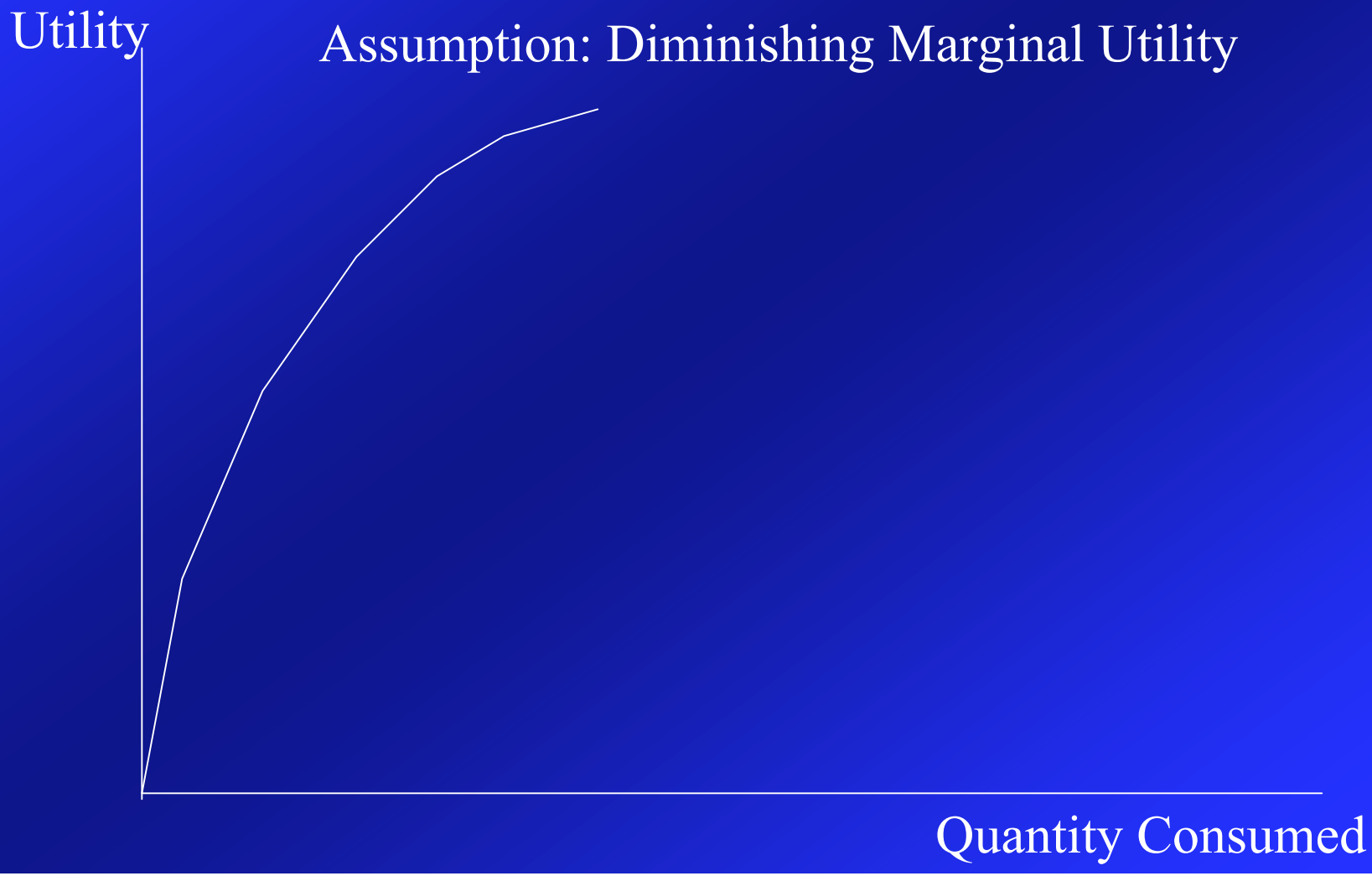
Measuring Costs and Benefits

- Measuring Benefits and Costs *(See Chap 4)*:
  - Consumers' Willingness to Pay (WTP)
  - Consumer Surplus (CS)
  - Producers' Surplus (PS)
  - Social Surplus (SS)
  - Review discussion of Fig. 4.2; 4.3
- Measuring Benefits in Secondary Markets *(See Chap 5)*

