Week 3. Demand and Elasticity

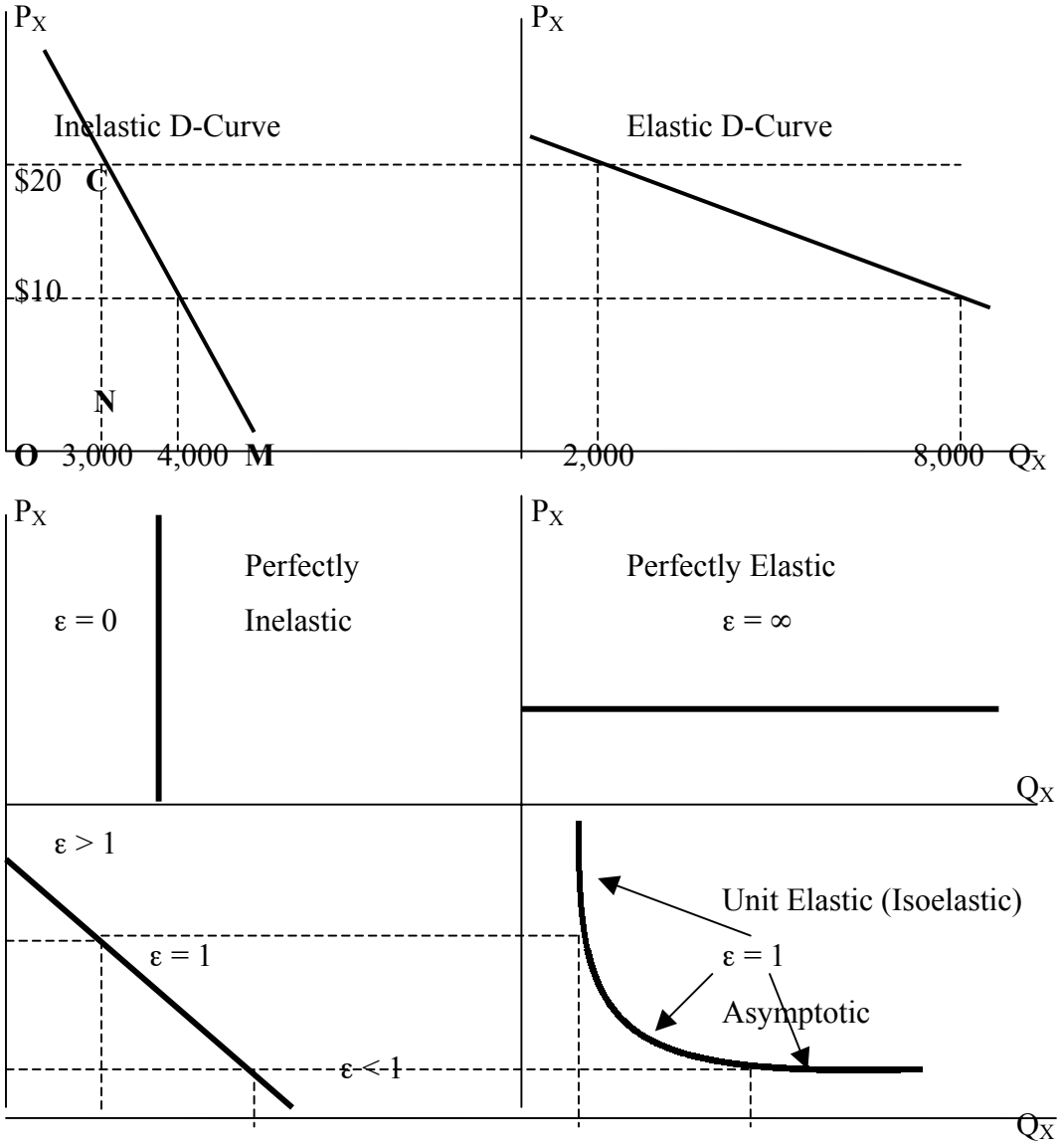
1. **What is Elasticity?**

a. **Price Elasticity of Demand** (for own good) is the ratio of the % Δ in Q_X demanded to the % Δ in P_X.

i) Elasticity in General: $\varepsilon_X = \dfrac{\%\Delta Q_X}{\%\Delta P_X} = \dfrac{\Delta Q_X / Q_X}{\Delta P_X / P_X} = \dfrac{\Delta Q_X}{Q_X} \times \dfrac{P_X}{\Delta P_X} = \dfrac{\Delta Q_X}{\Delta P_X} \times \dfrac{P_X}{Q_X}$

ii) Arc (Interval) Elasticity:

$$\varepsilon_X = \frac{\Delta Q_X /(Q_1 + Q_2)/2}{\Delta P_X /(P_1 + P_2)/2} = \frac{\Delta Q_X}{(Q_1 + Q_2)} \times \frac{(P_1 + P_2)}{\Delta P_X} = \frac{\Delta Q_X}{\Delta P_X} \times \frac{(P_1 + P_2)}{(Q_1 + Q_2)}$$



iii) Point Elasticity: $\varepsilon_X = \frac{\%\Delta Q_X}{\%\Delta P_X} = \frac{\Delta Q_X}{\Delta P_X} \times \frac{P_X}{Q_X} = \frac{NM}{NC} \times \frac{NC}{ON} = \frac{NM}{ON}$

iv) Isoelasticity (Constant): $\overline{R} = PQ \rightarrow Q = \frac{\overline{R}}{P} \rightarrow Q = AP_i^{\varepsilon_i}$

