Chapter 4: Firm Behavior

Instructions: These are the notes for Chapter 4. Make sure you review the material presented here and read the corresponding chapters on the textbook: **Chapter 12 on Mankiw.**

Industrial Organization

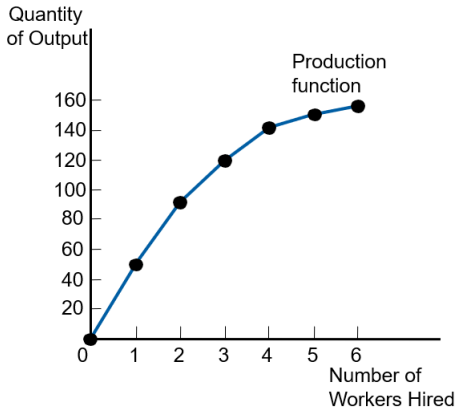
- **Industrial organization.** The study of firms' decisions about prices and quantities depending on the market conditions they face.
- The goal of a firm is to maximize profit
- Profit = Total Revenue − Total Cost
- Total Revenue, TR = P × Q
  - Total amount a firm receives for the sale of its output
  - i.e. quantity of output times the price
- Total cost, TC is the cost of the inputs that firm uses in production.

Economic Costs

- Two types of costs: explicit costs and implicit costs.
- **Explicit costs.** Input costs that require an outlay of money by the firm.
  - Accountants use only these costs.
- **Implicit costs.** Input costs that do not require an outlay of money by the firm.
  - Economists consider these costs in addition to explicit costs.
- Example: A bakery owner Caroline pays $2000 for flour is an explicit cost. Her alternative job as a programmer paying her $100 per hour is included in implicit costs.
- Accounting profit = Revenue − Explicit costs
- Economic profit = Revenue − Explicit costs − Implicit costs

  = Revenue − Total Cost
- Total Cost includes implicit costs for an economist because it affects decision making.

Production Function

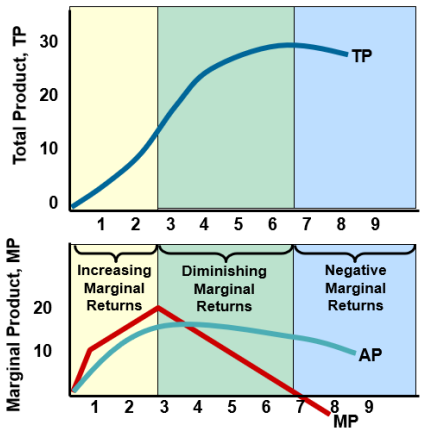


- **Production function.** Relationship between quantity of inputs used to make a good and the quantity of output of that good.
- **Total product (TP).** Total quantity of output that is produced.
- **Marginal product (MP)** reflects the change in output when one more unit of input is added.
- **Average product (AP).** The output produced per unit of input, i.e. $\frac{Total\ Product}{Units\ of\ input}$

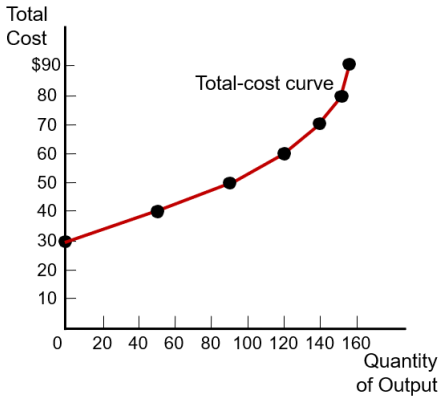
Total, Marginal, and Average Product: The Law of Diminishing Returns				
(1) Units of the Variable Resource (Labor input)	(2) Total Product (TP)	(3) Marginal Product (MP) Change in (2)/ Change in (1)		(4) Average Product (AP), (2)/(1)
0	0			-
1	10			
2	25			
3	45			
4	60			
5	70			
6	75			
7	75			
8	70			

