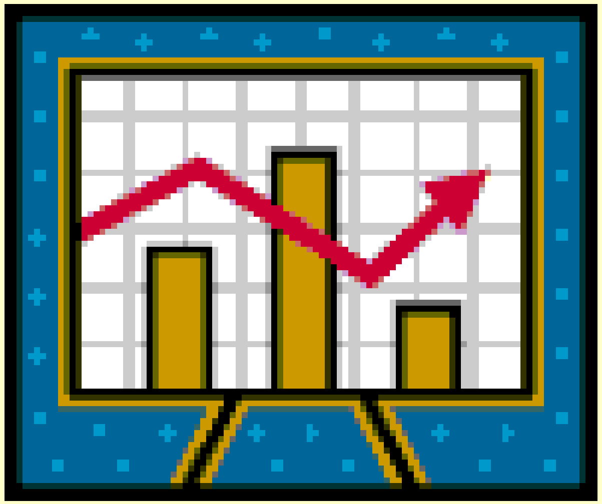
제 3 장

수요분석

Quantitative Demand Analysis



彈力性

Elasticity Concept

- Elasticity a.k.a. Sensitivity or Responsiveness
- 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.

탄력성의 계산

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.

수요의 가격탄력성

Own Price Elasticity of Demand

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

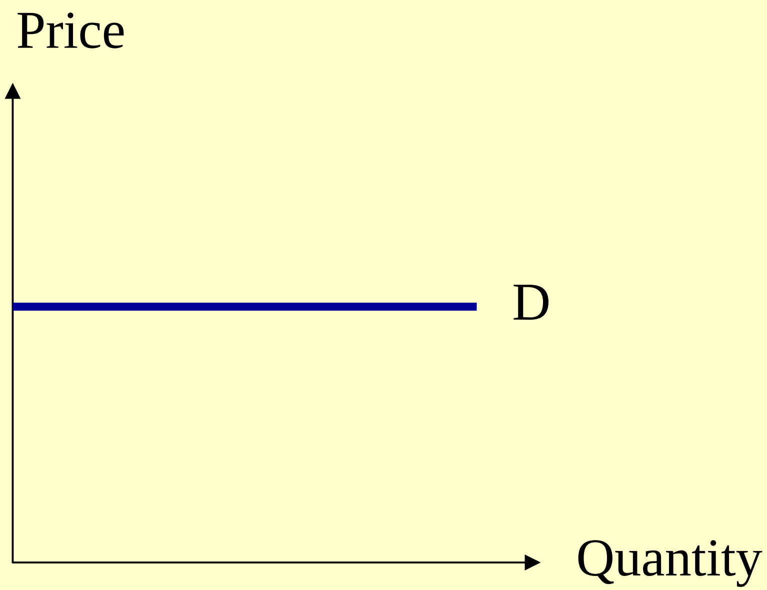
- Negative according to the “law of demand.”

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

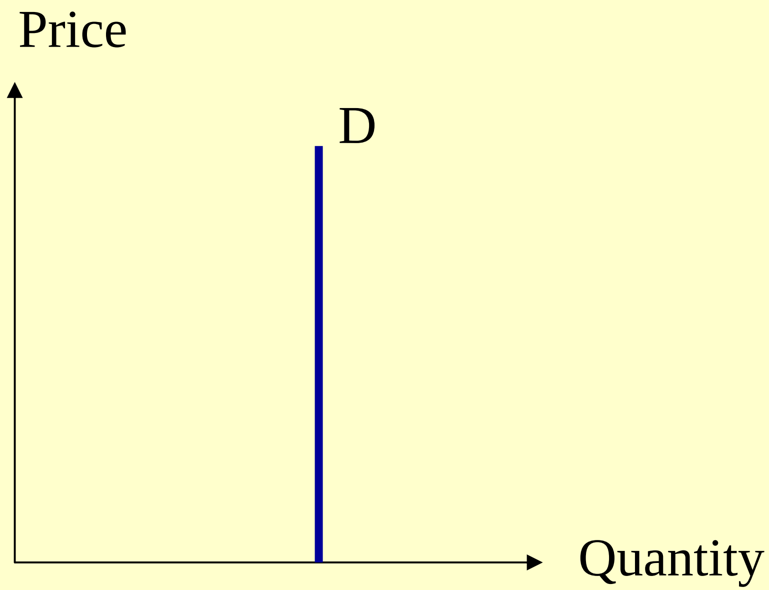
Inelastic: $\left| E_{Q_X, P_X} \right| < 1$

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

완전탄력적/비탄력적 수요
Perfectly Elastic & Inelastic Demand



Perfectly Elastic ($E_{Q_X, P_X} = -\infty$)



