

14.01 Principles of Microeconomics, Fall 2007

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Lecture 17

Supply Restrictions, Tax, and Subsidy

Outline

1. Chap 9: *Agricultural Price Support*
2. Chap 9: *Supply Restrictions*
3. Chap 9: *Tax and Subsidy*

1 Agricultural Price Support

In this case, government sets prices higher than the free market level, and buys excess supply (see Figure 1). The buyer's price is shown on the y-axis in the following graphs. The original consumer surplus equals the area between the

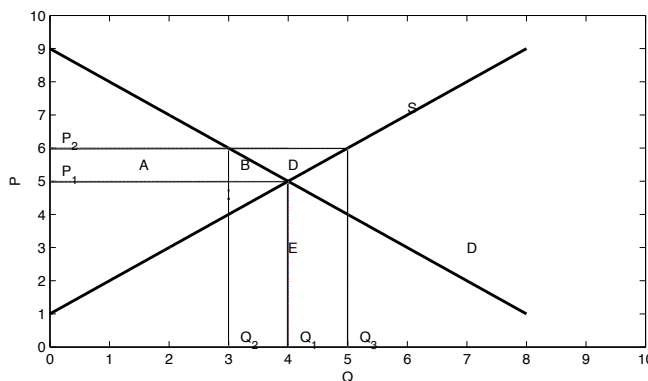


Figure 1: Agricultural Price Support.

demand curve and the line of price P_1 ; after the price support, it equals the area between the demand curve and the line of price P_2 , thus

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

The original producer surplus equals the area between the supply curve and the line of price P_1 ; after the price support, it equals the area between the supply

curve and the line of price P_2 , thus

$$\Delta PS = A + B + D.$$

Government buys quantity $Q_3 - Q_2$ at price P_2 ; the cost equals the area of the rectangular

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

The deadweight loss to the society is

$$DWL = -(B + E).$$

2 Supply Restrictions

Government restricts quantity supplied to be less than Q_1 (see Figure 2). The

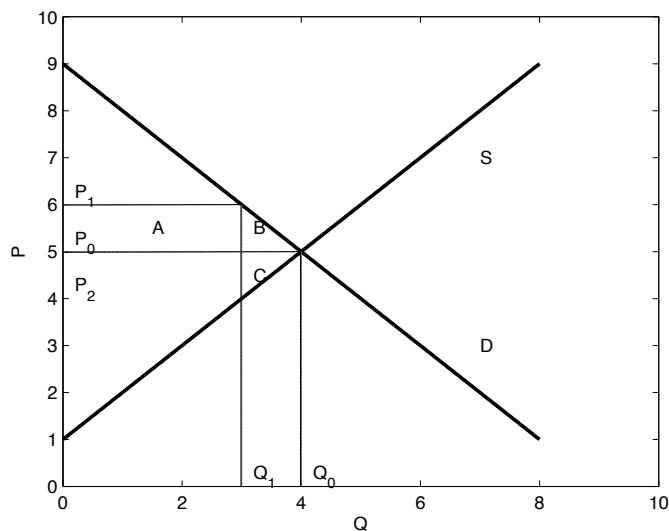


Figure 2: Supply Restriction.

original consumer surplus equals the area between the demand curve and the line of price P_0 ; after the supply restriction, it equals the area between the demand curve and the line of price P_1 , thus

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

The original producer surplus equals the area between the supply curve and the line of price P_0 ; after the supply restriction, it equals the area of the trapezoid, with the supply curve, the line of price P_1 , the line of quantity Q_1 , and the price axis as its sides, thus

$$\Delta PS = A - C.$$

Thus, the deadweight loss is

$$DWL = -(B + C).$$

Example government measures include import quota and tariff, which benefit domestic producers but hurt consumers.

2.1 Zero Quota

S_D is the domestic supply, and D_D is the domestic demand. If no import is allowed, the domestic price is P_0 . Without restriction on import, the domestic price would be the same as the world price P_W , which is lower than P_D (see Figure 3). Without import quota restriction, consumer surplus equals the area

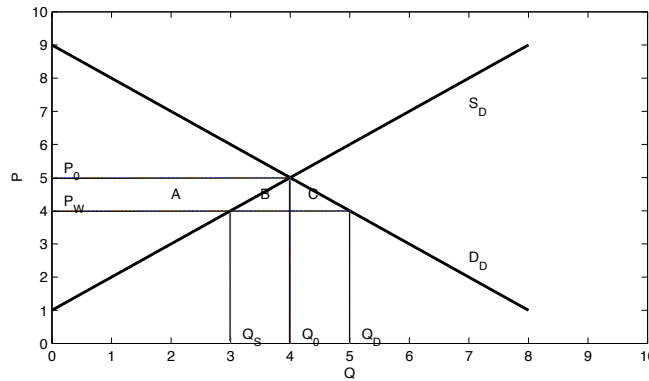


Figure 3: Zero Quota.

between the domestic demand curve and the line of price P_W ; if the quota is zero, it equals the area between the domestic demand curve and the line of price P_0 , thus

$$\Delta CS = -(A + B + C).$$

Without quota restriction, producer surplus equals the area between the domestic supply curve and the line of price P_W ; if the quota is zero, it equals the area between the domestic supply curve and the line of price P_0 , thus

$$\Delta PS = A.$$

The deadweight loss is

$$DWL = B + C.$$

2.2 Non-Zero Quota

Given the same S_D , D_D , and P_W , now suppose the government sets non-zero quota k . The domestic price P_1 is where the difference between domestic demand

