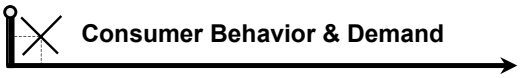
Before Starting New Material

Enrollment: Space in class. Should be on enrolled status

Official Section: Attend section for which enrolled If you do otherwise, must request permission of new GSI & regularly attend that section

Problem Set 1: Can get clarification only from GSI Section not for help w/ homework Due Start of lecture. Envelopes in front.

Worked S&D Examples: Today before new material



Questions We Can Answer

How much of each good should a consumer buy when he/she wants to have as much of each as possible, but has a fixed budget?

What is the total economic surplus consumers get from buying some amount of a good at a given price?

Utility Maximization

Utility: Measures satisfaction from consumption of good.

Consumer's Goal: Maximize Utility

Consumer's Constraint: Fixed Budget

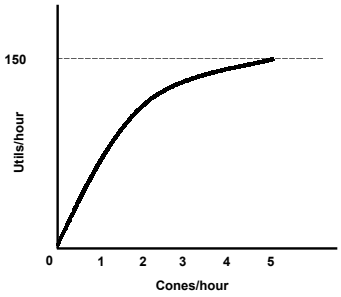
Econ 1: Don't look formally at Indifference Curve & Budget Constraint. So, we sort of intuit our way around the theory. Can get more formal theory in 100A.

Sarah's Total Utility from Ice Cream Consumption

Cone quantity (cones/hour)	Total utility (utils/hour)
0	0
1	50
2	90
3	120
4	140
5	150

Consider increasing utility "non-satiation"

Sarah's Total Utility from Ice Cream Consumption



Approximate graph, not drawn to scale

Law of Diminishing Marginal Utility

- The tendency for the additional utility gained from consuming an additional unit of a good to diminish as consumption increases

Utility Maximization

Consumer's Consumption Decision Across Goods:

Rational Spending Rule or Last Dollar Rule

Consumers' Demand For Single Good:

Maximize Economic Surplus
Compare MB to MC
Compare Reservation Price (WTP) to market P

Utility Maximization

Elaboration on example like problem 9 (section).

Two goods. Budget = $ 40 Price of public lecture PL= 10 Price of books PB=20

Units	U_L	MU_L	$(MU/P)_L$	U_B	MU_B	$(MU/P)_B$
0	0			0	0	
1	25	25	**2.5**	60	60	**3**
2	45	20	**2**	100	40	2
3	60	15	1.5	140	20	1

Last Dollar Rule Says: First Dollars to Book, Next to Lecture, Next to Lecture: 1 Book & 2 Lectures

Utility maximization: Expenditure (Budget = $40)

Lectures \ Books	0	1	2	3
3	30	50	70	90
2	20	40	60	80
1	10	30	50	70
0	0	20	40	60

Utility maximization: Utility How to Decide?

Lectures \ Books	0	1	2	3
3	60	120	160	200
2	45	105	145	185
1	25	85	125	165
0	0	60	100	140

Utility Maximization Suppose P_L=$11.10

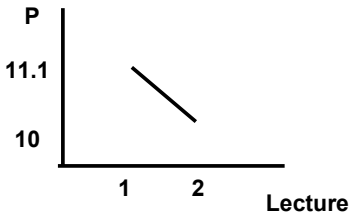
Can trace out Demand Curve

Units	U_L	MU_L	$(MU/P)_L$	U_B	MU_B	$(MU/P)_B$
0	0			0	0	
1	25	25	**2.5**	60	60	**3**
2	45	20	1.8	100	40	2
3	60	15	1.4	140	20	1

Now buy 1 book and 1 lecture

Utility Maximization Suppose P_L=$11.10

Can trace out Demand Curve for Lectures



Utility Maximization Demand Curve as MB Curve

MU/P determined demand schedule as prices changed in Public Lecture Demand example. Utility is a hard concept to deal with especially if we don't have all the theory tools at our disposal.

