

Chapter 13: The Costs of Production

- What is a production function? What is marginal product? How are they related?
 - What are the various costs, and how are they related to each other and to output?
 - How are costs different in the short run vs. the long run?
 - What are “economies of scale”?
-
- Economists assume the primary goal of a firm is:
 - What is Profit?

DEF: TOTAL REVENUE

DEF: TOTAL COST

DEF: PROFIT

- **Costs**

- Economists – the cost of something is what you give up to get it
- Some opportunity costs are obvious: Kate spends \$500 on fruit for fruit smoothies. That’s \$500 she can’t spend on something else. The opportunity cost of the fruit is \$500.

DEF: EXPLICIT COSTS

- Some opportunity costs are not so obvious. Kate is also a qualified pottery teacher and could make \$30/hour. So, for every hour Kate works at her shop, she gives up \$30.

DEF: IMPLICIT COSTS

Examples:

Forgone Wages

Opportunity Cost of Financial Capital

Kate uses \$200,000 of her savings to put a down payment on a shop. Her savings account paid 5% interest. Sarah would have earned \$10,000 in interest over the year if she had left her money in the bank. Forgone \$10,000 is an implicit cost.

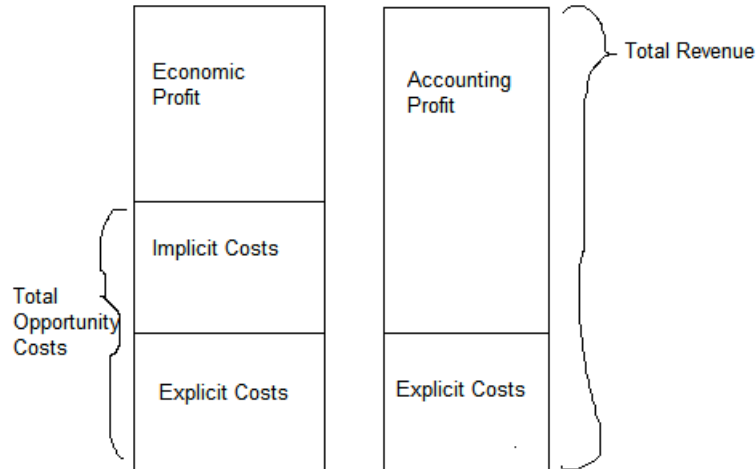
- An accountant would only consider explicit costs (what is on the books).
Ex. Kate uses only \$100,000 of savings and borrows \$100,000 from bank. Implicit cost is \$5,000 would have earned in interest. Explicit cost is interest she owes on the loan from the bank (suppose it is also 5%). She owes \$5,000 in interest. Total Cost to the economist: \$10,000. Total cost to the accountant: \$5,000.

- **Economic Profit vs. Accounting Profit**

DEF: ECONOMIC PROFIT

DEF: ACCOUNTING PROFIT

- If implicit costs > 0 then accounting profit will always be greater than economic profit.
- Economic Profit may be zero, but there are still positive accounting profits.



Production & Costs

- In the short-run, many decisions are fixed. Only some are variable. In the long-run all decisions are variable.

DEF: PRODUCTION FUNCTION

Example 1: Farmer Jack grows wheat. He has 5 acres of land. He can hire as many workers as he wants.