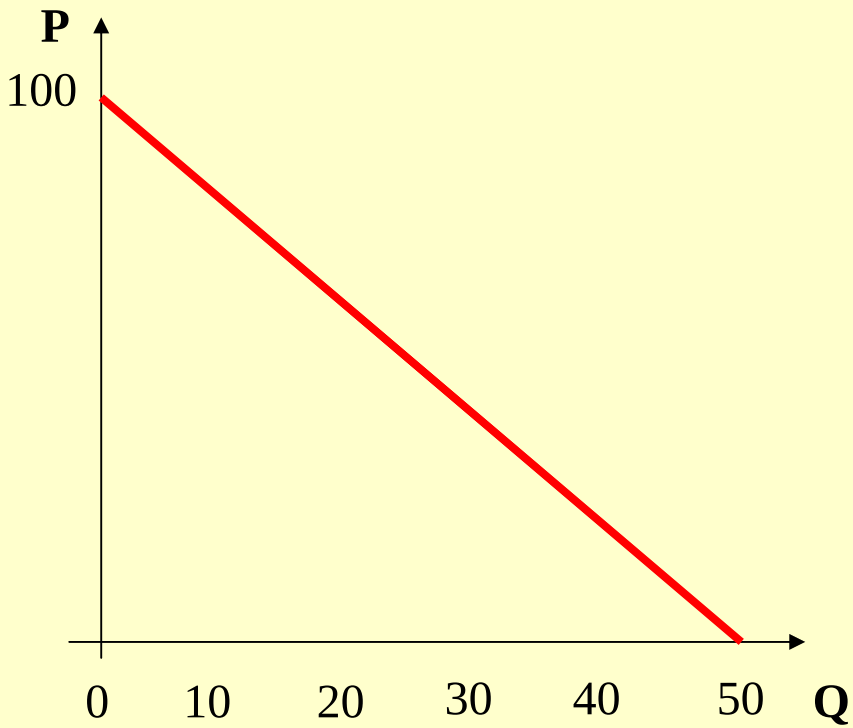
Perfectly Inelastic ($E_{Q_X, P_X} = 0$)

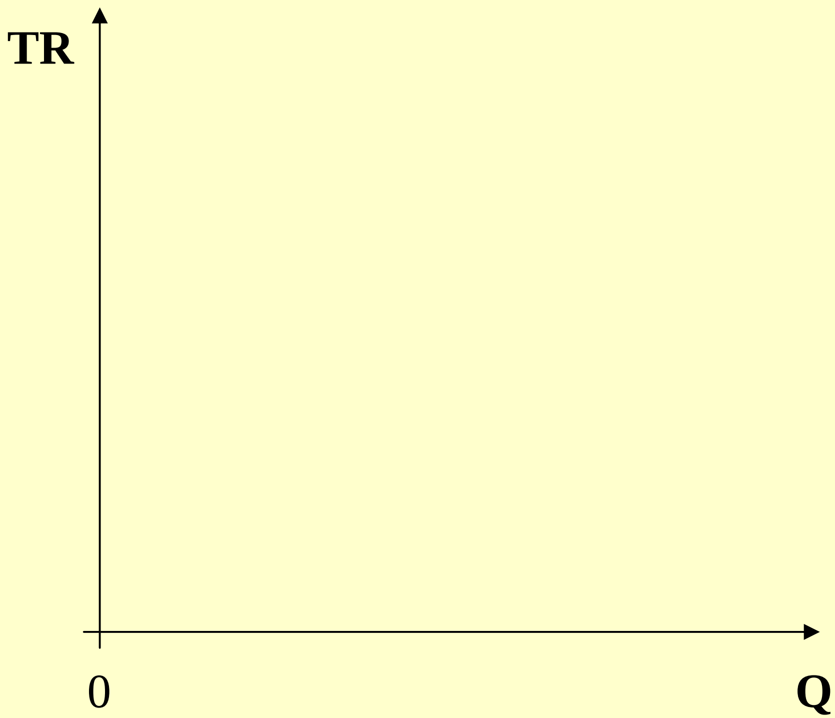
가격탄력성과 기업의 매출

Own-Price Elasticity and Total Revenue

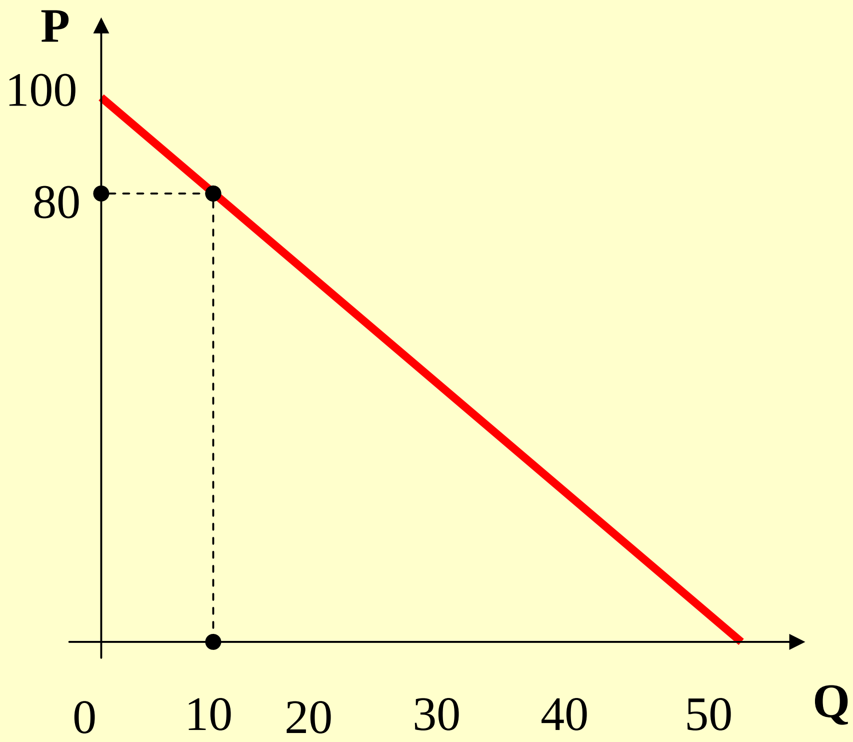
- Elastic Demand
  - Increase (a decrease) in price leads to a decrease (an increase) in total revenue.
- Inelastic Demand
  - Increase (a decrease) in price leads to an increase (a decrease) in total revenue.
- Unitary Demand
  - Total revenue is maximized at the point where demand is unitary elastic.