Measuring Benefits

Utility Theory

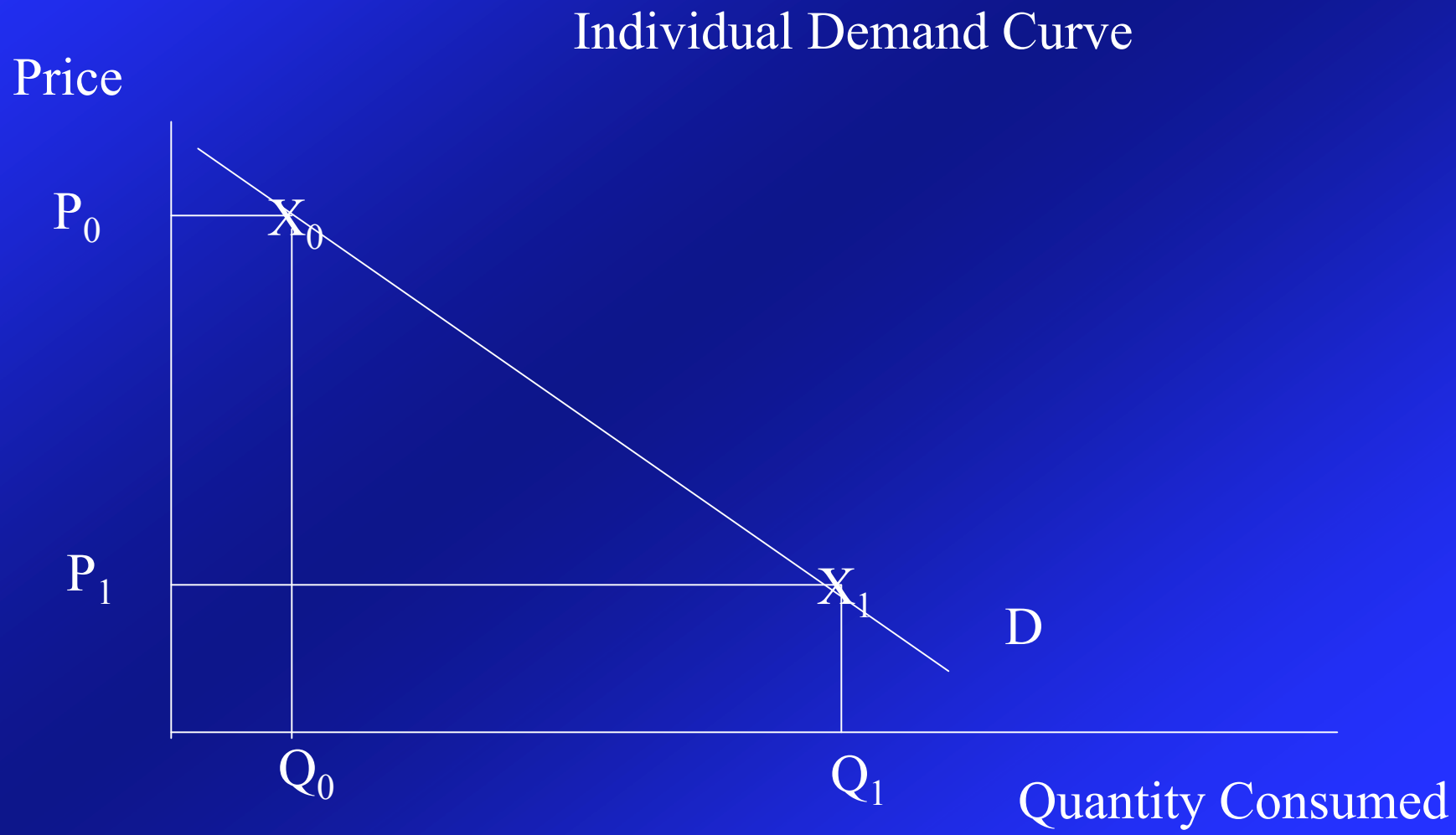
Assumption: Diminishing Marginal Utility



Measuring Benefits

- Diminishing marginal utility
- What evidence do we have that individuals' utilities have this property?
- "Revealed preferences"
  - At lower prices, people consume more.
  - As prices increase, the amount people consume decreases

Measuring Benefits



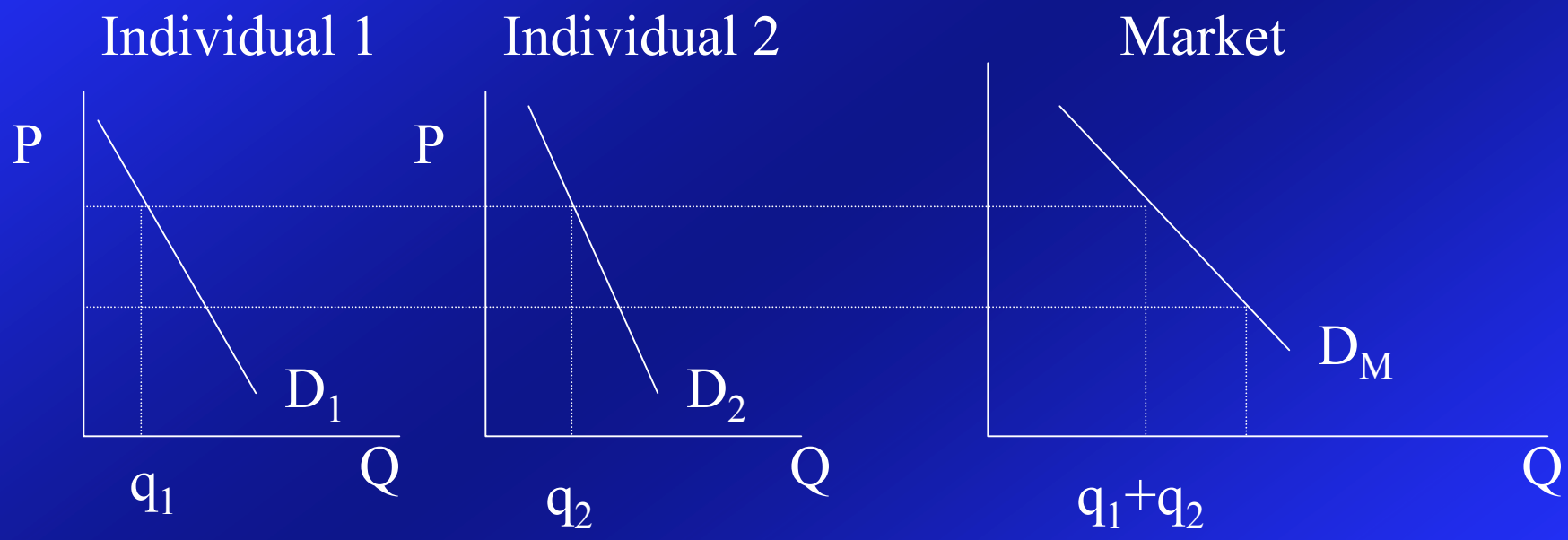
Measuring Benefits

- Demand curve shows actual expenditure behaviors of individuals
  - When goods are scarce, people willing to pay high price
  - When goods are abundant (people are already consuming a lot), people willing to pay only a lower price
- Measured in monetary terms
- **Note: Consumers' expenditure behaviors are constrained by their budgets!**
- Demand response has both substitution (pure preferences) and income effects

