

Monopoly

APEC 3001

Summer 2007

Readings: Chapter 12

Objectives

- Difference Between Monopoly & Perfect Competition
- Why Monopolies Exist
- How Monopolies Set Price & Quantity
- Profit Maximizing Rule For Monopoly Versus Perfect Competition
- Why Monopolies Are Inefficient
- Price Discriminating Monopolies & Efficiency
- Regulation of Monopoly

Monopoly

- Definition:
 - An industry structure in which a single seller of a product with no close substitutes serves the entire market.
- Monopolies set both price & quantity!
 - **MONOPOLIES HAVE NO SUPPLY CURVE!**

Monopoly Versus Perfect Competition

| Perfect Competition | Monopoly |
|--|---|
| Many Sellers | One Seller |
| Many Perfect Substitutes | No Close Substitutes |
| Price Determined By Market Not Individual Sellers (Face Perfectly Elastic Demand) | Price Determined By The Only Seller (Face Downward Sloping Demand) |

Why do monopolies exist?

- Exclusive Control Over Inputs
- Economies of Scale
- Patents
- Network Economies
- Government Licenses Or Franchises

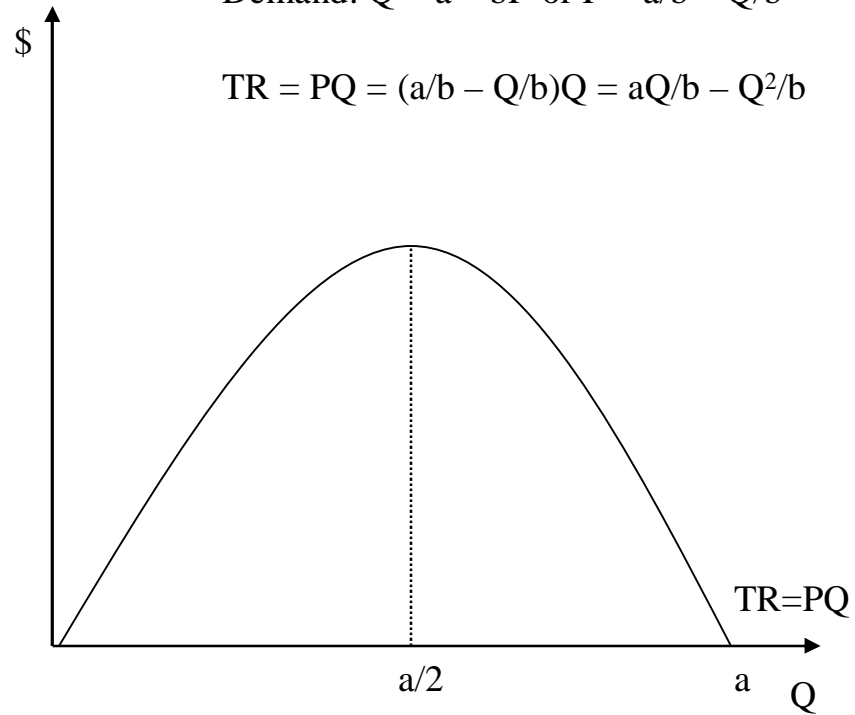
How do monopolies set price & quantity?

- Assume Profit Maximization
- Profit Equals Total Revenue Minus Total Costs: $\Pi = TR - TC$
- Total Costs Are Just Like the Competitive Firm
- Total Revenue is Different From Competitive Firm
 - If a monopoly increases its price, the quantity it can sell will fall.
 - $TR = P(Q)Q$

