ECON3102-005
Chapter 4: Firm Behavior

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Spring 2014

Review and Introduction

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- The representative firm demands labor and supplies consumption goods.

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- Y is output of consumption goods.

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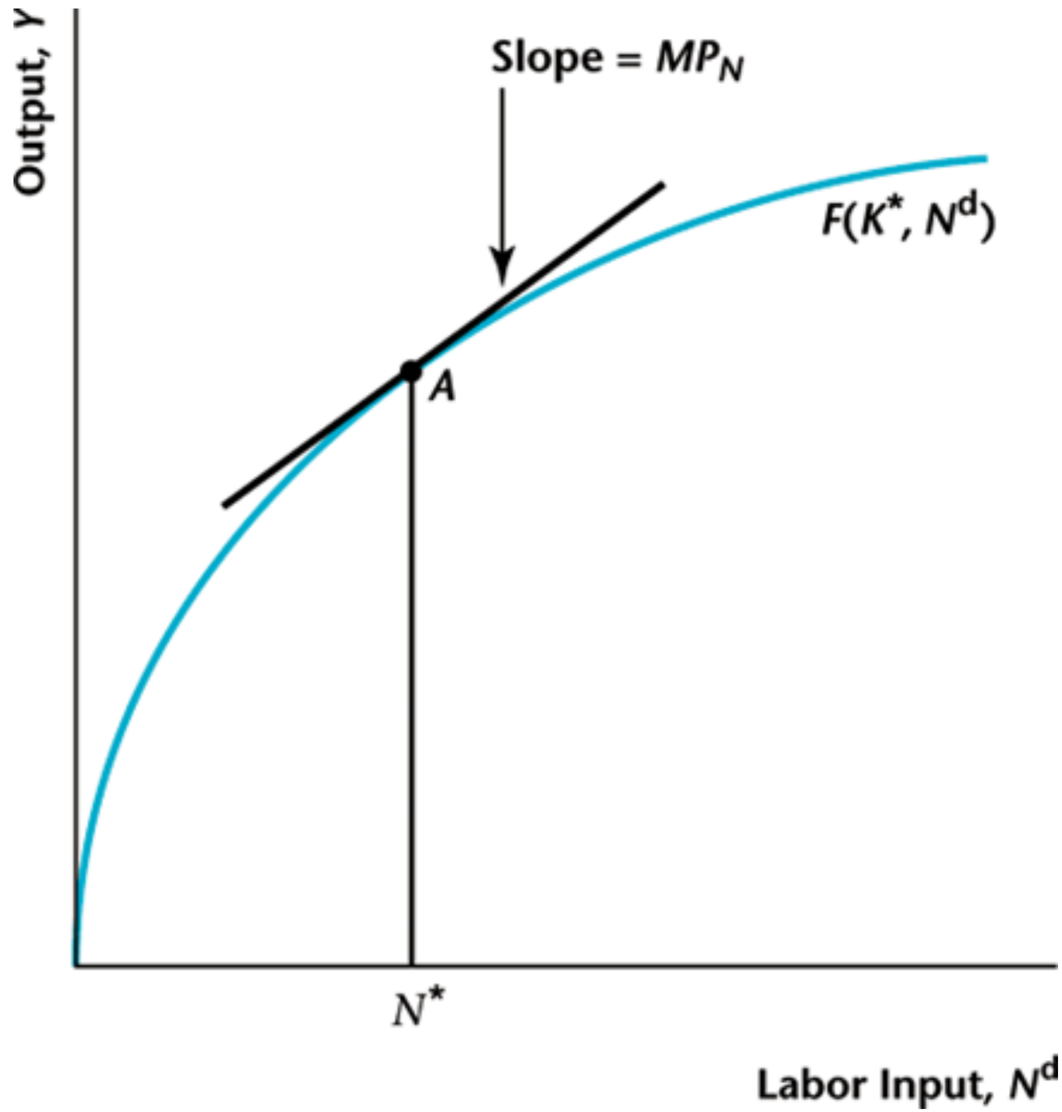
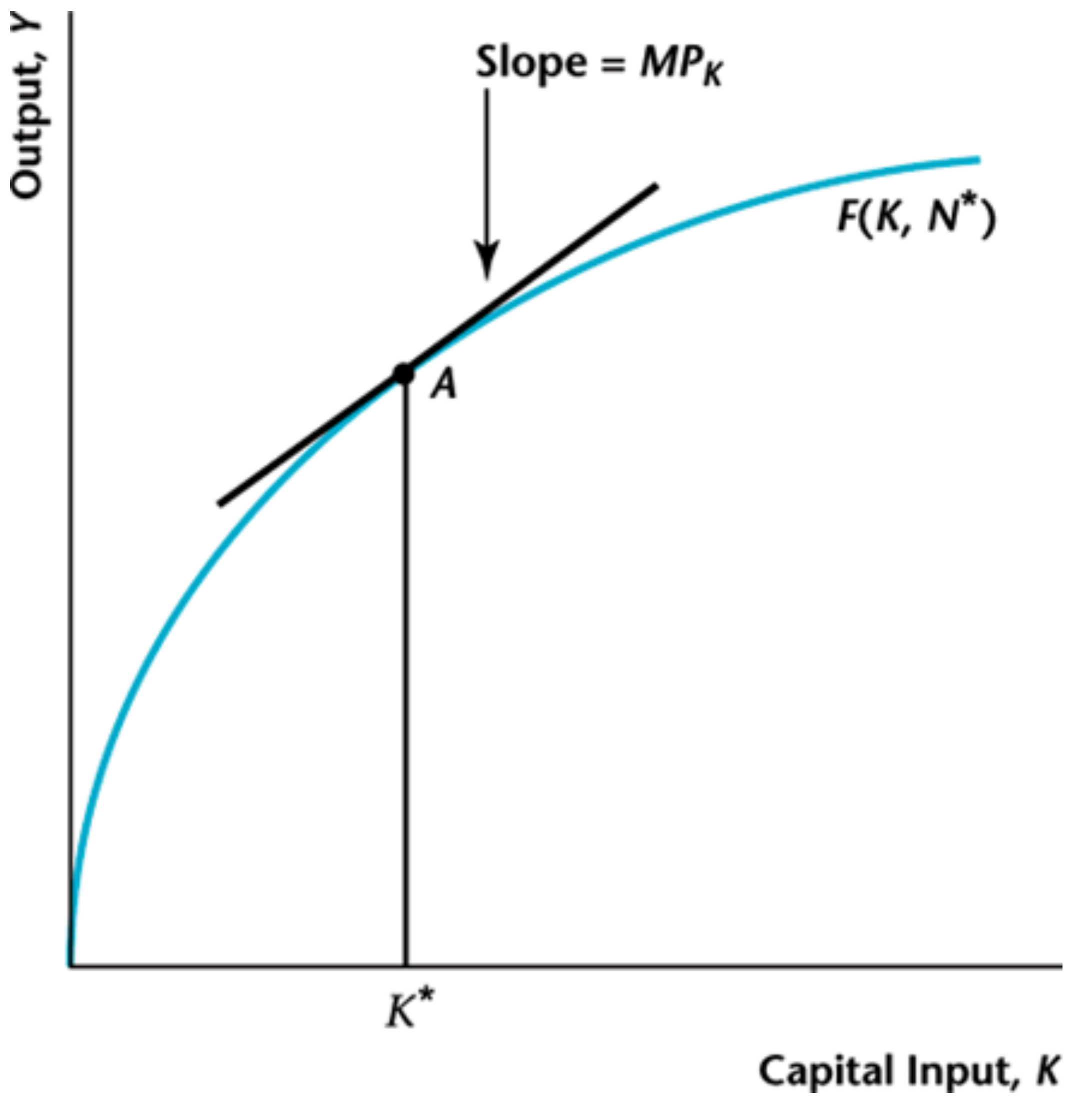
- Fixing the value of capital at arbitrary value $K*$, we let $MP_N(K, N^d)$ denote the marginal product of labor.
- Similarly, fixing the value of labor at arbitrary vale N , we let $MP_K(K, N^d)$ denote the marginal product of capital.

