

14.01 Principles of Microeconomics, Fall 2007

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Lecture 18

Tax, Subsidy, and General Equilibrium

Outline

1. Chap 9: *Tax*
2. Chap 9: *Subsidy*
3. Chap 16: *General Equilibrium*
4. Chap 16: *Exchange Economy*

1 Tax

Government imposes a \$1 tax on every unit sold (see Figure 1), as discussed in Lecture 17. The buyer's price is shown on the y-axis. The consumer surplus

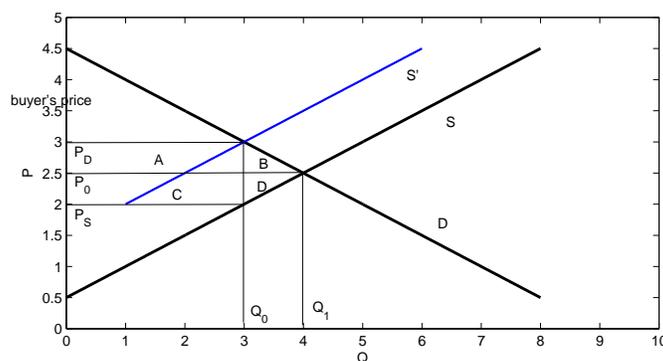


Figure 1: Tax.

and producer surplus both decrease:

$$\Delta CS = -(A + B),$$

$$\Delta PS = -(C + D).$$

Government revenue

$$\Delta G = A + C.$$

So the deadweight loss is

$$DWL = B + D.$$

The burden of a tax is shared by consumers and producers; the relative amount borne by consumers and producers depends on relative elasticities of demand and supply.

- If the demand is inelastic (see Figure 2),

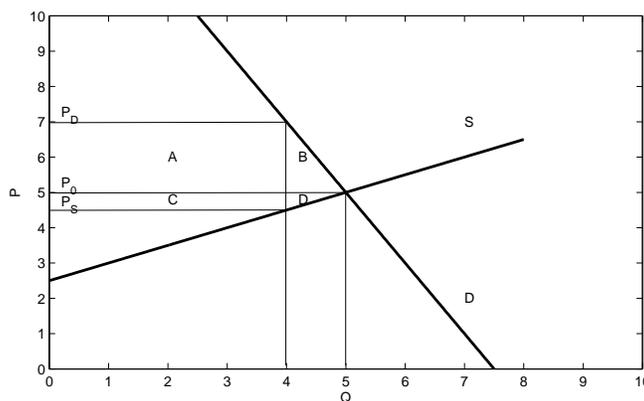


Figure 2: Tax Burden on Buyers, Relative Inelastic Demand Curve.

$$\Delta CS = -(A + B),$$

$$\Delta PS = -(C + D),$$

buyers bear most of the burden of the tax.

- If the supply is inelastic (see Figure 3),

$$\Delta CS = -(A + B),$$

$$\Delta PS = -(C + D),$$

producers bear most of the burden of the tax.

Pass-through fraction is the percentage of a tax borne by consumers. It tells the fraction of tax "passed through" to consumers through higher price. If $E_D = 0$, say the demand is perfectly inelastic (see Figure 4), buyers bear all of the tax burden:

$$\frac{E_S}{E_S - E_D} = 1.$$

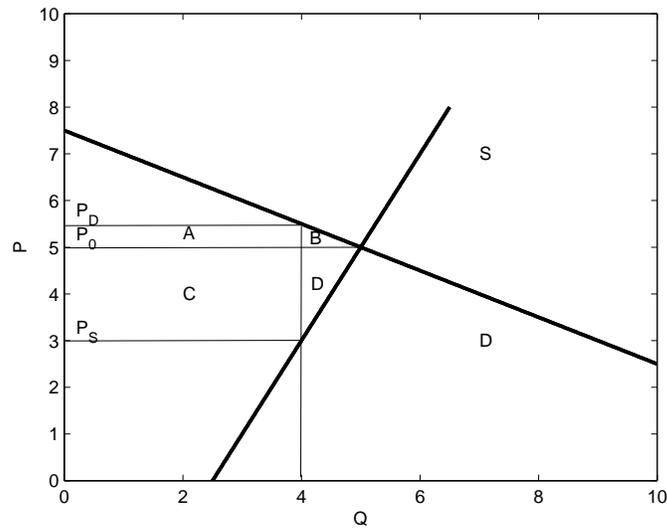


Figure 3: Tax Burden on Producers, Relative Inelastic Supply Curve.