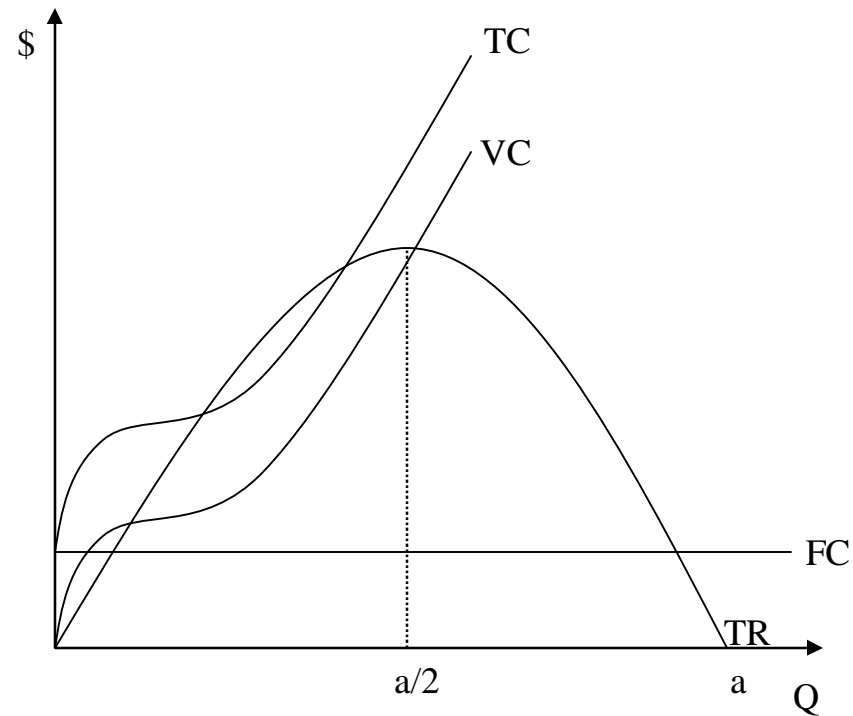
Total Revenue When Demand Is Linear

Demand: $Q = a - bP$ or $P = a/b - Q/b$

$TR = PQ = (a/b - Q/b)Q = aQ/b - Q^2/b$



Total Revenue, Variable Cost, & Total Cost

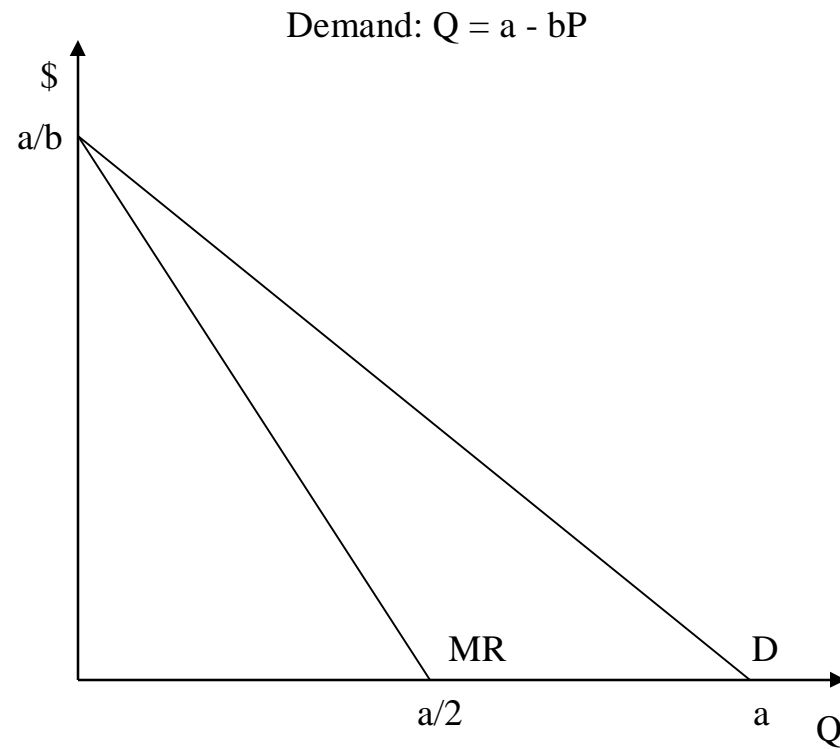


**Need to find the quantity
where $TR - TC$ is largest!**

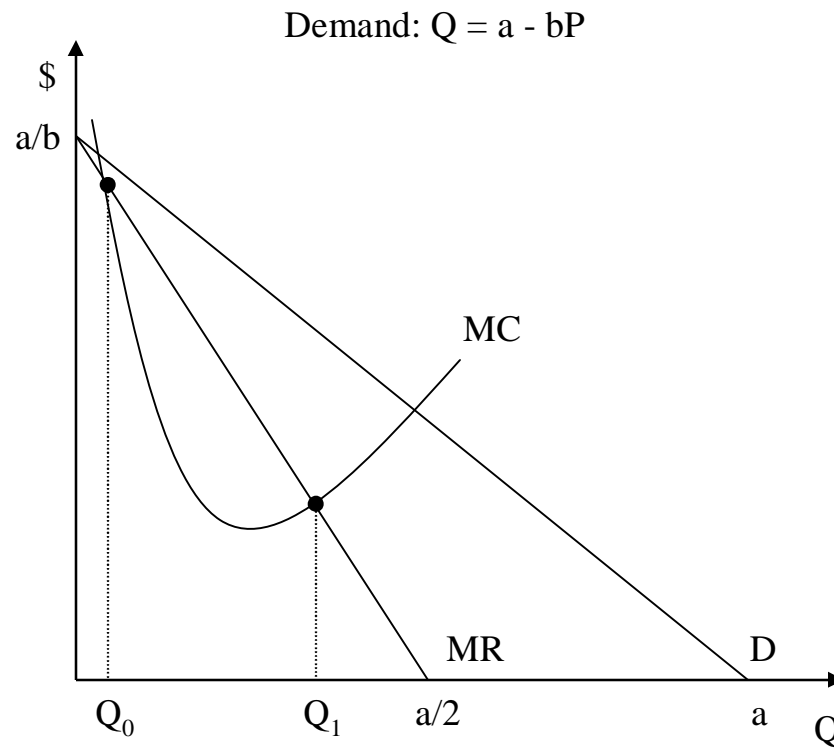
Where is $TR - TC$ largest?

