Microeconomics (W4)

Quantitative Demand Analysis

The Elasticity Concept

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Overview

The Elasticity Concept

- Own Price Elasticity
- Elasticity and Total Revenue
- Cross-Price Elasticity
- Income Elasticity

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The Elasticity Concept

- How responsive is variable "G" to a change in variable "S"

$$E_{G,S} = \frac{\%\Delta G}{\%\Delta S}$$

If $E_{G,S} > 0$, then S and G are directly related.

If $E_{G,S} < 0$, then S and G are inversely related.

If $E_{G,S} = 0$, then S and G are unrelated.

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The Elasticity Concept Using Calculus

- An alternative way to measure the elasticity of a function G = f(S) is

$$E_{G,S} = \frac{dG}{dS}\frac{S}{G}$$

If $E_{G,S} > 0$, then S and G are directly related.

If $E_{G,S} < 0$, then S and G are inversely related.

If $E_{G,S} = 0$, then S and G are unrelated.

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Own Price Elasticity of Demand

$$E_{Q_X,P_X} = \frac{\%\Delta Q_X{}^d}{\%\Delta P_X}$$

Negative according to the "law of demand."

Elastic: $\left|E_{Q_X,P_X}\right| > 1$

Inelastic: $\left|E_{Q_X,P_X}\right| < 1$

Unitary: $\left|E_{Q_X,P_X}\right| = 1$

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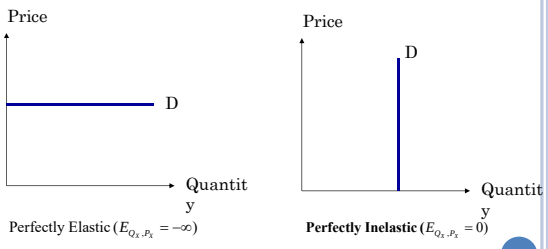
Perfectly Elastic & Inelastic Demand



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Own-Price Elasticity and Total Revenue

- Elastic
  - Increase (a decrease) in price leads to a decrease (an increase) in total revenue.
- Inelastic
  - Increase (a decrease) in price leads to an increase (a decrease) in total revenue.
- Unitary
  - Total revenue is maximized at the point where demand is unitary elastic.

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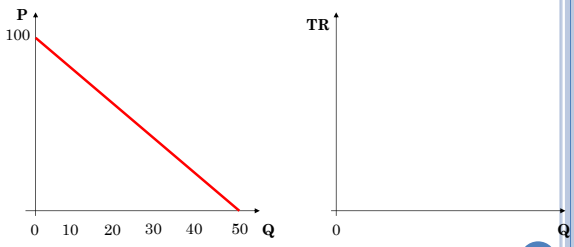
Elasticity, Total Revenue and Linear Demand



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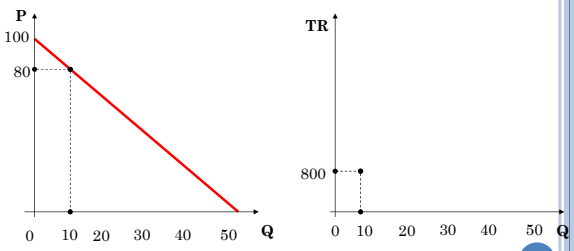
Elasticity, Total Revenue and Linear Demand



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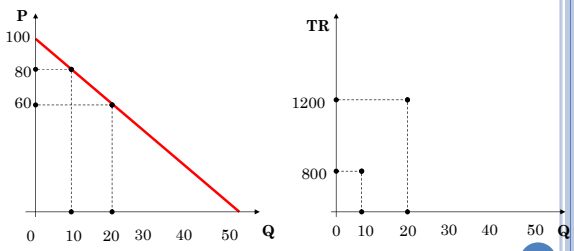
Elasticity, Total Revenue and Linear Demand



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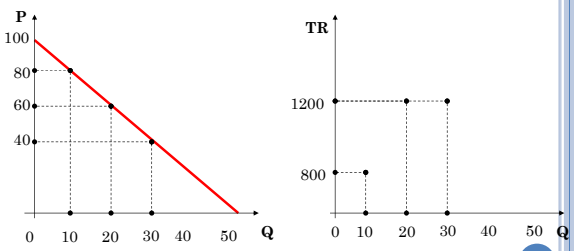
Elasticity, Total Revenue and Linear Demand



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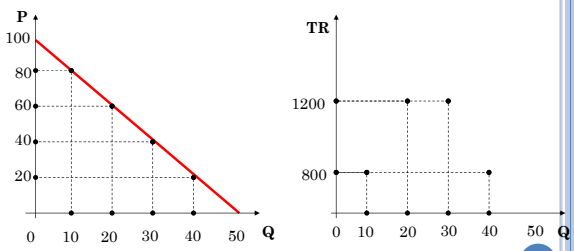
Elasticity, Total Revenue and Linear Demand



