Demand – Elasticities

• From the supplier’s point of view, they are concerned with how much quantity demanded will change when price changes.
• As we will see, their interest stems from the impact a change in price and quantity has on their total revenue.
• To determine the impact a price change will have on quantity demanded, we must consider the price elasticity of demand.
• The price elasticity of demand is defined as the percentage change in quantity demanded divided by the percentage change in price:

\[ E_D = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} = \frac{\text{change in quantity}}{\text{average quantity}} \cdot \frac{\text{change in price}}{\text{average price}} \]

• This is generally calculated as an absolute value and we will follow that convention.
• Notice how this differs from slope. Elasticities use average quantities to eliminate units of measurement from impacting the results (i.e. unlike with slope, units do not matter with elasticities).
• There are three types of elasticity: elastic, inelastic, and unit elastic.
  1. Elastic – \( E_D > 1 \). This means that quantity demanded changes by a larger percentage than the price change (more responsive).
  2. Inelastic – \( E_D < 1 \). This means that quantity demanded changes by a smaller percentage than the price change (less responsive).
  3. Unit elastic – \( E_D = 1 \). This means that quantity demanded changes by the same percentage as the price change (equally responsive).
• For examples, see attached Figure 5-1.
• Perfectly elastic and perfectly inelastic demand curves (see Figure 5-1 below). Notice that a perfectly inelastic demand curve has an infinite slope and a perfectly elastic demand curve has a slope of zero. DON’T GET SLOPE AND ELASTICITY CONFUSED!
• The price elasticity of demand declines as price moves down the demand curve. (See, for example, Figure 20.6a.)
• The price elasticity of demand is influenced by all of the determinants of demand, but certain determinants are of particular interest.
  1. Number of substitutes – the greater the number of substitutes, the greater the price elasticity of demand.
  • This can also be related to how a good is defined – clothing will be less elastic than jeans and jeans will be less elastic than Levis 501s..
  2. Proportion of income – ceteris paribus, the higher the price of a good relative to a person’s income, the greater the good’s price elasticity of demand. (Compare matches to cars.)
  3. Luxuries vs. Necessities – demand for necessities tends to be relatively inelastic and demand for luxuries tends to be more elastic.
4. Time – Demand becomes more price elastic over time, as people adjust their consumption patterns.

- So, how does this relate to total revenue? (See Figure 20.5 and attached Figures 5-3 and 5-4)
  - Total Revenue (TR) = price (P) x quantity sold (Q)
  - What happens to TR when the price is raised depends upon the price elasticity of demand.
    - If demand is elastic, TR falls.
    - If demand is inelastic, TR rises.
    - If demand is unit elastic, TR remains the same.
  - What happens to TR when the price is lowered also depends upon the price elasticity of demand.
    - If demand is elastic, TR rises.
    - If demand is inelastic, TR falls.
    - If demand is unit elastic, TR remains the same.
  - Total revenue is maximized when demand is unit elastic. (See Figure 20.6.)

- Other elasticity measures can be used to determine how quantity changes when the demand curve shifts.
  1. Income elasticity of demand:
     \[\text{Income elasticity of demand (E_i)} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}\]
     - For normal goods, this will be positive.
     - For inferior goods it will be negative.
  2. Cross price elasticity of demand:
     \[\text{Cross-price elasticity of demand (E_{x,y})} = \frac{\% \text{ change in quantity demanded of } x}{\% \text{ change in price of } y}\]
     - For substitutes, this will be positive.
     - For complements, this will be negative.

- Examples – drugs, taxes, who bears tax.
The Price Elasticity of Demand. The price elasticity of demand determines whether the demand curve is steep or flat. Note that all percentage changes are calculated using the midpoint method.

Figure 5-1
Total Revenue. The total amount paid by buyers, and received as revenue by sellers, equals the area of the box under the demand curve, $P \times Q$. Here, at a price of $5$, the quantity demanded is 100, and total revenue is $500.$

How Total Revenue Changes When Price Changes: Inelastic Demand. With an inelastic demand curve, an increase in the price leads to a decrease in quantity demanded that is proportionately smaller. Therefore, total revenue (the product of price and quantity) increases. Here, an increase in the price from 5 to 3 causes the quantity demanded to fall from 100 to 80, and total revenue rises from $500$ to $240.$
**Figure 5-4**

How total revenue changes when price changes: elastic demand. With an elastic demand curve, an increase in the price leads to a decrease in quantity demanded that is proportionately larger. Therefore, total revenue (the product of price and quantity) decreases. Here, an increase in the price from $4 to $5 causes the quantity demanded to fall from 50 to 20, so total revenue falls from $200 to $100.