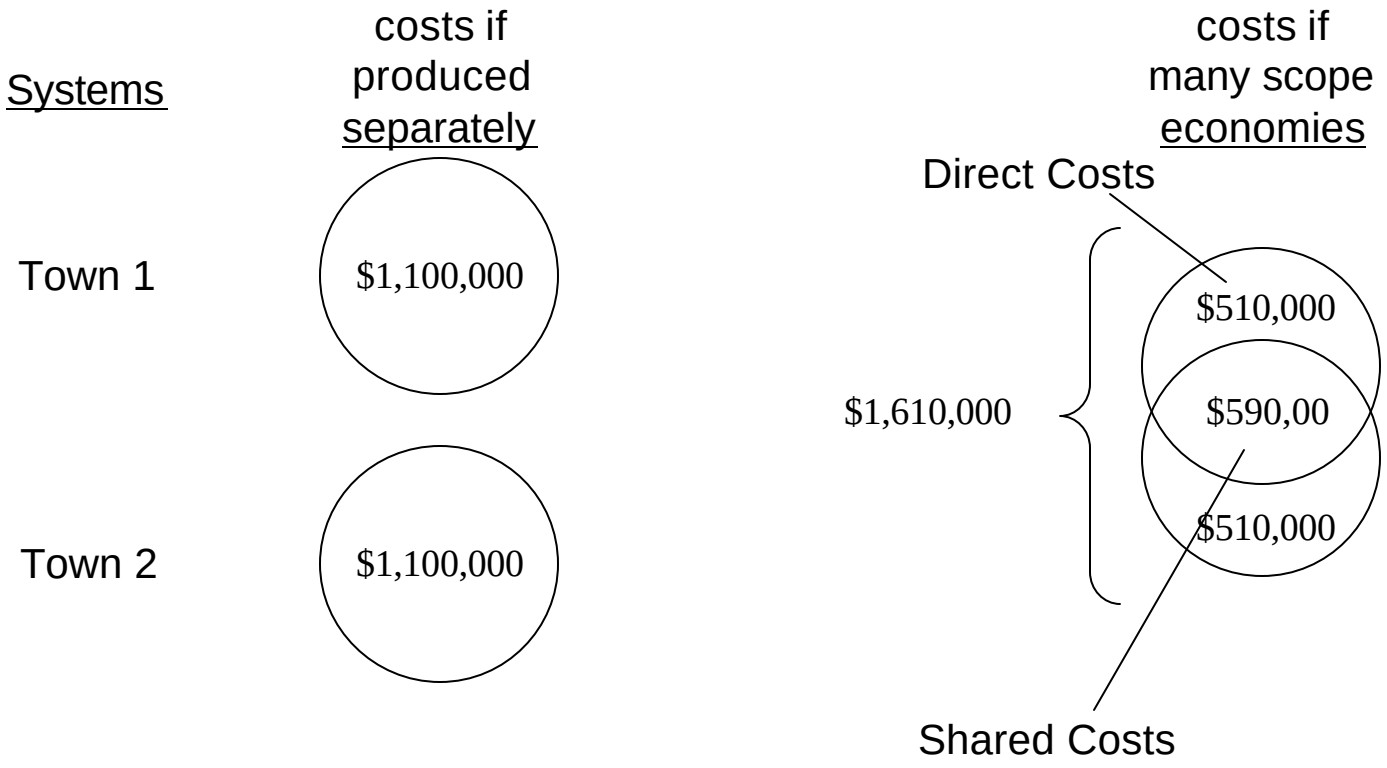
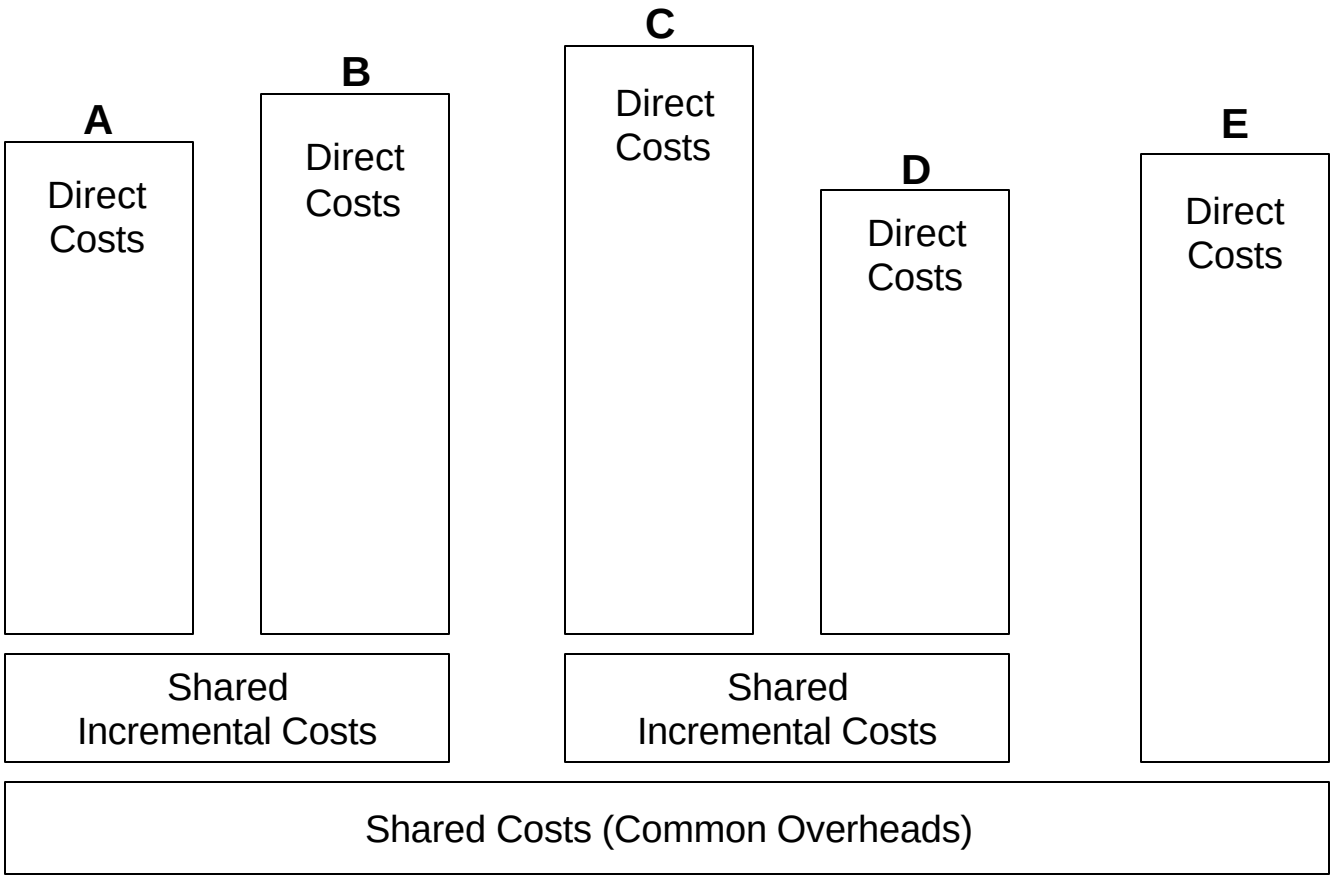