Market demand curves

- Market demand curve is (horizontal) sum of individual demand curves

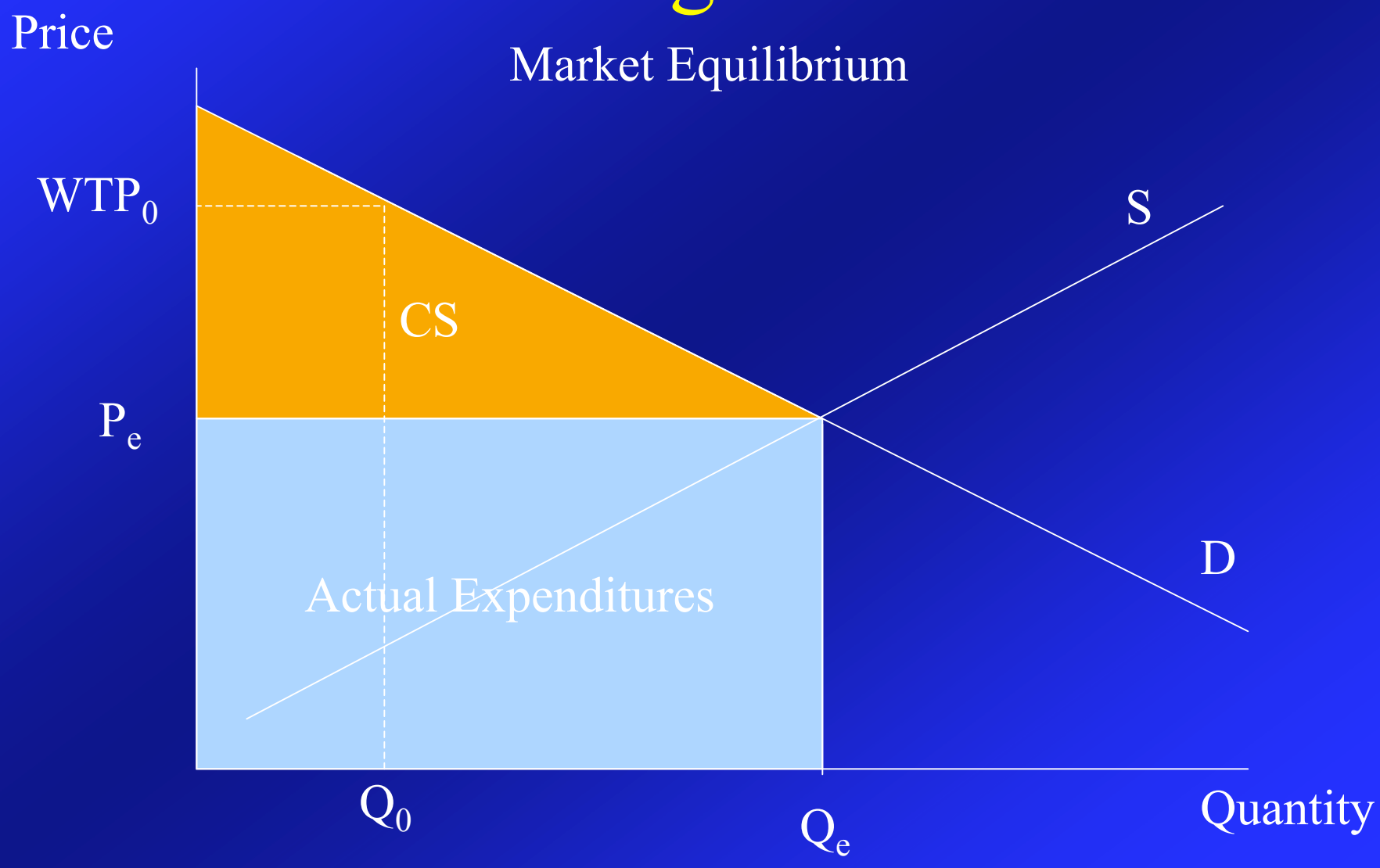
Market demand curves



Measuring Benefits

- Demand curve – Willingness to pay for different quantities
- In market exchanges, consumers to not actually pay all that they would be willing to pay.
- Producers are not able to discriminate prices charged for each unit sold.

