

Handout 3

1 Elasticity

- Measures how much one variable responds to changes in another variable.
- Types of elasticity measurements:
 1. **Price elasticity** of demand/supply: responsiveness of the *quantity* demanded/supply to a change in *price*.
 2. **Cross elasticity** of demand: responsiveness of the quantity demanded of one good, good X, to a change in the price of another good, good Y.
 3. **Income elasticity** of demand: responsiveness of the *quantity* demanded to a change in consumer *income*.
- No unit.

1.1 A More Formal Definition

- Elasticity of y with respect to x is the percentage change in y induced by a percentage change¹ in x .
- Elasticity $\epsilon_{yx} = \frac{d \ln y}{d \ln x} = \frac{dy}{dx} \cdot \frac{x}{y}$ (Notice: $\frac{d \ln y}{dy} = \frac{1}{y} \implies d \ln y = \frac{dy}{y}$)

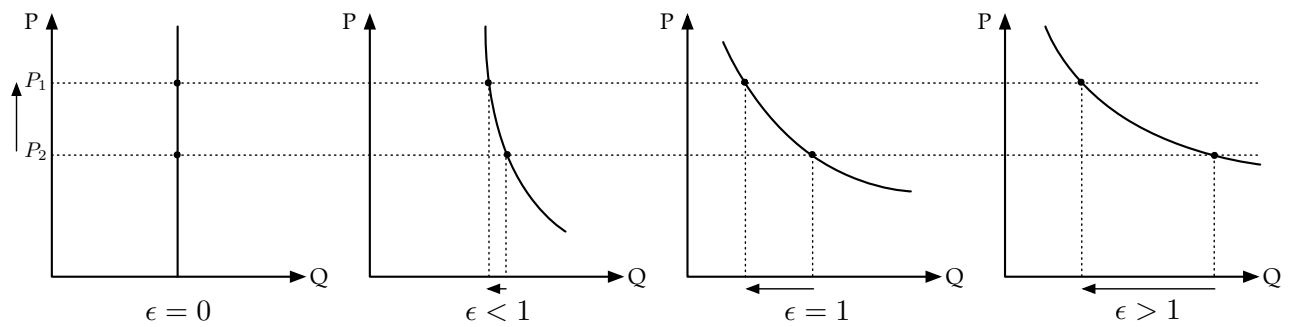
1.2 The Non-Calculus Version

- Elasticity of y with respect to $x = \frac{\text{percentage change in } y}{\text{percentage change in } x}$
- Price elasticity of demand = $\frac{\% \text{ change in } Q}{\% \text{ change in } P}$
= elasticity of Q (quantity) w.r.t. P (price)
- Percentage change = $\frac{\text{END value} - \text{START value}}{\text{AVERAGE value}}$
- e.g. suppose iPhone XR $\begin{cases} P : \$699 \rightarrow \$449 \\ Q : 1400 \rightarrow 1600 \end{cases}$
 - The percentage change in quantity = $\frac{1600 - 1400}{1500} = 13.33\%$
 - The percentage change in price = $\frac{449 - 699}{574} = -43.55\%$
 - Hence, the price elasticity of demand = $\frac{13.33\%}{-43.55\%} = -0.31$
 - Price elasticity is higher:
 - * when **close substitutes** are available (iPhone v.s. Samsung Galaxy , Google Pixel)
 - * for **narrowly defined** goods (shorts, skirts) than for **broadly defined** ones (clothing)
 - * for **luxuries** (Lamborghini) than for **necessities** (toilet paper)
 - * in the **long run** (more flexible) than the **short run** (no time for adjustments)

¹ The percentage change (in x) that induce the percentage change in y is very small.

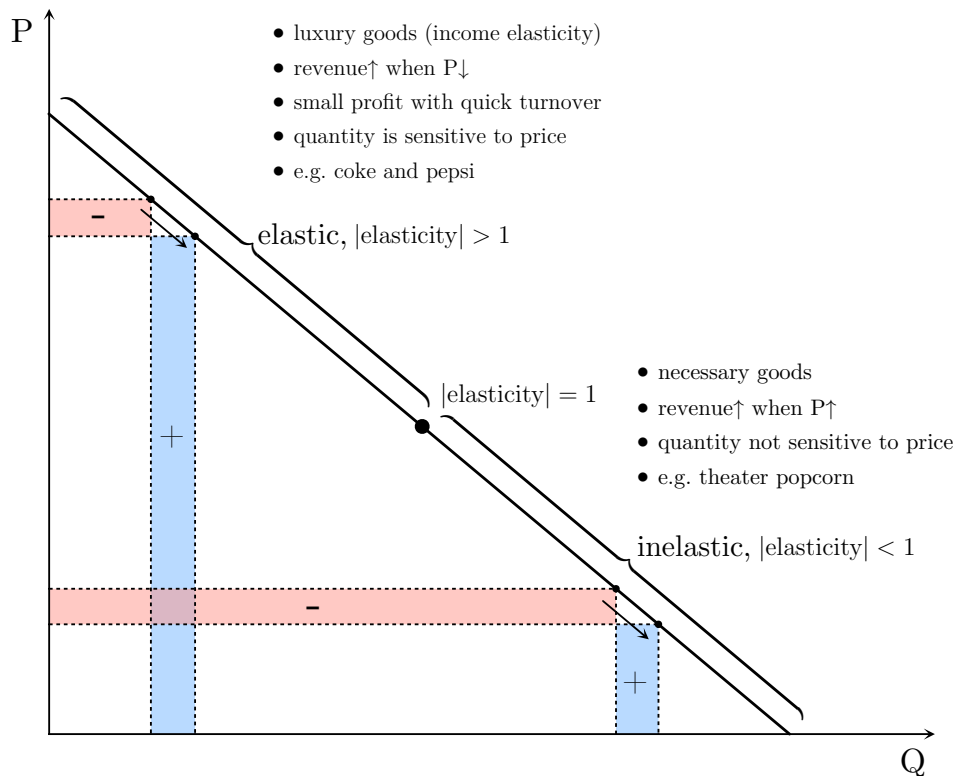
1.3 Graphic Representation

The elasticity represents the sensitivity of our objective variable to shocks.



- $\epsilon = 0$: perfect inelastic demand (no price sensitivity)
- $\epsilon < 1$: inelastic demand (low price sensitivity)
- $\epsilon = 1$: unit elastic demand (intermediate price sensitivity)
- $\epsilon > 1$: elastic demand (high price sensitivity)
- $\epsilon = \infty$: perfect elastic demand (extreme price sensitivity). The demand curve is a **horizontal** line.

2 Elasticity of a Linear Demand Curve



3 Price Controls

- Price ceiling: a legal maximum on the price of a good or service (maximum rent)
- Price floor: a legal minimum on the price of a good or service (minimum wage)
- Binding price ceiling: price ceiling $<$ equilibrium price.
- Binding price floor: price ceiling $>$ equilibrium price.

4 Taxes

- The additional amount of money that the government makes the buyers or the sellers to pay on each unit (or aggregate) of goods.
- The taxes on goods and services are revenues to pay for national defense, public goods (street lamps, freeway, National parks).
- The incidence of a tax: how the burden of a tax is shared among market participants.
- Tax \rightarrow equilibrium quantity \downarrow
- When the government impose a tax on the goods, the division of the burden of the tax between the buyer and the seller *depends on their price elasticity*.
 - Who is more inelastic bears more tax.