The Marginal Product of Labor



Production Function, Fixing the Quantity of Capital and Varying the Quantity of Labor

The Marginal Product of Capital



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  - Constant returns to scale means that a large firm replicates how a small firm produces many times over.
  - With CRS, an economy with a large firm is equivalent to an economy with many small firms in production.
  - This is a necessary condition to aggregate all firms in an economy to a representative firm.

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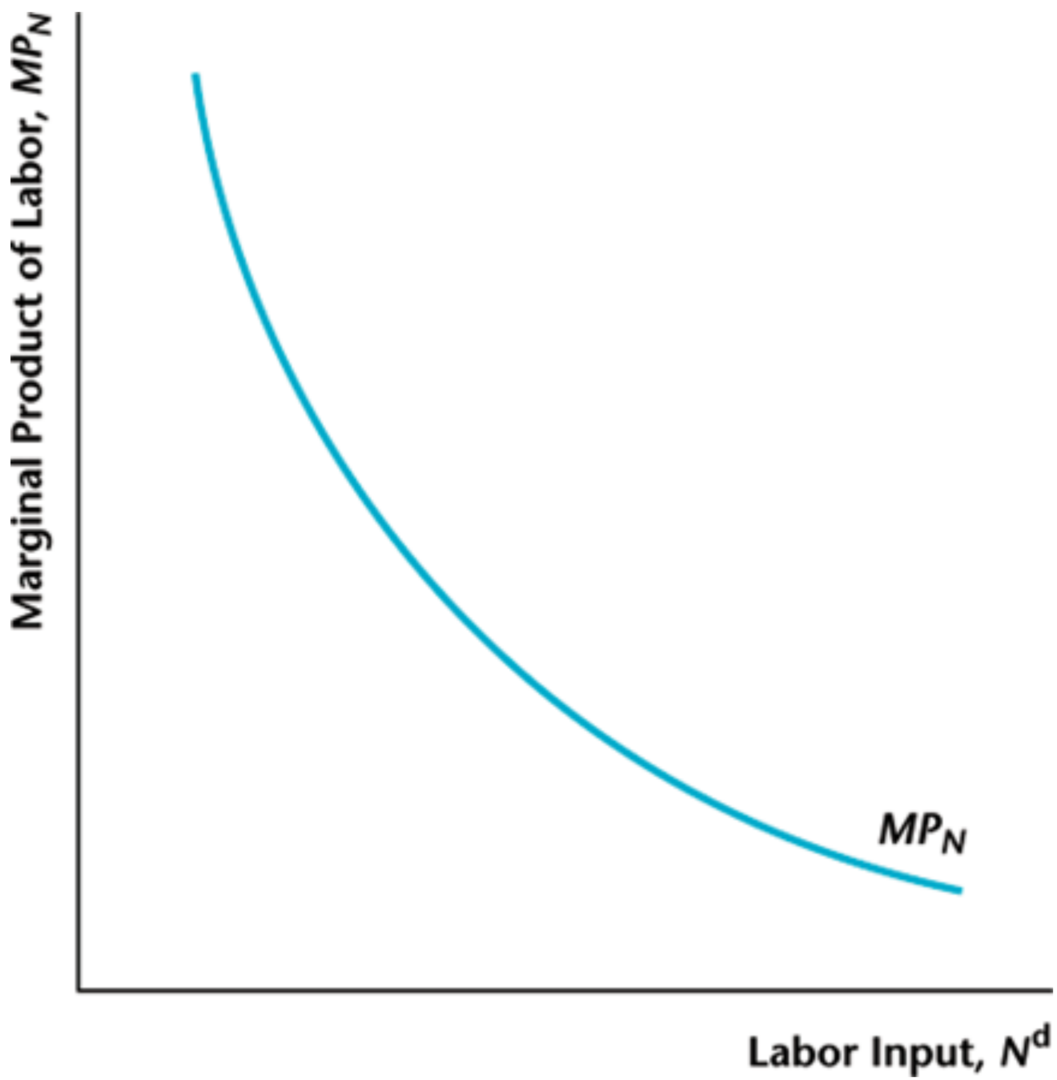
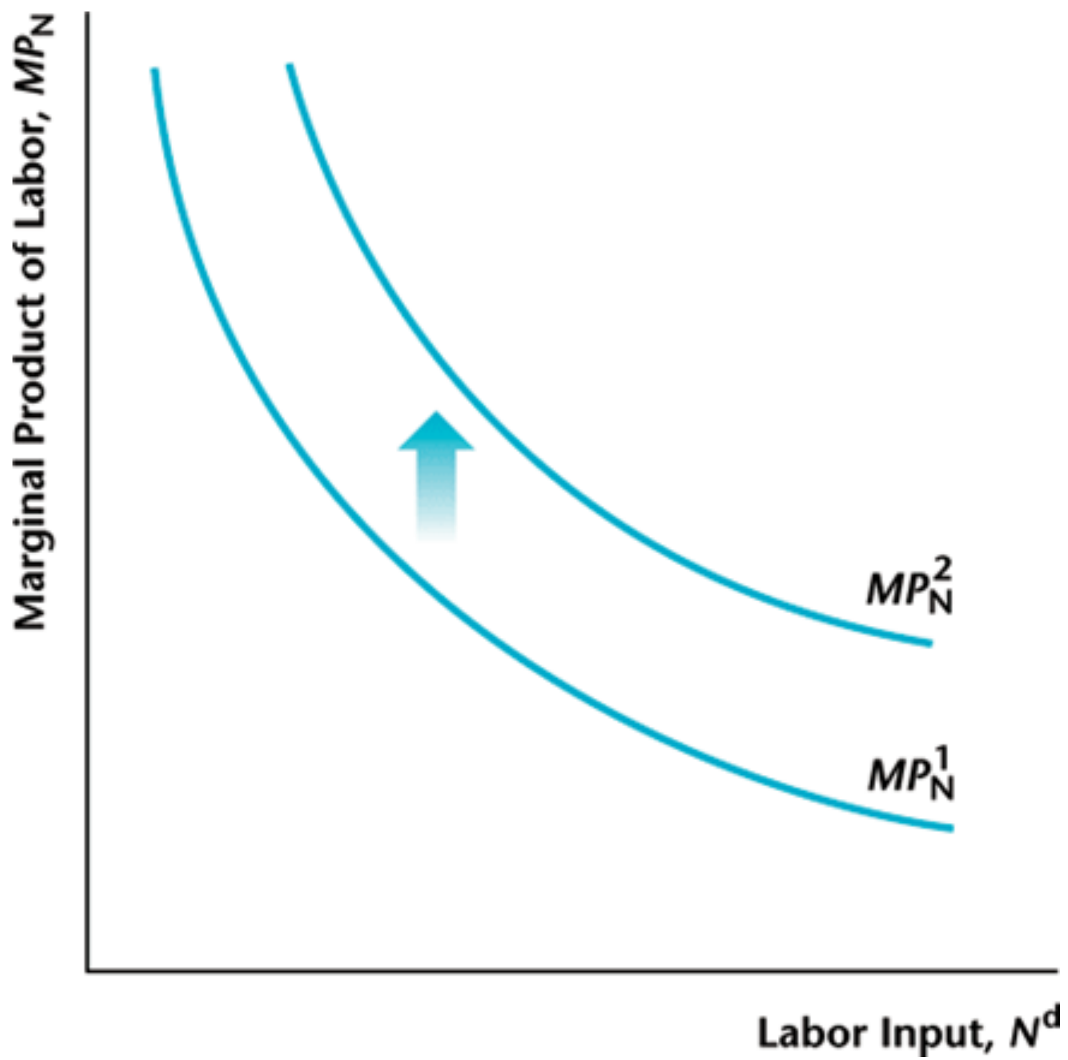
The Marginal Productivity of Labor



