

# SIGNIFICANCE & MEANING OF ECONOMIC COST

- Why care about costs?
  - Should drive business decisions regarding price, production, investment, etc.
  - Affects which companies and technologies succeed, and which ones fail
  - Determines the size of firms
  - Determines the level, structure and trends in prices paid for goods and services

# SIGNIFICANCE & MEANING OF ECONOMIC COST

- Meaning of economic cost
  - Measure the use of resources in the production of goods and services
  - Accountants measure only explicit expenses (and sometimes not even those)
  - “Opportunity cost” includes the value of employed resources in their best alternative use
    - what matters is expenditure affected by a decision
    - there may also be “external costs” born by those not involved in production (e.g., pollution)

# TAXONOMY OF COSTS

## Total v. Average v. Marginal

- $AC = TC / Q$  also referred to as “unit costs”
- $MC = \Delta TC / \Delta Q$  sometimes called “incremental”

# TAXONOMY OF COSTS



# TAXONOMY OF COSTS

## Fixed v. Variable

- how costs vary with level of output
- $[\text{total cost}] = [\text{variable cost}] + [\text{fixed cost}]$
- Example of fixed costs
- CA business license: \$800 per year  
(nontransferable)
- NYC taxi medallion: \$227,000 in perpetuity  
(transferable)

## TAXONOMY (cont'd)

- Short Run v. Long Run
- as before, depends on the time period considered, and hence whether inputs are “fixed” or “variable”
- make distinction between “fixed cost” and “fixed factor”

## TAXONOMY (cont'd)

- Sunk v. Avoidable (non-sunk)
- difference depends on whether cost can be avoided by some decision
- e.g., fixed cost *can* be avoided by shutting down.
- usually treat variable costs as avoidable, fixed costs as sunk
- because they are unavoidable, “sunk” costs should be ignored when making decisions

## **TAXONOMY (cont'd)**

- Other cost distinctions
- production vs. transaction costs
- one-time vs. recurring costs

# COST MINIMIZATION

- The firm's problem
  - A profit maximizing firm won't spend more to produce its output than it has to:

$$\begin{aligned} & \text{Minimize}_{L,K} TC = rK + wL \\ & \text{Subject to: } f(L,K) = Q_0 \end{aligned}$$

- The solution
  - in words: find the cheapest input combination that produces the desired level of output
  - iso-quant curve: input combinations that produce the same quantity of output
    - Slope of iso-quant = -  $MRTS_{L,K}$
  - $= - MP_L / MP_K$
  - iso-cost lines: input combinations that cost same amount
    - $wL + rK = C$  (a constant)
    - $\Rightarrow K = (C - wL) / r$
    - slope of iso-cost =  $\Delta K / \Delta L$  (along an iso-cost line) =  $- w / r$
    - compare: budget lines
  - Putting two together