Easy to Conceptualize: Demand curve as a Marginal Benefit Schedule. Where MB is WTP and is in $ terms

We can think of it this way for Econ 1. But, we do need to understand the Rational Spending Rule

Problem To Do

How should you allocate your budget of $ 10 between consumption of X and Y if you want to maximize your utility? Px=2 Py=4

Units	U x	MU x	(MU/P)x	U y	MU y	(MU/P)y
1	6			10		
2	10			16		
3	12			20		
4	13			22		

Slope Demand Curve

Reason 1: Slopes down since WTP for additional units falls as more are consumed

Reason 2: Diminishing Marginal Utility

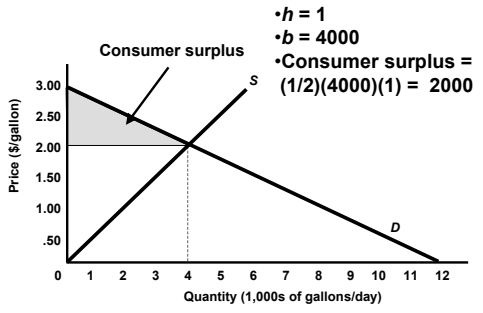
Reason 3: Interaction of Income & Substitution Effects.
For normal good, income & substitution effects re-enforce each other. Fall in price, like increase in real income, purchasing power rises, buy more. Also, if "purchasing power" held fixed, would buy more of the cheaper good.

Consumer's Economic Surplus

Consumer Surplus: Excess of buyer's reservation price (WTP or MB) over market price for all units of good purchased.

Lecture 4: Consumer surplus is max in unregulated PC market.

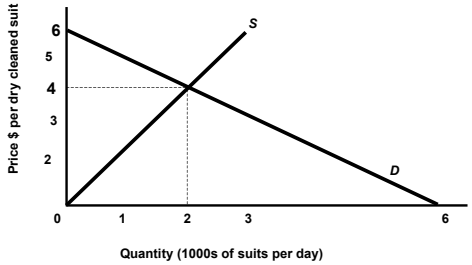
Consumer Surplus in the Market for Milk



Consumer Surplus = $2000 per day

Problem to Do

Consumer surplus for suit dry cleaning market



Summary

Diminishing Marginal Utility: As more of a good is consumed additions to utility decrease

Rational Spending Rule: Allocate budget across goods so that additions to utility per $ equal across goods. This rule maximizes utility, given fixed budget.

Downward Slope of Demand:
- Falling Marginal Benefit
- Diminishing Marginal Utility
- Income and Substitution Effects

Firm Behavior & Supply

Questions We Can Answer

Should a firm be a seller in a perfectly competitive industry and how much should it produce and sell?

What is the total economic surplus that suppliers get from selling some amount of a good at the prevailing price?

Profit Maximization

Profit = Total Revenue - Total Cost

Max Profit Rule (in general): MR= MC

Max Profit Rule (PC firm): P=MC

Additional revenue from selling additional unit is prevailing price P in perfectly competitive market

Marginal Revenue Equals Price for PC firm: MR = P

So, MR = MC Rule becomes P=MC for PC firm

Perfectly Competitive Firm

Benchmark Case: Ideal. In Lecture 4 we'll see that total economic surplus is max for unregulated PC market.

Assumptions:

Many buyers and seller

Homogeneous good

Perfect information

Free Entry & Exit

Perfectly Competitive Firm

Many buyers and sellers:

No single buyer or seller has influence on market price

Homogeneous good:

A buyer is just as happy buying from one firm as another. Eg. Fuji apple from Tom's Orchard Inc same as Fuji apple from Sally's Orchard Inc

Perfectly Competitive Firm

Perfect Information:

Sellers know market price ("demand curve" they face or equilibrium price given market demand and supply)

Buyers know who sellers are and the equilibrium market price P. They will certainly not buy from a seller if his price is even a shade above market price P.