Then, estimable equation is $\log Q = \log A + \varepsilon_i \log P_i \rightarrow q = a + \varepsilon_i p_i$

v) As P↓ & Q↑ in the lower range of D-curve, $\frac{\Delta Q}{\Delta P} \times \frac{P\downarrow}{Q\uparrow} = \varepsilon\downarrow$.

b. **Income Elasticity of Demand** is the ratio of the % Δ in Q_X demanded to the % Δ in Y (income).: $\varepsilon_Y = \frac{\%\Delta Q_X}{\%\Delta Y} = \frac{\Delta Q_X / Q_X}{\Delta Y / Y} = \frac{\Delta Q_X}{Q_X} \times \frac{Y}{\Delta Y} = \frac{\Delta Q_X}{\Delta Y} \times \frac{Y}{Q_X}$

c. **Price Elasticity of Supply** is the ratio of the % Δ in Q_X supplied to the % Δ in P_X.

$$\varepsilon_S = \frac{\%\Delta Q_S}{\%\Delta P} = \frac{\Delta Q_S / Q_S}{\Delta P / P} = \frac{\Delta Q_S}{Q_S} \times \frac{P}{\Delta P} = \frac{\Delta Q_S}{\Delta P} \times \frac{P}{Q_S}$$

d. **Cross Elasticity of Demand** for Q_X to a Δ in P_Y is the ratio of the % Δ in Q_X to the % Δ in P_Y that brings about the Δ in Q_X.:

$$\varepsilon_{XY} = \frac{\%\Delta Q_X}{\%\Delta P_Y} = \frac{\Delta Q_X / Q_X}{\Delta P_Y / P_Y} = \frac{\Delta Q_X}{Q_X} \times \frac{P_Y}{\Delta P_Y} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_Y}{Q_X}$$

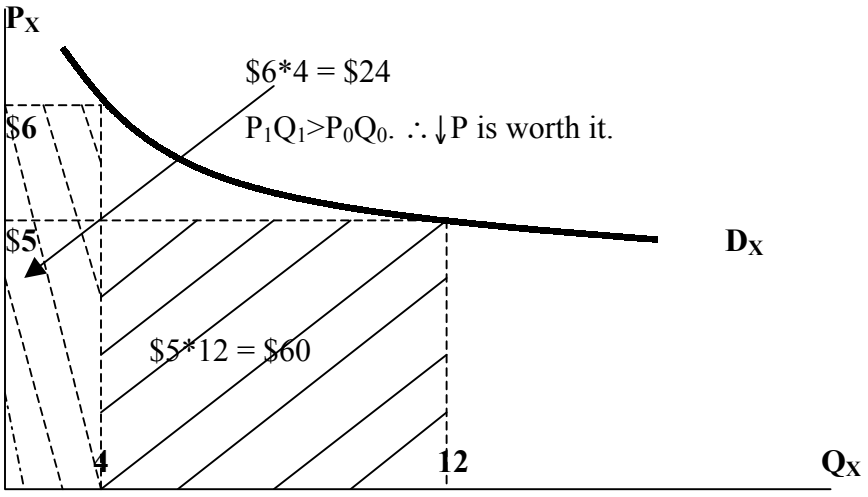
i) If $\varepsilon_{XY} > 0 \rightarrow$ X & Y are substitutes.

ii) If $\varepsilon_{XY} < 0 \rightarrow$ X & Y are compliments.

2. **Price Elasticity and Total Revenue**

a. If the demand for X is elastic, a $P_X\uparrow \rightarrow (Q_X * P_X)\downarrow$.

b. If the demand for X is inelastic, a $P_X\uparrow \rightarrow (Q_X * P_X)\uparrow$.



3. **What Determines Elasticity of Demand?**

a. Nature of the Good

i) *Necessities*, such as basic foodstuffs, normally have very inelastic D-curves.

ii) *Luxury Goods*, such as restaurant meals, have rather elastic D-curves.

b. Availability of Close Substitutes

i) When markets offer close substitutes for a given product, its demand will be more elastic. (*eg*. Coke & Pepsi)

ii) The demand for narrowly defined commodities is more elastic than the demand for more broadly defined commodities. (*eg*. Texaco brand as opposed to gasoline in general)

c. Fraction of Income Absorbed:

- Very inexpensive items tend to have inelastic demands (*eg*. Shoelaces)

d. Passage of Time

- The demand for many products is more elastic in the LR than in the SR. (*eg*. Switching from fossil fuel heating to alternative energy source for HH, when the price of petroleum ↑.)

4. **Shifts of the Demand Curve**

$Q_X = f(P_X, Y, N, P_Y, P_Z, Taste, \ldots)$

$Q_X = \alpha + \beta P_X$, where $\alpha = Y + N + P_Y + P_Z + Taste, \ldots,$ and $\beta < 0$.

a. Any change in P_X will cause movement along the D-curve.

b. Any change in all other variables (income, size of the market, substitutes & compliments, tastes, advertising…) will cause the D-curve to shift.