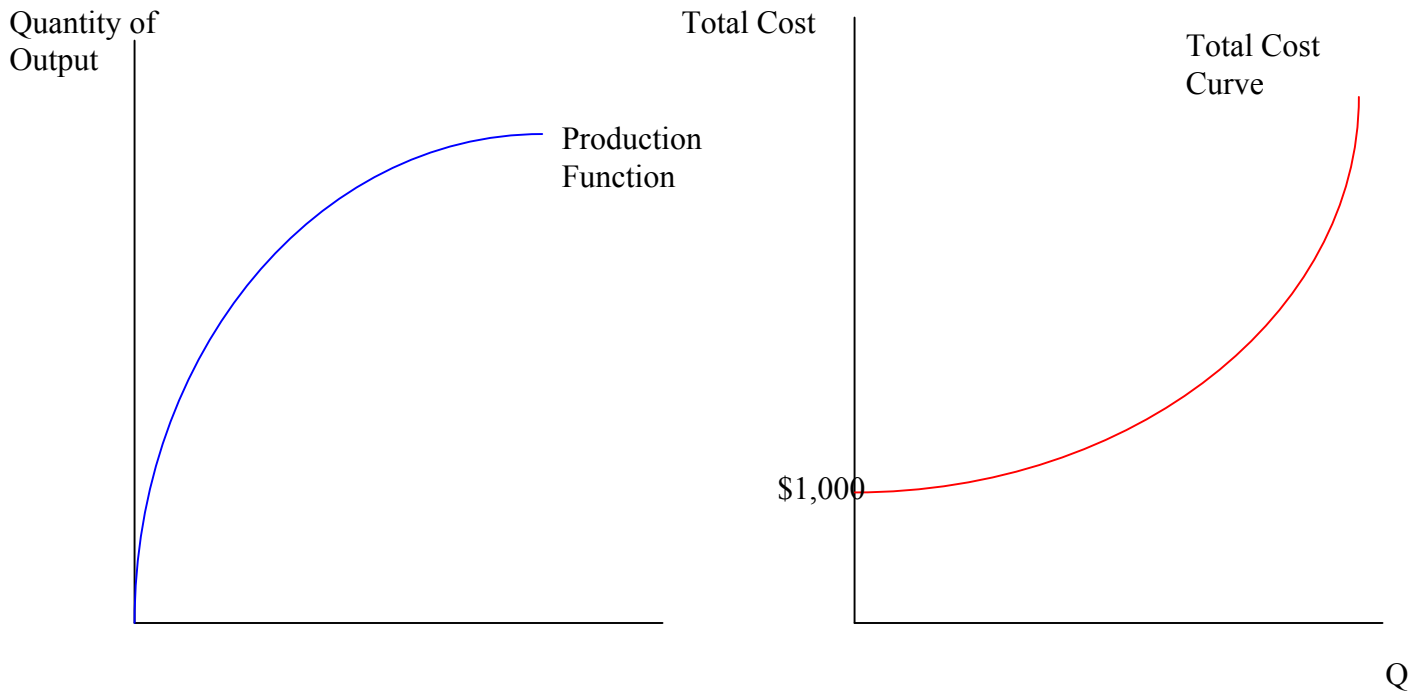
L (no. of workers)	Q (bushels of wheat)
0	0
1	1000
2	1800
3	2400
4	2800
5	3000

DEF: MARGINAL PRODUCT

L (no. of workers)	Q (bushels of wheat)	MPL
0	0	
1	1000	1000
2	1800	800
3	2400	600

4	2800	
5	3000	

- **DEF: DIMINISHING MARGINAL PRODUCT:** the marginal product of an input declines as the quantity of the input increases (other things equal)



- Farmer Jack must pay \$1000 per month for the land; regardless of how much wheat he grows.
- The market wage for a farm worker is \$2000 per month. So Farmer Jack’s costs are related to how much wheat he produces....

EXAMPLE 1: Farmer Jack’s Costs

L (no. of workers)	Q (bushels of wheat)	Cost of land	Cost of labor	Total Cost
0	0	\$1,000	\$0	\$1,000
1	1000	\$1,000	\$2,000	\$3,000
2	1800	\$1,000	\$4,000	\$5,000
3	2400	\$1,000	\$6,000	\$7,000
4	2800	\$1,000	\$8,000	\$9,000
5	3000	\$1,000	\$10,000	\$11,000