- First derivative tells us where we are at a minimum or maximum:
 - $\Pi' = TR' - TC' = 0 \Rightarrow TR' = TC'$
 - Recall TR' is marginal revenue (MR)
 - Recall TC' is marginal costs (MC)
 - Therefore, $MR = MC$ for a minimum or maximum.
 - This looks suspiciously similar to perfect competition, so what is the difference?
 - For perfect competition, $TR = P_0Q$, such that $TR' = MR = P_0$.
 - For monopoly, $TR = P(Q)Q$, such that $TR' = MR = P'(Q)Q + P$
 - Example with linear demand $Q = a - bP$:
 - $P = a/b - Q/b$
 - $TR = (a/b - Q/b)Q = aQ/b - Q^2/b$
 - $TR' = MR = a/b - 2Q/b$
 - » Equation of a line.
 - » $MR = a/b$, when $Q = 0$.
 - » $MR = 0$, when $Q = a/2$.

Linear Demand & Marginal Revenue



Marginal Revenue & Marginal Cost

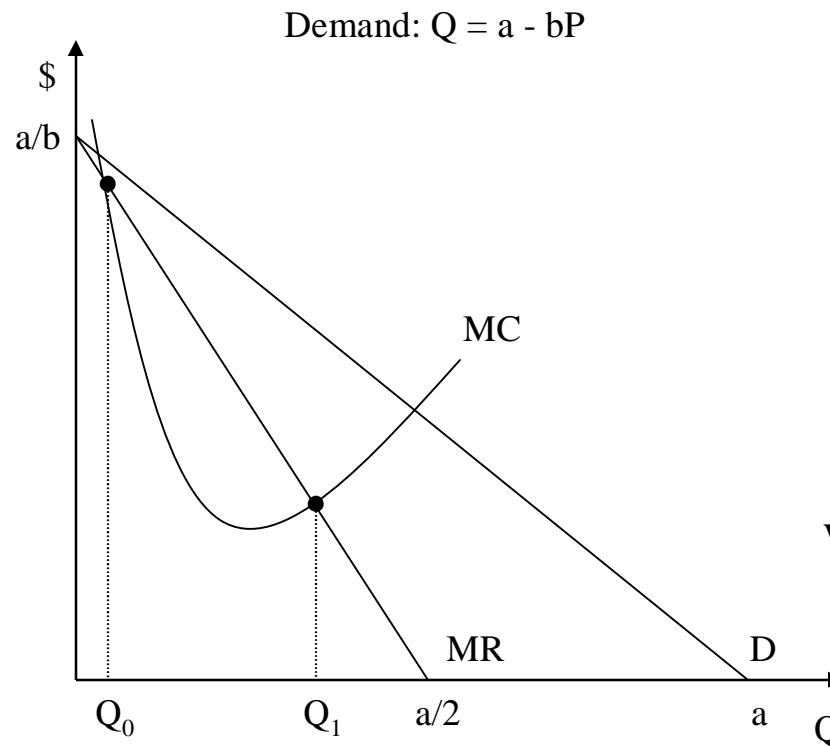


**How can we choose
between Q_0 & Q_1 ?**

Choosing the Right Output When $MR = MC$

- Setting the first derivative of Π equal to 0 tells us we want $MR = MC$.
 - But $MR = MC$ for a minimum as well as a maximum.
- Recall that the second derivative can help us distinguish between a minimum & maximum.
 - $\Pi'' = TR'' - TC'' < 0$, for a maximum!
 - $\Pi'' = TR'' - TC'' > 0$, for a minimum!
 - Note that $TR'' = MR'$ & $TC'' = MC'$
 - Therefore, we need $MC' > MR'$ for a maximum.
 - But what does this mean?

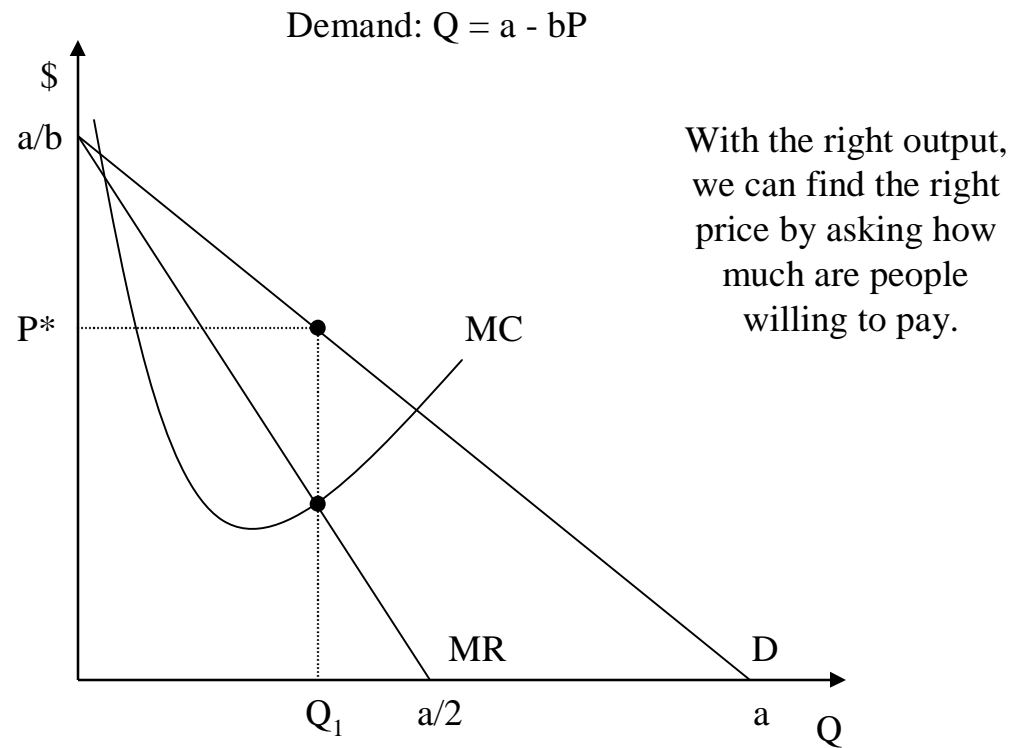
Choosing the Right Output When $MC = MR$