Total, Marginal, and Average Product: The Law of Diminishing Returns				
(1) Units of the Variable Resource (Labor input)	(2) Total Product (TP)	(3) Marginal Product (MP) Change in (2)/ Change in (1)		(4) Average Product (AP), (2)/(1)
0	0			-
1	10	10	Increasing marginal returns	10.00
2	25	15		12.50
3	45	20		15.00
4	60	15	Diminishing marginal returns	15.00
5	70	10		14.00
6	75	5		12.50
7	75	0		10.71
8	70	-5	Negative marginal returns	8.75

- **Law of Diminishing Returns.** Economic law stating that when the quantity of input in the production is increased, the increase in output becomes smaller.



Total Cost Function



- **Total Cost function.** Relationship between quantity produced and total costs.
- Implication of the production function
- Total Cost = Fixed cost + Variable cost
- Fixed cost are costs that do not vary with output i.e. cost of building, rent, insurance..
- Variable cost vary with output i.e. input materials, fuel, power, labor..

Question

- If you owned a small farm, which of the following would be a fixed cost?
  a. harvest labor
  b. hail insurance
  c. fertilizer
  d. seed

Per-unit Costs

- Per-unit costs are useful in making comparisons to price
- Average fixed cost, AFC = TFC/Q
- Average variable cost, AVC = TVC/Q
- Average total cost, ATC = TC/Q = AFC + AVC
- Marginal cost, MC = ΔTC/ΔQ
  - i.e. additional cost of producing 1 more output.

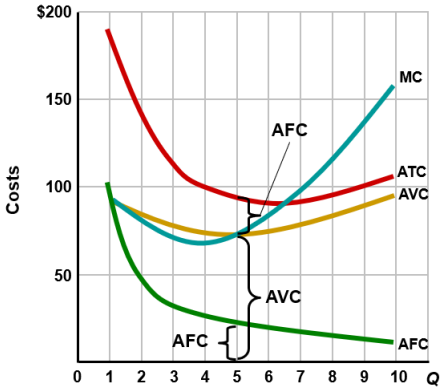
Total, Average, and Marginal Cost Schedules for an Individual Firm in the Short Run

	Total Cost Data			Average Cost Data			Marginal Cost
(1) Total Product (Q)	(2) Total Fixed Cost (TFC)	(3) Total Variable Cost (TVC)	(4) Total Cost (TC) TC = TFC + TVC	(5) Average Fixed Cost (AFC) AFC = TFC/Q	(6) Average Variable Cost (AVC) AVC=TVC/Q	(7) Average Total Cost (ATC) ATC = TC/Q	(8) Marginal Cost (MC) MC =ΔTC/ΔQ
0	$100	$0		-	-	-	-
1		90					
2		170					
3		240					
4		300					
5		370					
6		450					
7		540					
8		650					
9		780					
10		930					

Total, Average, and Marginal Cost Schedules for an Individual Firm in the Short Run

	Total Cost Data			Average Cost Data			Marginal Cost
(1) Total Product (Q)	(2) Total Fixed Cost (TFC)	(3) Total Variable Cost (TVC)	(4) Total Cost (TC) TC = TFC + TVC	(5) Average Fixed Cost (AFC) AFC = TFC/Q	(6) Average Variable Cost (AVC) AVC=TVC/Q	(7) Average Total Cost (ATC) ATC = TC/Q	(8) Marginal Cost (MC) MC =ΔTC/ΔQ
0	$100	$0	$100				
1	100	90	190	$100.00	$90.00	$190.00	$90
2	100	170	270	50.00	85.00	135.00	80
3	100	240	340	33.33	80.00	113.33	70
4	100	300	400	25.00	75.00	100.00	60
5	100	370	470	20.00	74.00	94.00	70
6	100	450	550	16.67	75.00	91.67	80
7	100	540	640	14.29	77.14	91.43	90
8	100	650	750	12.50	81.25	93.75	110
9	100	780	880	11.11	86.67	97.78	130
10	100	930	1030	10.00	93.00	103.00	150

