Lecture 9(ii)

Announcements

- Work on "Consumer Theory" worksheet for recitation
- Vote on 3 policy platforms at week 10 at Canvas. (need to do this to get bonus points for HW 8
- Office hours today: 1:30-3:25 (4-135 Hanson)

Lecture

1. Review Cost table from last class, to work out case of:
   U-Shaped average cost
2. Constant returns to scale
3. Economies of Scale
4. Examples of Wal-Mart and Amazon
5. Short-run Supply of Competitive Firm

Meet S11

Details of her widget operation.

Fixed Cost of $4 to be in business
These are costs that are the same regardless of quantity produced.

Examples:

- Salary of the CEO
- Electric bill for lights
- rent on factory

Variable Input:
Labor ($2 an hour)
Widget Juice ($1 quart, need one quart per widget

(Cost in $)

Q	L hours	Labor Cost (wage= $2 hr)	Mater-ials Cost	Variabl Cost
0	0.0	0	0	0
1	.5	1	1	2
2	2.0	4	2	6
3	4.5	9	3	12
4	8.0	16	4	20

The cost structure for S11 exhibits

Diminishing Marginal Returns

To get first widget, need half hour of labor

To get second widget, need 1.5 hours of labor more.

So return on additional units of labor added is diminishing.

This is what happens when pick the low hanging fruit first.
(Note, here we don't have diminishing returns in materials)

One big table

Q	FC Fixed Cost	VC Variable Cost	TC Total Cost
0	4	0	4
1	4	2	6
2	4	6	10
3	4	12	16
4	4	20	24

AFC	AVC	ATC	MC Marginal Cost
-	-	-	
4	2	6	2
2	3	5	4
1.33	4	5.33	6
1	5	6	8

TC = FC + VC
AFC = Average Fixed Cost = FC/Q
AVC = Average Variable Cost
= VC/Q

Marginal Cost: change in cost from increasing output one unit.

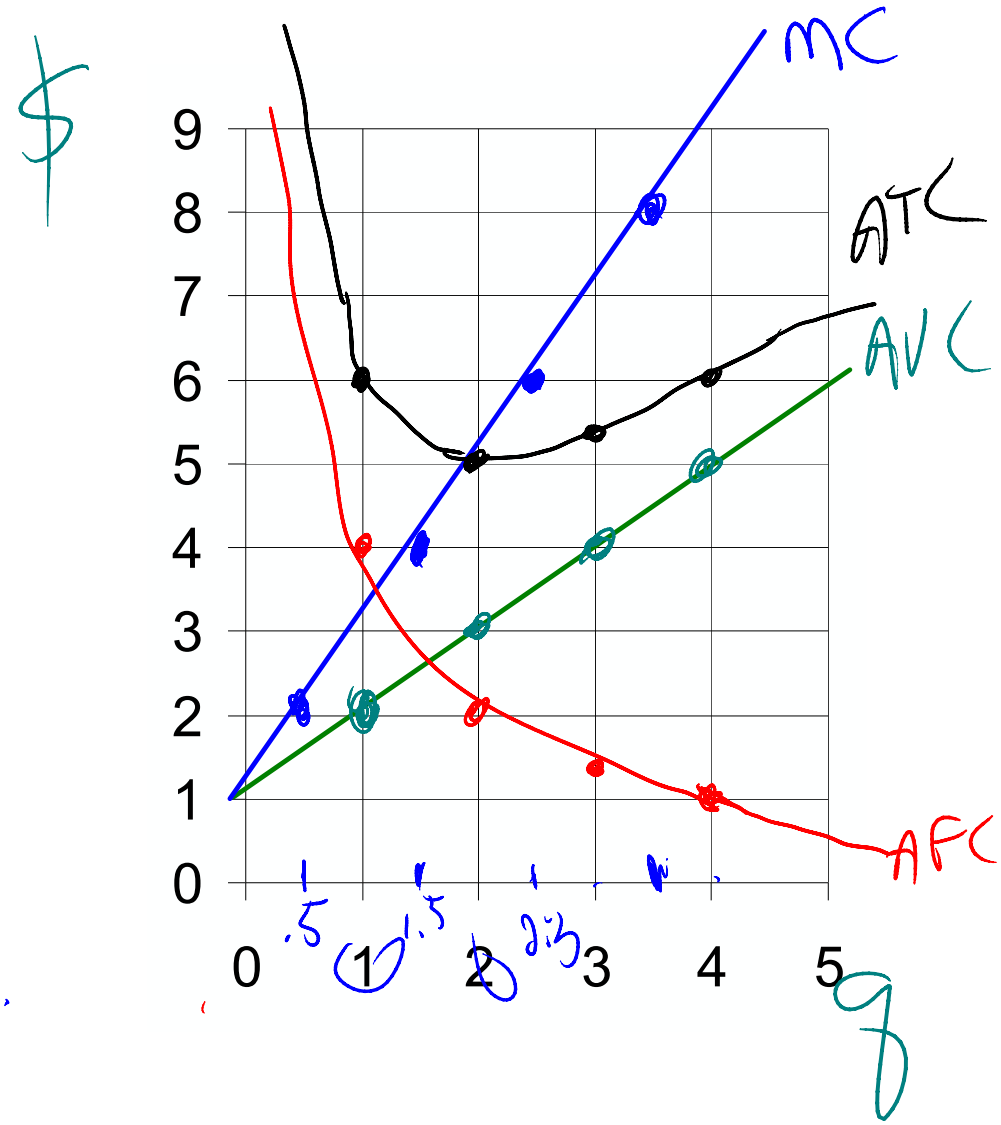
MC between 0 and 1 is 2 = 6 - 4
MC between 1 and 2 is 4 = 10 – 6
MC between 2 and 3 is 6 =16 – 10

