MANCHESTER 1824

The University of Manchester

2.2 Fundamentals of Markets

Important Acknowledgement:

These notes on Kirschen/Strbac (Chapter 2.2, 2004) are based on slides prepared by Daniel Kirschen (U Manchester) with edits by Leigh Tesfatsion (Iowa State U).

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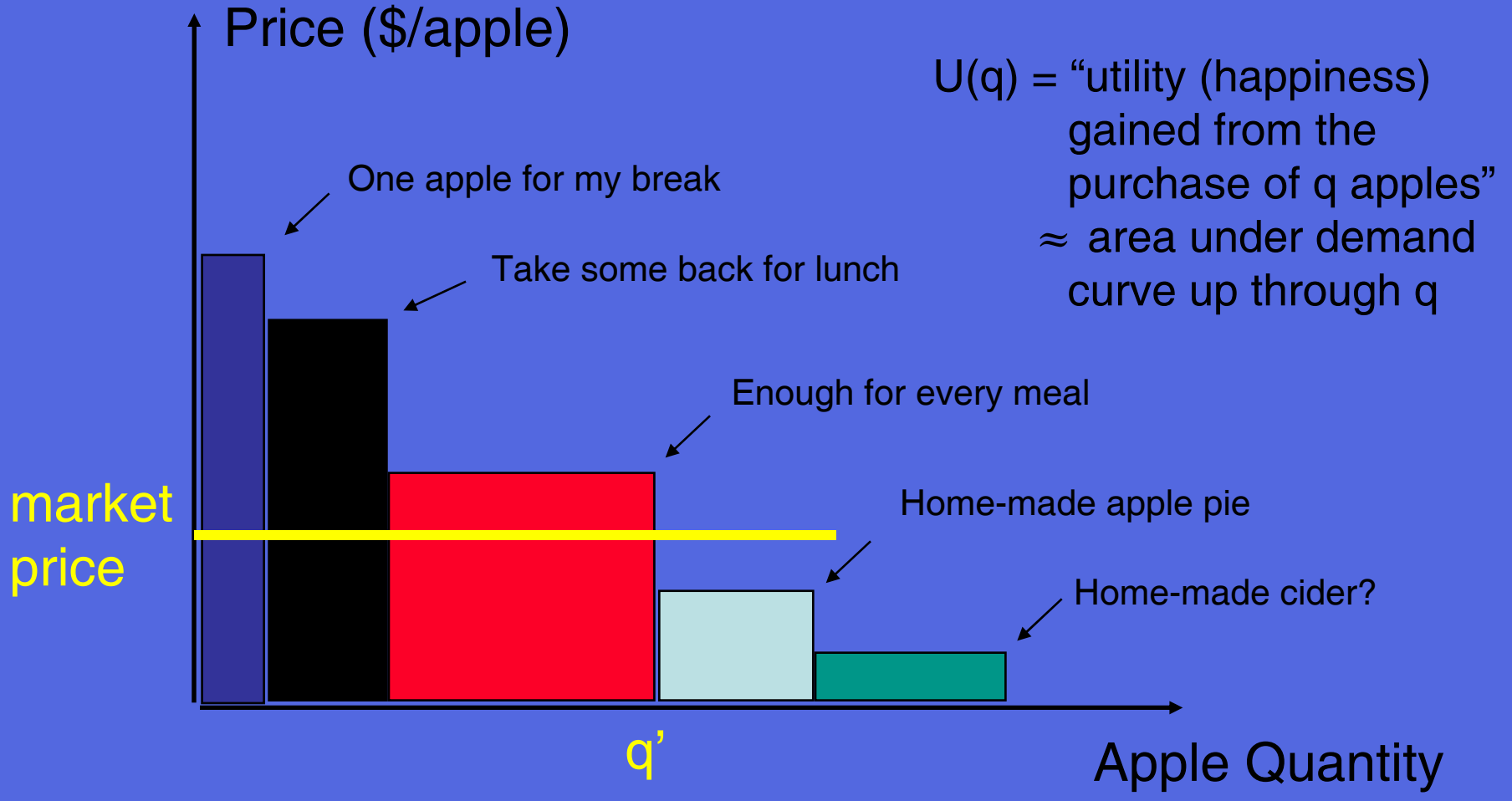
Why markets…

- Opportunity for sellers and buyers to:
  - compare prices
  - make supply offers
  - make demand bids
- Achieve an equilibrium between supply and demand

Example: How does a consumer of apples decide on reservation prices for his apple purchases?

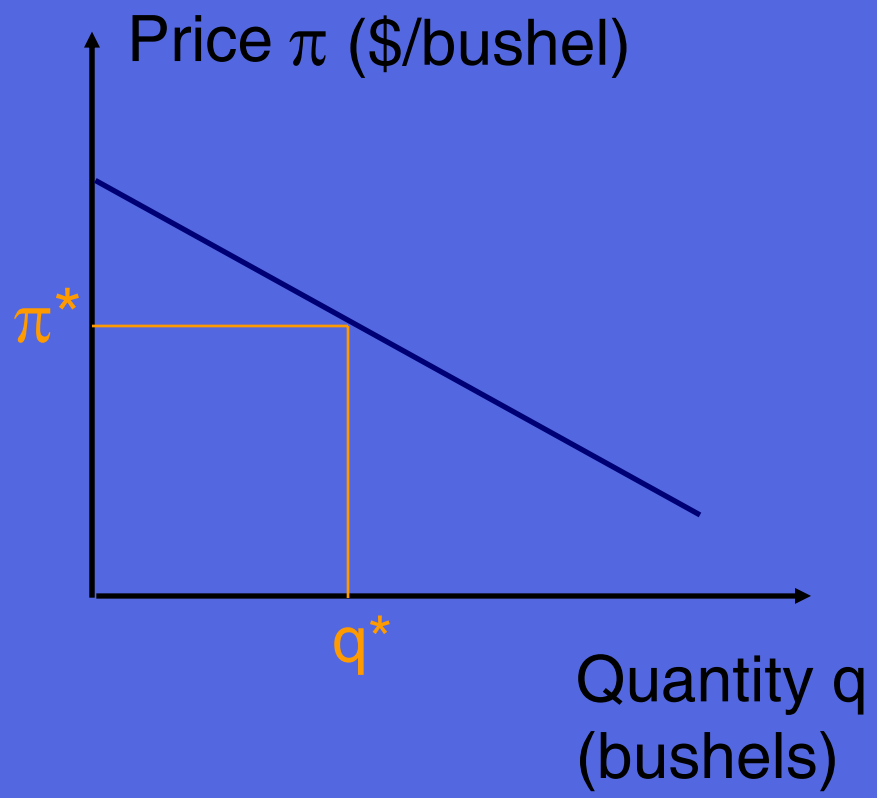


U(q) = "utility (happiness) gained from the purchase of q apples" ≈ area under demand curve up through q

A competitive (price-taking) utility-maximizing consumer purchases apples until the point q' where the market price exceeds his reservation price.