For Q_0 , $MC = MR$,
 $MC' < 0$, & $MR' < 0$,
but $MC' < MR'$.
We have a minimum,
not maximum!

For Q_1 , $MC = MR$,
 $MC' > 0$, & $MR' < 0$,
so $MC' > MR'$.
We have a maximum!

Choosing the Right Price with the Right Output

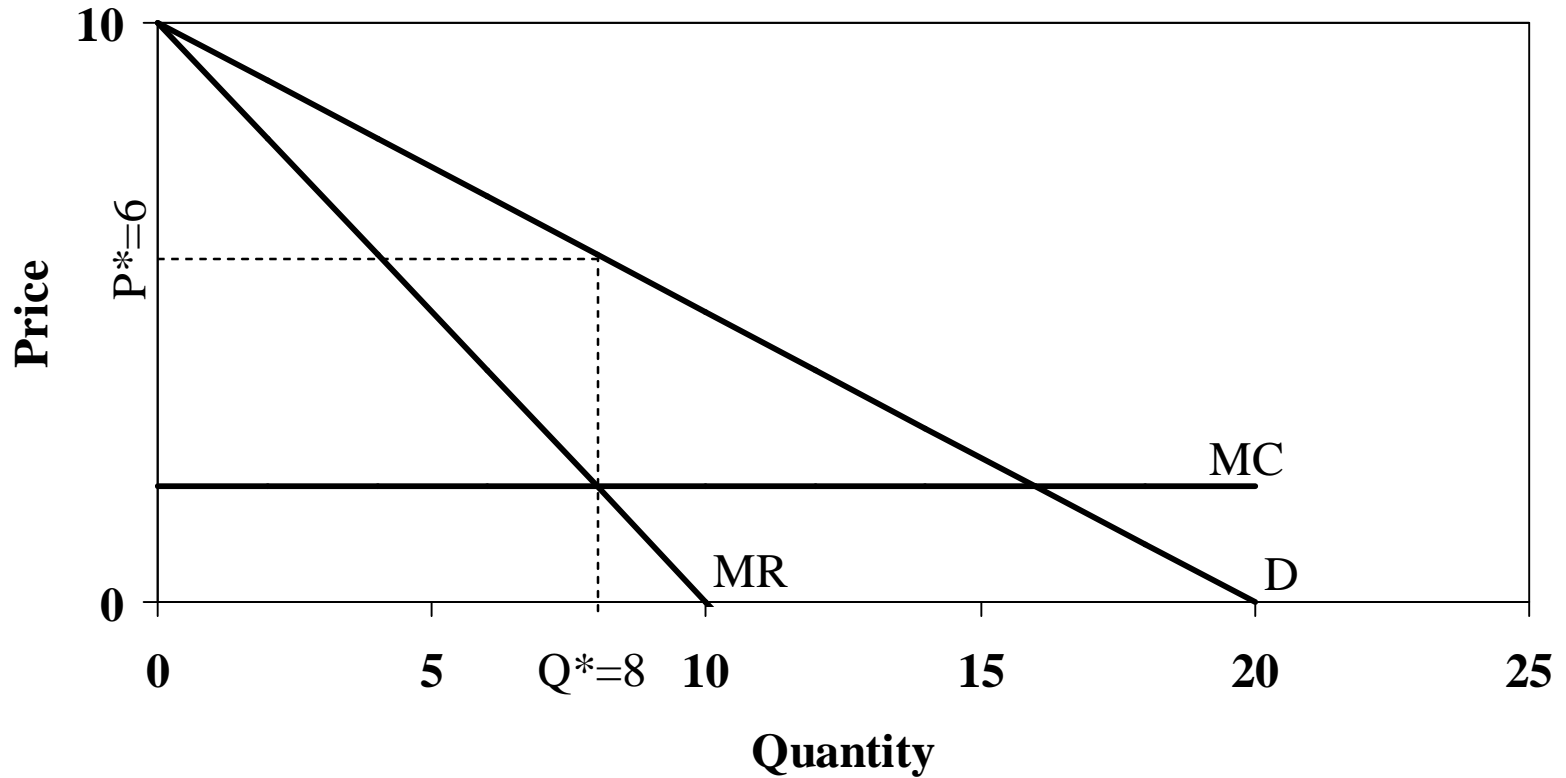


Choosing the Right Price with the Right Output

Example

- Two Conditions
 - $MC = MR$
 - $MC' > MR'$
- Example: Suppose $Q = 20 - 2P$ & $MC = 2$
 - $P(Q) = 10 - 0.5Q$
 - $TR = P(Q)Q = (10 - 0.5Q)Q = 10Q - 0.5Q^2$
 - $TR' = MR = 10 - Q$
 - For the first condition: $MC = MR \Rightarrow 2 = 10 - Q^* \Rightarrow Q^* = 8$
 - For the second condition: $MC' = 0$, so $MC' = 0 > MR' = -1$
 - $P^* = 10 - 0.5Q^* = 10 - 0.5 \times 8 = 6$