Put this all together:

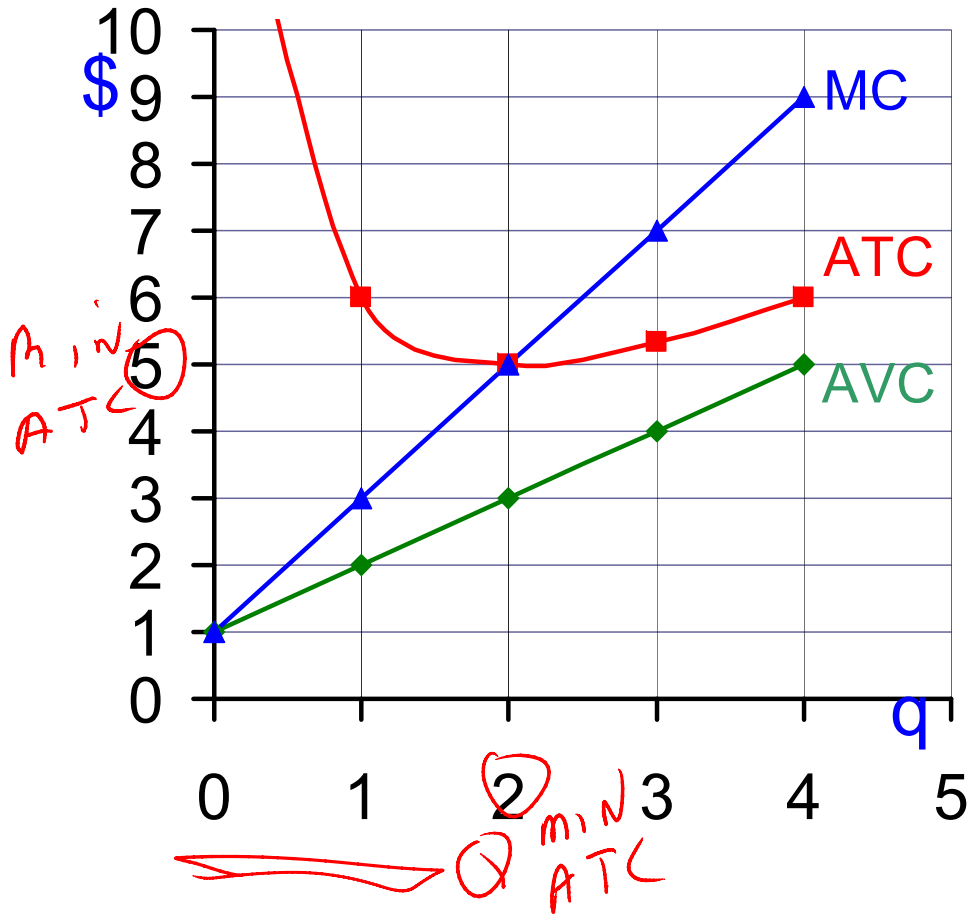
Q	FC	VC	TC	MC	AFC	AVC	ATC
0	4	0	4				
1	4	2	6	2	4	2	6
2	4	6	10	4	2	3	5
3	4	12	16	6	1.33	4	5.33
4	4	20	24	8	1	5	6

C for "cost," F for "fixed,"
V for "variable," T for "total,"
A for "average," M for "marginal."