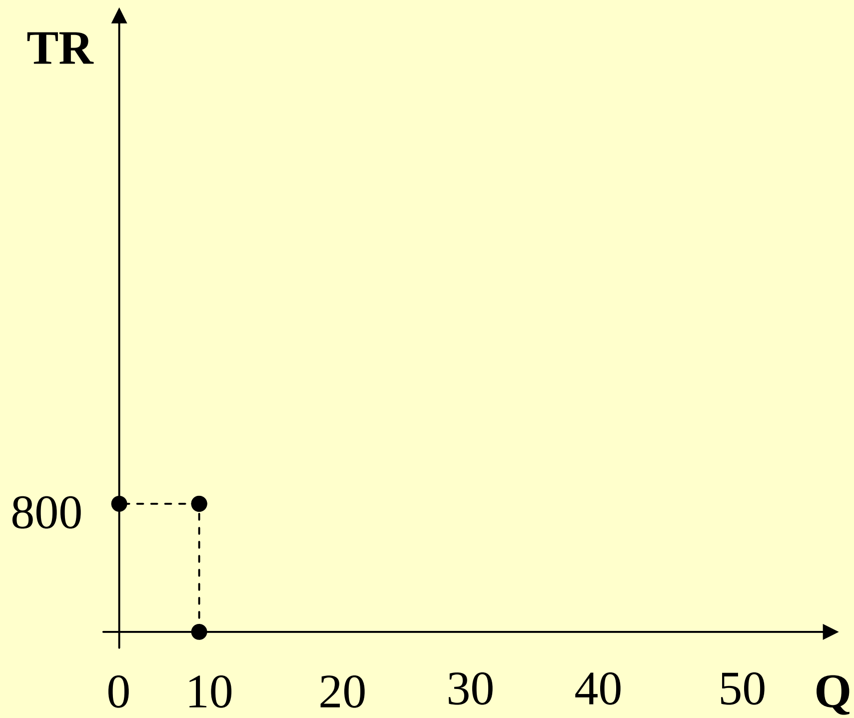
Elasticity, Total Revenue and Linear Demand



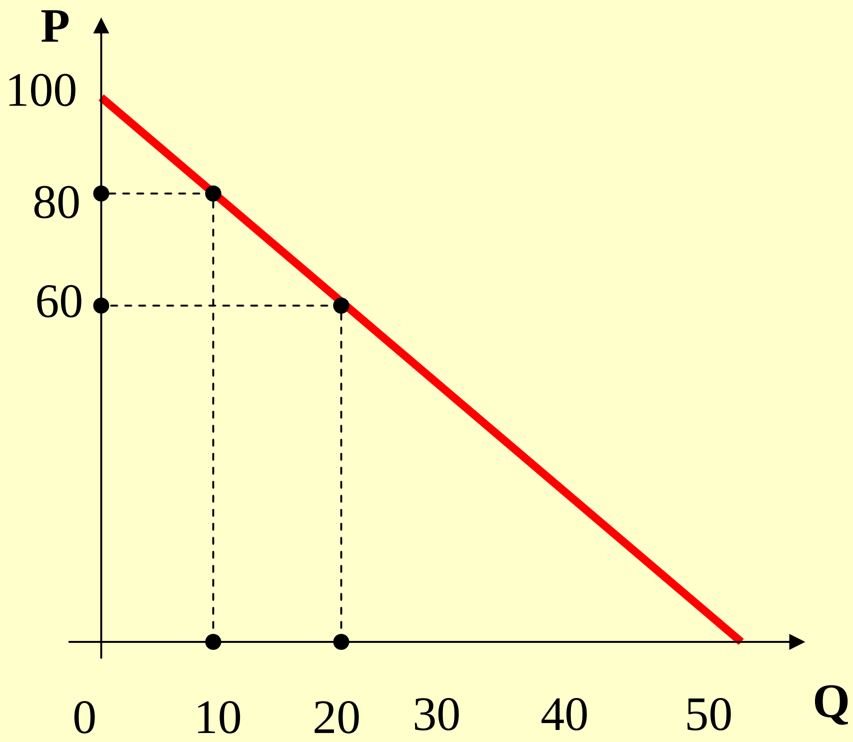


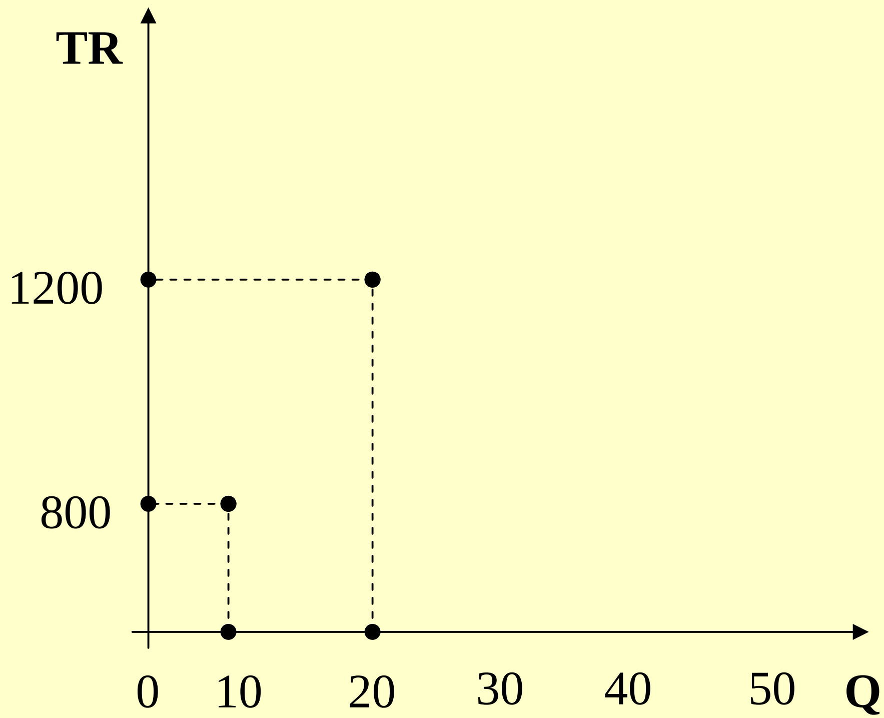
Elasticity, Total Revenue and Linear Demand