Total Market Demand Schedule:

Example below for “infinitesimal” (continuous) units



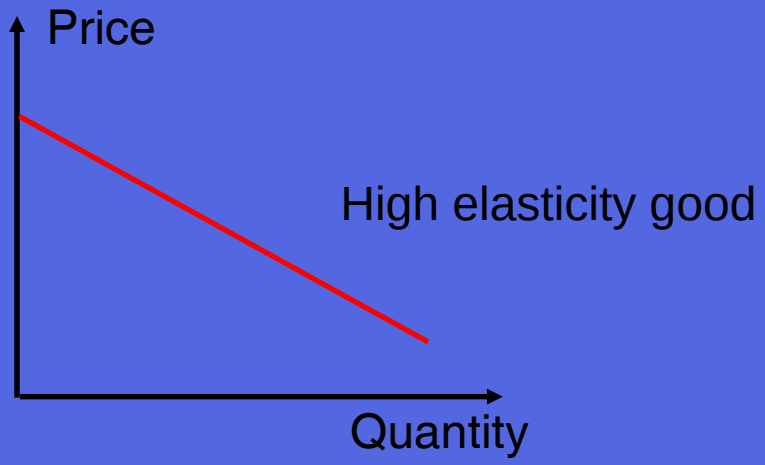
- Aggregation of the individual demands of all buyers
- Demand Schedule:

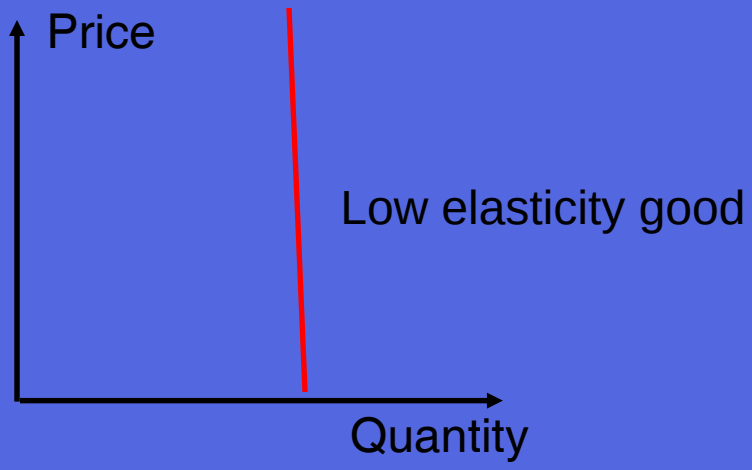
$$q = D(\pi)$$

- Inverse Demand Schedule:

$$\pi = D^{-1}(q)$$

Price Elasticity of Demand:





- Slope of demand schedule indicates the "price elasticity of demand," i.e., the % change in quantity demanded per % change in price
- **High elasticity (flat slope)**
  - Non-essential good
  - Easy substitution by other goods
- **Low elasticity (steep slope)**
  - Essential good
  - No substitutes
- **Demand for electrical power in U.S. currently has very low elasticity in the short run !**

Price Elasticity of Demand:

- Mathematical definition for “differentiable” demand:

  π = price, q = quantity demanded

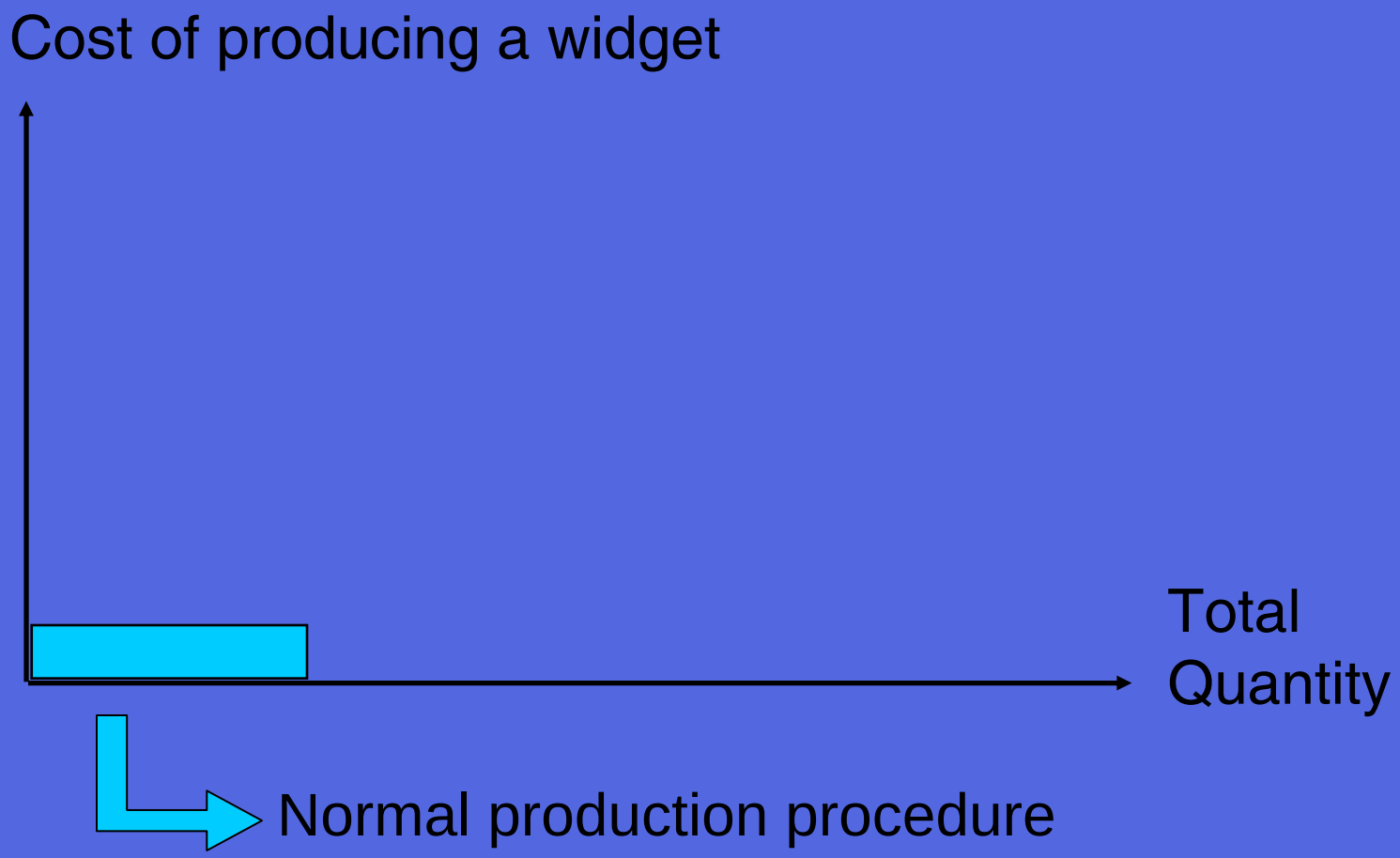
$$\varepsilon = \frac{\frac{dq}{q}}{\frac{d\pi}{\pi}} = \frac{\pi}{q} \cdot \frac{dq}{d\pi} = \frac{\%\text{ change in q}}{\%\text{ change in } \pi}$$

- Dimensionless quantity

Supply Side Example:
A Competitive (Price-Taking) Producer

- How many widgets shall I produce today?
  - **Goal:** Maximize my ***net revenue on all widgets sold*** (revenue minus avoidable costs)
  - Assuming positive production level, produce one more widget if and only if my sale price π is at least as great as my ***marginal cost MC*** (i.e., my cost of producing this next widget): $\pi \geq MC$
  - Need to know my cost of producing the next widget
- More generally, need to consider ***avoidable costs VC*** (i.e., costs that can be avoided by not producing anything and by possibly taking suitable additional actions)
- Ignore ***sunk costs SC*** (i.e., costs that cannot be avoided)
  - Example of SC: Investment in specialized production equipment with no resale value

How much does the next widget cost?



