**Outline for Lecture 15**

Long-Run Production Costs

*The Long-Run Cost Curve (specific case: five plant sizes)*

Suppose that a firm can operate in five alternative plants in the short run, Plants 1 through 5, with respective short-run average total cost curves (ATC1 through ATC5) illustrated in Figure 9.7.

In the illustration, vertical white lines identify the levels of output at which the firm should change its plant size to achieve the lowest average total cost.

To see why, suppose that the firm produces an output of less than 20 units, say, 15 units. In this case, the lowest average total cost is achieved in Plant 1 because ATC1 lies below all other ATC curves for 15 units. Provided that plant is a variable resource in the long run, the firm chooses Plant 1, indicating that the blue section of ATC1 is part of the firm’s long-run average total cost curve for output levels below 20 units.

Suppose now that the firm raises production to somewhere between 20 and 30 units, say, 25 units. In this case, the lowest average total cost is achieved in Plant \_\_\_\_ because \_\_\_\_ lies below all other ATC curves for 25 units. Provided that plant is a variable resource in the long run, the firm chooses Plant \_\_\_\_, indicating that the blue section of \_\_\_\_ is part of the long-run average total cost curve for output levels between 20 and 30 units.

Similarly, the blue section of \_\_\_\_ is part of the long-run average total cost curve for output levels between 30 and 50 units, the blue section of \_\_\_\_ is part of the long-run average total cost curve for output levels between 50 and 60 units, and the blue section of \_\_\_\_ is part of the long-run average total cost curve for output levels above 60 units.

Given these five cases illustrated by Figure 9.7, how do we obtain the long-run average total cost curve in the specific case? Is it smooth or bumpy? Explain.

*The Long-Run Cost Curve (general case: unlimited plant sizes)*

The blue long-run average total cost curve in Figure 9.7 is drawn under the assumption that the firm can operate in five alternative plants in the short run. However, in modern manufacturing industries (such as automobiles, pharmaceuticals, etc.) the number of possible plant sizes is virtually unlimited.

In line with this reasoning, each red average total cost curve in Figure 9.8 represents a possible plant size in the long run.

Given all the red curves illustrated by Figure 9.8, how do we obtain the long-run average total cost curve in the general case? Is it smooth or bumpy? Explain.

*Economies and Diseconomies of Scale*

The shape of the long-run average total cost curve is explained by economies and diseconomies of scale.

Economies of Scale

In the upper panel of Figure 9.9, economies of scale correspond to the downsloping part of the curve; in the output range between zero and q1, average total cost \_\_\_\_ as production rises in the long run.

Explain economies of scale: why is the average total cost decreasing with rising output?

Diseconomies of Scale

In the upper panel of Figure 9.9, diseconomies of scale correspond to the upward sloping part of the curve; in the output range above q2, average total cost \_\_\_\_ as production rises in the long run.

Explain diseconomies of scale: why is the average total cost increasing with rising output?

**Materials for Lecture 15**

Start with the textbook to get familiar with the content and progression of the lecture. Then, go to videos and supplemental articles, if provided, for further clarification and additional examples.

Textbook

Read carefully pages 192 through 195 from the textbook.

Video

Long-run average total cost curve, economies of scale, and diseconomies of scale

<http://www.youtube.com/watch?v=68-vmWJQqlo>