

LECTURE 21: COMPETITION II

I. Recall last class:

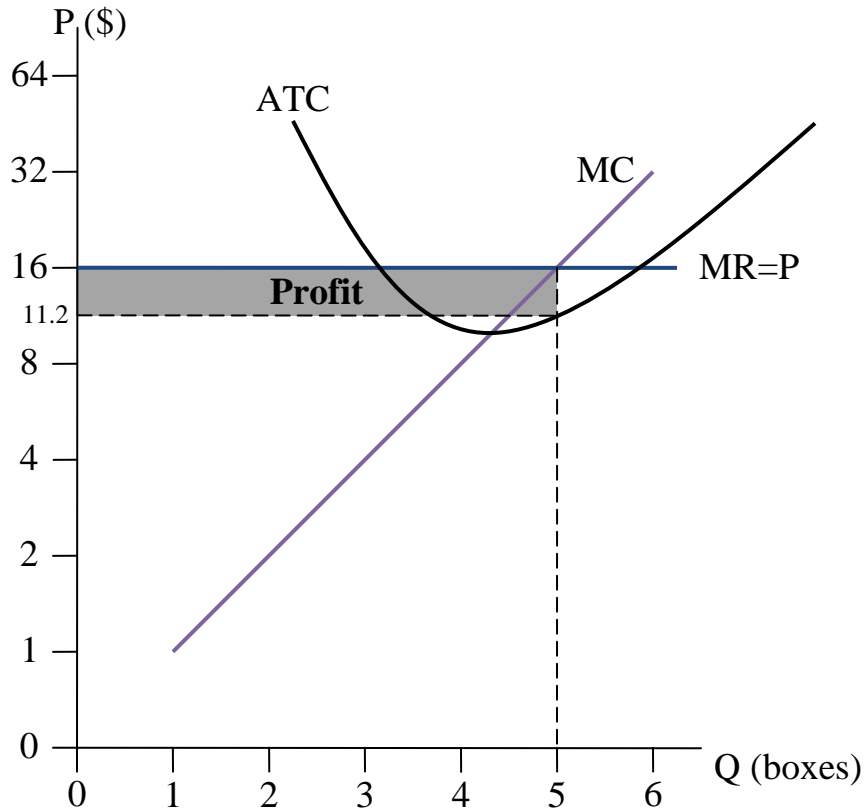
<i>Output</i>	<i>TFC</i>	<i>TVC</i>	<i>TC</i>	<i>MC</i>
0	25	0	25	
1	25	1	26	1
2	25	3	28	2
3	25	7	32	4
4	25	15	40	8
5	25	31	56	16
6	25	63	88	32

<i>Output</i>	$\Delta \Pi$	Π	<i>TR</i>	<i>TC</i>	<i>ATC</i>	<i>MC</i>	<i>MR</i>
0		-25	0	25			
1	15	-10	16	26	26	1	16
2	14	4	32	28	14	2	16
3	12	16	48	32	10.67	4	16
4	8	24	64	40	10	8	16
5	0	24	80	56	11.20	16	16
6	-12	8	96	88	14.67	32	16

- a. Note that price is constant, marginal cost is increasing, and average total cost has a U-shape.
 - i. One rule that bears mentioning—but hard numbers make it hard to capture due to their lumpiness—is that the marginal cost curve *always* intersects the average total cost curve at its lowest point.
 - ii. If an additional unit costs less than the average unit costs, producing that unit should lower ATC.
 - iii. If an additional unit costs more than the average unit costs, producing that unit should increase ATC.
 - iv. If an additional unit costs the same as the average unit costs, producing that unit should not change ATC.¹

¹ If you're curious about the mathematical proof for this rule, let me know and I'll happily walk you through it. But it requires calculus so I leave it out in the notes to avoid confusion.

- b. Let's aggregate this information into a diagram using these relationships (note the logarithmic scale).



- c. The process for solving this diagram is always the same:
- i. Find the quantity where $MC = MR$.
 - ii. At that quantity, how much does each unit sell for (here it's the constant, $MR=P$)?
 - iii. At that quantity, how much does each unit cost to make (by referencing the ATC curve)?
 - iv. The difference between the price and the cost-per-unit is the profit-per-unit.
 - v. Multiplying the profit-per-unit the number of units (quantity) gives you the total profit.

II. Proof

a. $\Pi = TR - TC = PQ - TC$

b. $\Pi = 1(PQ - TC) = \frac{Q}{Q}(PQ - TC) = Q\frac{1}{Q}(PQ - TC)$

c. $\Pi = Q\left(\frac{PQ}{Q} - \frac{TC}{Q}\right) = Q\left(P - \frac{TC}{Q}\right) = Q(P - ATC)$