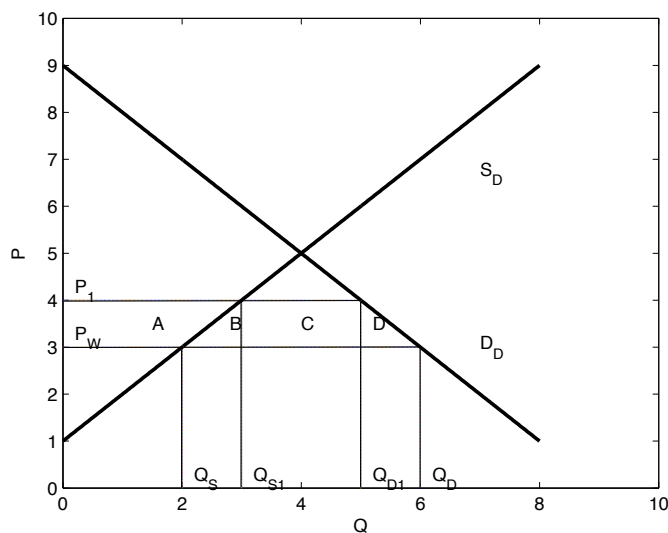


Figure 4: Non-Zero Quota.

(Q_{D1}) and domestic supply (Q_{S1}) is k (see Figure 4). Likewise, the change of consumer surplus

$$\Delta CS = -(A + B + C + D);$$

and the change of domestic producer surplus

$$\Delta PS_D = A.$$

The net domestic loss equals

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

The foreign producer surplus increases by excess profits, which equal the area of rectangular C

$$\Delta PS_F = C.$$

The total deadweight loss is

$$DWL = B + D.$$

The domestic loss is

$$\text{Domestic Loss} = B + C + D.$$

2.3 Import Tariff

Government imposes a tariff $P_1 - P_W$ on each unit imported (see Figure 5). The change of consumer surplus and domestic producer surplus are

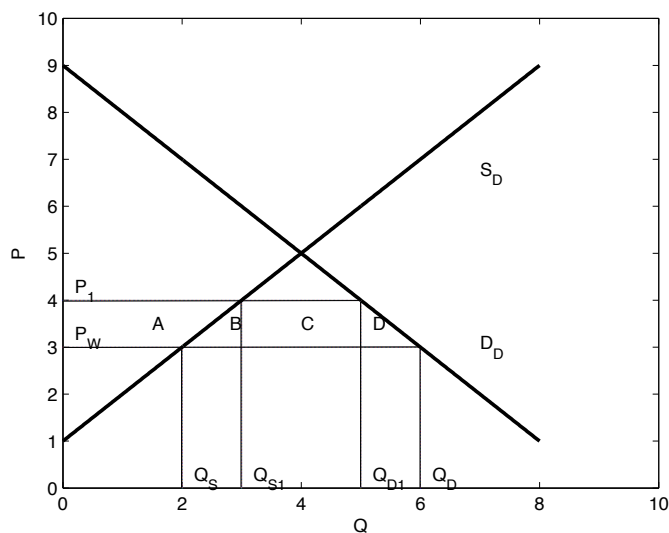


Figure 5: Import Tariff.

$$\Delta CS = -(A + B + C + D)$$

and

$$\Delta PS_D = A,$$

respectively. Foreign producers gain nothing, that is to say

$$\Delta PS_F = 0,$$

because C becomes the revenue of government

$$\Delta G = C.$$

The deadweight loss is

$$DWL = B + D,$$

which equals to the domestic loss.

3 Tax and Subsidy

Assume that government imposes a \$1 tax on each cigarette unit. Given the market price P , if the tax is paid by

- producers, then buyers pay P and producers get $P - 1$;
- consumers, then buyers pay $P + 1$ and producers get P .

Therefore, the price paid by buyers and the price received by producers always have a difference of 1 (see Figure 6). Let P_D be the buyer's price and P_S be the seller's price.

$$P_D - P_S = 1.$$

In figure 6, we put buyer's price on the y axis. Therefore, with the tax, the supply curve moves from S to S' . The equilibrium buyer's price is P_D , and the equilibrium seller's price is P_S . Thus, the consumer surplus and producer

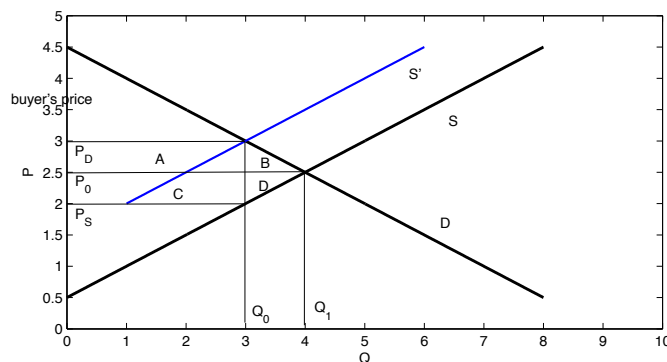


Figure 6: Tax.

surplus both decrease:

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

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

Government revenue

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

So, the deadweight loss is

$$DWL = B + D.$$