

Lecture IX: Developing the Basic Nature of Supply

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Readings

Basic Definitions of Supply

Development of Supply

Readings

- ▶ Becker Lecture 11 – 18
- ▶ Landsburg Chapters 20 – 21

Basic Definitions of Supply

- ▶ The supply is the amount that firms will offer to the market at any price given the prices of other outputs and inputs.
- ▶ Let us start by viewing the market as an engineering process as depicted in Figure 1

Engineering Schematic of Economy

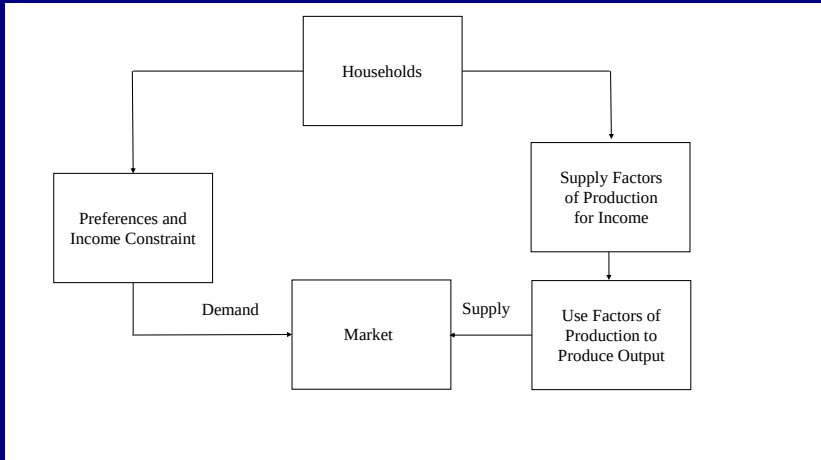


Figure : Engineering Schematic of Economy

- ▶ The firms combine inputs and mediate between the factor market and the output market.
 - ▶ Becker introduces the concepts of the firm using Coases's article "The Nature of the Firm".
 - ▶ I have several lectures on the nature of the firm
 - ▶ <http://ricardo.ifas.ufl.edu/aeb6933.finance/Lecture07-2013.pdf> – Lecture VII: Coase, Transaction Costs, and the Boundaries of the Firm.
 - ▶ <http://ricardo.ifas.ufl.edu/aeb6933.finance/Lecture08-2013.pdf> – Lecture VIII: Grossman and Hart – Vertical and Lateral Integration [Part I]
 - ▶ <http://ricardo.ifas.ufl.edu/aeb6933.finance/Lecture09-2013.pdf> – Lecture IX: Grossman and Hart – Vertical and Lateral Integration [Part II]
 - ▶ <http://ricardo.ifas.ufl.edu/aeb6933.finance/Lecture10-2013.pdf> – Lecture X: Williamson

- ▶ These lectures basically involve the boundaries of the firm – at the margin does a firm choose to produce an input or purchase it?
 - ▶ The basic concept is a core area of competency – I am good at producing this item.
 - ▶ My production function is $y = f(x_1, x_2)$ where x_1 is my labor or management and x_2 is an input I buy from someone else.
 - ▶ If I extend my production into an input – do I purchase x_2 or do I buy it.
 - ▶ The concept is trading diseconomies of scope – I am not good at producing x_2 against some sort of monopoly power.

To the basics – development of supply

- ▶ The starting point for the development of supply is a simple production function – assuming one input x , the production function gives the map between inputs and outputs as depicted in Figure 2.

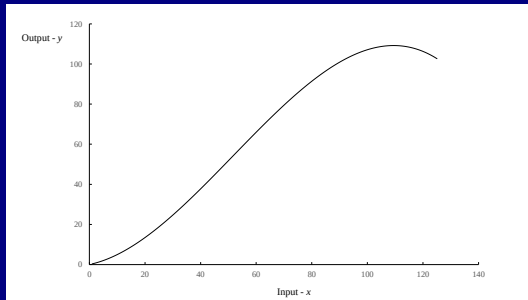


Figure : Production Function

- In this case

$$f(x) = \frac{100(100x + 7.75x^2 - 0.05x^3)}{35,000}. \quad (1)$$

- In later lectures we will develop the firm's problem more fully, but for now we simply assume that the firm chooses the level of input that maximizes profit

$$\max_x p_y f(x) - p_x x \Rightarrow \begin{cases} p_y \frac{\Delta f(x)}{\Delta x} = p_x \\ \text{or} \\ \frac{\Delta f(x)}{\Delta x} = \frac{p_x}{p_y} \end{cases} \quad (2)$$

- For the purposes of this class, it is easier to rotate the production function. Specifically, if $y = f(x)$ is a one-to-one mapping over some range $x \in (x_1, x_2)$ then

$$y = f(x) \Leftrightarrow x = f^{-1}(y) = g(y) \quad (3)$$

as depicted in Figure 3.