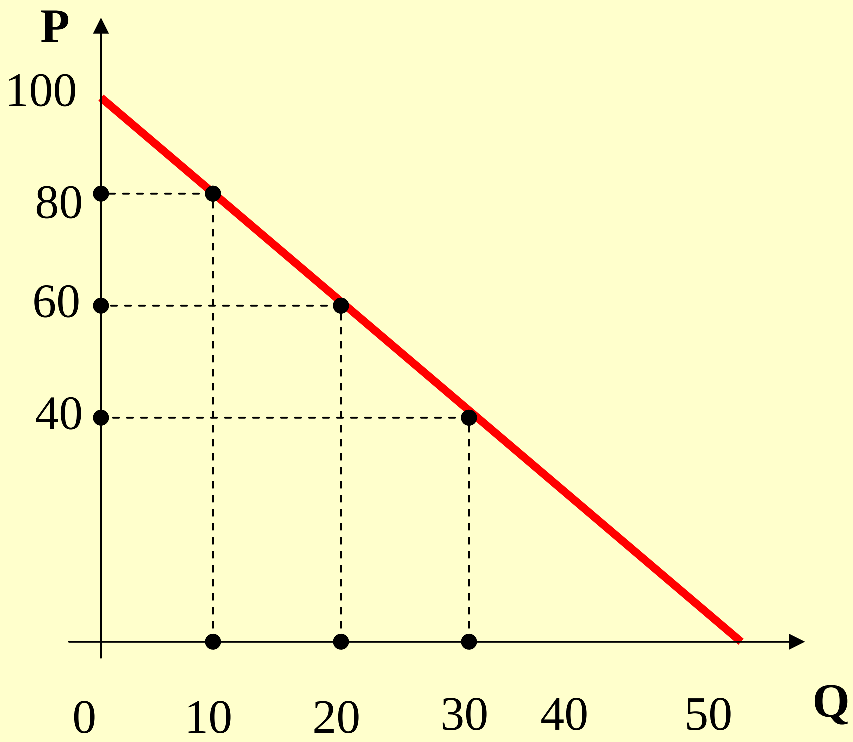


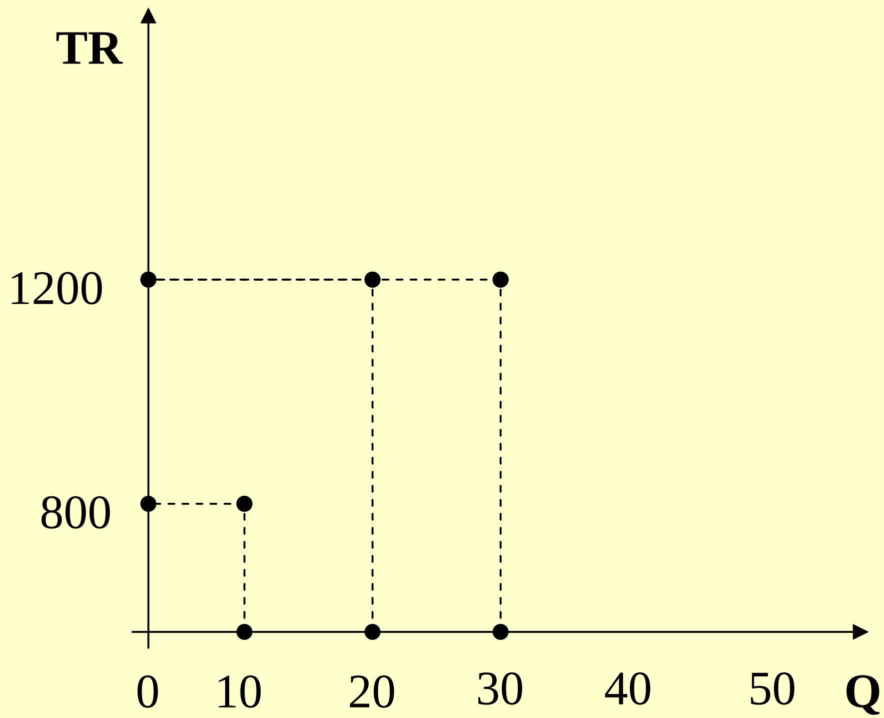
Elasticity, Total Revenue and Linear Demand