Shift in The Marginal Product of Labor as K increases



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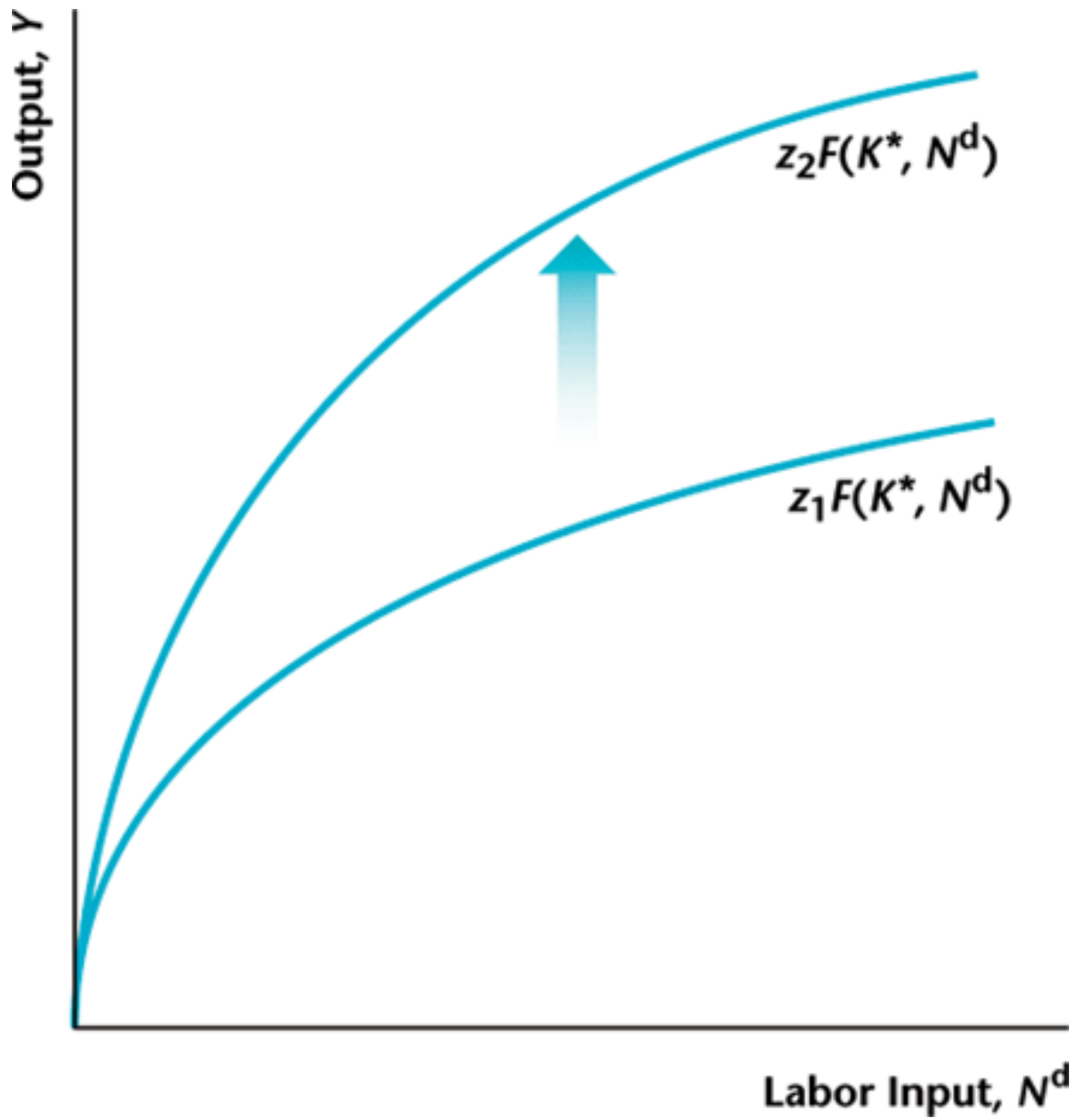
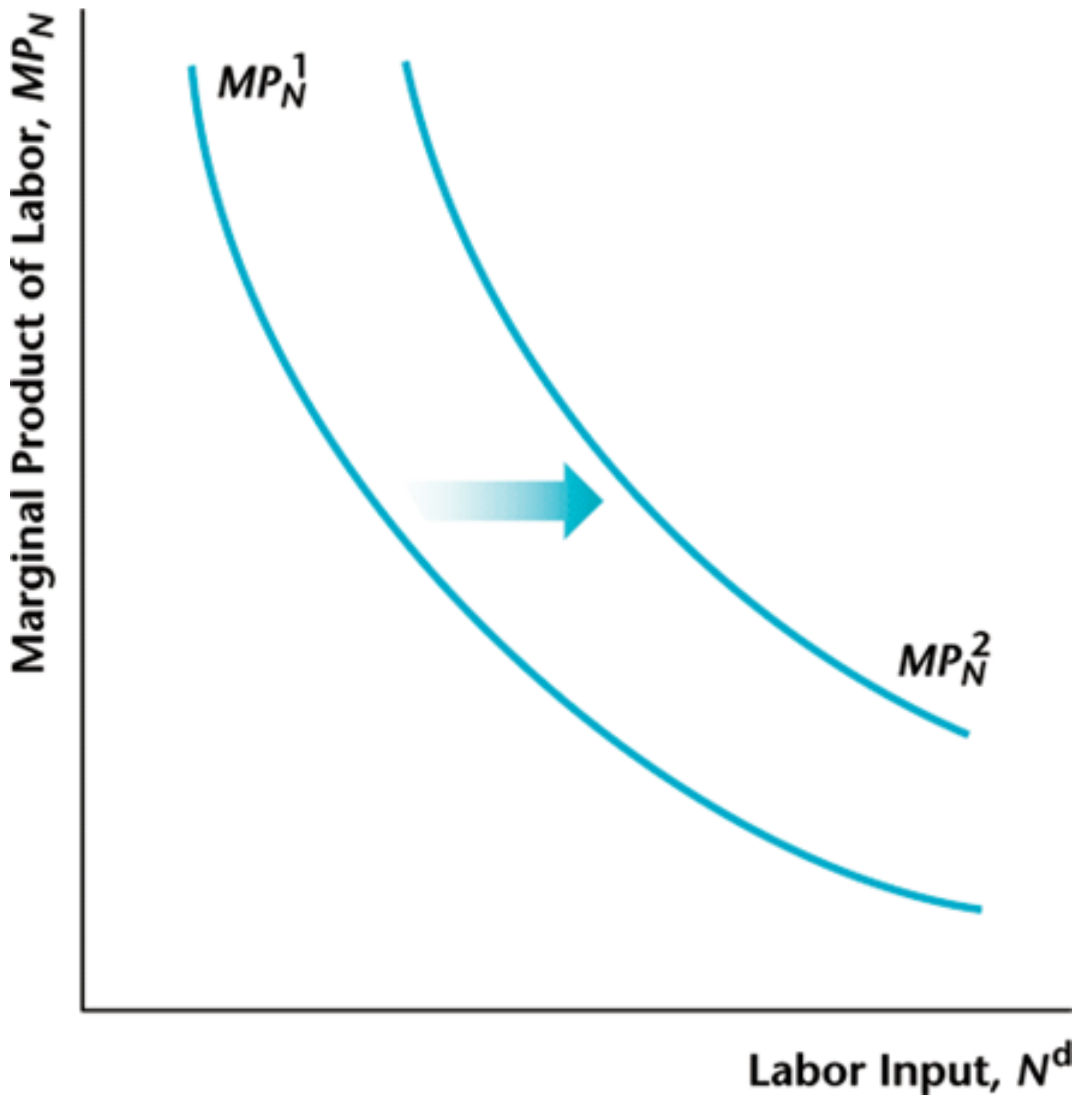
- Increase in $z \Rightarrow$ shift of the production function up
- Also, increase in $z \Rightarrow MP_N$ increases
- Also, increase in $z \Rightarrow MP_K$ increases
- An increase in z could be the discovery of new technologies, a drop in energy prices, changes in government policies.

