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**Lecture 13: Production with One Input, MPL**

1. The production side
   1. Just as we’ve explored how consumers make decisions, let us consider how producers make decisions
   2. Just as consumers use goods and services to gain utility, producers use inputs, or factors of production, to create output (or goods and services).
   3. Producers are concerned about both the short run and the long run
      1. *Fixed input*—factor of production which does not change
      2. *Short run*—when one or more factors of production cannot change, or when there is at least one fixed input
      3. *Long run*—when all factors of production can change, or when fixed inputs become variable
   4. Capital is commonly referred to a fixed input. Factories are fixed in the short run—it takes time to build a new factory. Labor is generally variable in the short run, as it takes less time to find labor.
      1. Note this changes from industry to industry and job to job. A CEO might be fixed in the short term since finding a replacement takes a while. At the same time, a truck is a capital input which you can buy more of relatively quickly.
      2. But *in general* labor is variable and capital is fixed.
2. Production with just labor
   1. *Average product*—output per unit of a particular input
      1. Total output / total input
      2. E.g. Average product of labor: On average, how much does each worker produce?
   2. *Marginal product*—additional output per additional unit of a particular input
      1. Change in output / change in input
      2. E.g. Marginal product of labor: If you hire one more person, how much will that person add to your total production?
   3. The total product curve follows an S-shape: when labor is low, adding additional labor drastically increases product. (i) Then adding labor slightly increases production. (ii) Then adding labor starts decreasing production. (iii)
      1. Here the MPL curve is positive and upward sloping. Adding workers allows the division of labor which, as Smith argued, drastically increases productivity. This is also called *increasing marginal returns.*
      2. Here, the MPL is positive and downward sloping. Adding workers is helpful, but the division of labor only gets you so far. You start assigning workers to less and less critical tasks. This is also called *decreasing marginal returns*.
      3. Here, the MPL is negative and downward sloping. Adding additional workers is actually decreasing production. Workers are idle, they bump into productive workers, they gossip with productive workers. Their work, even if good, interferes with other good work. Too many cooks spoil the soup.

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APL

* 1. When marginal product > average product, average product is increasing.
  2. When marginal product < average product, average product is decreasing.
  3. In other words, the marginal product curve intersects the average product curve at its maximum point.

1. Review