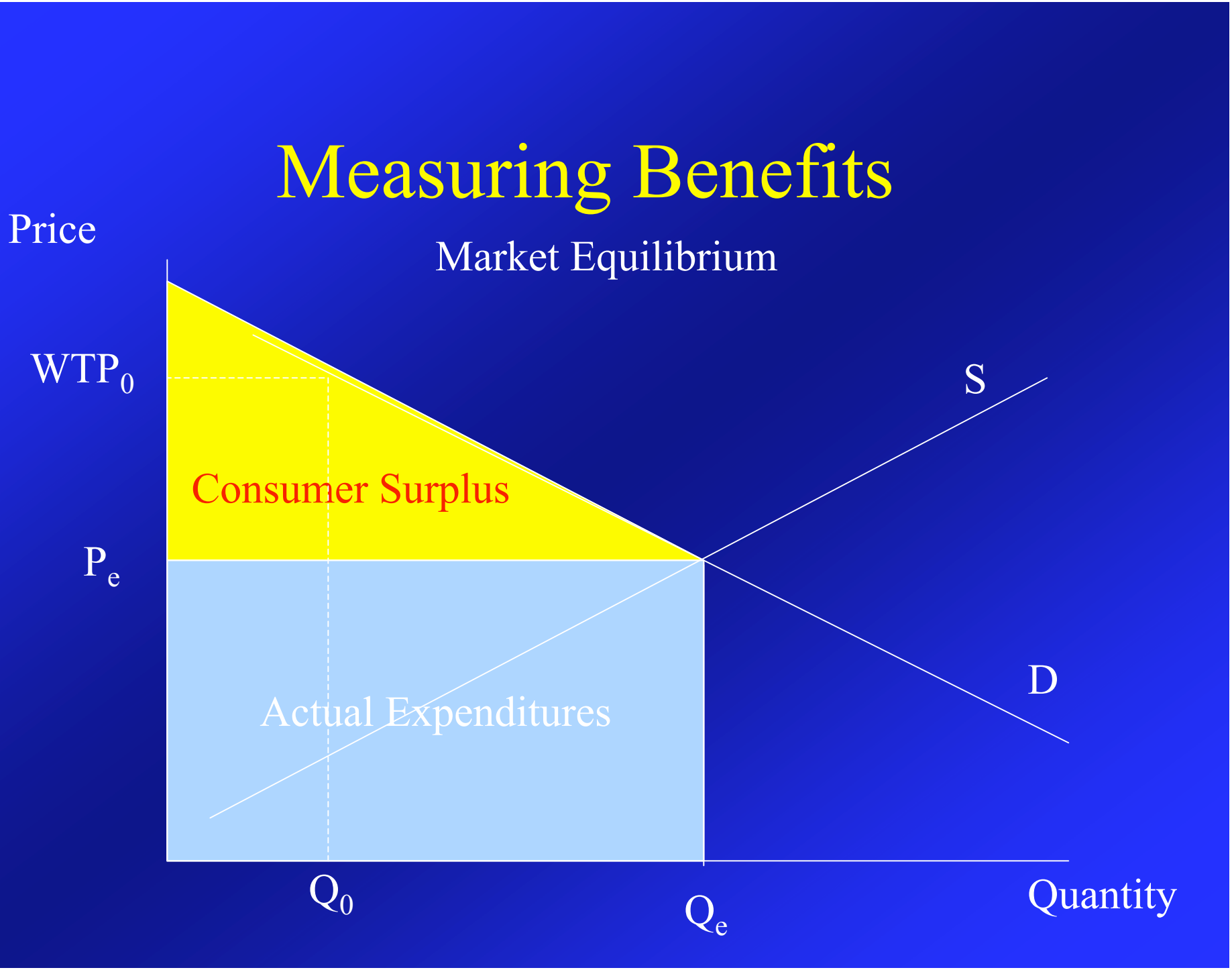
Measuring Benefits

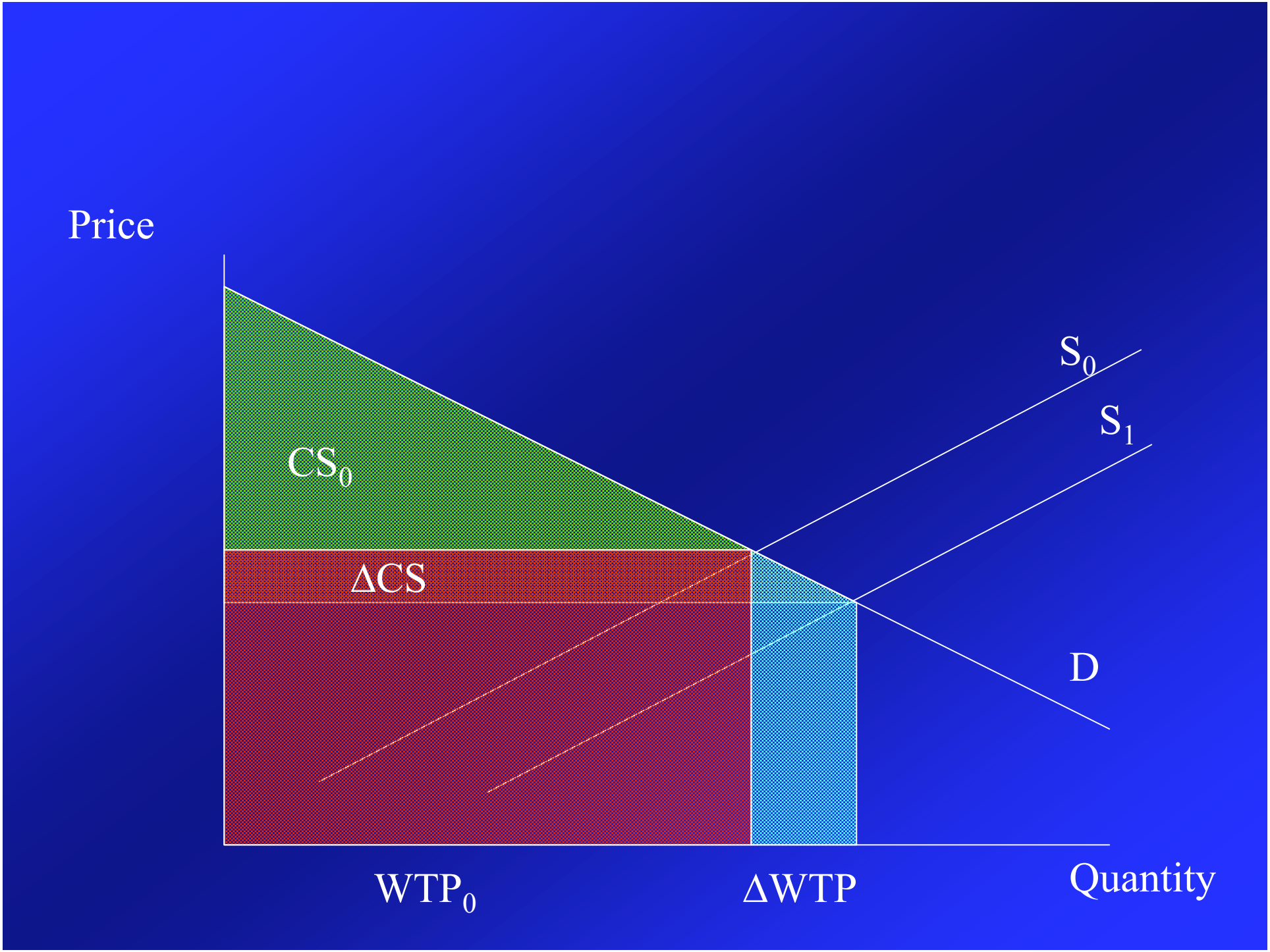


Measuring Benefits

- Difference between WTP and actual expenditures is Consumer Surplus CS.
- WTP is the theoretically correct measure, and of benefits from an activity.
  - Includes transfers (to producers)
- CS is measure of "net" benefits
  - widely used in empirical studies
  - Based on estimated market demand curves