Changes in TFP: z increases



Effects of an increase in TFP on MP_N



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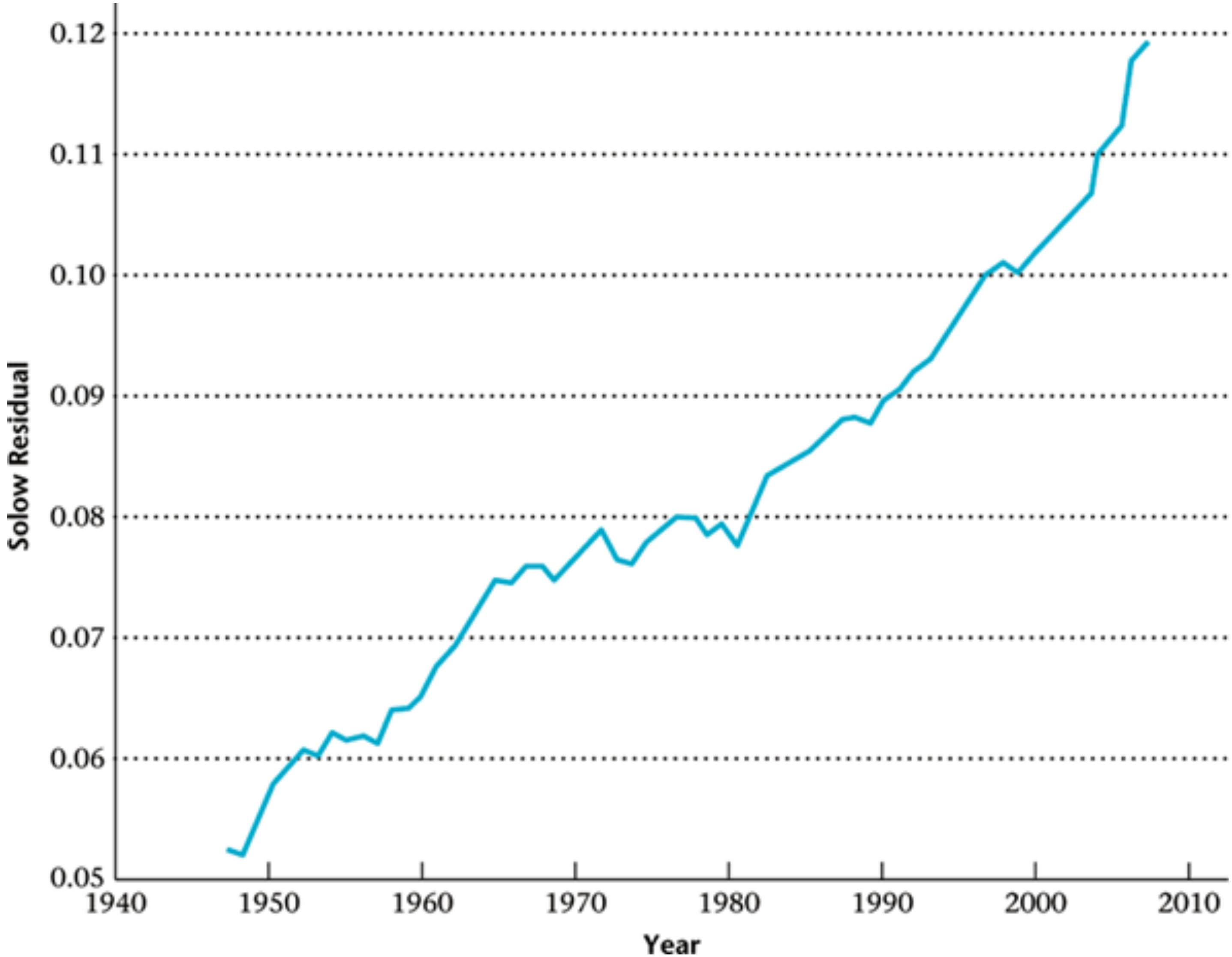
- In the United States, $alpha = 0.36$ approximately.
- $Y = zK^{0.36}(N^d)^{0.64} \Rightarrow$