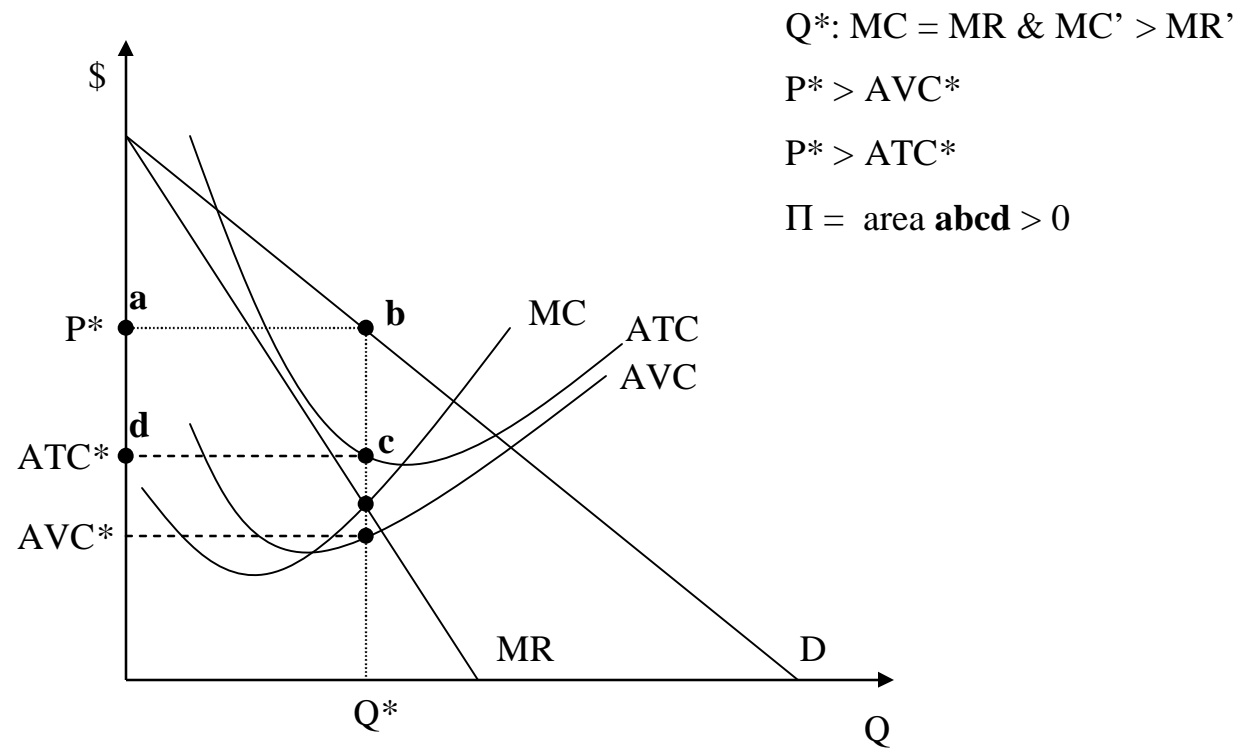
Graphical Example of the Monopoly Solution When
 $Q = 20 - 2P$ and $MC = 2$



