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# **Diminishing Returns and U-Shaped Cost Curves**



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- Economists often draw cost curves like the letter “U” (the “U-shaped cost curves”).
- For a U-shaped cost curve, cost falls in the initial phase, reaches a minimum point, and finally begins to rise.
- Let’s explore the reasons.



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# Concepts applied to costs

- The short run is the period of time that is long enough to adjust variable inputs, such as materials and production labor, but too short to allow all inputs to be changed. In the short run, fixed or overhead factors such as plant and equipment cannot be fully modified or adjusted. Therefore, in the short run, labor and materials costs are typically variable costs, while capital costs are fixed.
- In the long run, all inputs can be adjusted—including labor, materials, and capital. Hence, in the long run, all costs are variable and none are fixed.



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# Why is the cost curve U-shaped?

- Consider the short run in which capital is fixed but labor is variable.
- In such a situation, there are diminishing returns to the variable factor (labor) because each additional unit of labor has less capital to work with.
- As a result, the marginal cost of output will rise because the extra output produced by each extra labor unit is going down. In other words, diminishing returns to the variable factor will imply an increasing short-run marginal cost. This shows why diminishing returns lead to rising marginal costs.



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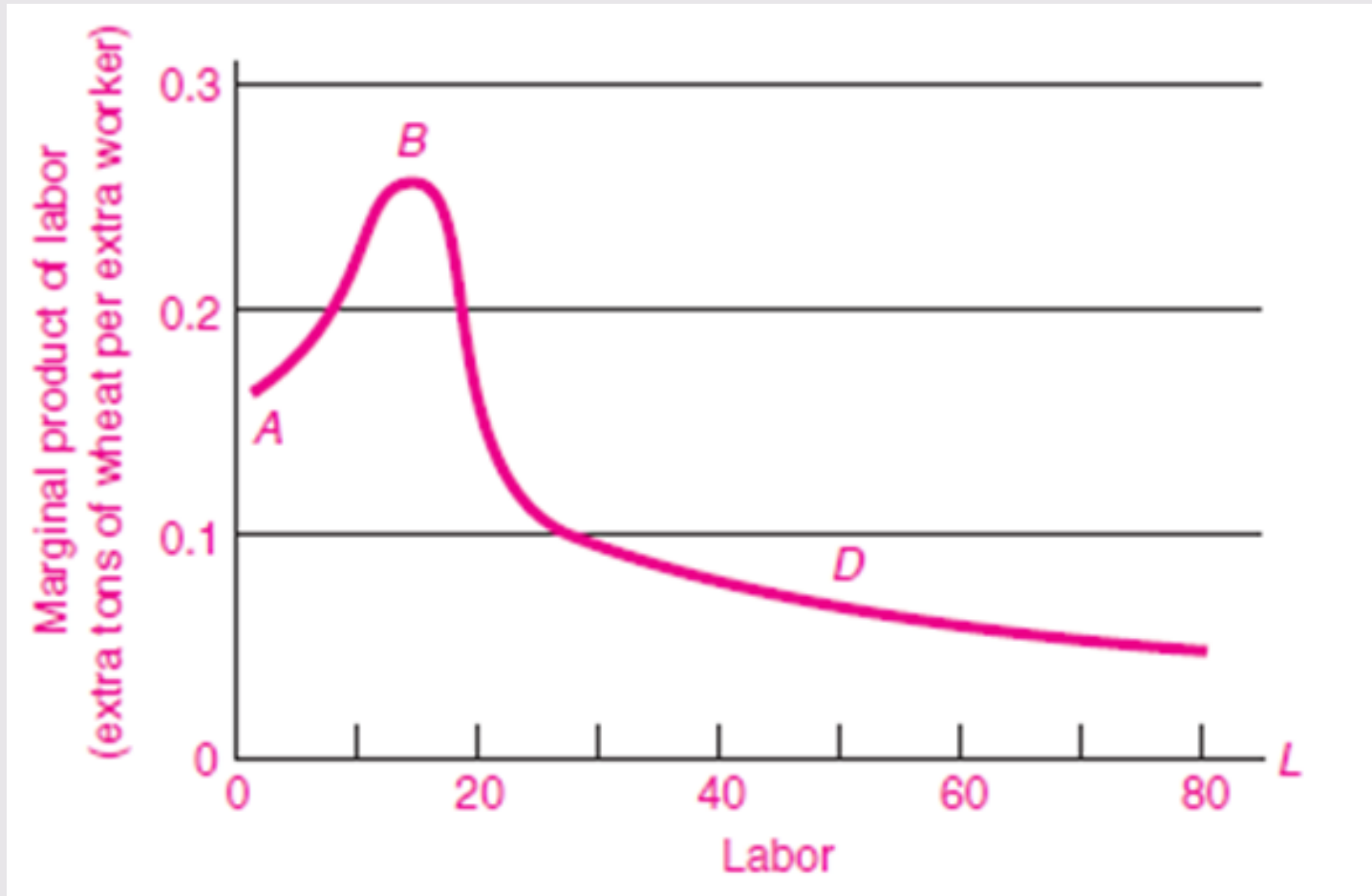
(1) Output (tons of wheat)	(2) Land inputs (acres)	(3) Labor inputs (workers)	(4) Land rent (\$ per acre)	(5) Labor wage (\$ per worker)	(6) Total cost (\$)
0	10	0	5.5	5	55
1	10	6	5.5	5	85
2	10	11	5.5	5	110
3	10	15	5.5	5	130
4	10	21	5.5	5	160
5	10	31	5.5	5	210
6	10	45	5.5	5	280