Perfectly Competitive Firm

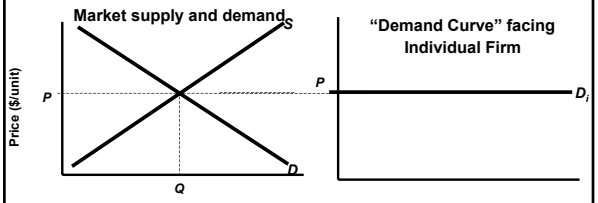
Free Entry & Exit:

Or, as F&B say: Productive resources mobile
A Key behind idea of entry & exit
"Resource" can be legal/institutional

Or, say: No barriers to entry & exit

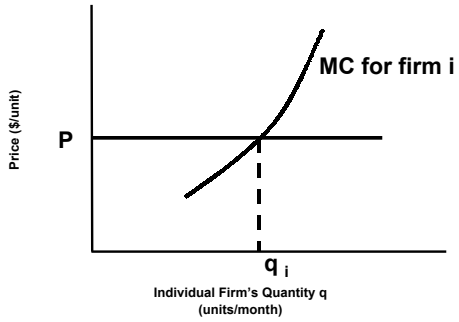
Any firm can easily acquire inputs needed (to "set up shop") to produce. And, any firm can quit easily, leave industry if it is not worth it to stay.

"Demand Curve" Facing Perfectly Competitive Firm



Perfectly Elastic Demand (D_i) facing individual firm i means if he charges price even a shade more, loose all customers who go buy from other firms at price P. (Certainly will not charge less than P. Why?)

Individual Firm Profit Maximizing Quantity (P = MC)



We'll see where MC comes from ….

Firm Output (q) vs Market Output (Q)

Market Output = Sum of individual firm $_i$ output

$$Q = \Sigma_i q_i$$

$$Q = q_1 + q_2 \ldots + q_n$$

with n firms in market

(Can say "big Q" is sum of "little q")

Costs, Costs, Costs !!!

Patience please!

Factors of Production: What the firm uses to produce a good. The inputs. Eg. labor (workers), equipment, materials (like metal for cars, seeds for tomato plants)

Fixed Factor: Factor whose level does not vary for different output levels. Eg. robotic equipment for assembly line

Variable Factor: Factor whose level does vary for different output levels Eg. workers

Costs, Costs, Costs !!!

Patience please!

Total Cost of Production: The sum of fixed and variable costs of production at each output level

Fixed Cost : The sum of costs for all fixed factors

Variable Cost: The sum of costs of all variable factors at each output level

Note: "at each output level" not relevant for fixed cost. Why?

Costs, Costs, Costs !!!

Patience please!

Average Total Cost (ATC):
Total Cost per unit = TC / q

Average Fixed Cost (AFC):
Total Fixed Cost per unit = TFC / q

Average Variable Cost (AVC) :
Total Variable Cost per unit = TVC / q

Costs, Costs, Costs !!!

Marginal Cost

Measures how total cost changes with a change in ouput

(Definition allows unequal increments for "change in output", as in F&B example)

$$MC = \frac{\Delta TC}{\Delta Output}$$

Cost Schedule (Simple Example)

Output q	Total Cost TC	Marginal Cost MC	Profit TR-TC
0	5	----	0
1	7	2	3
2	13	6	7
3	21	8	**9**
4	33	12	7

If market price P=10, profit maximizing output for this firm is q = 3. Set "P = MC".
(Note: TFC=5)

Cost Schedule (F&B Example, Table 6.1)
Employment and Output
Glass Bottle Maker

Employees (Variable Factor)	TVC	Bottles (q)
0	**0**	**0**
1	**12**	**80**
2	**24**	**200**
3	**36**	**260**
4	**48**	**300**
5	**60**	**330**
6	**72**	**350**
7	**84**	**362**

Costs (F&B Example, Table 6.2)

Output (Bottles)	Total Fixed Cost (TFC)	Total Variable Cost (TVC)	Total Cost (TC))	Marginal Cost (MC)
0	**40**	**0**	**40**	
80	**40**	**12**	**52**	**0.15**
200	**40**	**24**	**64**	**0.10**
260	**40**	**36**	**76**	**0.20**
300	**40**	**48**	**88**	**0.33**
330	**40**	**60**	**100**	**0.40**
350	**40**	**72**	**112**	**0.60**
362	**40**	**84**	**124**	**1.00**