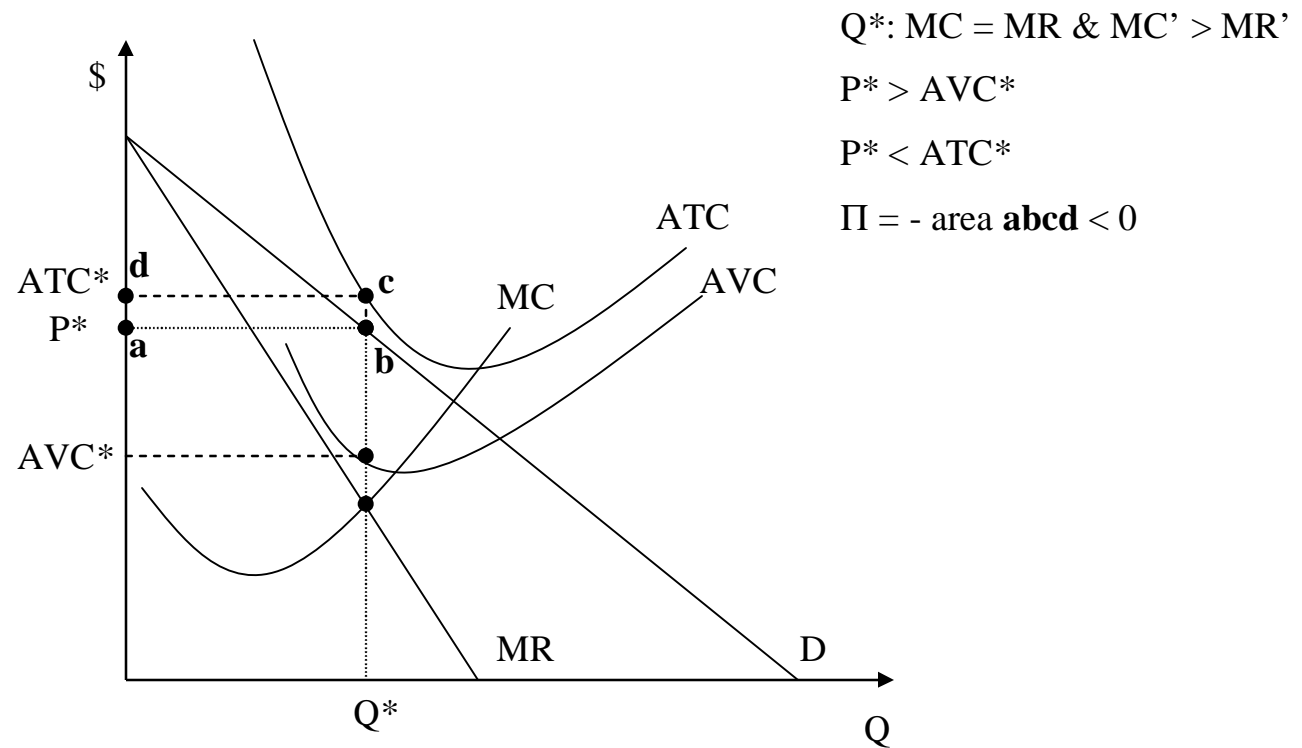
But Will Producing Nothing Ever Be Optimal

- In the short run, producing nothing implies $\Pi = -FC$
- In the short run, producing something implies $\Pi = TR - VC - FC$
- Therefore, we should produce something if
 - $MC = MR$
 - $MC' > MR'$
 - $TR - VC - FC > -FC \Rightarrow TR > VC$ or $AR = P^* > AVC$

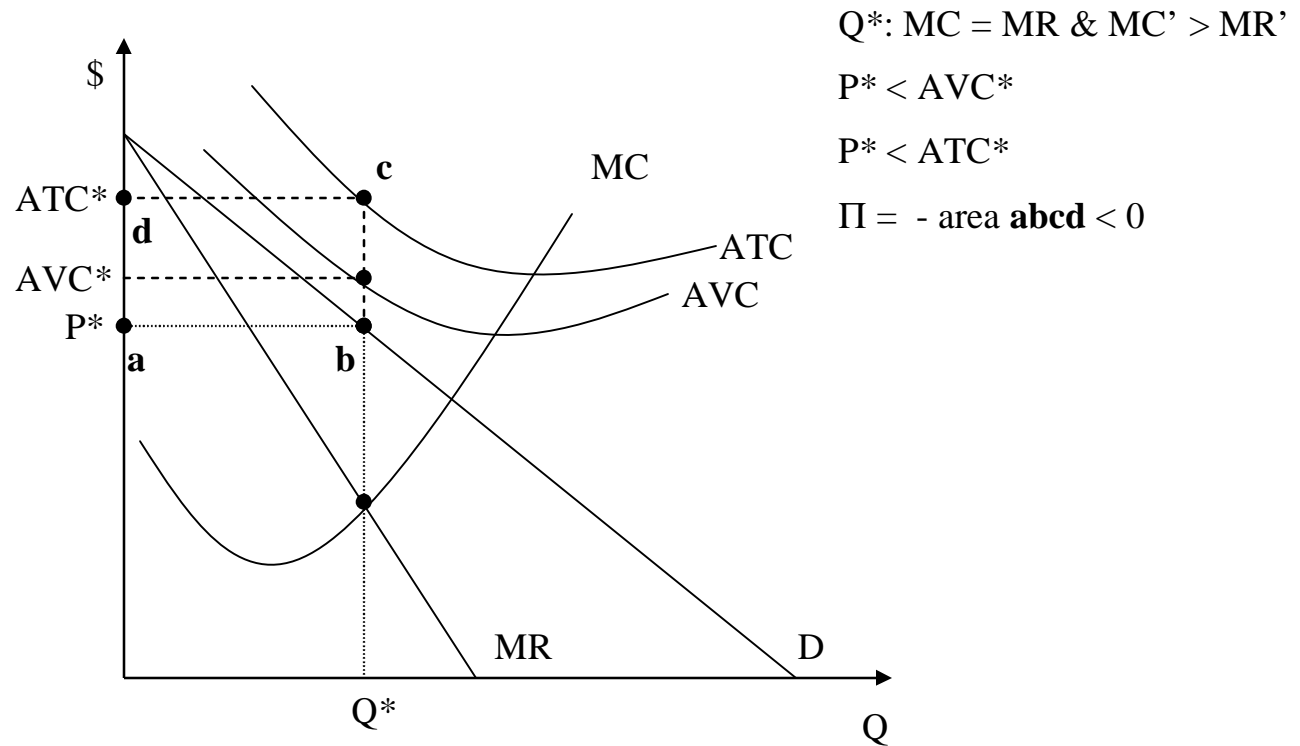
Example of Monopoly With Short Run Profit



Example of Monopoly With Short Run Losses



Example of When a Monopoly Should Shut Down in the Short Run



What changes in the long run?