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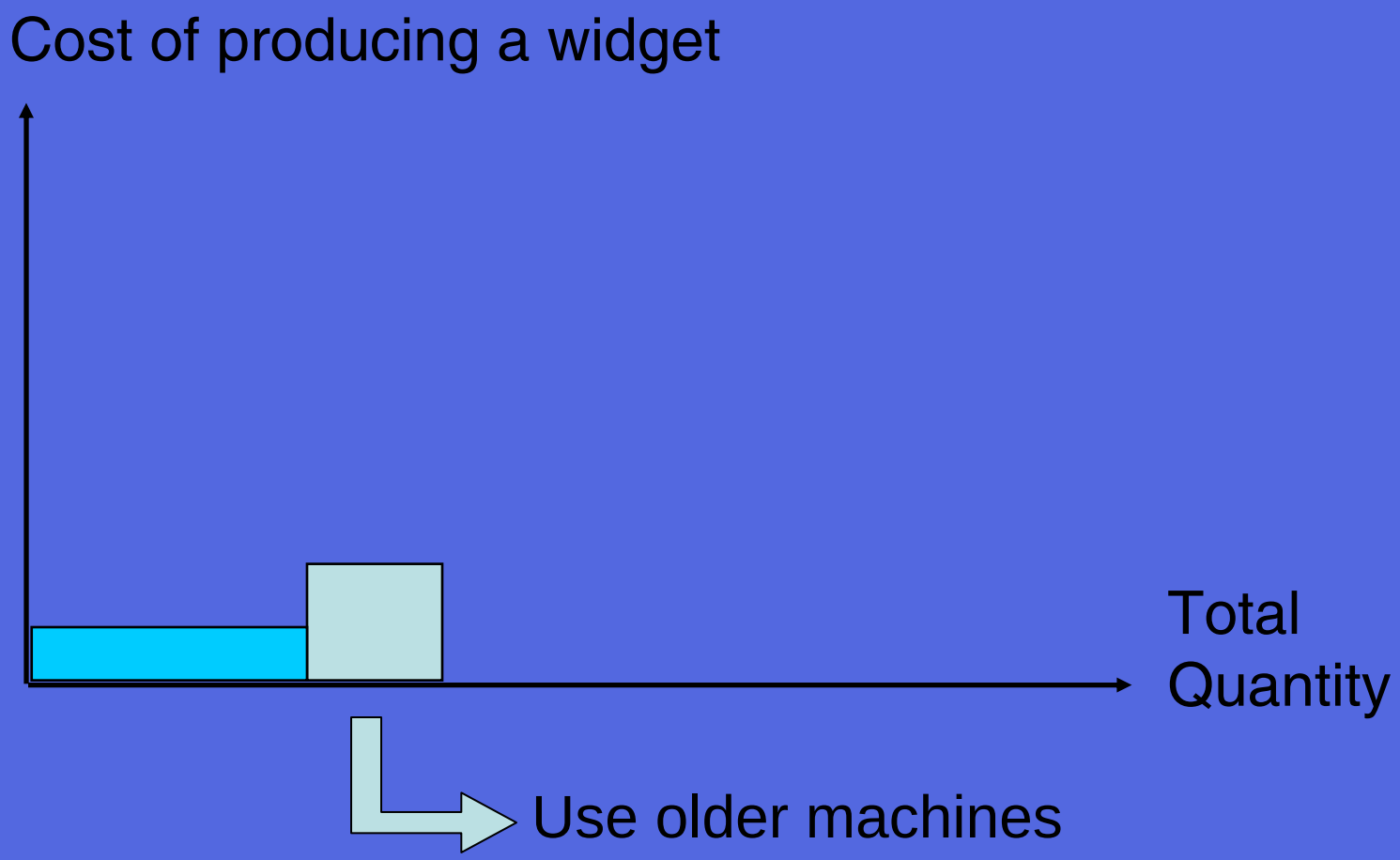

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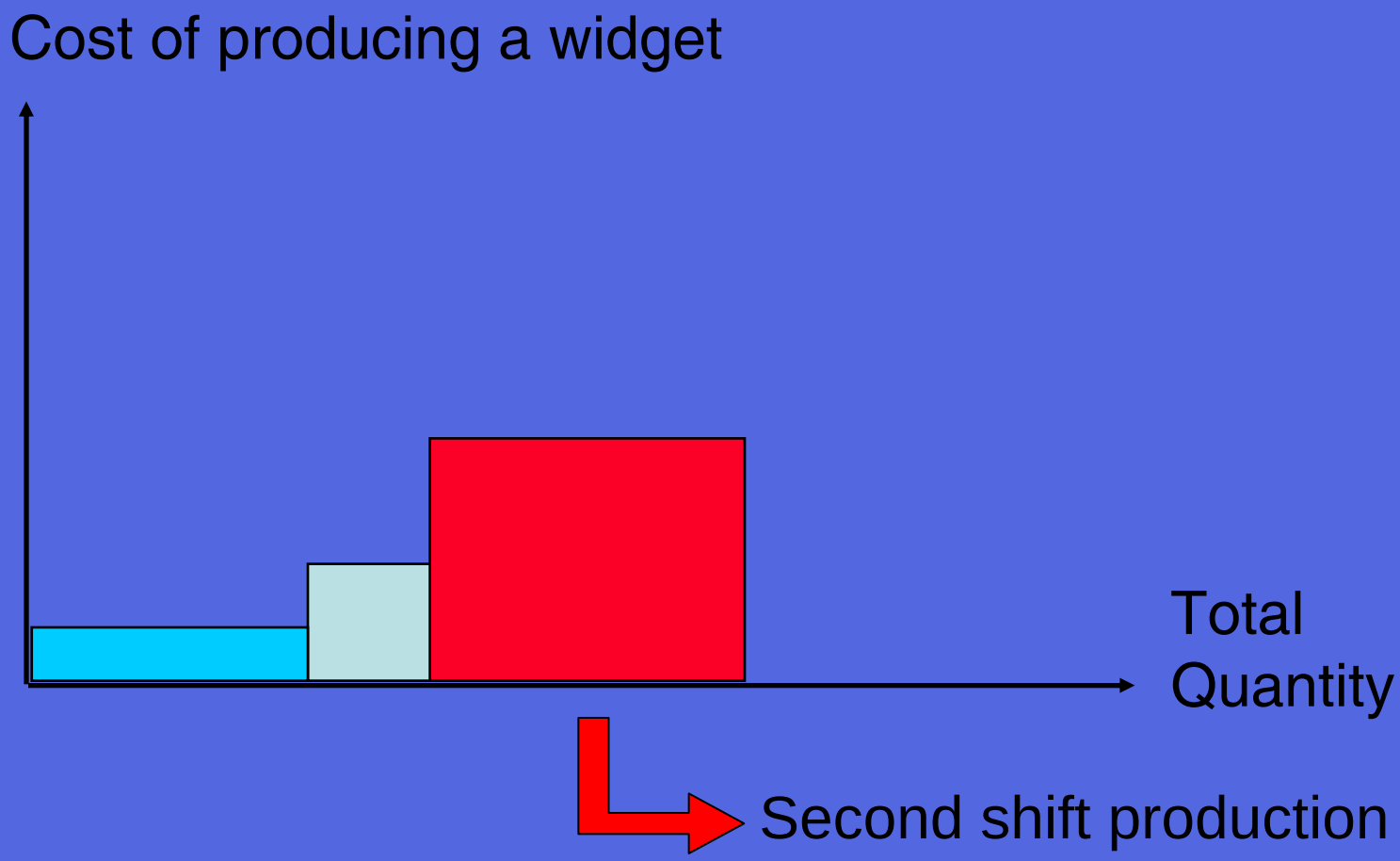