Eg. First 80 bottles, MC = 52-40 / 80 = 0.15

Costs (F&B Example, Table 6.2)

	Output (Bottles)	Total Revenue		Total Cost (TC))		Profit
0	0	0		40		-40
1	80	28	**MR = .35**	52	**MC = .15**	-24
2	200	70	**MR = .35**	64	**MC = .10**	6
3	260	91	**MR = .35**	76	**MC = .20**	15
4	**300**	**105**	**MR = .35**	**88**	**MC = .33**	**17**
5	330	115.50	**MR = .35**	100	**MC = .44**	15.50
6	350	122.50	**MR = .35**	112	**MC = .60**	10.50
7	362	126.70	**MR = .35**	124	**MC = 1.00**	2.70

Text's "MB" replaced with MR. For PC firm, MR = P. (P=0.35)

PC Firm SR Decision

Profit Maximizing Output can involve

Positive Profit > 0
Zero Profit Profit =0
Loss Profit < 0

Operate (produce) if TR > TVC

P x q > TVC
P > TVC/q
P > AVC

Otherwise, Shut Down

Firm's Shut Down Decision

Shuts down if revenues can't cover avoidable costs.

Short Run : Shut down if it reduces losses.

Fixed costs are sunk (unavoidable) & not relevant to shut down *decision*

Only Variable costs are avoidable in SR

Operate in SR if revenues cover variable costs.

Long Run: All costs are variable & so avoidable. All costs are relevant to shut down *decision.*

PC Firm SR Shut Down Decision

Shut Down if

P < AVC

That is, shut down if

P < min AVC

Since P=MC at profit max q,
only relevant MC is MC above min AVC, for a firm that will produce (not shut down) in SR

F&B Statement of Shut Down Decision Confusing Wording

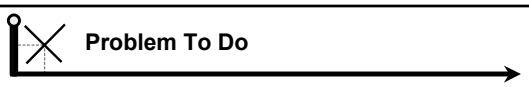
F&B Statement is confusing. They state shut down decision as: TR > TVC at *all levels of output*.

Better:

Option 1: TR > TVC at all profit maximizing output levels

Option 2: TR > TVC at all P

(In #2 Implicit that output levels are where P=MC)



Problem To Do

Market price P = 70. (1) Calculate MC (2) Find Profit Max Output (3) Calculate TR, Profit

Cabinets	TC	MC	TR	Profit
0	50			
1	70			
2	100			
3	150			
4	230		280	50

PC Firm's Profit Maximization Graphical Approach

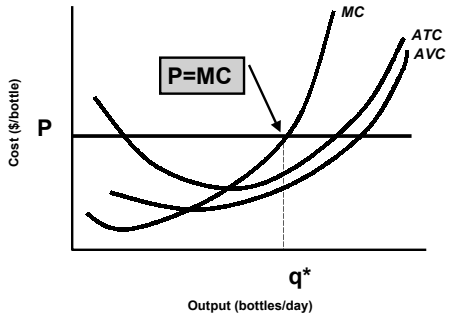
Ouptut and Shutdown Decision

Elements of Graph: Must have MC, P, AVC
Make sure MC cuts AVC at min point.

Profit-Max Output: Find P=MC. Draw line to horizontal q axis.