- Three Conditions
 - $LMC = MR$
 - $LMC' > MR'$
 - $P^* > LAC$
- Same as the short run, except we use long run costs instead of short costs!

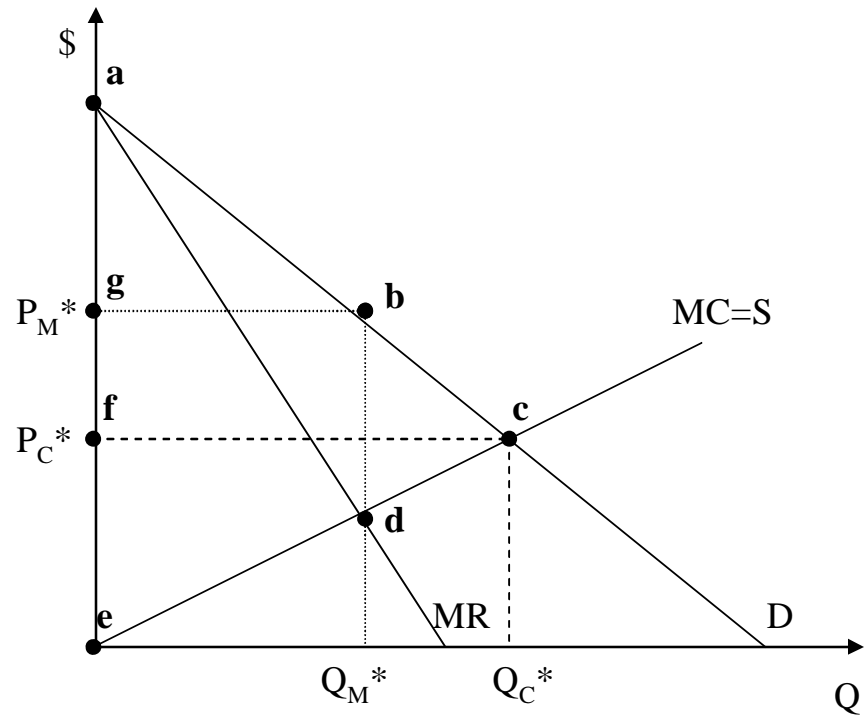
Insightful Relationship

- $MR = P'(Q)Q + P(Q) = P(Q) (1 + P'(Q)Q/P(Q)) = P(Q)(1 + \eta^{-1})$
 - $MC = P(Q)(1 + \eta^{-1}) < P(Q)$
 - Monopoly produces where price exceeds marginal cost!
 - Recall that perfect competitors produce where price equals marginal costs.
 - For an inelastic demand $0 > \eta > -1$, so $\eta^{-1} < -1$ or $MR < 0$.
- Implications:
 - The difference in the monopoly & competitive price will be higher when the elasticity of demand is higher!
 - A monopoly will never produce where demand is inelastic!

Inefficiency of Monopoly

| | <u>Perfect Competition</u> | | <u>Monopoly</u> |
|------------------|----------------------------|---|------------------|
| Price | P_C^* | | P_M^* |
| Quantity | Q_C^* | | Q_M^* |
| Consumer Surplus | area acf | > | area abg |
| Producer Surplus | area cef | < | area bdeg |
| Total Surplus | area ace | > | area abde |

