

Economics 101A (Lecture 17)

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Outline

1. Cost Curves II
2. Supply Function
3. One-step Profit Maximization
4. Introduction to Market Equilibrium
5. Aggregation
6. Market Equilibrium in the Short-Run

1 Cost Curves II

Case 3. *Technology with setup cost.* Plot production function, total cost, average and marginal. Supply function?

2 Supply Function

- Supply function: $y^* = y^*(w, r, p)$
- What happens to y^* as p increases?
- Is the supply function upward sloping?

- Remember f.o.c:

$$p - c'_y(w, r, y) = 0$$

- Implicit function:

$$\frac{\partial y^*}{\partial p} = -\frac{1}{-c''_{y,y}(w, r, y)} > 0$$

as long as s.o.c. is satisfied.

- Yes! Supply function is upward sloping.

3 One-step Profit Maximization

- Nicholson, Ch. 9, pp. 265–270 [OLD: Ch. 13, pp. 346–350].
- One-step procedure: maximize profits
- Perfect competition. Price p is given
 - Firms are small relative to market
 - Firms do not affect market price p_M
 - Will firm produce at $p > p_M$?
 - Will firm produce at $p < p_M$?
 - $\implies p = p_M$

- Revenue: $py = pf(L, K)$
- Cost: $wL + rK$
- Profit $pf(L, K) - wL - rK$

- Agent optimization:

$$\max_{L,K} pf(L, K) - wL - rK$$

- First order conditions:

$$pf'_L(L, K) - w = 0$$

and

$$pf'_K(L, K) - r = 0$$

- Second order conditions? $pf''_{L,L}(L, K) < 0$ and

$$\begin{aligned} |H| &= \begin{vmatrix} pf''_{L,L}(L, K) & pf''_{L,K}(L, K) \\ pf''_{L,K}(L, K) & pf''_{K,K}(L, K) \end{vmatrix} = \\ &= p^2 \left[f''_{L,L}f''_{K,K} - (f''_{L,K})^2 \right] > 0 \end{aligned}$$

- Need $f''_{L,K}$ not too large for maximum

- Comparative statics with respect to p , w , and r .
- What happens if w increases?

$$\frac{\partial L^*}{\partial w} = - \frac{\begin{vmatrix} -1 & pf''_{L,K}(L, K) \\ 0 & pf''_{K,K}(L, K) \end{vmatrix}}{\begin{vmatrix} pf''_{L,L}(L, K) & pf''_{L,K}(L, K) \\ pf''_{L,K}(L, K) & pf''_{K,K}(L, K) \end{vmatrix}} < 0$$

and

$$\frac{\partial L^*}{\partial r} =$$

- Sign of $\partial L^* / \partial r$ depends on $f''_{L,K}$.

4 Introduction to Market Equilibrium

- Nicholson, Ch. 10, pp. 279–295 [OLD: Ch. 14, pp. 368–382.
- Two ways to analyze firm behavior:
 - Two-Step Cost Minimization
 - One-Step Profit Maximization
- What did we learn?
 - Optimal demand for inputs L^* , K^* (see above)
 - Optimal quantity produced y^*

- **Supply function.** $y = y^*(p, w, r)$

- From profit maximization:

$$y = f(L^*(p, w, r), K^*(p, w, r))$$

- From cost minimization:

MC curve above *AC*

- Supply function is increasing in p

- Market Equilibrium. Equate demand and supply.

- Aggregation?

- Industry supply function!

5 Aggregation

5.1 Producers aggregation

- J companies, $j = 1, \dots, J$, producing good i
- Company j has supply function

$$y_i^j = y_i^{j*}(p_i, w, r)$$

- Industry supply function:

$$Y_i(p_i, w, r) = \sum_{j=1}^J y_i^{j*}(p_i, w, r)$$

- Graphically,

5.2 Consumer aggregation

- Nicholson, Ch. 10, pp. 279–282 [OLD: Ch. 7, pp. 172–176]
- *One-consumer economy*
- Utility function $u(x_1, \dots, x_n)$
- prices p_1, \dots, p_n
- Maximization \implies

$$\begin{aligned}x_1^* &= x_1^*(p_1, \dots, p_n, M), \\ &\vdots \\ x_n^* &= x_n^*(p_1, \dots, p_n, M).\end{aligned}$$

- Focus on good i . Fix prices $p_1, \dots, p_{i-1}, p_{i+1}, \dots, p_n$ and M

- **Single-consumer demand function:**

$$x_i^* = x_i^*(p_i | p_1, \dots, p_{i-1}, p_{i+1}, \dots, p_n, M)$$

- What is sign of $\partial x_i^* / \partial p_i$?
- Negative if good i is normal
- Negative or positive if good i is inferior

- *Aggregation*: J consumers, $j = 1, \dots, J$

- Demand for good i by consumer j :

$$x_i^{j*} = x_i^{j*} (p_1, \dots, p_n, M^j)$$

- Market demand X_i :

$$\begin{aligned} X_i & (p_1, \dots, p_n, M^1, \dots, M^J) \\ &= \sum_{j=1}^J x_i^{j*} (p_1, \dots, p_n, M^j) \end{aligned}$$

- Graphically,

- Notice: market demand function depends on distribution of income M^J

- Market demand function X_i :
 - Consumption of good i as function of prices \mathbf{p}
 - Consumption of good i as function of income distribution M^j

6 Market Equilibrium in the Short-Run

- Nicholson, Ch. 14, pp. 368–382.
- What is equilibrium price p_i ?
- Magic of the Market...
- Equilibrium: No excess supply, No excess demand
- Prices \mathbf{p}^* equates demand and supply of good i :

$$Y^* = Y_i^S(p_i^*, w, r) = X_i^D(p_1^*, \dots, p_n^*, M^1, \dots, M^J)$$

- Graphically,

- Notice: in short-run firms can make positive profits

- Comparative statics exercises with endogenous price

p_i :

- increase in wage w or interest rate r :

- change in income distribution

7 Next Lecture

- Elasticities
- Taxes and Subsidies
- Long-Run Equilibrium