Shut Down: If P < min AVC, shutdown
Otherwise , operate

Price = Marginal Cost: The Perfectly Competitive Firm's Profit-Maximizing Output Rule



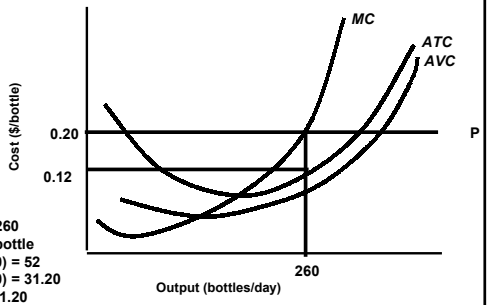
PC Firm's Profit Maximization Graphical Approach

Profit and Loss

Elements of Graph: Must have MC, P, AC (or ATC). Can also have AVC, AFC

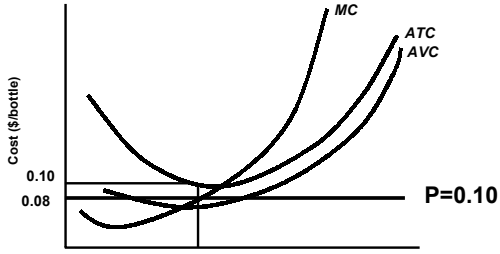
At profit max output level,
Step 1: Draw vertical line from P=MC to q axis
Step 2: Find intersection of vertical line and ATC
Step 3: Draw horizontal line from ATC (at q) to vertical axis.
Step 4: Shade area between P & AC up to level q
Step 5: If P > AC, profit. If AC > P, loss.

PC Firm's SR Profit Positive Profit (P>ATC)



- P = MC at q=260
- *ATC* = .12 / bottle
- *TR* = (.20)(260) = 52
- *TC* = (.12)(260) = 31.20
- Profit = 52 - 31.20
- Profit is $ 20.80 per day

PC Firm's SR Profit Negative Profit (i.e. Loss, P < ATC)



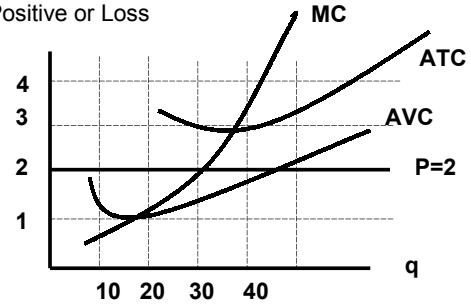
Profit = (0.08 - 0.10) (180)
= (-0.02) (180) = - 3.60
Loss is $3.60 per day

F&B Figure 6.8 Error

Shaded area showing loss is wrong.
P=MC point not correctly drawn.
Calculations are correct.

Problem To Do

Determine: (1) SR Output (2) Shut Down Decision (3) Positive or Loss



Observations

Observation 1:

Rising MC reflects diminishing marginal returns.

(See F&B example of Bottle Co. and Harry's Recycling Services)

Rising MC reflects rising reservation price

Due to diminishing returns, given opportunity cost, production becomes more expensive, because additional workers are less & less productive.

Observations

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Observation 2: PC firm's supply curve is MC above min AVC (why?)

Observation 3: Market Supply curve is horizontal sum of individual supply curves. Individual firm supply curves (MC curves) could be non-identical

Observation 4: Upward slope of supply curve due to diminishing returns . Also consistent with non-identical firms (high cost produce only at higher price)

Producer's Economic Surplus

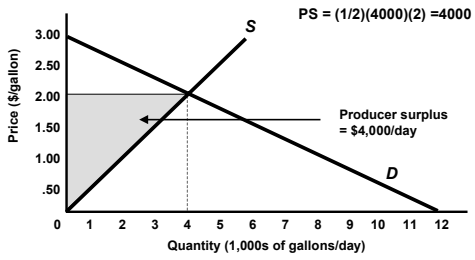
Producer Surplus: The excess of price above cost for the total amount supplied.

Cost is given by MC and is the producers reservation price ("willingness to accept" price).

(Recall: Buyer's reservation price is "willingness to pay")

Producer surplus also gives the excess of revenue above variable cost.

Producer Surplus in the Market for Milk



Summary

Perfectly Competitive Industry is one with:

- many buyers & sellers
- homogeneous good
- perfect information
- free entry & exit

PC Firm's SR Profit Maximization Decision

- Set Output where P=MC
- Shut down if P < min AVC

PC Firm's Supply Curve: MC above min AVC. Rising slope due to diminishing returns in presence of fixed factor