Surplus Lost Due To Monopoly = area **bcd**



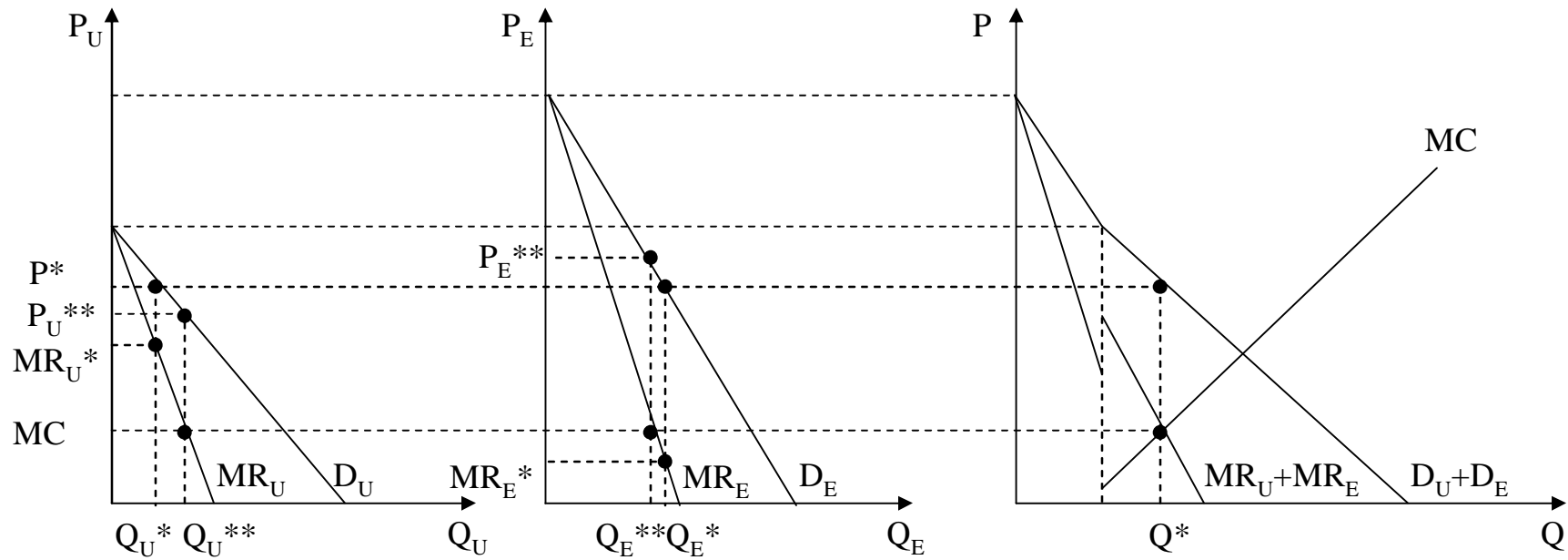
Price Discrimination

Definitions

- Price Discrimination:
 - The practice of charging different buyers different prices for the same product.
- Perfect (First-Degree) Price Discrimination:
 - Price discrimination where the price a buyer pays equals its willingness to pay.
- Arbitrage:
 - The purchase of a product for costless and risk-free resale at a higher price.

Price discrimination cannot exist if arbitrage is possible!

Price Discrimination Between U.S. (U) and European (E) Markets



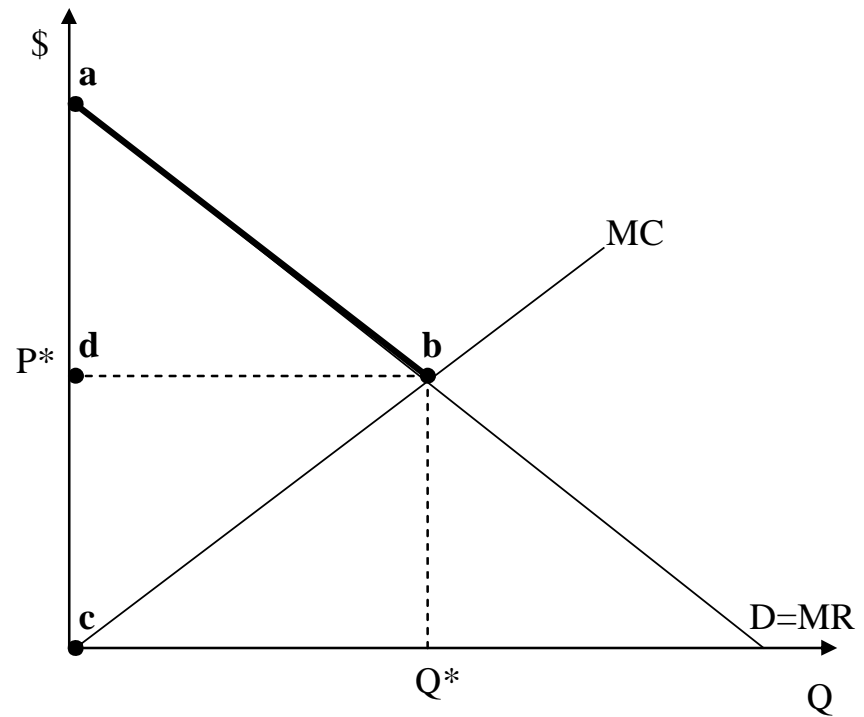
Note: $Q_U^* + Q_E^* = Q^*$

$Q_U^{**} + Q_E^{**} = Q^*$

Perfect (First-Degree) Price Discrimination, Efficiency, and Equity

| | <u>Perfect Competition</u> | <u>Monopoly</u> |
|------------------|----------------------------|-----------------|
| Price | P^* | Varies = D |
| Quantity | Q^* | Q^* |
| Consumer Surplus | area abd > | 0 |
| Producer Surplus | area bcd < | area abc |
| Total Surplus | area abc = | area abc |

Surplus Lost Due To
Monopoly = 0



Price Discrimination

- Price discrimination allows monopolies to charge higher prices to buyers who are willing to pay more.
 - Good: Increases Efficiency
 - Bad: Distribution of Market Benefits More to Producers

What can we do about the bad associated with monopoly?

- Regulate
 - Impose Price Caps
 - Restrict Profits
- State Ownership
 - Public Transit Systems
 - Public Utilities
- Meet Market Power with Market Power
 - Monopsony: Single buyer of a product.
- Prohibit Monopoly Behavior
 - Sherman Act 1890 & Clayton Act 1914
 - 1982 Break Up of AT&T
 - 1998 US versus Microsoft Lawsuit

What You Should Know

- Difference Between Monopoly & Perfect Competition
- Why Monopolies Exist
- How Monopolies Set Price & Quantity
- Profit Maximizing Rule For Monopoly
- Why Monopolies Are Inefficient
- How Monopoly Pricing & Output Differs From Perfect Competition
- Price Discriminating Monopolies & How Price Discrimination Affects Efficiency
- Ways to Curb Monopoly Power