$$z = \frac{Y}{K^{0.36}(N^d)^{0.64}}$$

Solow Residuals for the United States



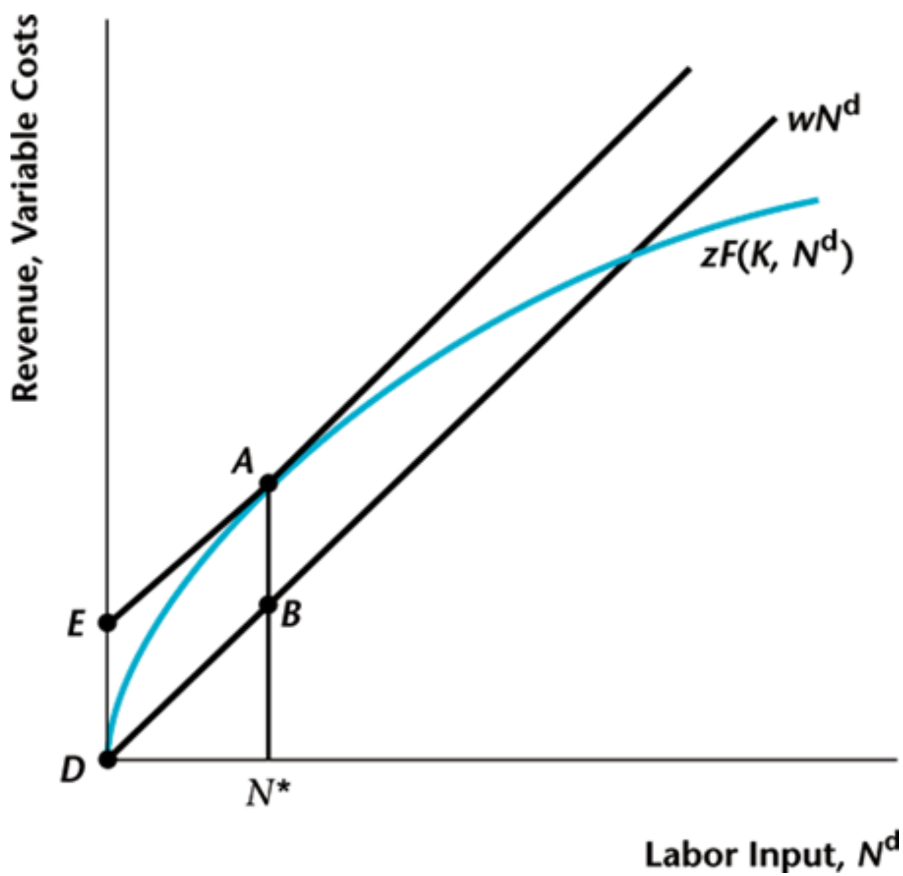
Profit Maximization of the Representative Firm

The goal of the representative firm is to solve:

$$\max_{N^d, K} = zF(K, N^d) - wN^d,$$

where K is fixed, w is given, and π is real profit.

Profit Maximization of the Representative Firm (contd)