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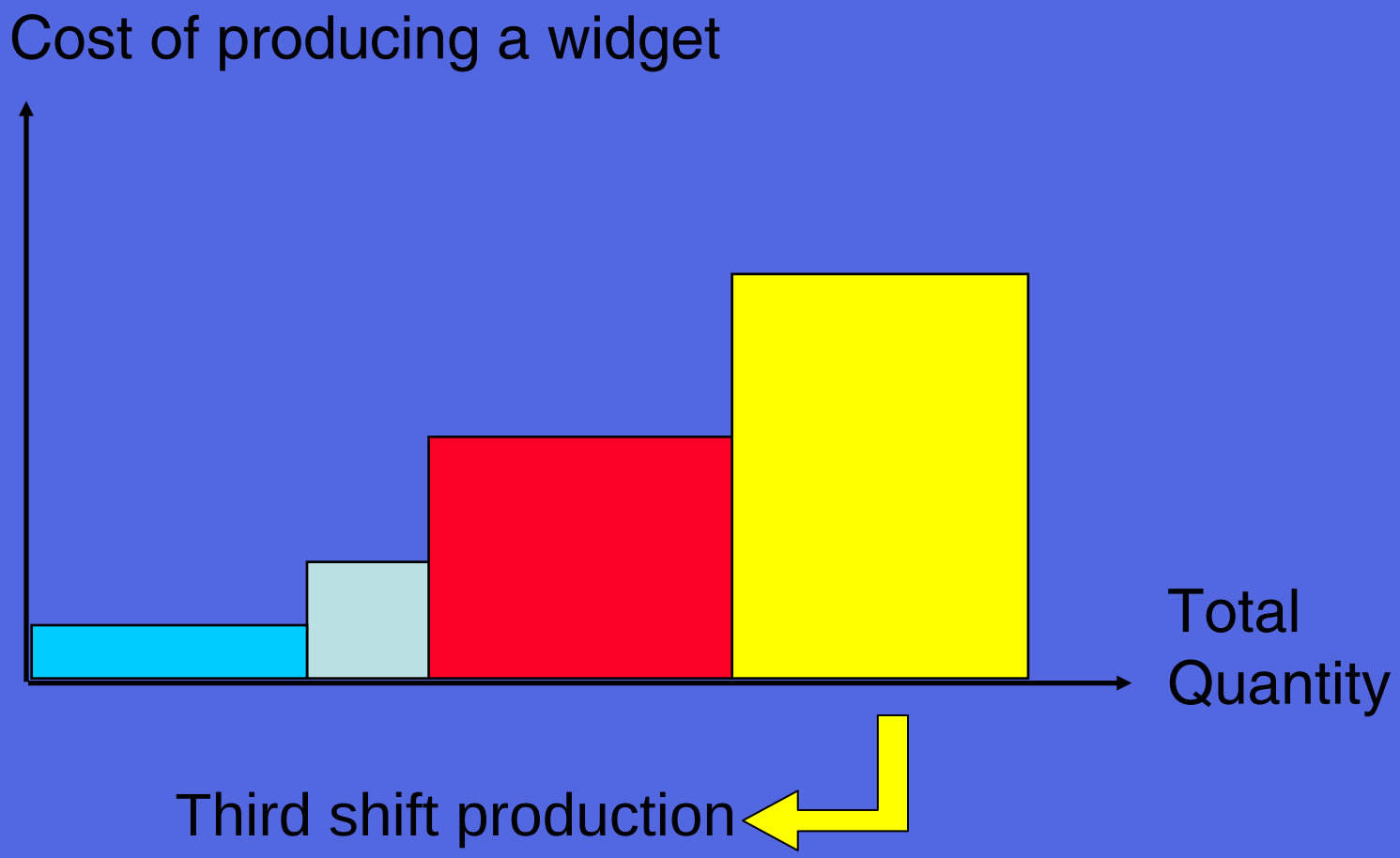

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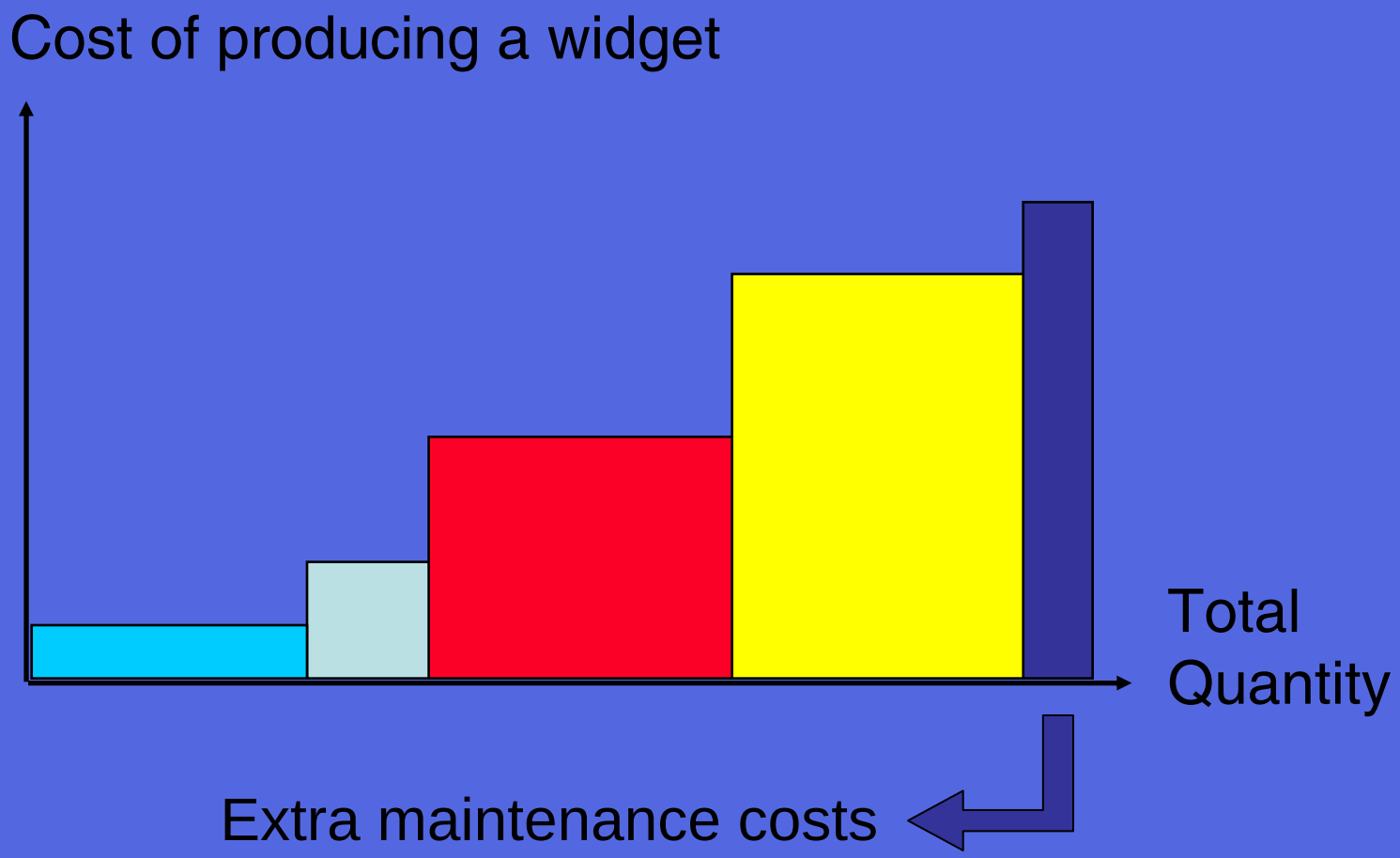
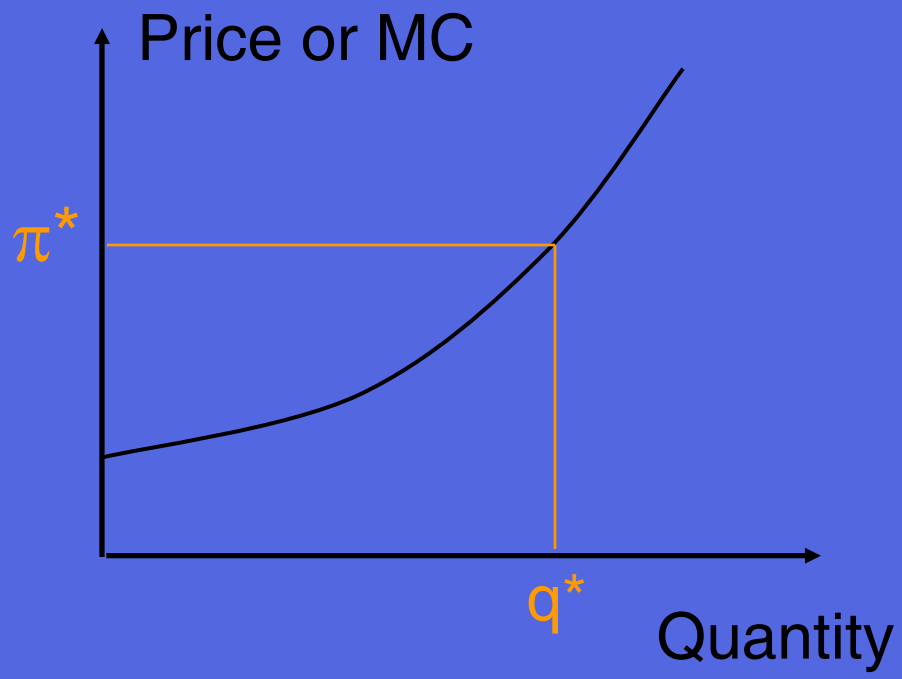