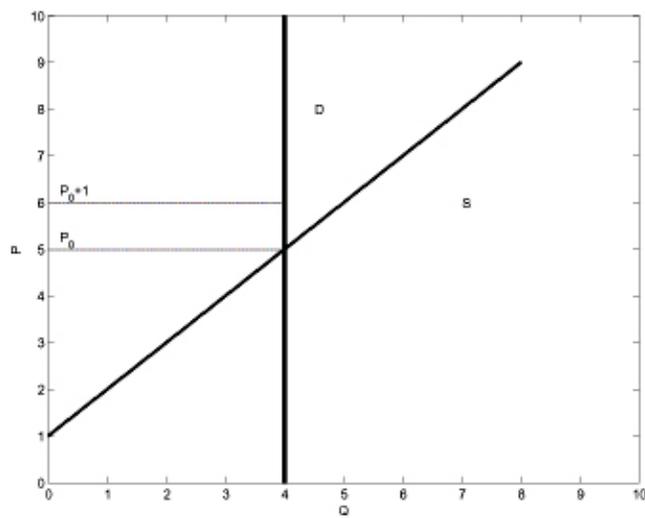


Figure 4: Tax Burden on Buyers, Perfectly Inelastic Demand Curve.

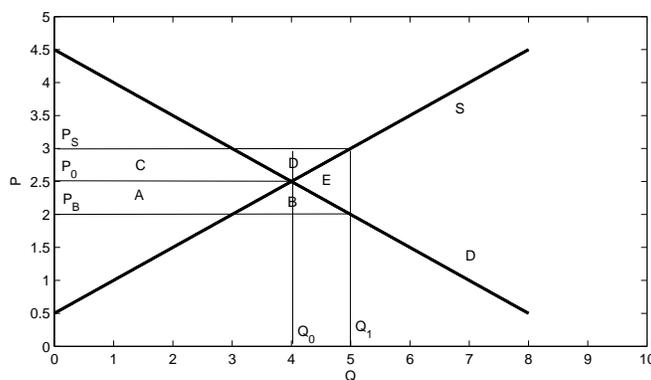


Figure 5: Subsidy.

2 Subsidy

Government subsidizes \$1 for each unit sold (see Figure 5). In this case, sellers' price is higher than buyers' price:

$$P_B = P_S + 1.$$

The consumer surplus increases by

$$\Delta CS = A + B;$$

and the producer surplus increases by

$$\Delta PS = C + D.$$

Government expenditure equals the whole area between P_B and P_S under the quantity Q_1

$$\Delta G = -(A + B + C + D + E).$$

The deadweight loss is

$$DWL = E.$$

Likewise we can discuss the benefit of subsidy:

- if $\frac{E_D}{E_S}$ is small, namely, the demand is more inelastic, the benefit of subsidy goes mostly to buyers;
- if $\frac{E_D}{E_S}$ is large, namely, the supply is more inelastic, the benefit of subsidy goes mostly to sellers.

3 General Equilibrium

Partial equilibrium. Ignores effects from other markets.

General equilibrium. Simultaneous determination of the prices and quantities in all relevant markets, taking into account feedback effects.

Feedback effect. The price or quantity adjustment in one market caused by price and quantity adjustments in related markets.