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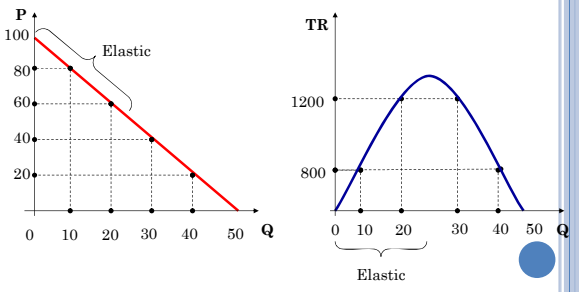
Elasticity, Total Revenue and Linear Demand



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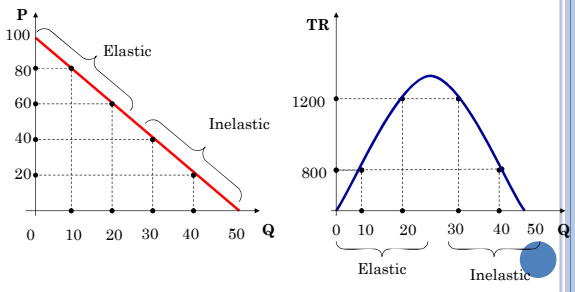
Elasticity, Total Revenue and Linear Demand



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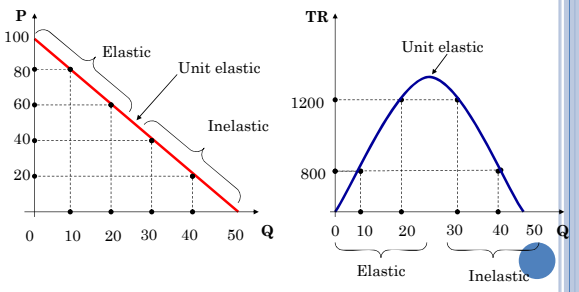
Elasticity, Total Revenue and Linear Demand



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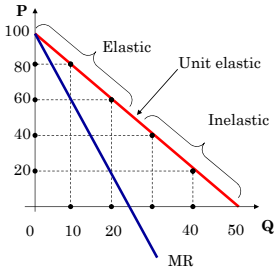
Demand, Marginal Revenue (MR) and Elasticity



- For a linear inverse demand function, $MR(Q) = a + 2bQ$, where $b < 0$.
- When
  - MR > 0, demand is elastic;
  - MR = 0, demand is unit elastic;
  - MR < 0, demand is inelastic.

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Factors Affecting Own Price Elasticity

- Available Substitutes

  The more substitutes available for the good, the more elastic the demand.
- Time
  - Demand tends to be more inelastic in the short term than in the long term.
  - Time allows consumers to seek out available substitutes.
- Expenditure Share

  Goods that comprise a small share of consumer's budgets tend to be more inelastic than goods for which consumers spend a large portion of their incomes.

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Cross Price Elasticity of Demand

$$E_{Q_X,P_Y} = \frac{\%\Delta Q_X^{\,d}}{\%\Delta P_Y}$$

If $E_{Q_X,P_Y} > 0$, then X and Y are substitutes.

If $E_{Q_X,P_Y} < 0$, then X and Y are complements.

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Income Elasticity

$$E_{Q_X,M} = \frac{\%\Delta Q_X^{\,d}}{\%\Delta M}$$

If $E_{Q_X,M} > 0$, then X is a normal good.

If $E_{Q_X,M} < 0$, then X is a inferior good.

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Uses of Elasticities

- Pricing.
- Managing cash flows.
- Impact of changes in competitors' prices.
- Impact of economic booms and recessions.
- Impact of advertising campaigns.
- And lots more!

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Example 1: Pricing and Cash Flows

- According to an FTC Report by Michael Ward, AT&T's own price elasticity of demand for long distance services is -8.64.
- AT&T needs to boost revenues in order to meet it's marketing goals.
- To accomplish this goal, should AT&T raise or lower it's price?

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Answer: Lower Price!

- Since demand is elastic, a reduction in price will increase quantity demanded by a greater percentage than the price decline, resulting in more revenues for AT&T.

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Example 2: Quantifying the Change

- If AT&T lowered price by 3 percent, what would happen to the volume of long distance telephone calls routed through AT&T?

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Answer

- Calls would increase by 25.92 percent!

$$E_{Q_X,P_X} = -8.64 = \frac{\%\Delta Q_X^{\,d}}{\%\Delta P_X}$$

$$-8.64 = \frac{\%\Delta Q_X^{\,d}}{-3\%}$$

$$-3\% \times (-8.64) = \%\Delta Q_X^{\,d}$$

$$\%\Delta Q_X^{\,d} = 25.92\%$$

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Example 3: Impact of a change in a competitor's price

- According to an FTC Report by Michael Ward, AT&T's cross price elasticity of demand for long distance services is 9.06.
- If competitors reduced their prices by 4 percent, what would happen to the demand for AT&T services?

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Answer

AT&T's demand would fall by 36.24 percent!

$$E_{Q_X,P_Y} = 9.06 = \frac{\%\Delta Q_X{}^d}{\%\Delta P_Y}$$

$$9.06 = \frac{\%\Delta Q_X{}^d}{-4\%}$$

$$-4\% \times 9.06 = \%\Delta Q_X{}^d$$

$$\%\Delta Q_X{}^d = -36.24\%$$

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