Economists assume a competitive producer's supply schedule coincides with his MC function



- Considers only avoidable costs
- Does not take sunk costs into account
- Supply schedule:

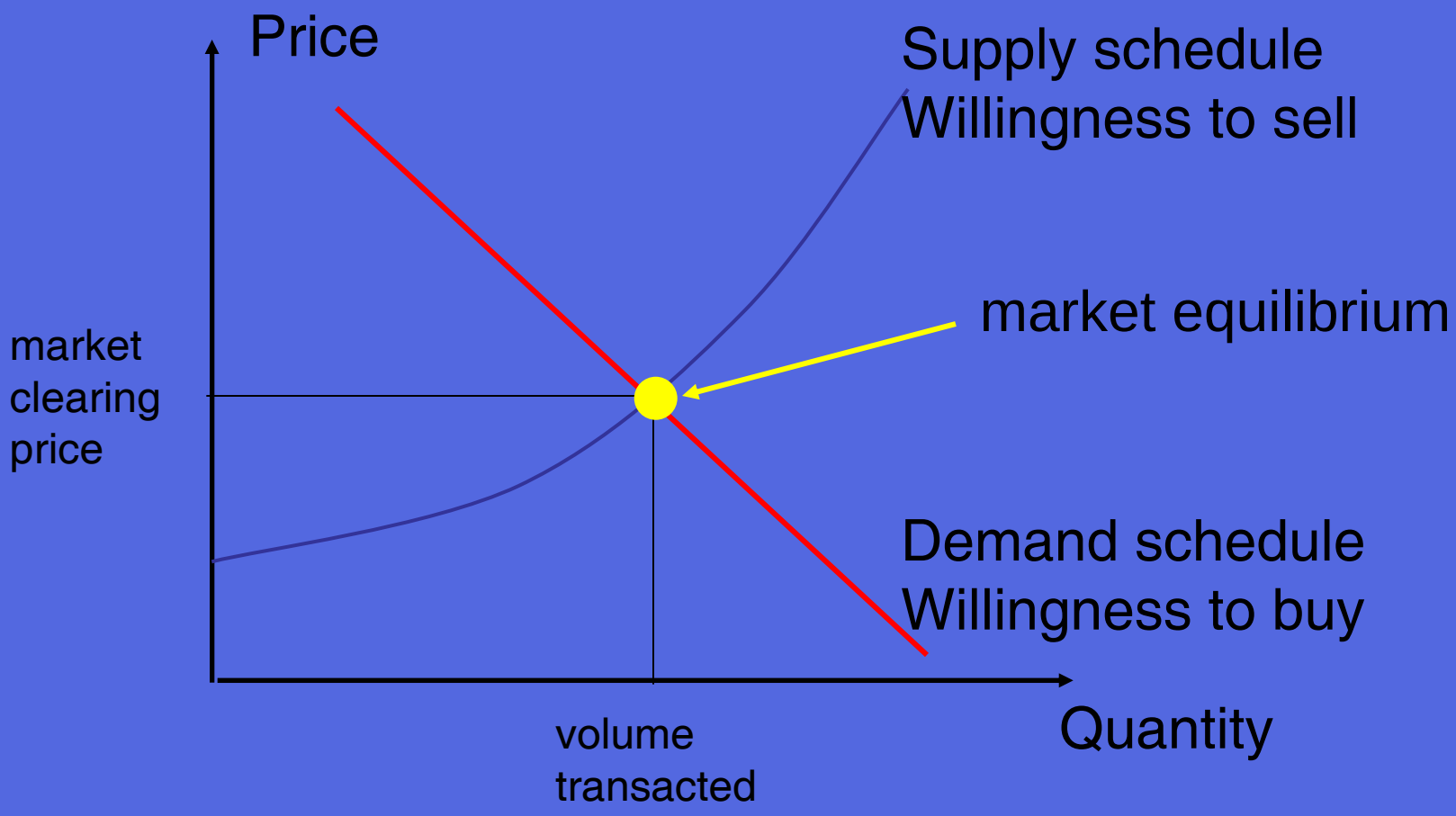
$$\pi = S^{-1}(q)$$

- Inverse supply schedule:

$$q = S(\pi)$$

- Total supply schedule for a competitive market is formed from aggregation of individual producers' supply schedules

Market Equilibrium (S=D):



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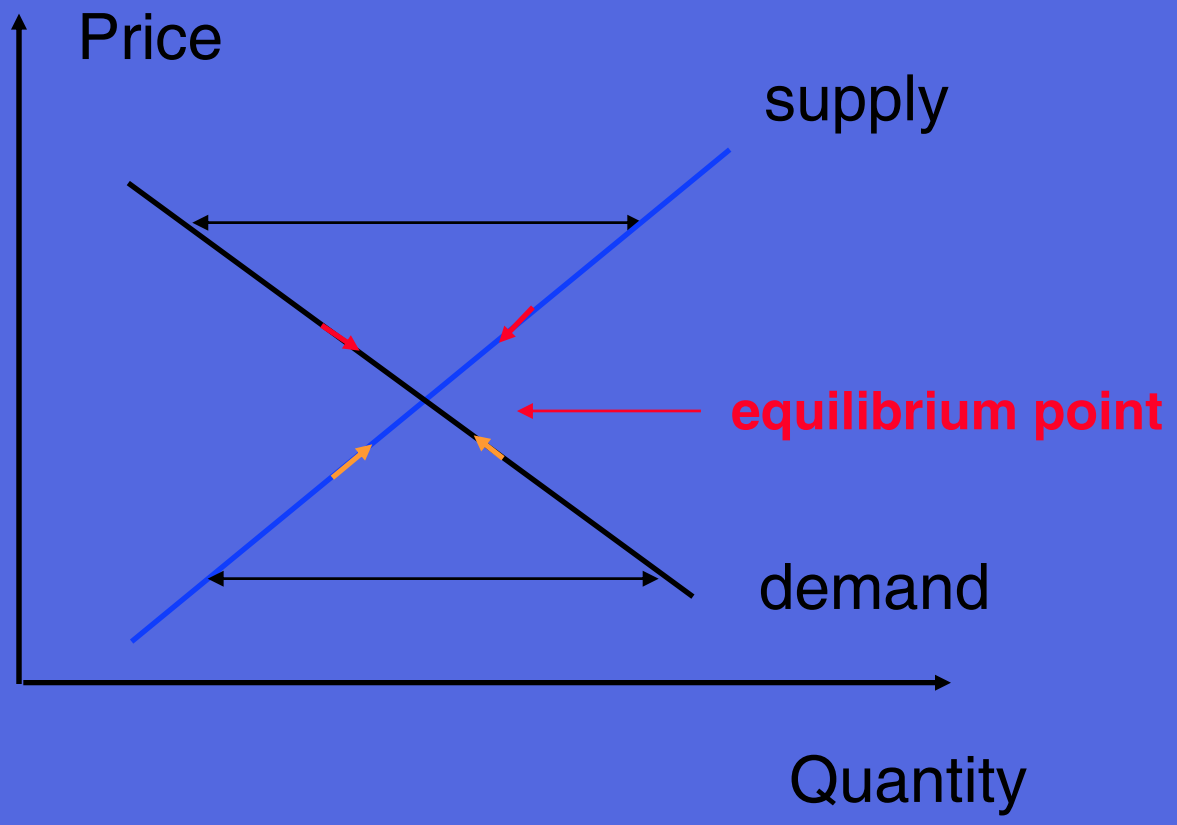