Let's Graph S11's Cost Structure



S11's Cost Structure
Example of U-Shaped Cost Curve



Points of interest.

1. For Q<2, ATC falling
Region of:
Increasing returns to Scale
(also called economies of scale)

2. For Q>2, ATC rising
Region of:
Decreasing returns to scale
(also called diseconomies of scale.)

3. Q = 2, Minimum Average Cost

Facts:
Q<2, MC<ATC and ATC falling
Q>2, MC>ATC and ATC rising
Q = 2, MC=ATC and at ATC min.

Constant Returns to Scale

As increase production, scale up all inputs in the same proportion. So costs increase proportionately.

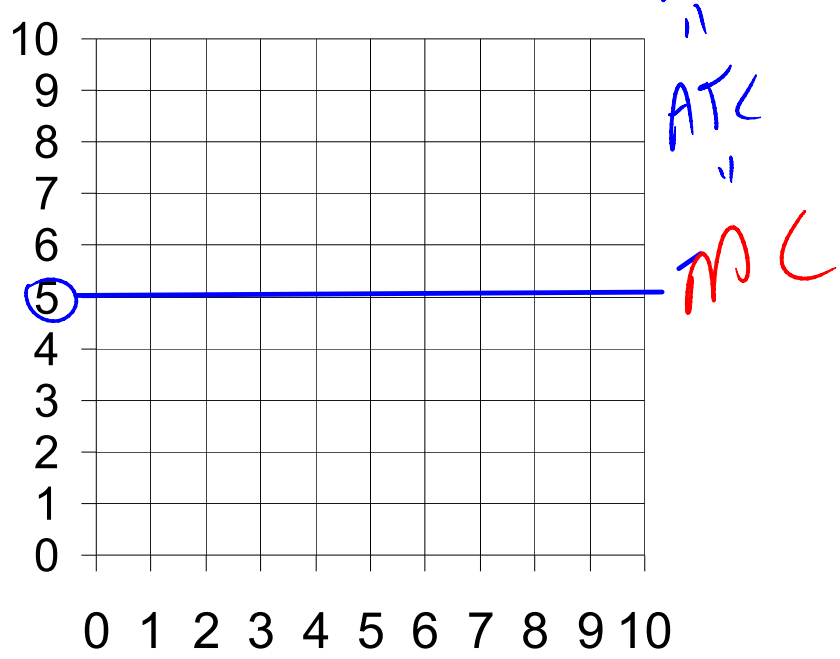
Example: Housepainting

S12's Cost Structure

Q	TC	ATC
0	0	-
1	5	5
2	10	5
3	15	5
4	20	5

$TC = 5Q$

Graph of S12's Cost Structure



Economies of Scale
(Over entire range of Q)

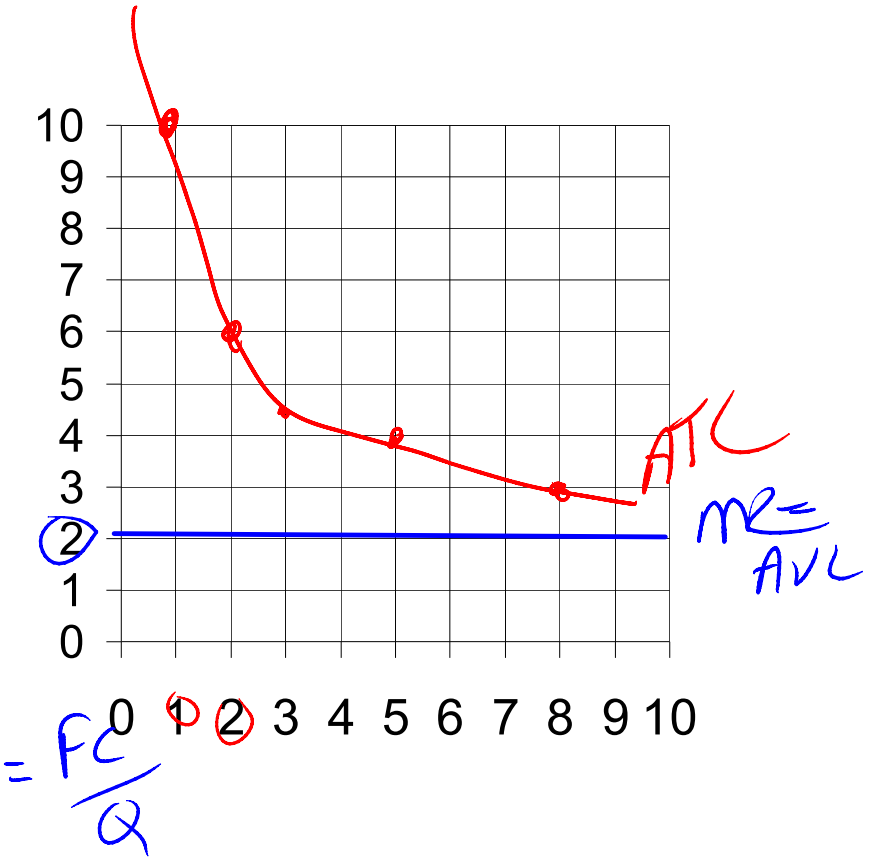
S13 has FC = 8 and
constant marginal cost of 2