Inverse Function Mapping

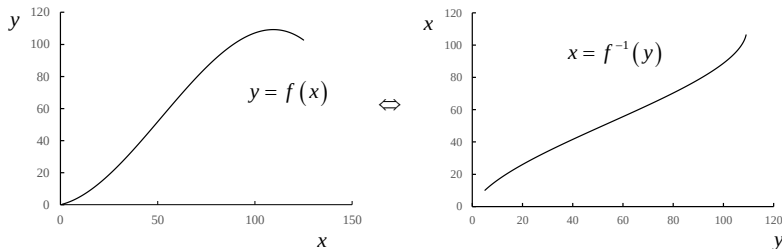


Figure : Inverse Function Mapping

- Given this assumption we can redefine the optimization problem as

$$\max_y p_y y - p_x g(y) \Rightarrow \max_y p_y - C(y, p_x) \Rightarrow p_y = \frac{\Delta C(y, p_x)}{\Delta y}. \quad (4)$$

The supply function, the relationship between the price of the good and quantity of the good that will be offered for sale is the marginal cost function

$$y = S(p_y, p_x) = \frac{\Delta C(y, p_x)}{\Delta y} = \frac{p_x \Delta g(y)}{\Delta y} \quad (5)$$

- To bring this together, the total cost of production is simply $C(y, p_x) = p_x \times g(y)$ where $g(y)$ is the inverse mapping of the production function Figure 4 for $p_x = 5$.

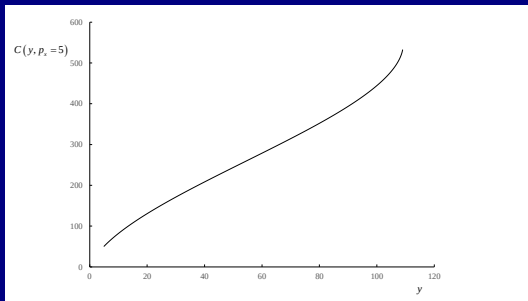


Figure : Total Cost of Production

- ▶ Two relationships necessary for the derivation of supply are the marginal cost function

$$MC(y, p_x) = p_x \frac{\Delta g(y)}{\Delta y} \quad (6)$$

and the average cost function

$$AC(y, p_x) = \frac{p_x g(y)}{y}. \quad (7)$$

these functions are presented in Figure 5

Marginal and Average Costs

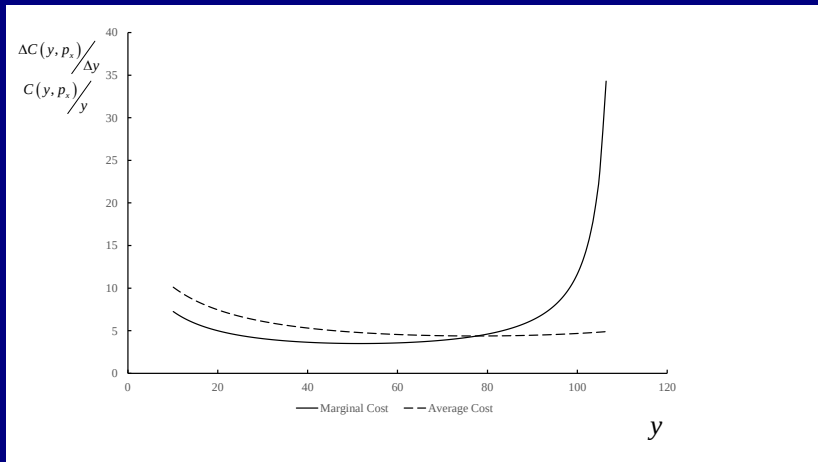


Figure : Marginal and Average Costs

- ▶ The firm's supply curve is defined as the firm's marginal cost curve above the intersection of the marginal cost and average cost curves.
- ▶ Profit is maximized – the firm's supply point – is where the marginal cost curve equals the price of the output.
- ▶ In this case if $p_y = 4.75$ the optimal level of output is 81.33.