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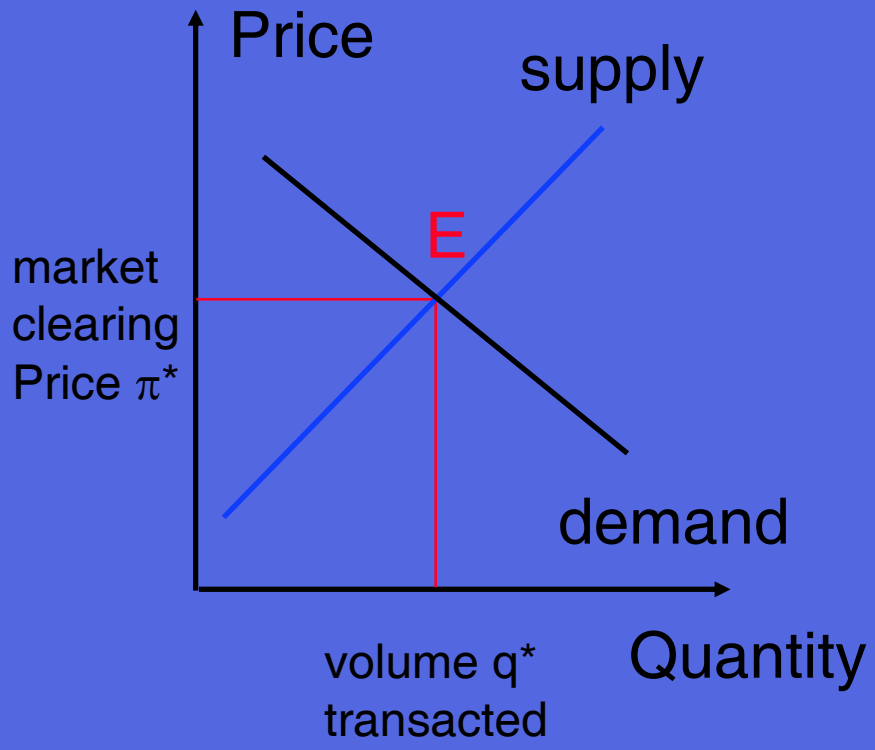


$$q^* = D(\pi^*) = S(\pi^*)$$

$$\pi^* = D^{-1}(q^*) = S^{-1}(q^*)$$

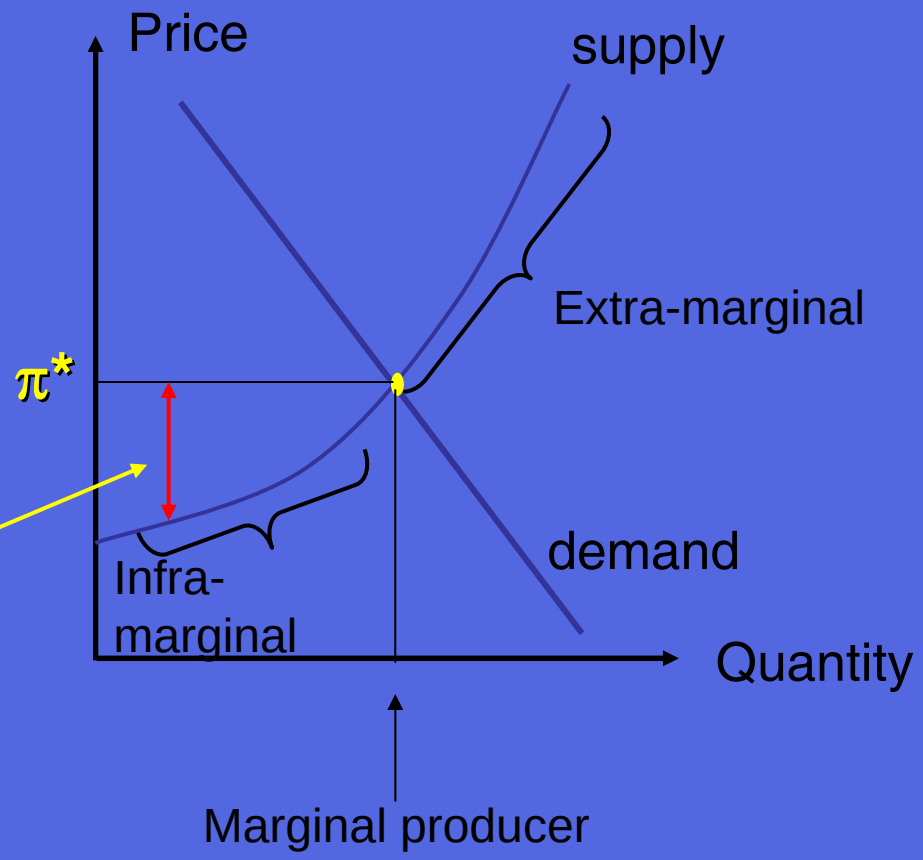
- At E, price-taking sellers have no incentive to change their quantity supplies
- At E, price-taking buyers have no incentive to change their quantity demands

Uniform-Price Double Auction:

- Sellers submit supply offers: quantity and price
  - Offers are stacked in *ascending* order (by price) to construct Total Supply Schedule S
- Buyers submit demand bids: quantity and price
  - Bids are stacked in *descending* order (by price) to construct Total Demand Schedule D
- Any intersection point is an S=D market equilibrium (CMC point):
  - Market clearing price
  - Market clearing quantity

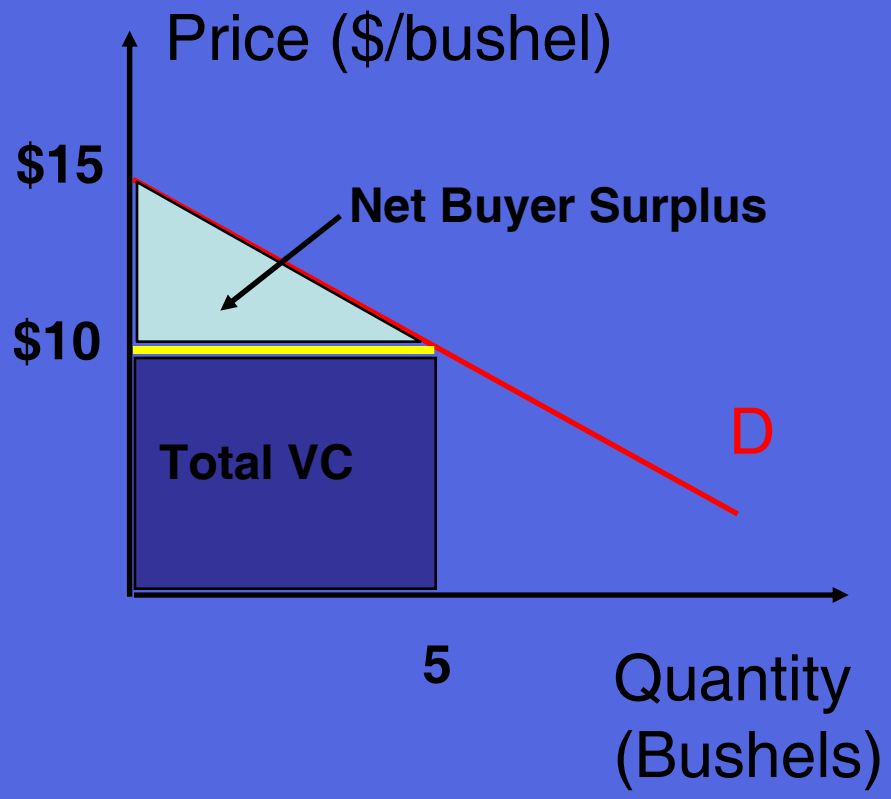
Uniform-Price Double Auction:

- Every quantity unit sells at the market clearing price π^*
- Market price set by “last” unit sold
- ***Marginal producer:***
  - Sells this last unit
  - Gets exactly its offer price
- ***Infra-marginal producers:***
  - Collect positive net revenues
  - Get paid more than their offer
- ***Extra-marginal producers:***
  - Sell nothing

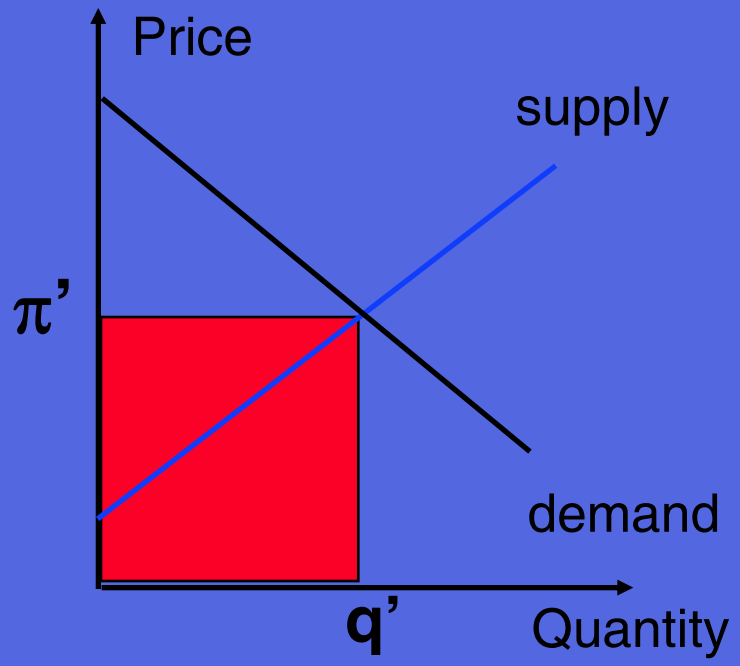


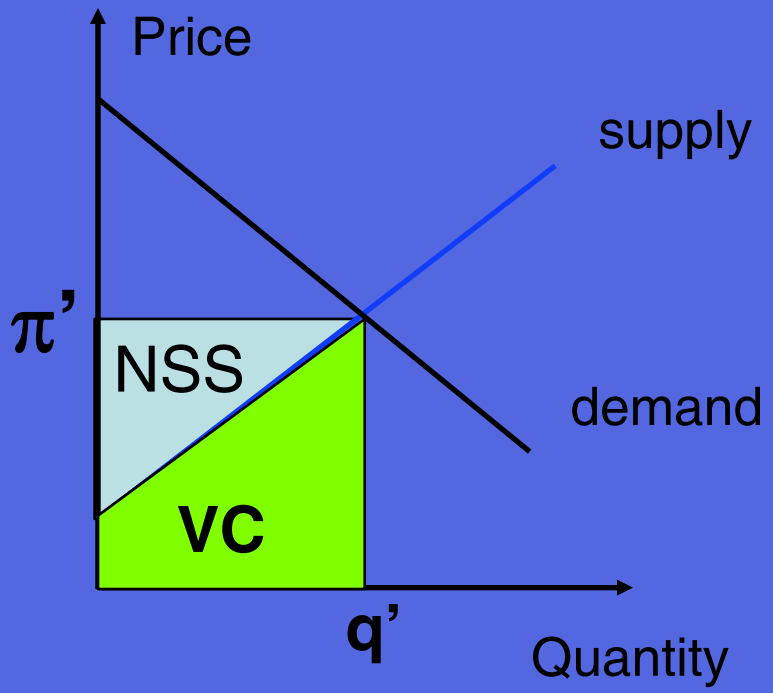
Net Buyer Surplus (NBS):

- Suppose a buyer purchases 5 bushels of apples at $10/bushel
- Total Avoidable Cost = $50
- With this trade the buyer gets bushels at $10/bushel for which he would have been willing to pay more.
- NBS (yellow triangle) measures the buyer's *Net Buyer Surplus* from the purchase of 5 bushels of apples at $10/bushel



Net Seller Surplus (NSS):





Seller Revenue = π' x q'

- *Avoidable Cost (VC)* includes variable costs of producing q' plus all avoidable fixed costs
- Net Seller Surplus = [Seller Revenue – VC]

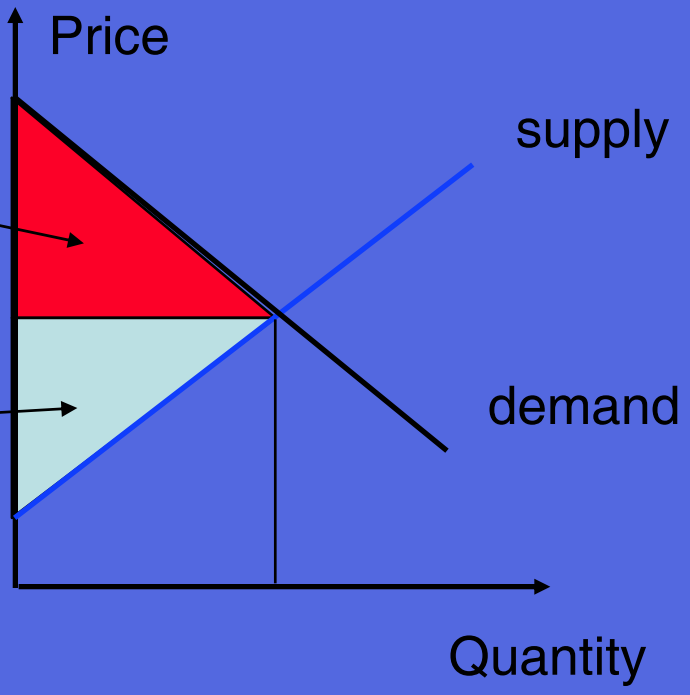
Total Net Seller-Buyer Surplus (TNSBS):