TC = 2Q + 8

ATC = TC/Q = 2 + 8/Q

Q	TC	ATC
0	8	-
1	10	10
2	12	6
3	14	4.7
4	16	4
8	24	3

Graph of S13's Cost Structure



$AFC = \frac{FC}{Q}$

Here ATC is always falling, never turns back up. So decreasing over entire range of Q

Let's play find the fixed cost.

Pick a q, lets try q=8.

At 8, ATC = 3

AVC = 2

AFC = ATC - AVC = 1

= FC/8

Youcan use:

FC = q*AFC = 1*8 =8.

If pick q = 4. Then ATC = 4

AVC = 2

AFC = 2, so

FC = q*AFC = 2*4 = 8.

Same thing

Example industries where scale economies are important

Pharmaceuticals

Fixed cost for research

Marginal cost of making pills small compared to AFC

Software: MC quite low relative to AFC. MC when distribute on internet = 0!

Jumbojet passenger planes with more than 500 people. (Airbus 380), $16 billion in development costs before fly first plane.

Discount Retailing: By maintaining large scale, Wal-Mart has keep average total costs from its logistics low

For example, there are fixed cost to set up a distribution center. By putting many stores close to distribution centers, Wal-Mart enjoys economies of scale (and can keep inventories low and replenish empty shelves quickly. e.g. restocked flags on 9/11)

Can read about strategy of packing stores close to each other to enjoy economies of density in my paper.
http://www.econ.umn.edu/~holmes/papers/ecta7699.pd
f

The paper is technical, so let's just look at the a movie of how Wal-Mart rolled out its store openings
http://www.econ.umn.edu/~holmes/papers/Wal-Mart_Stores_and_RegDCs.wmv

In industries were scale economies are huge relative to the market size, there is only room for a few players. Discount Retailing: Wal-Mart, Target, K-Mart, plus regional players.

Scale Economics in Wal-Mart's Import Distribution System
(See Holmes and Singer (2017) at my web site).

ina is source of 86 percent of
lmart's ocean container imports

Big story now: Online Shopping
Early thinking on this: would diminish scale economies because small retailers could tap into UPS and FedEX networks.

Turned out to be the opposite!
To get fast delivery, Amazon is developing its own distribution system.

Amazon's share of online sales is increasing as the overall market grows.

Fixed cost of "last mile"

Amazon's model very different from Walmart's model.

Supply of Competitive Firm

Takes P as given

Supply of S1?
Easy. P>1 then Q = 1
P<1 then Q = 0

Supply of S11?
Harder

Suppose P = $7. What to do?
Start by making a table

Profit = Revenues minus Total Cost

Pick Q to maximize profit

Q	R P×Q	Total Cost	Profit R-TC	MC	MR
0	0	4	-4		7
1	7	6	1	3	7
2	14	10	4	5	7
3	21	16	5	7	7
4	28	24	4	9	7

Profit maximizing quantity = 3

Shortcut to figuring this out (so don't need to make a table)

Look at Marginal Revenue (change in revenue from producing one more. For competitive firm, MR=P. Compare with Marginal Cost (MC)