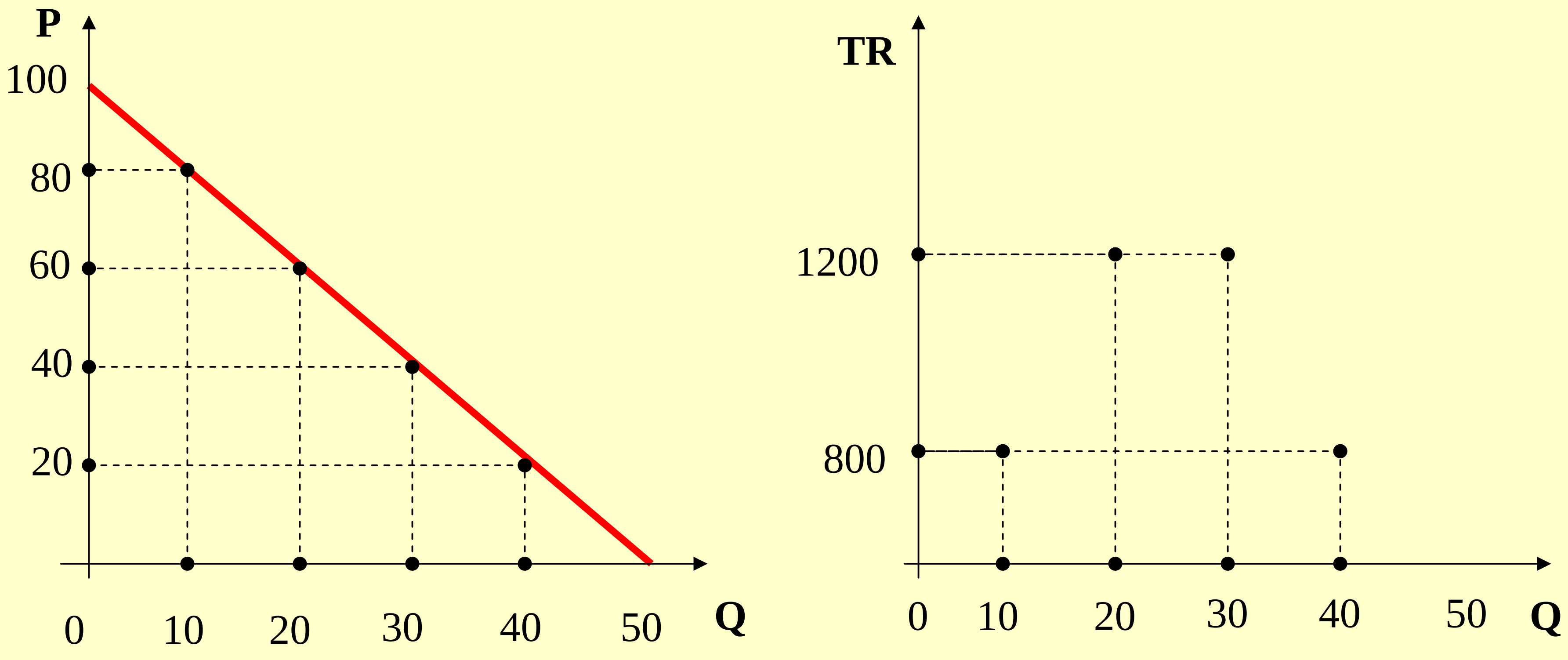


Elasticity, Total Revenue and Linear Demand

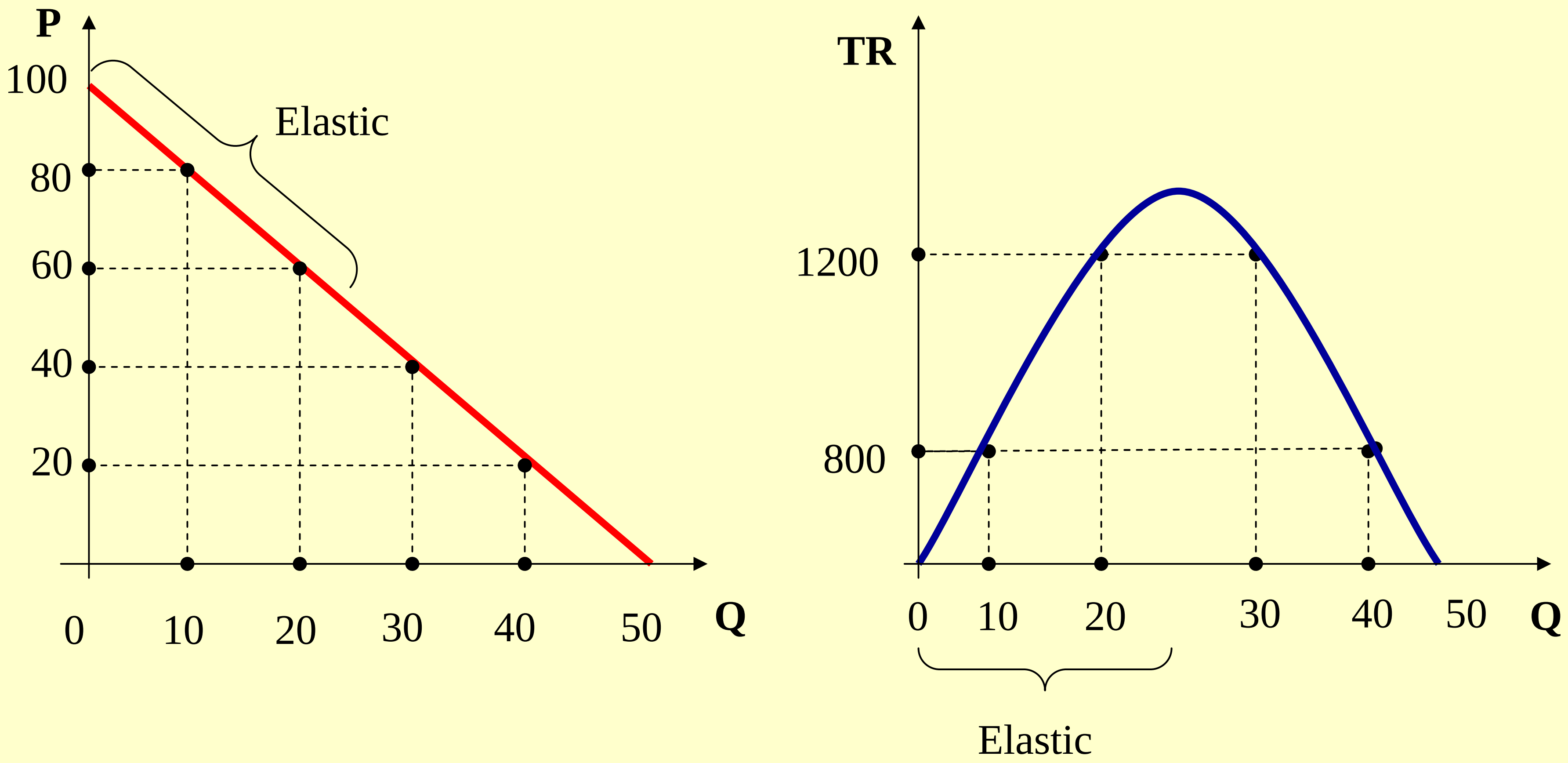