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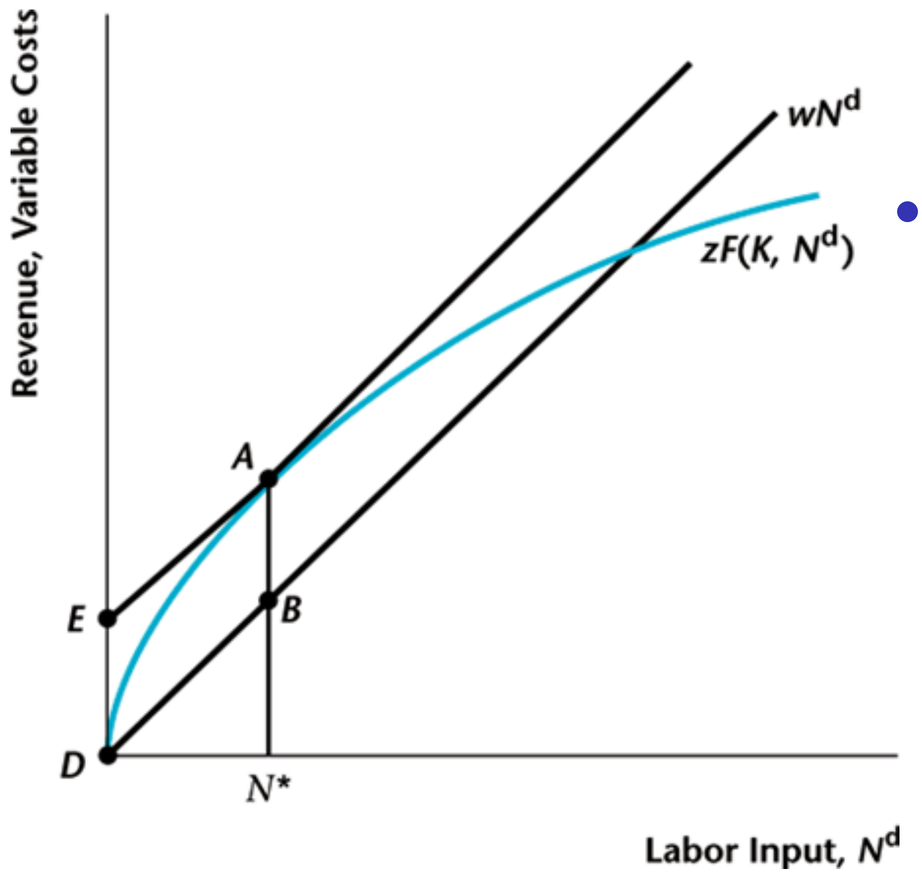

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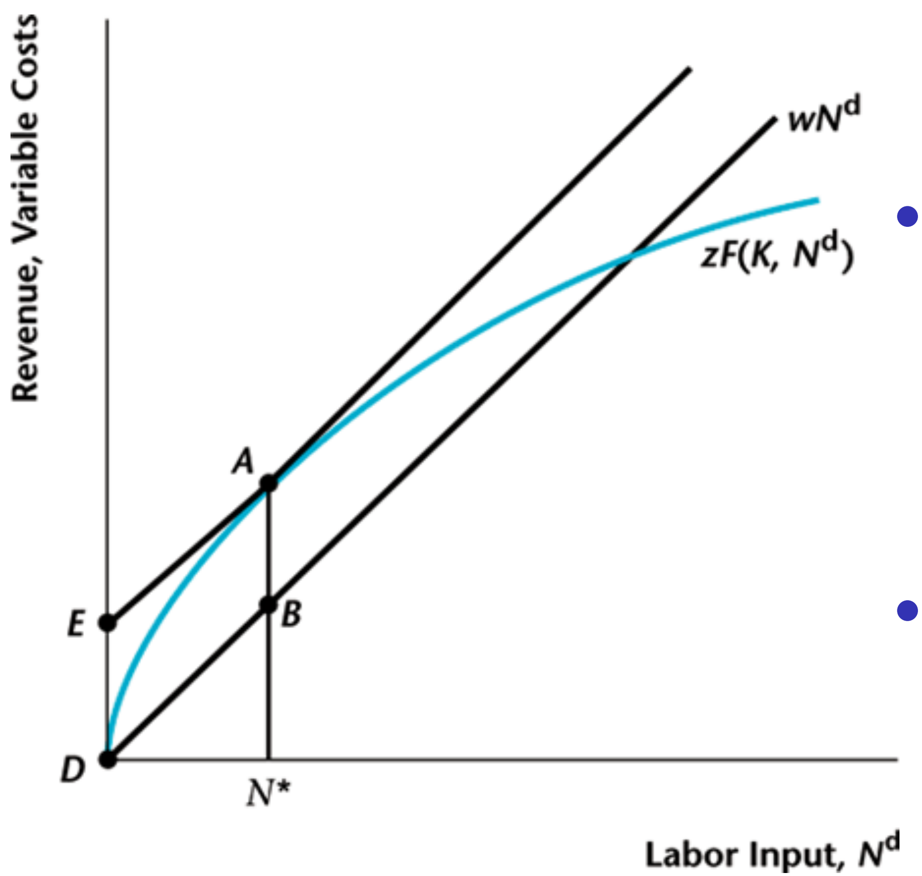

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- This is because an extra hour hired produces MP_N units of output and costs w units of the consumption good. Hence, labor demand is downward sloping, just like MP_N.

Labor Demand Curve