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# Diminishing Returns

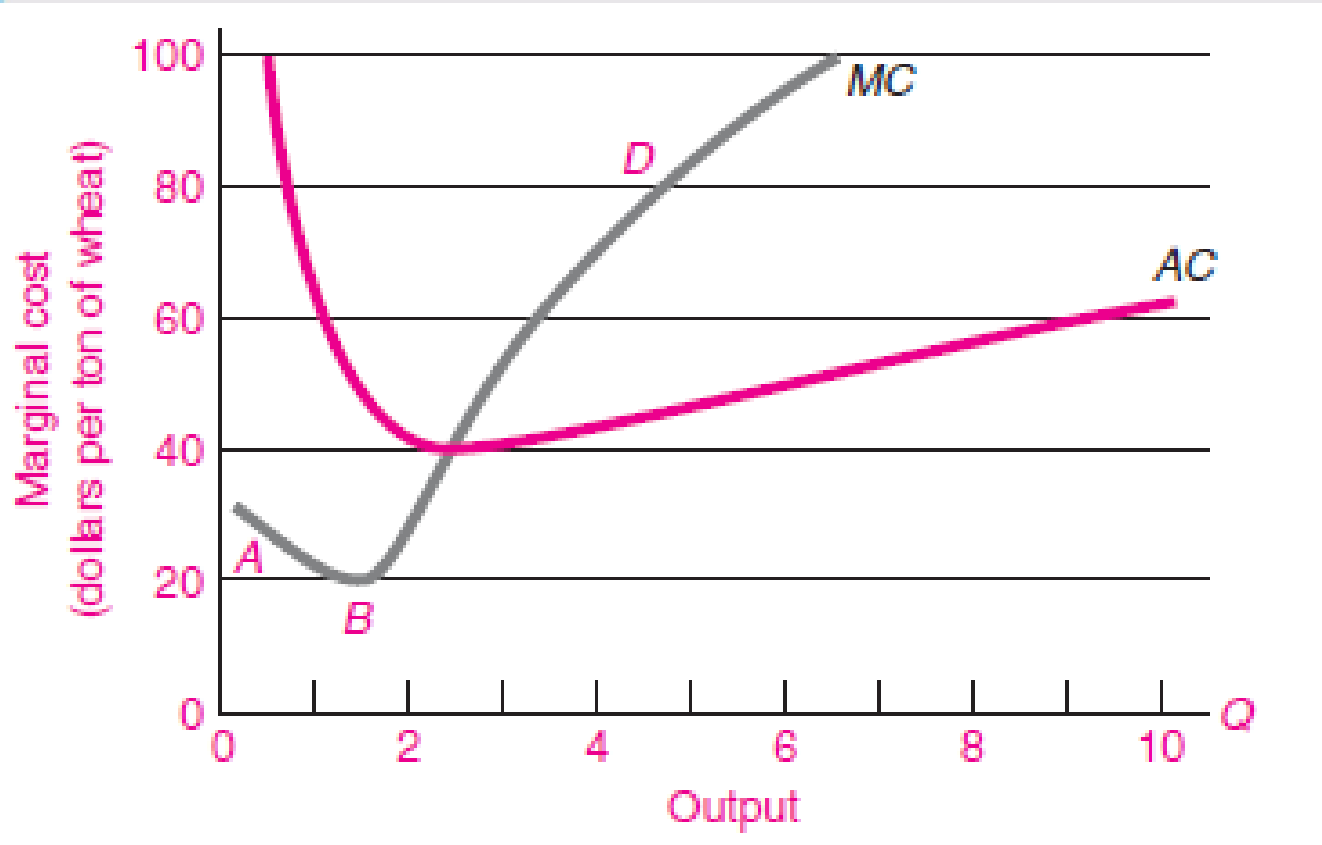




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# Produce Upward-Sloping MC





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# **The Link between Production and Costs**





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- What are the factors that determine the cost curves?
- The key elements are
  - (1) factor prices and
  - (2) the firm's production function



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Clearly the prices of inputs like labor and land are important ingredients of costs.

Higher rents and higher wages mean higher costs.

But costs also depend on the firm's technological opportunities.

If technological improvements allow the firm to produce the same output with fewer inputs, the firm's costs will fall.



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Indeed, if you know factor prices and the production function, you can calculate the cost curves.



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As per the previous table farmer Smith rents 10 acres of Wheatland and employs variable labor.

According to the farming production function, careful use of labor and land allows the inputs and yields shown in columns (1) to (3) of the table.

At input prices of \$5.5 per acre and \$5 per worker, we obtain Smith's cost of production shown in column (6).

All other cost concepts (such as those shown in Table ) can be calculated from the total cost data.



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**THANK YOU**