Measuring Benefits

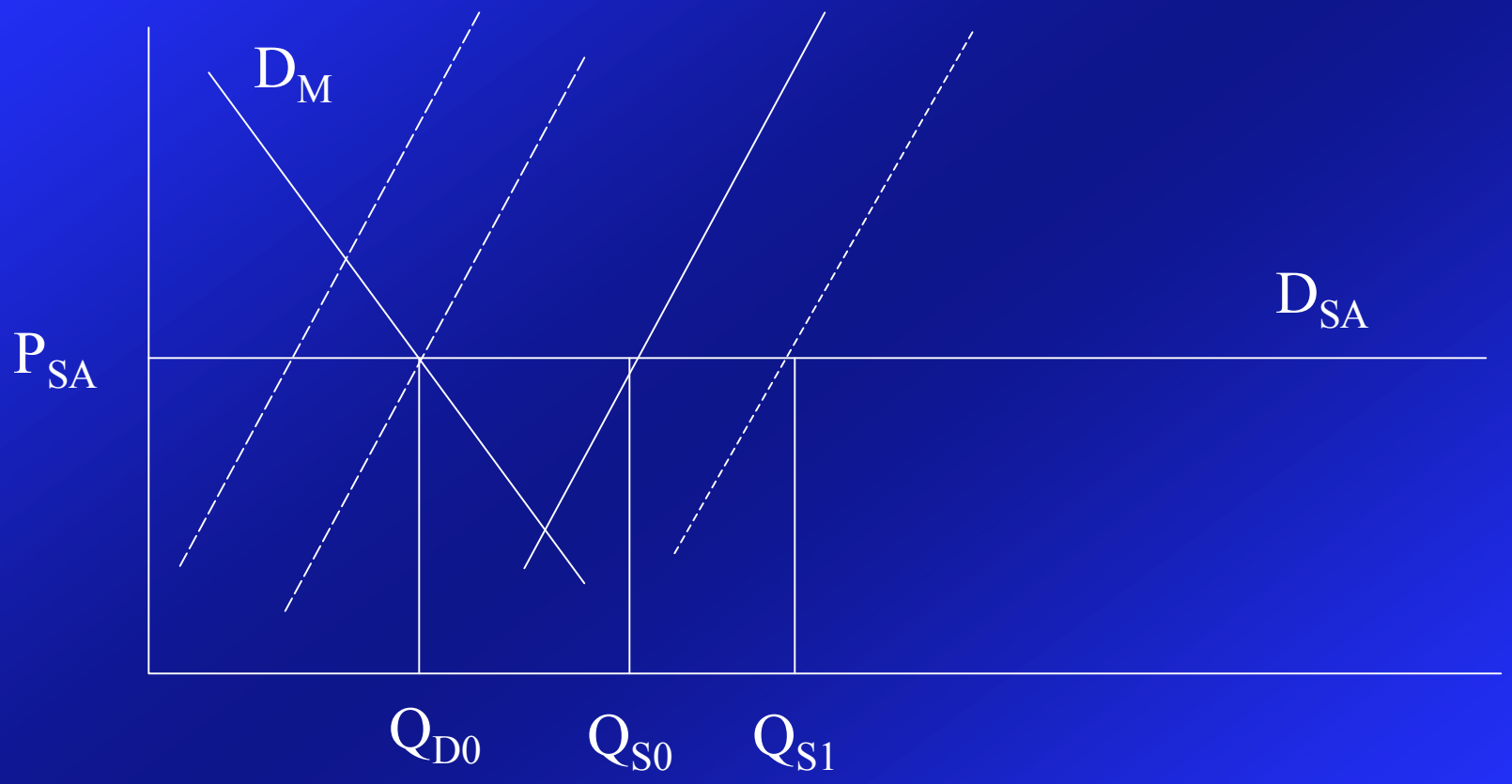



Price
S_0
S_1
CS_0
ΔCS
D
WTP_0
ΔWTP
Quantity

Measuring Benefits

- WTP and CS **do not** change if market price does not change, **and**
- Perfectly elastic demand curve
- Example – Expanding electricity production in Mozambique