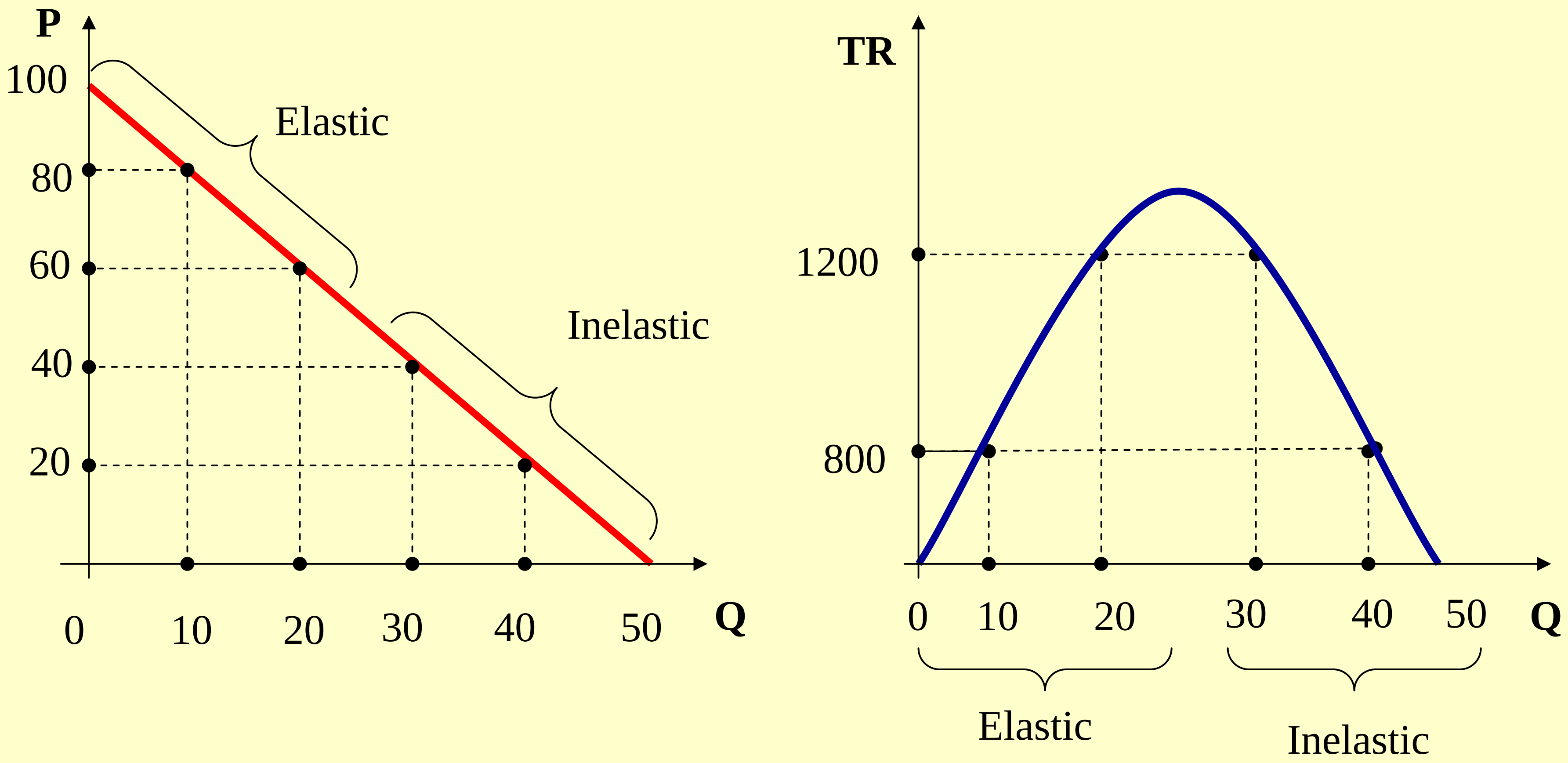
Elasticity, Total Revenue and Linear Demand