DEF: MARGINAL COST

- **Total Costs can be Divided into 2 Groups**

DEF: FIXED COSTS

DEF: VARIABLE COSTS

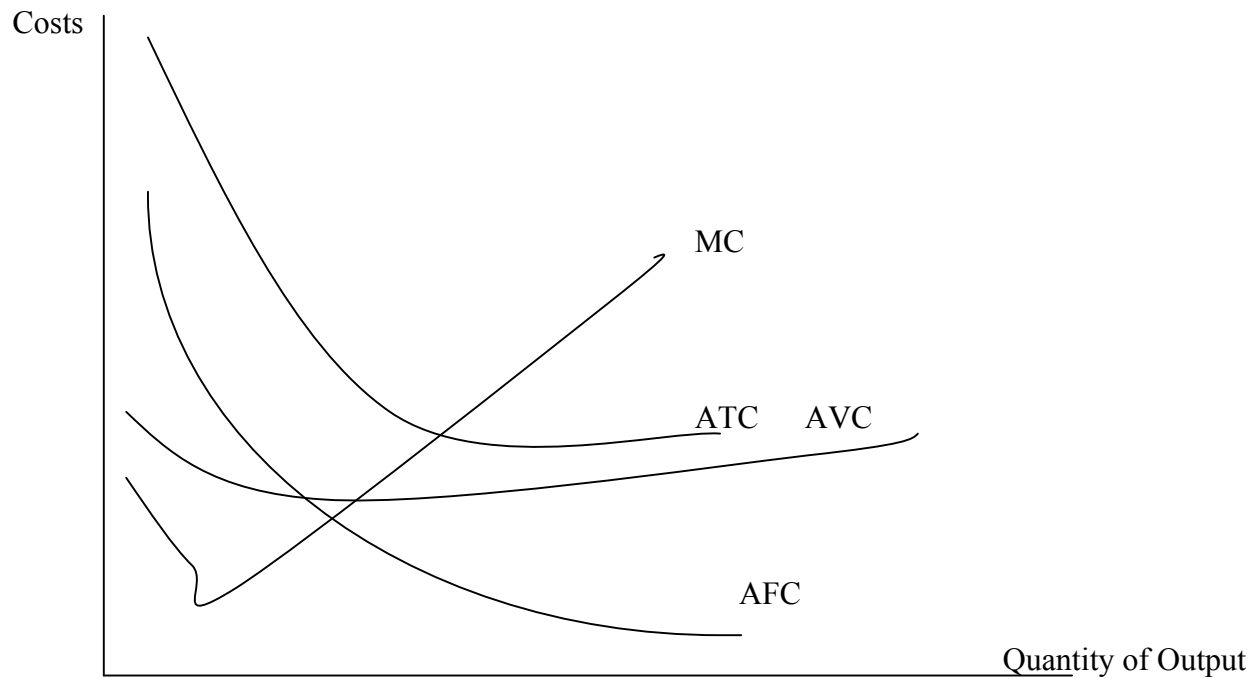
$$TC = FC + VC$$

- **Average Costs**

DEF: AVERAGE TOTAL COST

DEF: AVERAGE FIXED COST

DEF: AVERAGE VARIABLE COST



ACTIVE LEARNING 3: Costs

Fill in the blank spaces of this table.

Q	VC	TC	AFC	AVC	ATC	MC
0		\$50	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	
1	10			\$10	\$60.00	\$10
2	30	80				30
3			16.67	20	36.67	
4	100	150	12.50		37.50	
5	150			30		60
6	210	260	8.33	35	43.33	

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- **Shapes of the Curves**

- U-Shaped ATC curve
 - $ATC = AFC + AVC$
 - Bottom of the ATC curve is the _____.

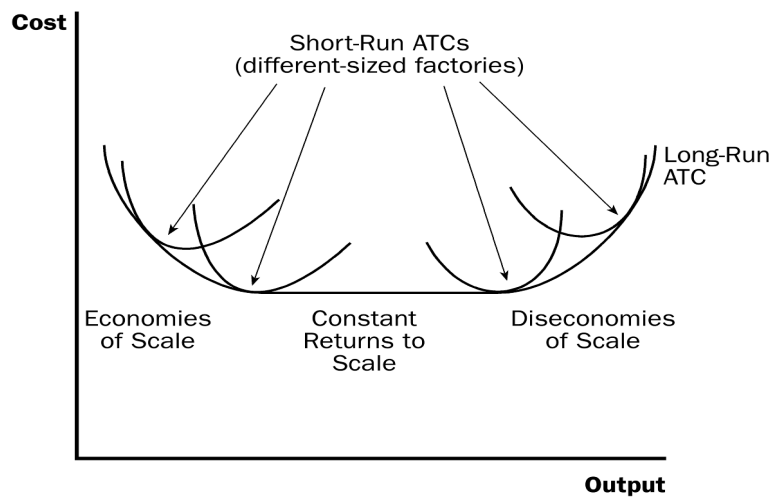
- Relationship between MC & ATC
 - When $MC < ATC$ ATC is falling
 - When $MC > ATC$ ATC is rising

Costs in the Short Run & Long Run

- Short run: Some inputs are fixed (e.g., factories, land). The costs of these inputs are *FC*.
- Long run: All inputs are variable (e.g., firms can build more factories, or sell existing ones).
- In the long run, *ATC* at any *Q* is cost per unit using the most efficient mix of inputs for that *Q* (e.g., the factory size with the lowest *ATC*).

LRATC with 3 factory sizes

A typical LRATC Curve



1. Definition of _____: the property whereby long-run average total cost falls as the quantity of output increases.
2. Definition of _____: the property whereby long-run average total cost rises as the quantity of output increases.
3. Definition of _____: the property whereby long-run average total cost stays the same as the quantity of output changes.

Suggested problems: Problems and Applications- 1, 4, 10