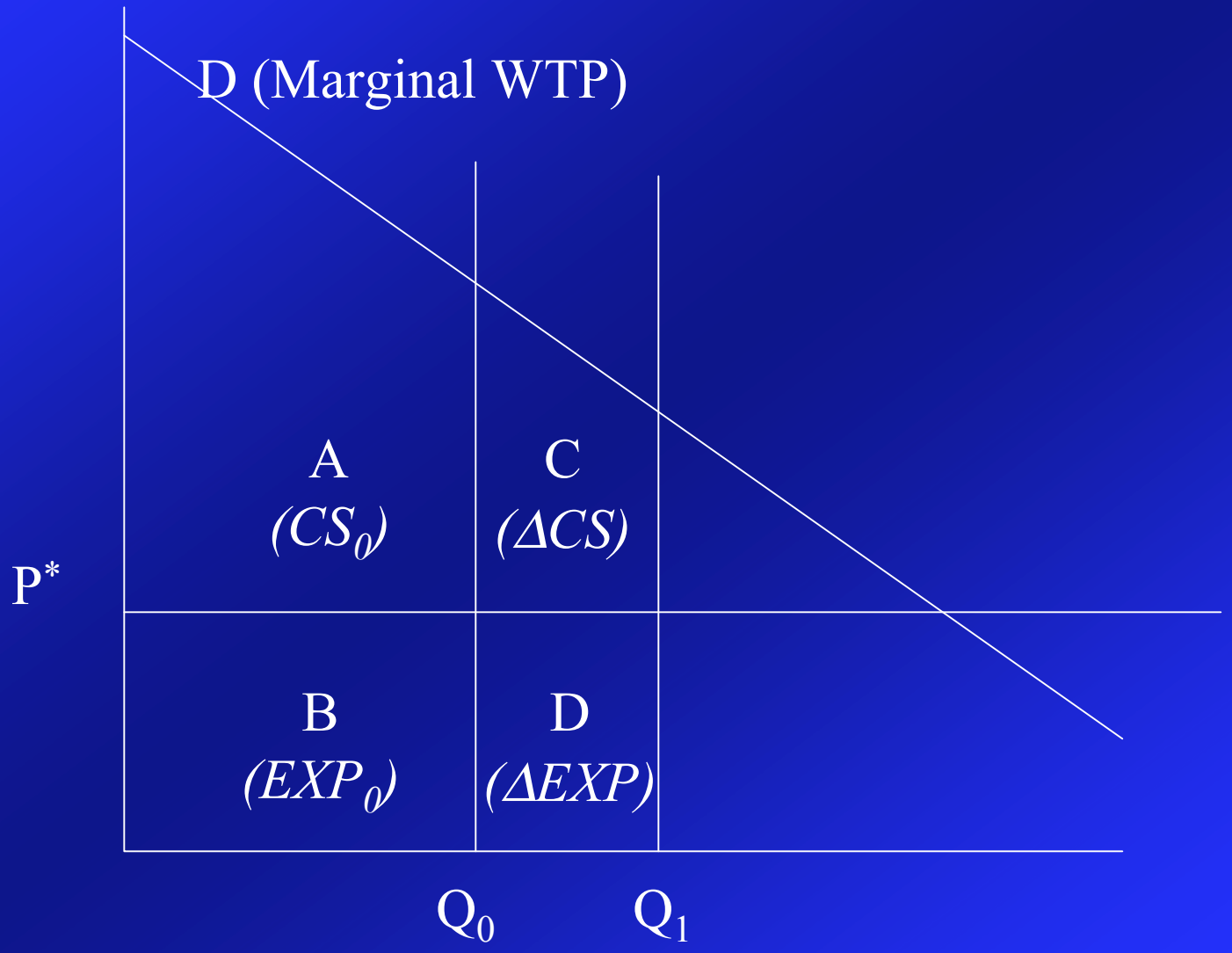
Mozambique market for electricity



Measuring Benefits

- WTP and CS **do** change if market price does not change **and**
- Constant, or administratively controlled price (and shift in supply)
- Example: increase in local cable distribution capacity (cable access price determined in national market)

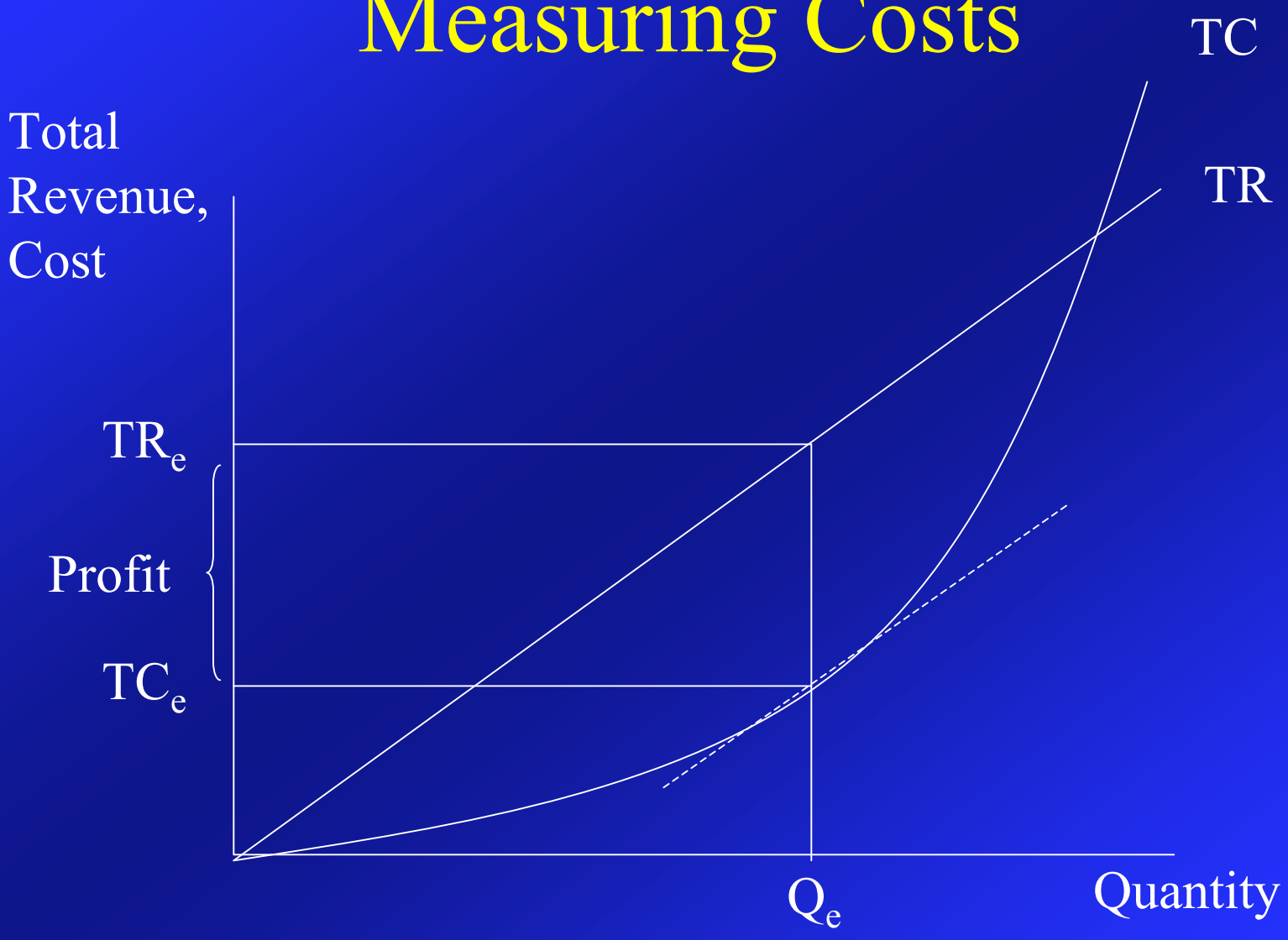
Local Market for Cable Connections



Measuring Costs

- Area under supply curve (MC curve)
- Analogous to consumer, in market exchanges, producers' revenues are greater than minimum necessary to meet their production costs
- Assumptions:
  - Perfect competition
  - Profit-maximization (MR = MC)