Net Buyer Surplus

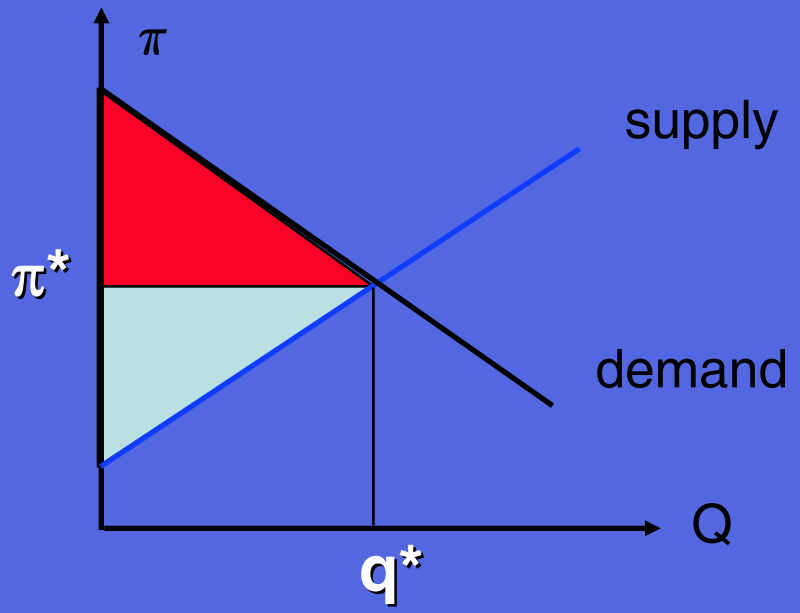
+

Net Seller Surplus

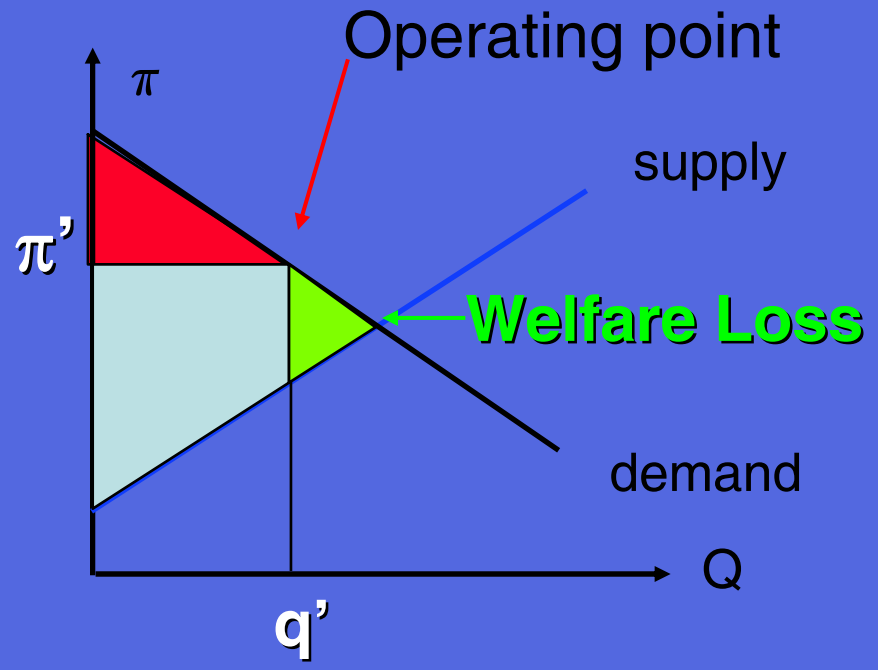
= TNSBS



Market Equilibrium and Trader Welfare:



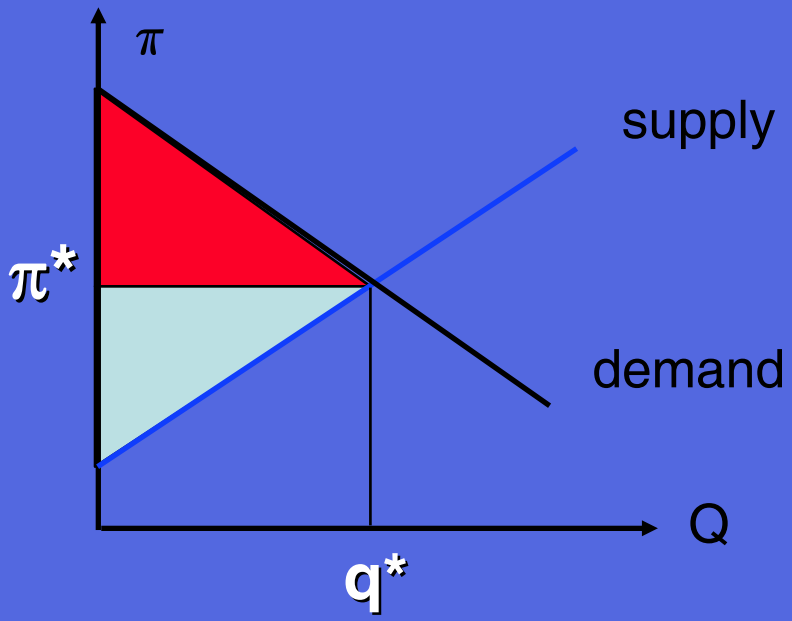
Market equilibrium at the *uniform* price π^* (all units sell at same price)



At ***higher*** uniform price π':

- larger net seller surplus
- smaller net buyer surplus
- smaller TNSBS

Market Equilibrium and Trader Welfare:



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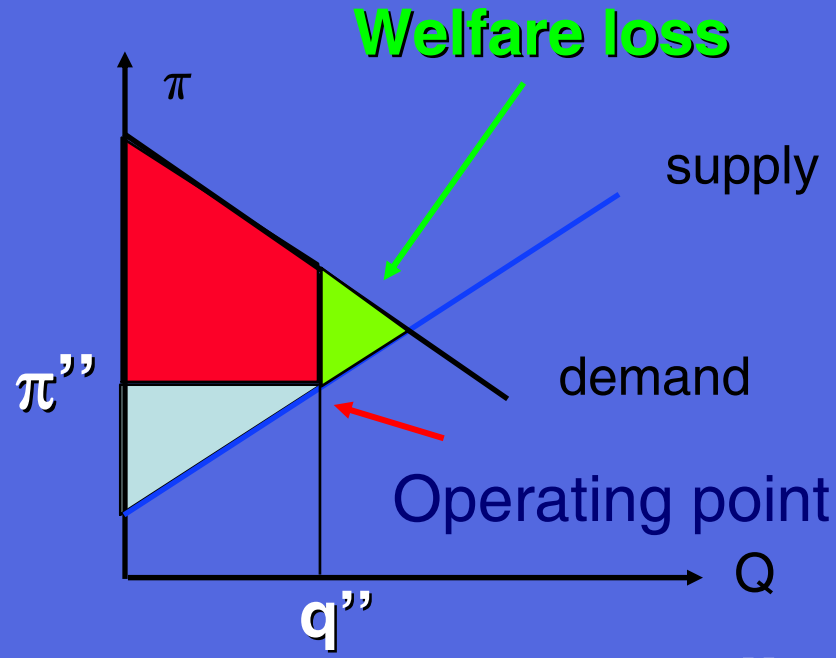

At ***lower*** uniform price π'' :

- Smaller seller surplus
- Higher buyer surplus
- Smaller TNSBS

Efficient market:

- A market is ***efficient*** if buyers & sellers extract maximum possible Total Net Seller-Buyer Surplus (TNSBS)
- Maximum possible TNSBS is extracted at competitive market clearing (CMC) points
- Factors favouring market efficiency
  - Large numbers of buyer and sellers (“liquid” or “thick” market)
  - Standardized commodity units
  - Buyers and sellers have access to good market information (prices, locations of all buyers/sellers,…)

Is a Uniform-Price Auction Market Necessary for Market Efficiency? *NOT NECESSARILY!*

- Consider a “bilateral trade” market consisting of sellers and buyers who trade directly and independently with each other (no intermediaries)
- Buyers “shop around” for the best deal
- Sellers check the prices of their rival sellers to avoid being “undercut”
- The market is efficient if the buyers and sellers manage to discover a market equilibrium price and quantity.

Examples:

- Efficient markets
  - Corn available at a farmers' market ?
  - Chicago mercantile exchange ?
- Inefficient markets
  - Used cars ?
  - Collateralized Debt Obligations (CDOs) based on subprime mortgages ?