$$MRTS_{L,K} = MP_L / MP_K = w / r$$

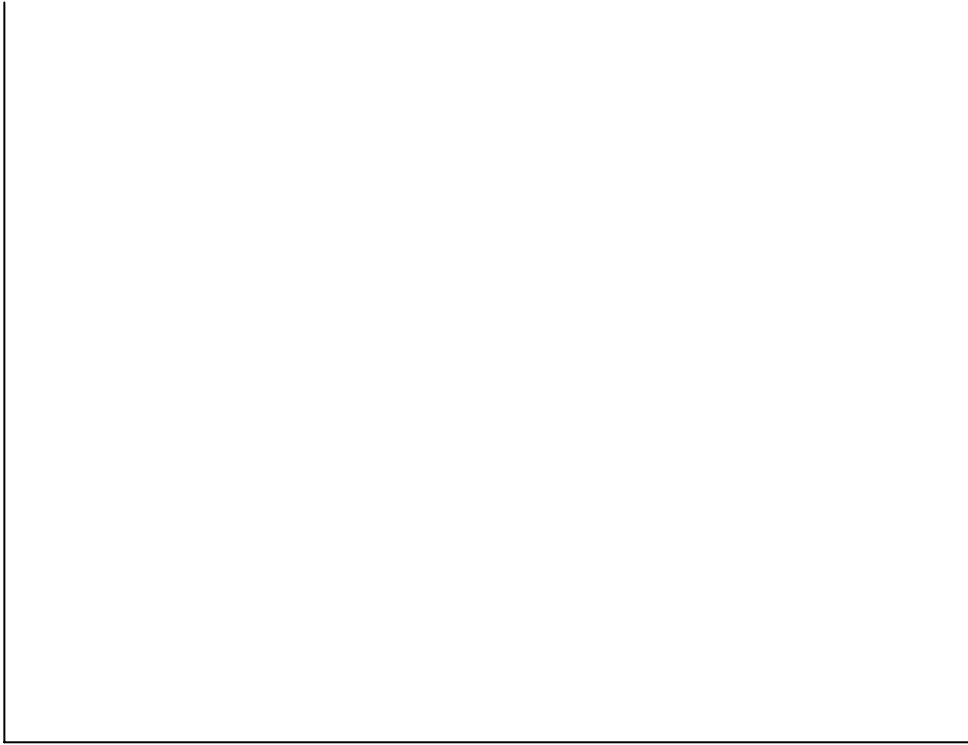
# COST MINIMIZATION

- Solution: another view

$$MP_L / w = MP_K / r$$

- $1/w$  = the amount of labor that can be purchased for \$1
- $MP_L$  = the amount of output that can be produced with last unit of labor
- $MP_L/w$  = output derived from last \$ spent on labor
- similar interpretation for capital
- therefore, equate incremental output of last \$ spent on each input across inputs

# **COST MINIMIZATION**



# COMPARATIVE STATICS

Output Expansion Path:  $L(Q)$  and  $K(Q)$  are labor and capital levels that minimize

cost

- plot optimal cost-minimizing input combinations as output increases (i.e., moves in the northeast direction)
- if the cost-minimizing quantity of an input rises (falls) with output, then it is a “normal” (“inferior”) input.
- compare: income-consumption curve

# COMPARATIVE STATICS



# COMPARATIVE STATICS

Factor Price Change:  $L(w; Q)$  gives labor that minimizes cost for each wage rate.

- increase the price of one input (e.g., wage)
- factor substitution:
  - All else equal, an increase in  $w$  must decrease labor and increase capital due to diminishing  $MRTS_{L,K}$
- compare: price-consumption curve

# COMPARATIVE STATICS



# Output Elasticity of Total Cost

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Estimates: (from Indian manufacturing):

Industry	$E_{TC,Q}$
Iron and Steel	0.553
Cotton Textiles	1.211
Cement	1.162
Electricity and Gas	0.382

# Duality in Production and Cost

- Firm's input decisions have a dual nature.
- Optimal choice of K and L
  - Minimal cost subject to the production function
  - Maximum output subject to the cost constraint
- Formally,
  - Maximum  $F(L,K)$
  - Subject to  $wL + rK = C_0$

## Duality in Production and Cost (Con't)

- Solution: from the relevant lagrangian we obtain the necessary conditions

$$MP_k - \mu r = 0$$

$$MP_L - \mu w = 0$$

- Solving these equations, we have

$$MP_K / r = MP_L / w$$

- Or

$$MP_L / MP_K = w / r$$

# SUMMARY

- Opportunity cost is the relevant notion of economic cost.
- A profit-maximizing firm will minimize the cost of producing its chosen level of output.
- Costs are minimized when the MRTS equals the input price ratio.
- The input demand functions show how the cost-minimizing quantities of inputs vary with the quantity of the output and the input prices.
- The short run cost minimization problem solves the firm's problem when one or more inputs are fixed.
- Returns to scale have a counter part in the shape of the cost function captured by degree of "economies of scale."