

# Introduction to Location Theory

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ECON 166  
Prof. J. M. Pogodzinski  
Lecture 5

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## Agenda for Lecture 5

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- Tales of Three Other Cities
  - Introduction to Location Models – continued
  - Profit maximization – general framework
  - Principle of *Median* Location
  - Agglomeration Economies
    - Economies of Urbanization
    - Economies of Localization
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## Tales of Three Other Cities

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- Growth patterns of the three other cities
  - Employment distribution of the three other cities
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## More about Profit Maximization

- Profit maximization when price depends on quantity (market-powerful firm)
- Profit maximization when price is given (independent of quantity) – perfectly competitive firm

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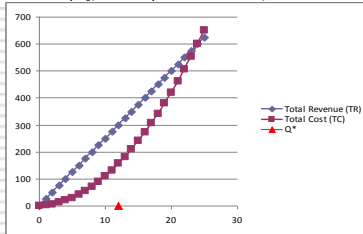
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## Profit Maximization

Perfectly Competitive Firm – see ue\_lecture\_4.xls

Total Revenue =  $pQ$ , where  $p$  is a constant, so TR is a straight line



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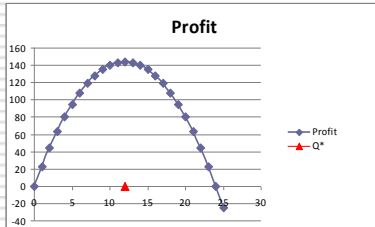
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## Profit Maximization

Perfectly Competitive Firm

$$\text{Profit} = \text{TR} - \text{TC}$$



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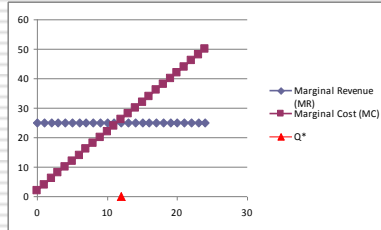
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# Profit Maximization

Perfectly Competitive Firm

Marginal Revenue (MR) = Marginal Cost (MC)  
Marginal Revenue is constant (horizontal line); Marginal Cost is increasing



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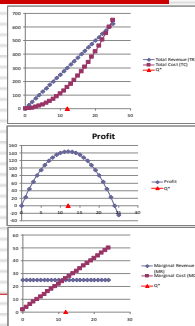
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# Profit Maximization

Perfectly Competitive Firm



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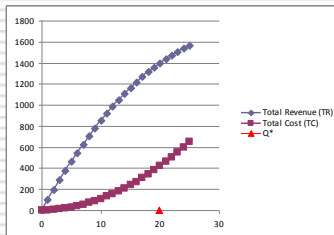
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# Profit Maximization

Market-Powerful (e.g., Monopolistically Competitive) Firm – see ue\_lecture\_4.xls

Total Revenue =  $pQ$ , where  $p$  depends on  $Q$  (the inverse demand curve), so TR is not a straight line



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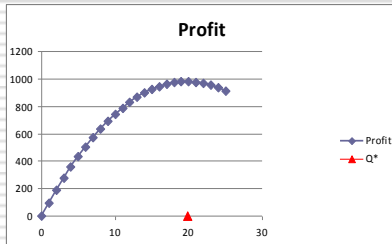
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# Profit Maximization

Market-Powerful (e.g., Monopolistically Competitive) Firm

$$\text{Profit} = \text{TR} - \text{TC}$$



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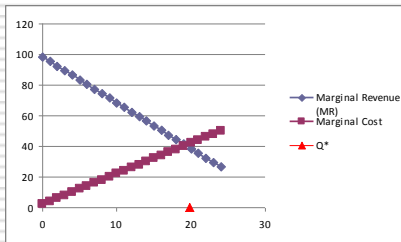
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# Profit Maximization

Market-Powerful (e.g., Monopolistically Competitive) Firm

Maximum Profit occurs where  $MR = MC$ ;  $MR$  is not constant



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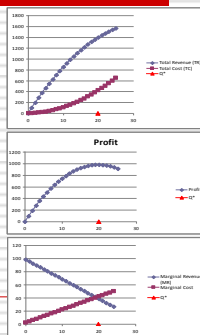
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# Profit Maximization

Market-Powerful (e.g., Monopolistically Competitive) Firm



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## Long-run Equilibrium of the Firm

Long-run is that period of time when two conditions\* are satisfied:

- All inputs are variable; in the short-run only *some* inputs are variable. This implies that in the long-run there is zero fixed cost.
- In the long-run entry has taken place; positive economic profits in the short-run are the signal for entry, so in the long-run there are zero economic profits (the Zero Profit Condition)

\* It is possible to conceptually distinguish these two conditions, so some people talk about the long-run as the period in which one or the other but not both conditions are satisfied.