Measuring Costs

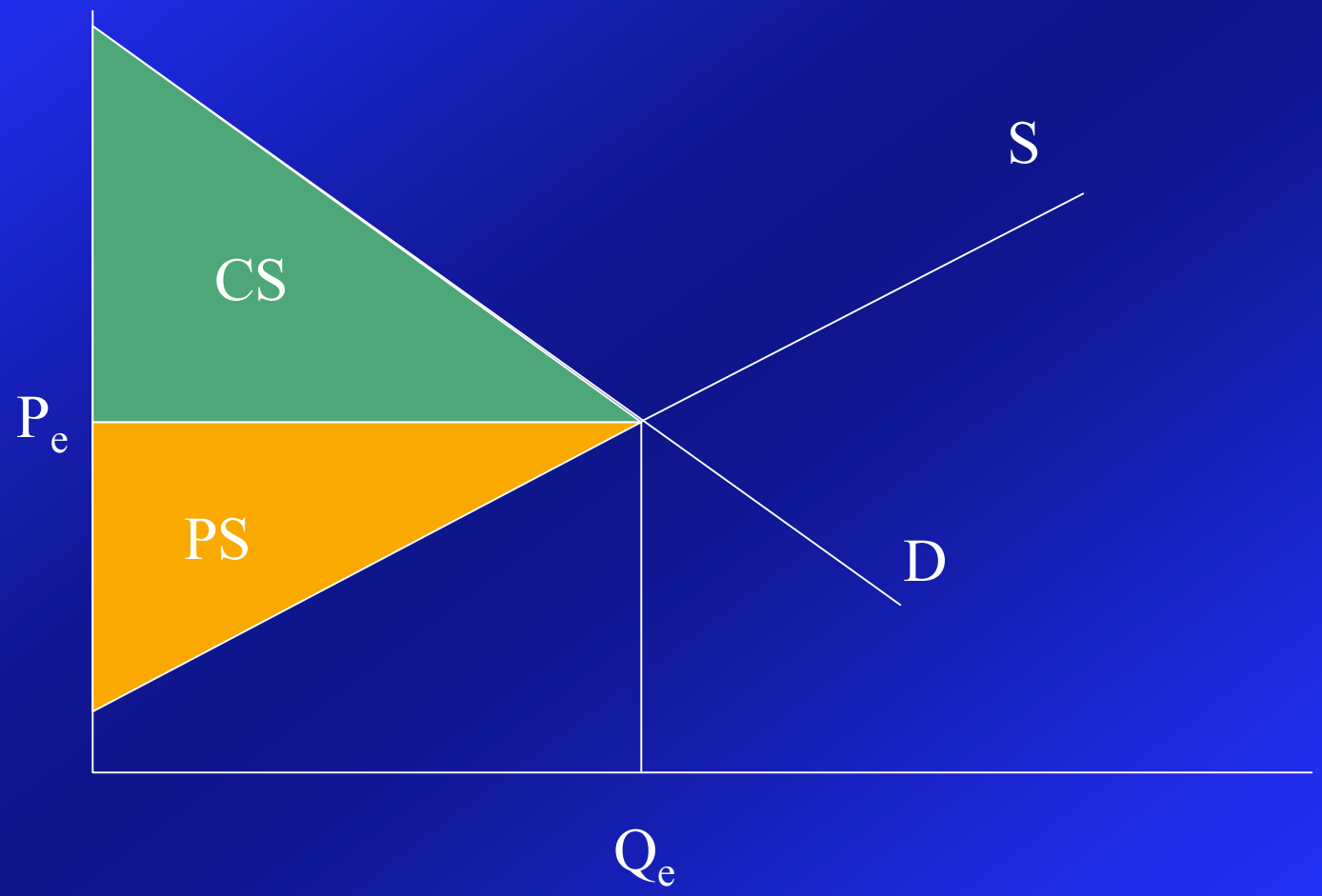


Measuring Costs

Measuring Costs

- What factors may cause supply curve to shift?
  - Technological change
  - Prices of inputs
    - May change due to infrastructure invesments
  - Government policies – taxes/subsidies

Social Surplus



Social Surplus

- Social Surplus = Consumer surplus + Producer Surplus
- Social surplus is maximized in competitive markets
  - ***Assuming no market imperfections!***
  - ***Assuming no externalities!***

Change in Social Surplus

- Annual policy:

$$\Delta W = \Delta CS + \Delta PS + \Delta GS + \Delta EE$$

CS = Consumer Surplus

PS = Producer Surplus

GS = Government Surplus

EE = External Effect

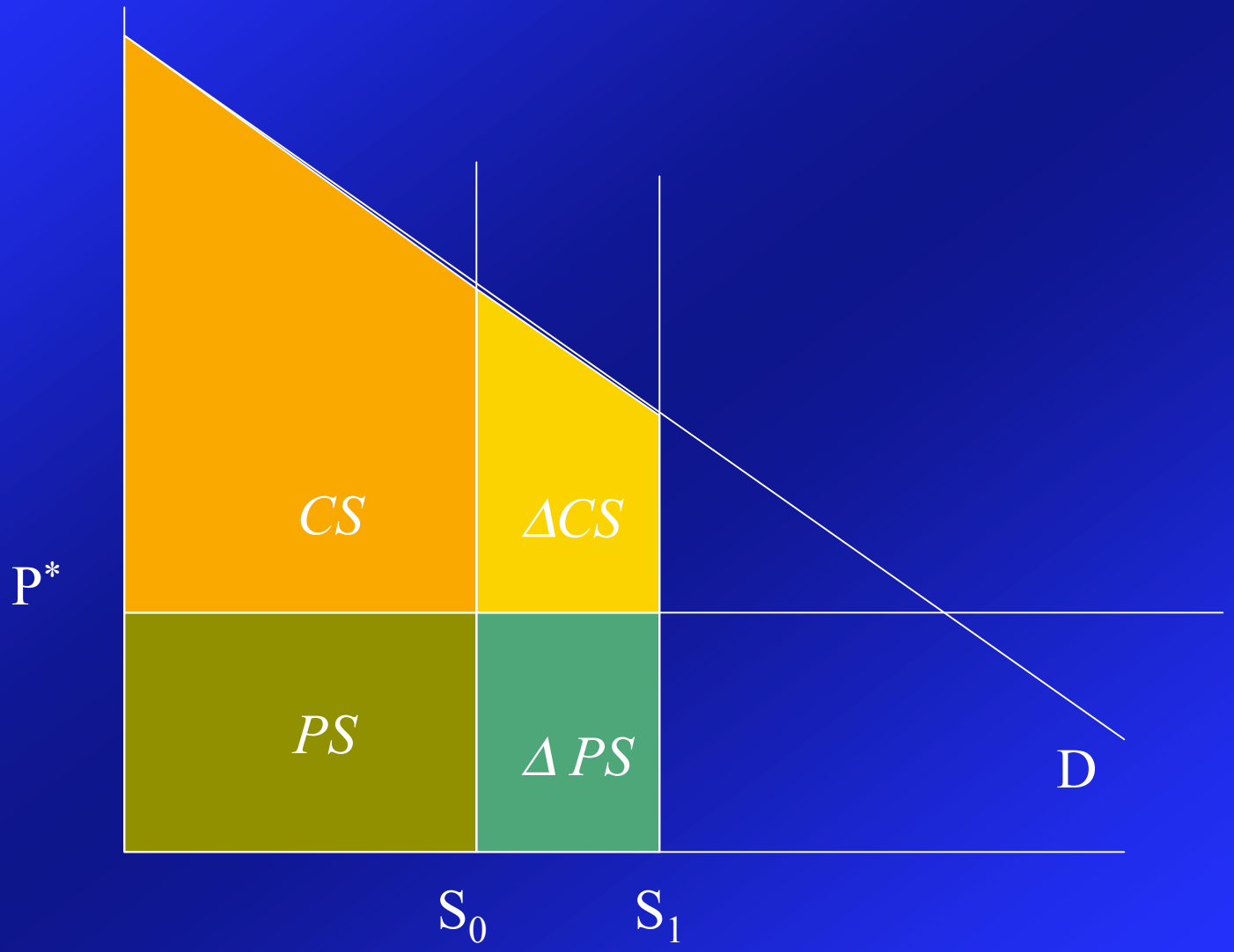
- Investment project:

$$\Delta W = -[\text{Initial Investment}] + \sum_i(\Delta CS_i + \Delta PS_i + \Delta GS_i + \Delta EE_i)$$

Over i years of useful life of the investment

Review Boardman Figure 4.3

Local Market for Cable Connections



Local Market for Cable Connections

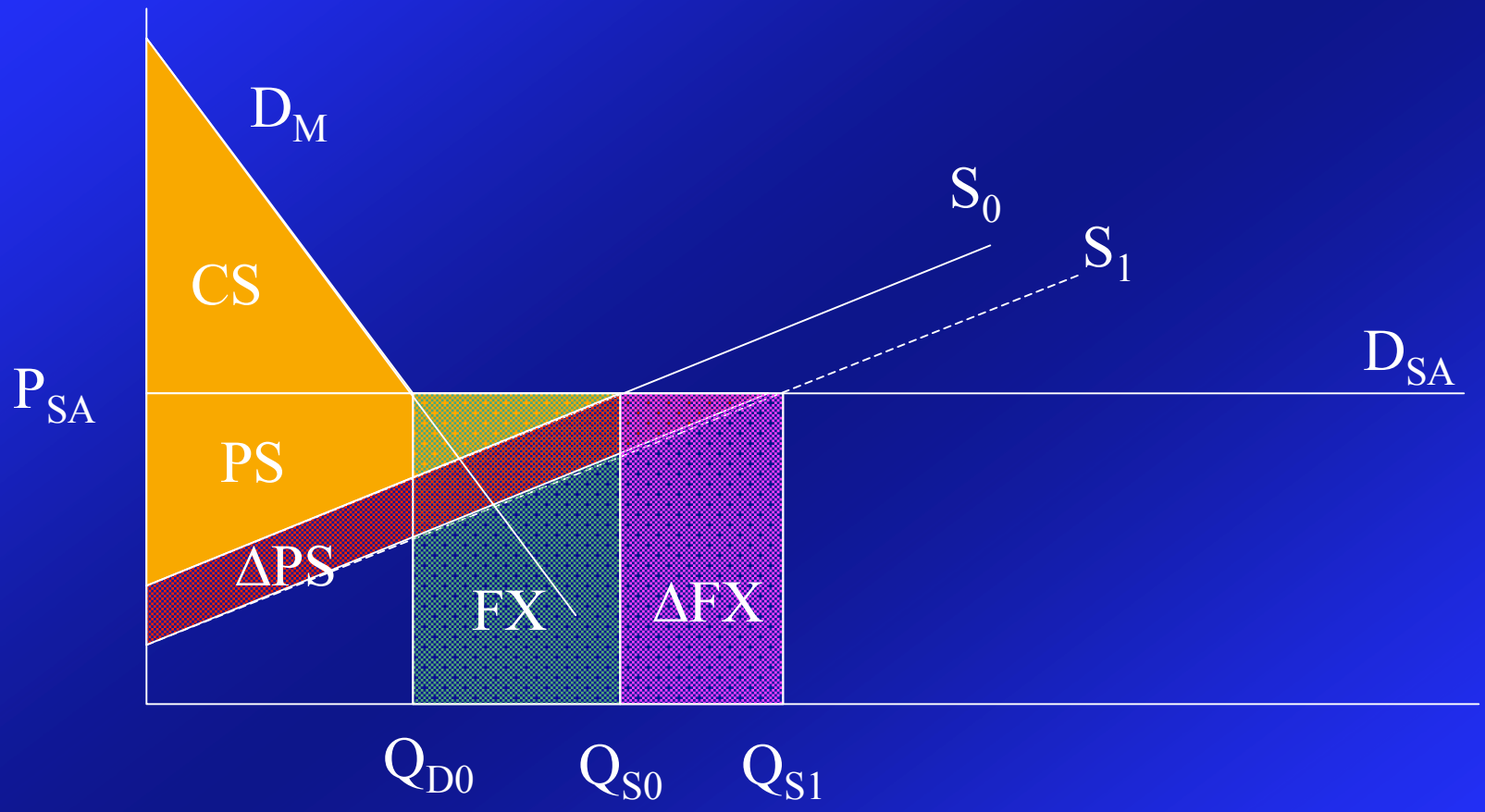
Net Benefit =

- [Initial investment] +

$\sum_i \{df_i(\Delta CS_i + \Delta PS_i)\}$

ΔPS and ΔPS summed over the i years of the useful life of the investment (discounted by discount factor df_i)

Mozambique market for electricity



With international trade, need to add changes in Foreign exchange (FX) flows

Mozambique market for electricity

Net Benefit =

- [Initial investment] +

$\sum_i \{df_i(\Delta PS_i + \Delta FX_i)\}$

ΔPS and ΔFX summed over the i years of the useful life of the investment (discounted by discount factor df_i)