Example (DVD and Movie Tickets Markets). The price of a DVD is \$3, and the price of a movie ticket is \$6 at equilibrium. Now tax \$1 on the movie ticket (see Figure 6). The specific process of price change is listed as follows:

MOVIE TICKET :

$$S_M \rightarrow S'_M,$$

Price change: 6 → 6.35;

DVD :

The price change of movie tickets shifts the demand curve of DVD.

$$D_V \rightarrow D'_V,$$

Price change: 3 → 3.5;

MOVIE TICKET :

The price change of DVD shifts the demand curve of movie tickets.

$$D_M \rightarrow D'_M,$$

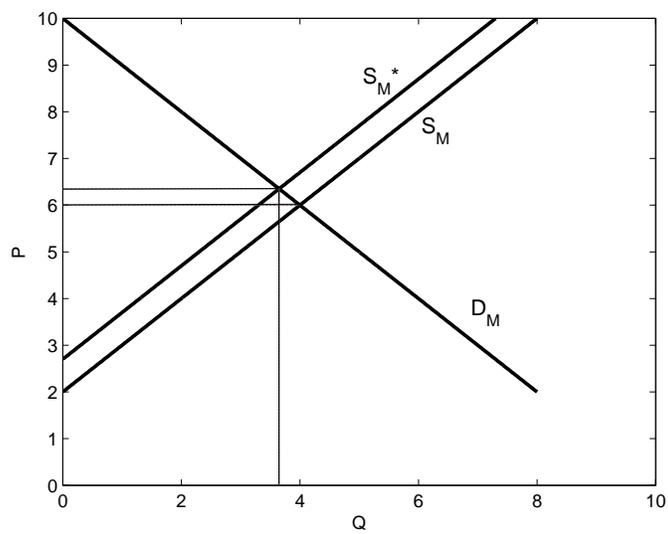
Price change: 6.35 → 6.75;

and so on. The final equilibrium prices are

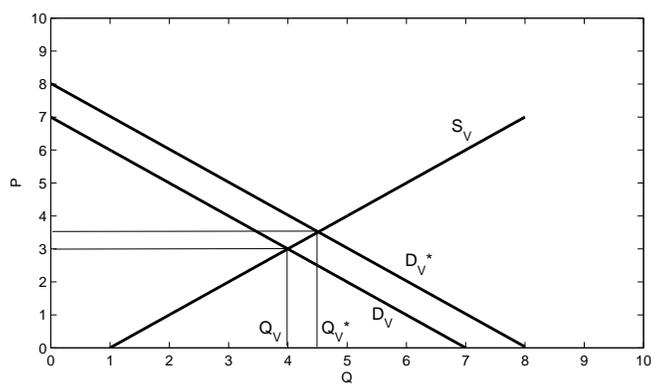
$$P(\text{MOVIETICKET}) = 6.85;$$

$$P(\text{DVD}) = 3.58.$$

If we ignore the feedback effects, we might underestimate the price change bought by the tax.



(a) Price Change of Movie Ticket.



(b) Price Change of DVD.

Figure 6: General Equilibrium of DVD and Movie Ticket Markets.

4 Exchange Economy

Assume that:

- there are two consumers A and B;
- there are two goods, food and clothing;
- the quantities of food and clothing are 10 and 6, and A has 7 food and 1 clothing, while B has 3 food and 5 clothing;
- they know each others' preferences;
- transaction cost is zero.

The edgeworth box is shown in Figure 7.

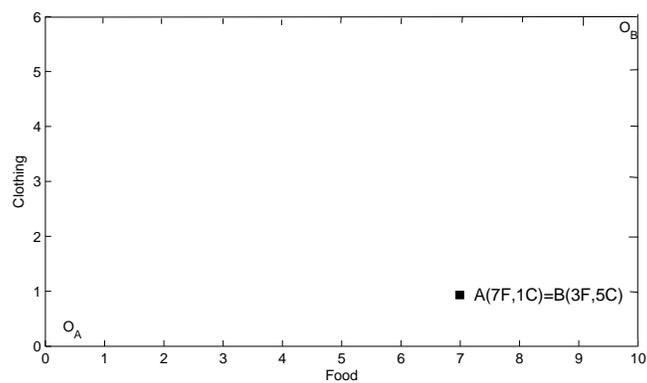


Figure 7: Edgeworth Box.