

Microeconomics, Module 11: "Monopoly" (Chapter 10)

Taxes, Price, and Quantity

(The attached PDF file has better formatting.)

Linear Demand Curves and Excise Taxes

A monopolist with constant marginal costs, $MC = k$, faces a linear demand curve $Q = \alpha - \beta P$, so $\partial Q/\partial P = -\beta$. We want to find the effect on the equilibrium price P^* of a \$1 per unit excise tax.

- A. Rewrite the demand curve as P in terms of Q .
- B. What is the total revenue curve? (Total revenue is $P \times Q$.)
- C. What is the marginal revenue curve? (Marginal revenue is the partial derivative of total revenue with respect to quantity.)
- D. What is the monopoly quantity? (Equate marginal revenue and marginal cost.)
- E. What is the monopoly price? (Find the price from the demand curve.)
- F. What is the marginal cost with the excise tax?
- G. What is the monopoly price with the excise tax?
- H. What is the monopoly quantity with the excise tax?

Solution:

Part A: The market demand curve is $Q = \alpha - \beta P$, so $\partial Q/\partial P = -\beta$. We rewrite the demand curve as $P = \alpha/\beta - Q/\beta$.

Part B: Total revenue = $P \times Q = \alpha Q/\beta - Q^2/\beta$.

Part C: Marginal revenue = $\partial(\text{Total Revenue}) / \partial Q = \alpha/\beta - 2Q/\beta$.

Part D: The monopolist produces a quantity where marginal revenue equals marginal cost. The marginal cost is a constant k , so

$$\alpha/\beta - 2Q/\beta = k \Rightarrow \alpha/\beta - k = 2Q/\beta \Rightarrow Q = \beta/2 \times (\alpha/\beta - k) = \alpha/2 - k\beta/2.$$

Part E: The monopoly price is $P = \alpha/\beta - Q/\beta = \alpha/\beta - (\alpha/2 - k\beta/2)/\beta = \alpha \times (1/\beta - 1/2) + k/2$.

Part F: An excise tax of \$1 increases the marginal cost by \$1, so the monopoly price is

$$P = \alpha \times (1/\beta - 1/2) + (k+1)/2.$$

An excise tax of \$1 increases the price by \$1/2.

Part G: An excise tax of \$1 increases the marginal cost by \$1, so

$$\alpha/\beta - 2Q^*/\beta = k+1 \Rightarrow \alpha/\beta - (k+1) = 2Q^*/\beta \Rightarrow Q^* = \beta/2 \times (\alpha/\beta - (k+1)) = \alpha/2 - (k+1)\beta/2.$$

The decrease in quantity for an excise tax of \$1 is $\beta/2$.

- In a competitive market, an excise tax of \$1 with a flat marginal cost curve increases the price by \$1 and decreases quantity by β .
- In a monopoly market, an excise tax of \$1 with a flat marginal cost curve increases the price by \$0.50 and decreases quantity by $\beta/2$.