Illustration of cost structure

Script Pages 5-7



Benefits and problems of FDC

Script Pages 8-10

- Benefits
  - » Costs allocated = revenue requirement
  - » Appears fair and traceable
  - » Establishes accounting-based cost for RORR and ring fencing
- Problems
  - » arbitrary and allows costs shifting
  - » costs allocated to successful businesses
  - » sends false cost signals to management

Consider FDC in Ring Fencing

- Regulator of a fixed line operator deregulates fixed line service in one city, but not in another.
- Uses FDC to ring fence between the two cities, using number of lines as the allocator.

- In year 2, the operator loses 50,000 customers to its rivals

Year 1

			Year 1 - Competition Begins		
			Regulated	N Regulated	Total
Lines			100,000	200,000	300,000
Cost Cateory	**Total**	**Allocator**			
Operating Expenses	$3,000,000	Lines	$1,000,000	$2,000,000	$3,000,000
Investment	$300,000,000	Lines	$100,000,000	$200,000,000	$300,000,000
WACC	15%				
Revenue Requirement	$48,000,000		$16,000,000	$32,000,000	$48,000,000

Year 2

			Year 1 - Competition Begins		
			Regulated	**N Regulated**	**Total**
Lines			100,000	200,000	300,000
Cost Cateory	**Total**	**Allocator**			
Operating Expenses	$3,000,000	Lines	$1,000,000	$2,000,000	$3,000,000
Investment	$300,000,000	Lines	$100,000,000	$200,000,000	$300,000,000
WACC	15%				
Revenue Requirement	$48,000,000		$16,000,000	$32,000,000	$48,000,000

			Year 2 - Competitive Losses		
			Regulated	N Regulated	Total
Lines			100,000	150,000	250,000
Cost Cateory	**Total**	**Allocator**			
Operating Expenses	$3,000,000	Lines	$1,200,000	$1,800,000	$3,000,000
Investment	$300,000,000	Lines	$120,000,000	$180,000,000	$300,000,000
WACC	15%				
Revenue Requirement	$48,000,000		$19,200,000	$28,800,000	$48,000,000

Keys in effective FDC

Script Pages 10-11

- Minimize accounts that contain costs for multiple services
  - » Separate accounts for long distance cables and local line cables
- Use cost causation rather than relative use (directly assign, indirectly attribute, allocate)
- Control cost reallocation to non-competitive services

Controlling cost reallocation

Script Pages 10-11

- Create facility pools for competitive services (for example, a minimum number of local lines for telecommunications) that:
  - » do not shift to non-competitive services without permission
  - » are the maximum the competitive service can use without an increase in the pool

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