Marginal Cost Curve

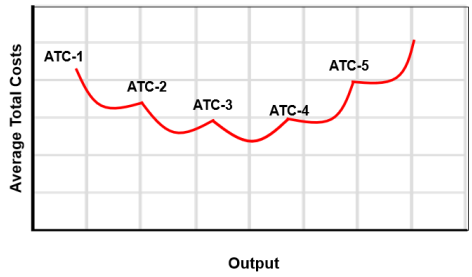


- At first, MC decreases and then increases because of MP assumption: diminishing marginal product.
- Marginal cost intersects AVC where AVC is at its minimum!
- When MC<AVC, AVC is decreasing because producing one more unit brings the AVC down.
- When MC>AVC, AVC is increasing because producing one more unit increases the AVC.

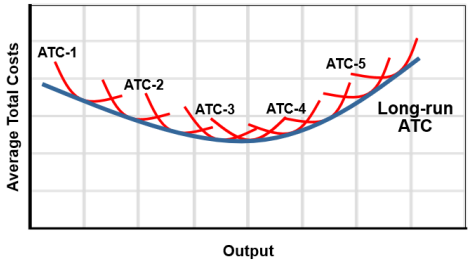
Short-run vs. Long-run

- **Short run.** A period of time that is too brief for a firm to alter its plant capacity, but the firm can change output somewhat by increasing or decreasing its variable inputs.
  - i.e. can decrease/increase how many to produce, but can't build a new plant.
- **Long run.** A period of time that is long enough for the firm to adjust the plant size as well as enter or leave the industry.
  - i.e. can decrease/increase how many to produce, and can build a new factory, or exit business.
- Note: the length of short run and long run differs across industries.

Long-run Total Cost Curve

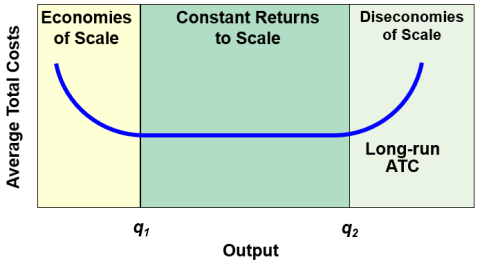


- In the long run, all costs are variable (no TVC or TFC) so there is only long-run ATC.
- ATC-1 to ATC-5 are short-run ATCs at different output levels.

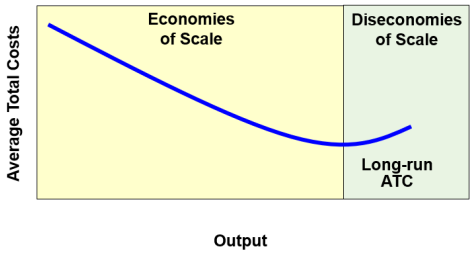


- Long-run ATC is obtained by connecting short-run ATCs at different output levels.
- Long-run ATC is U-shaped because of economies of scale, followed by diseconomies of scale.
- Economies of scale at first because firm uses the advantage of flexibility or benefit learning by doing..
- Diseconomies of scale later on because firm becomes too big to control and coordinate.

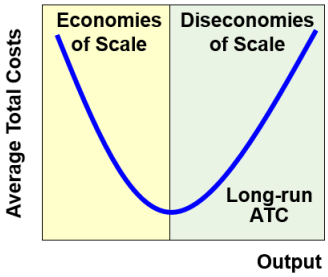
Different Industry Structures



- Small- and large-scale producers will coexist and be equally successful.
- Apparel, banking, furniture, food, small appliances..



- A few large- scale firms.
- Automotive, steel, microchips, operating systems..



- a large number of small firms.
- Bakery, hair salon..

Question

- The government imposes a $1,000 per year license fee on all pizza restaurants. As a result, which cost curves shift?

  a. average total cost and average marginal cost

  b. average total cost and average fixed cost

  c. average variable cost and marginal cost

  d. average variable cost and average fixed cost