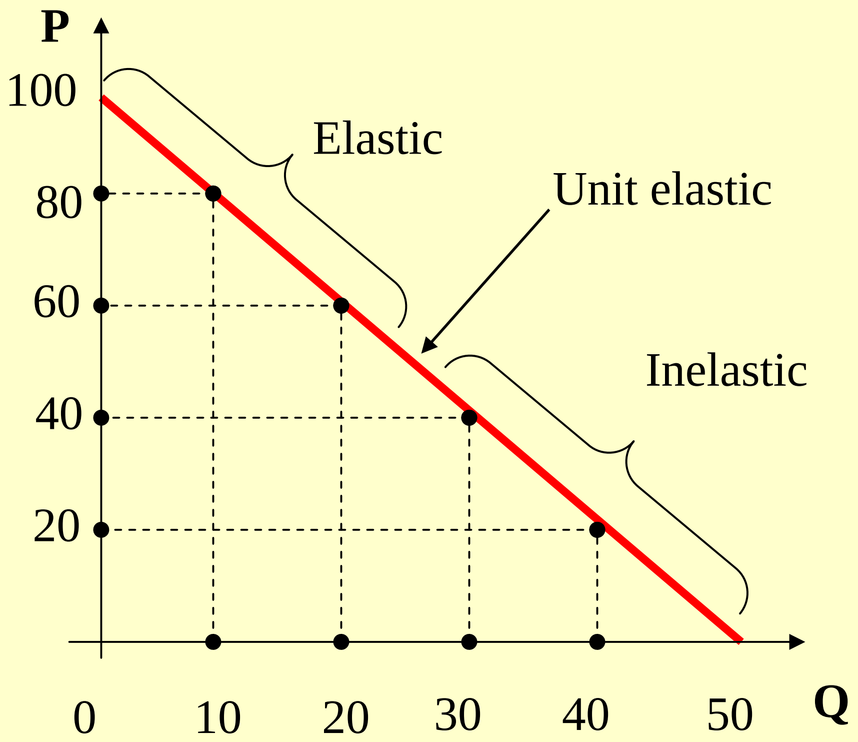
Elasticity, Total Revenue and Linear Demand

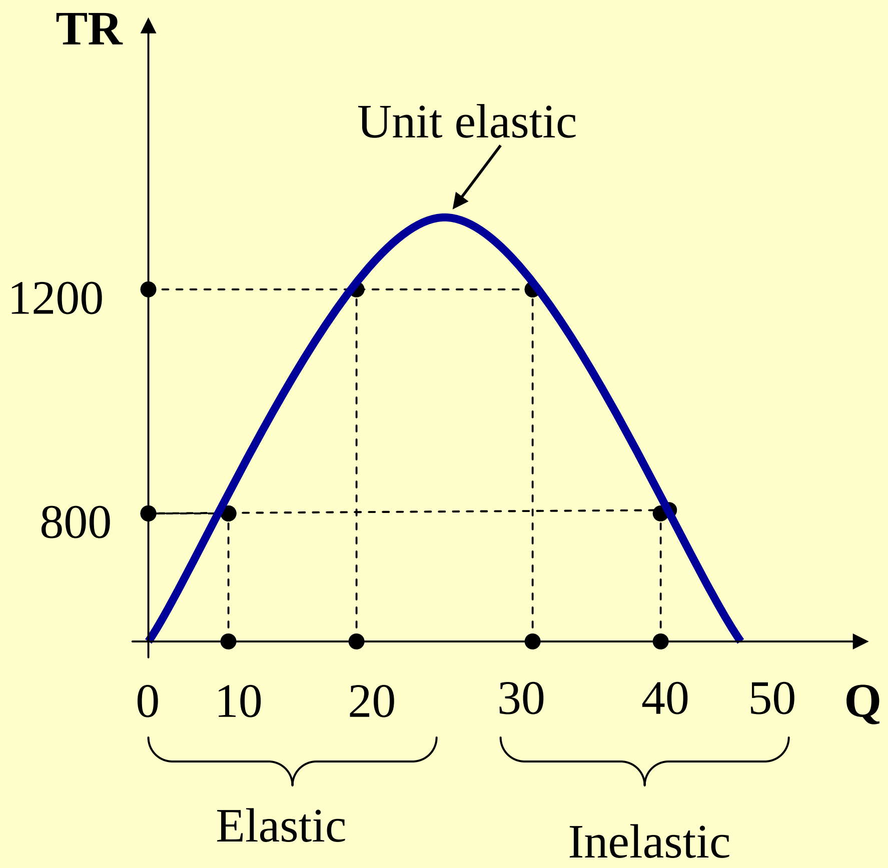


Elasticity, Total Revenue and Linear Demand



Elasticity, Total Revenue and Linear Demand





수요의 가격탄력성에 영향을 주는 요소
Factors Affecting Own Price Elasticity

- Available Substitutes (대체재의 유무)
  - The more substitutes available for the good, the more elastic the demand.
- Time (시간변수)
  - 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 (예산에서의 비중)
  - 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.

교차탄력성

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 (대체재).

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

소득탄력성
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 (정상재).

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

If $E_{Q_X,M} = 0$, then X is independent of income (독립재).

탄력성의 이용범위
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!

Example 1: Pricing and Cash Flows

- According to an KFTC Report, KT's own price elasticity of demand for long distance services is -8.64.
- KT needs to boost revenues in order to meet it's marketing goals.
- To accomplish this goal, should KT raise or lower it's price?

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 KT.

Example 2: Quantifying the Change

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

Answer

- Calls would increase by 25.92 percent!

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

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

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

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

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

- According to an KFTC Report, KT's cross price elasticity of demand for long distance services is 9.06.
- If competitors (SKT or LGT) reduced their prices by 4 percent, what would happen to the demand for KT services?

Answer

- KT's demand would fall by 36.24 percent!

