Economics 101A
(Lecture 21, Revised)

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Outline

1. Midterm 2
2. Profit Maximization: Monopoly

1 Midterm 2

- **Problem 1.** One input, L, with wage w

- Production function f:

$$f(L) = \begin{cases} \left(L - \bar{L}\right)^{\alpha} & \text{if} \quad L \geq \bar{L} \\ 0 & \text{if} \quad 0 \leq L < \bar{L} \end{cases},$$

- Notice: $\bar{L} > 0$

- Picture

- Returns to scale:

- Decreasing? ($f(tL) \leq tf(L)$ for all $t > 1$ and all $L \geq 0$)

- No! Take any $L_0 < \bar{L}$ and $t = 2\bar{L}/L_0$. Then,

$$f(tL_0) = f\left(2\bar{L}\right) = \left(2\bar{L} - \bar{L}\right)^{\alpha} > tf(L_0) = 0$$

- Increasing?

- Yes, for $\alpha \geq 1$.

- Easy for $L_0 < \bar{L}$ (see above)

- Consider now $L_1 > \bar{L}$.

$$
\begin{aligned}
f(tL_1) &= \left(tL_1 - \bar{L}\right)^{\alpha} = \left(tL_1 - t\frac{\bar{L}}{t}\right)^{\alpha} = \\
&= t^{\alpha}\left(L_1 - \frac{\bar{L}}{t}\right)^{\alpha} > t^{\alpha}\left(L_1 - \bar{L}\right)^{\alpha} \\
&> tf(L_1)
\end{aligned}
$$

for $\alpha \geq 1$.

- Cost minimization:

$$\min wL$$
$$s.t. f(L) \geq y$$

- Also: $y > 0$

- Only one input! Pick quantity L that produces exactly output y

- Equilibrium $L^*\left(w, y|\bar{L}, \alpha\right)$ is solution to

$$\left(L^*\left(w, y|\bar{L}, \alpha\right) - \bar{L}\right)^{\alpha} = y$$

or

$$L^*\left(w, y|\bar{L}, \alpha\right) = \bar{L} + y^{1/\alpha}$$

- Notice: solution does not depend on w.

- Firm cannot substitute away to another input

- Cost function:

$$c\left(w, y|\bar{L}, \alpha\right) = wL^*\left(w, y|\bar{L}, \alpha\right) = w\bar{L} + wy^{1/\alpha}$$

- Graphically, it's reflection with respect to 45 degree line of production function

- **Problem 2.**

- Figure of utility function

- Prospect theory explains actual choices under risk better than expected utility theory

- Intuition for solution:

- Low reference point r:
  - convex part of utility
  - risk-prone
  - "Would rather take a gamble than settle for a worse job than r"
  - Trying-to-break-even effect

- Low reference point r:
  - concave part of utility
  - risk-averse
  - "Better not take too much risk, given that safe job is already better than r"

2 Profit Maximization: Monopoly

- Nicholson, Ch. 18, pp. 496–504

- Nicholson, Ch. 13, pp. 335–342

- **Perfect competition.** Firms small relative to market

- **Monopoly.** One, large firm. Firm sets price p to maximize profits.

- What does it mean to set prices?

- Firm chooses p, demand given by $y = D(p)$

- (OR: firm sets quantity y. Price $p(y) = D^{-1}(y)$)

- Write maximization with respect to y

- Firm maximizes profits, that is, revenue minus costs:

$$\max_y p(y)\, y - c(y)$$

- Notice $p(y) = D^{-1}(y)$

- First order condition:

$$p'(y)\, y + p(y) - c'_y(y) = 0$$

or

$$\frac{p(y) - c'_y(y)}{p} = -p'(y)\frac{y}{p} = -\frac{1}{\varepsilon_{y,p}}$$

- Compare with f.o.c. in perfect competition

- Check s.o.c.

- Elasticity of demand determines markup:
  - very elastic demand $\longrightarrow$ low mark-up
  - relatively inelastic demand $\longrightarrow$ higher mark-up

- Graphically, y^* is where marginal revenue $\left(p'\left(y\right)y + p\left(y\right)\right)$ equals marginal cost $\left(c_y'\left(y\right)\right)$

- Find p on demand function

- Example.

- Linear inverse demand function $p = a - by$

- Linear costs: $C(y) = cy$, with $c > 0$

- Maximization:

$$\max_y (a - by)\, y - cy$$

- Solution:

$$y^*(a, b, c) = \frac{a - c}{2b}$$

and

$$p^*(a, b, c) = a - b\frac{a - c}{2b} = \frac{a + c}{2}$$

- s.o.c.

- Figure

- Comparative statics:

  - Change in marginal cost c

  - Shift in demand curve a

- Monopoly profits

- Case 1. High profits

- Case 2. No profits

- Welfare consequences of monopoly
  - Too little production
  - Too high prices
- Graphical analysis