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## Long-run Equilibrium of the Firm

continued

- Nature of "economic profits" as opposed to "accounting profits"
- How does *Zero Profit Condition* Work?

$$\text{Profit}(Q) = \text{TR}(Q) - \text{TC}(Q) = 0$$

basically,  $p$  in TR expression adjusts downward with entry until economic profits are reduced to zero

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## Firms that distribute output to customers at various locations

- Assumptions: input and production costs do not vary by location
- Customers located along straight line (see illustration)

A B C D E F G G'

- Firm must choose *one* location for production
- One delivery per trip

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## Principle of Median Location

- Transportation costs are minimized when the firm is located at the median location (ignoring G' this is D)

A B C D E F G G'

- Why does the principle of median location hold?\*

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## Lessons from the Principle of Median Location

- Location of the most distant customer does not alter the optimal location (if G moves to G')
- Median location is indeterminate if there are an *even* number of customers
- Principle of median location can be reconciled with One Input, One Market Model
- Principle of median location gives rationale for growth of cities

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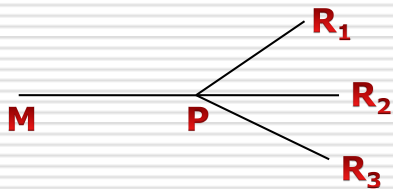
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## Port Cities



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## Other Factors in Location Decisions\*

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- Labor Costs
  - Other inputs: energy, capital, land
  - Intermediate inputs
  - The knowledge input
  - Taxes and public services
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## Agglomeration Economies

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- Agglomeration economies (traditional definition and categorization)
    - Economies of scale within the firm
    - Localization economies
    - Urbanization economies
    - Interindustry linkages
  - Rosenthal and Strange (2003)
    - Industry (continuum)
    - Geographic (distance)
    - Temporal
    - Organization (structure) of industry
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## Economies of Scale within the Firm

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- Average cost declines when output increases at a given location
  - What would an economy without scale economies be like?
  - Implications of extent of scale economies for size of cities
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## Localization Economies

- External to firm, related to size of local industry
- Definition of "industry"
- Specific to particular industries
- Shopping effects
- Economies of scale in the provision of inputs (labor, capital, services)

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## Urbanization Economies of Scale

- Shopping economies
  - Diversity of goods and services
- Provision of inputs not specific to an industry
  - Diversity of goods and services
  - Urban infrastructure
    - Transportation facilities
    - WiFi network?
    - Cultural and recreational amenities

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## Empirical Evidence

- Henderson (1986)
- Rosenthal & Strange (2001)
- Henderson (2003)

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## Static Theory of External Economies and Diseconomies

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- Distinction between private costs/benefits and social costs/benefits
  
  - Examples:
    - Pollution
    - congestion
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## Localization Economies

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- $TC = n(tc)$ , where  $n$  is the number of firms and  $tc$  is the total cost of each firm
  - $tc = q(ac)$ , where  $q$  is the output of each firm and  $ac$  is the average cost of each firm
  - $AC = TC/n = tc(n)/nq = tc/q = ac$
  - $\Delta TC = \Delta nq(ac) + \Delta ac(nq) + \Delta qn(ac)$
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## Localization Economies **continued**

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- $MC = (\Delta TC/\Delta n)/q$   
 $= q(ac)/q + (\Delta ac/\Delta n)(nq)/q$   
 $= AC + n(\Delta ac/\Delta n)$
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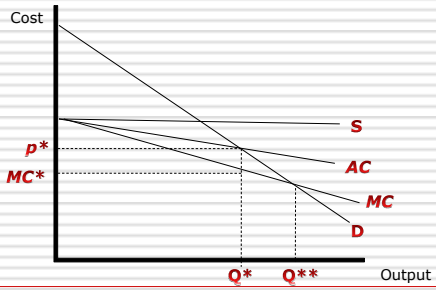
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## Localization Economies Figure 3.7



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## End of Lecture 4

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