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

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

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

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

Interpreting Demand Functions

- Mathematical representations of demand curves.
- Example:

$$Q_X{}^d = 10 - 2P_X + 3P_Y - 2M$$

- X and Y are substitutes (coefficient of P_Y is positive).
- X is an inferior good (coefficient of M is negative).

Example of Linear Demand

- $Q^d = 10 - 2P$.
- Own-Price Elasticity: $(-2)P/Q$.
- If $P=1$, $Q=8$ (since $10 - 2 = 8$).
- Own price elasticity at $P=1$, $Q=8$:

  $(-2)(1)/8 = -0.25$.

Log-Linear Demand

- General Log-Linear Demand Function:

$$\ln Q_X{}^d = \beta_0 + \beta_X \ln P_X + \beta_Y \ln P_Y + \beta_M \ln M + \beta_H \ln H$$

$$\text{Own Price Elasticity}: \quad \beta_{\mathrm{X}}$$

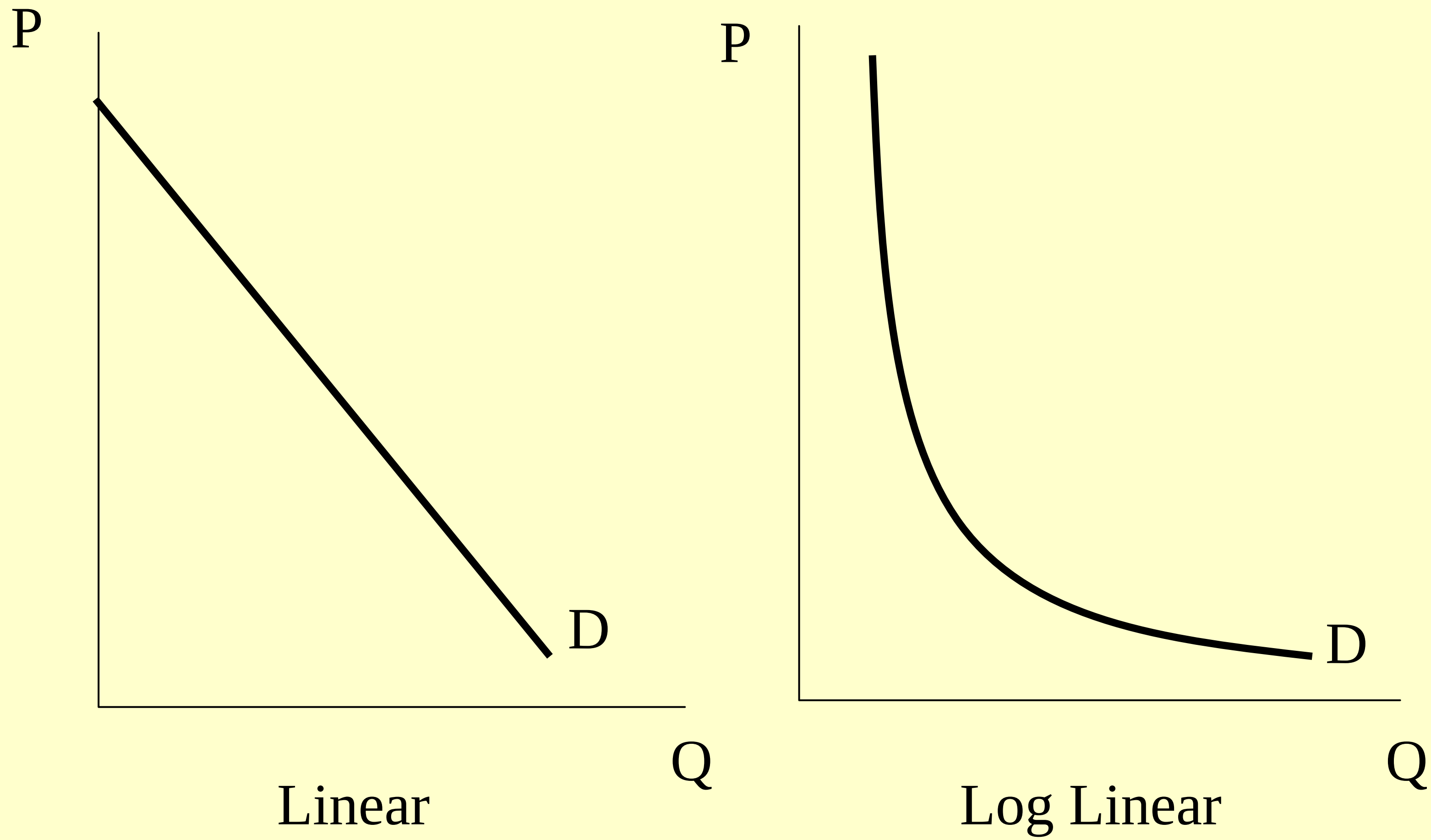
$$\text{Cross Price Elasticity}: \quad \beta_{\mathrm{Y}}$$

$$\text{Income Elasticity}: \quad \beta_{\mathrm{M}}$$

Example of Log-Linear Demand

- $\ln(Q^d) = 10 - 2 \ln(P)$.
- Own Price Elasticity: -2.

Graphical Representation of Linear and Log-Linear Demand



Conclusion

- Elasticities are tools you can use to *quantify* the impact of changes in prices, income, and advertising on sales and revenues.
- Given market or survey data, regression analysis can be used to estimate:
  - Demand functions.
  - Elasticities.
  - A host of other things, including cost functions.
- Managers can quantify the impact of changes in prices, income, advertising, etc.