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

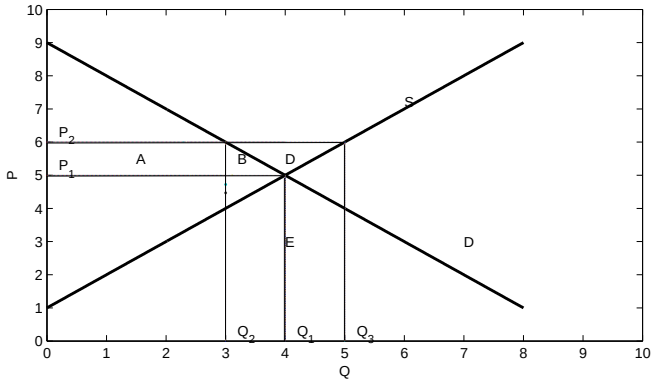


Figure 1: Agricultural Price Support.

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

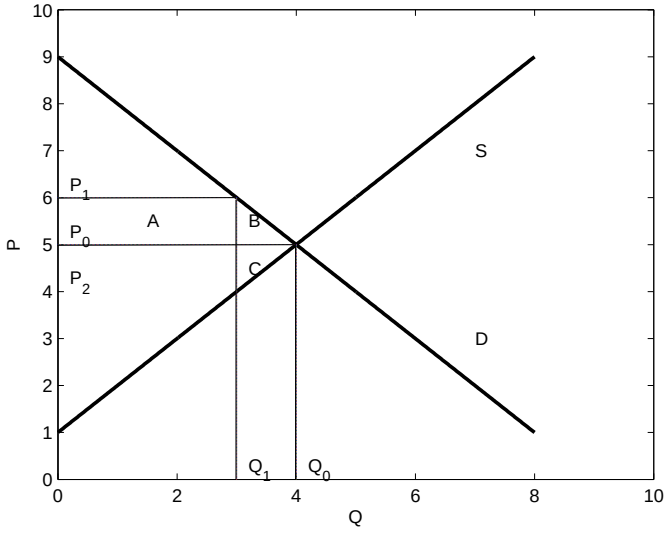


Figure 2: Supply Restriction.

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

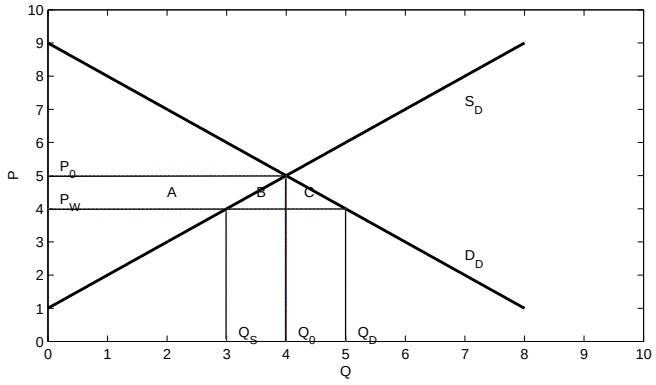


Figure 3: Zero Quota.

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

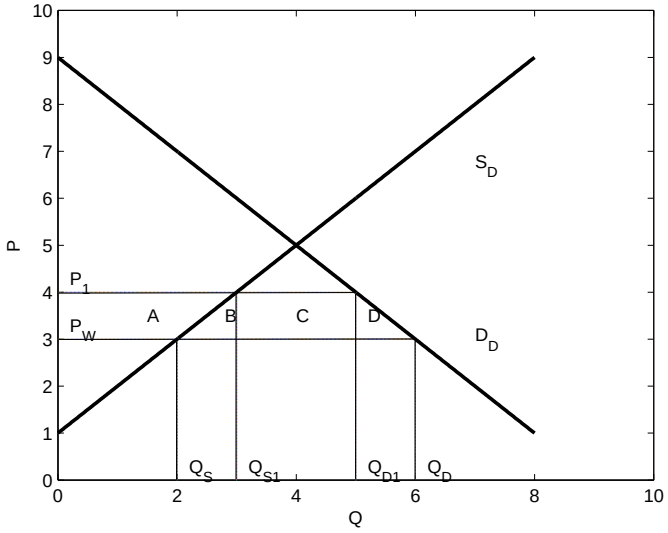


Figure 4: Non-Zero Quota.

($Q_{D1}$) 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

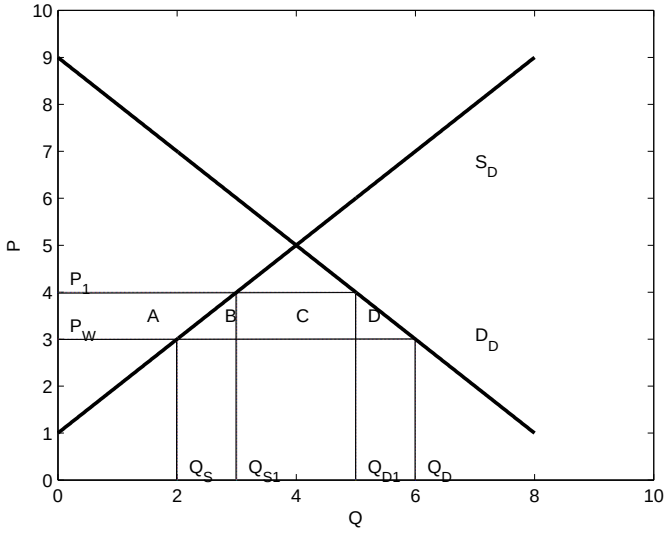


Figure 5: Import Tariff.

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

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 $P_B$ 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

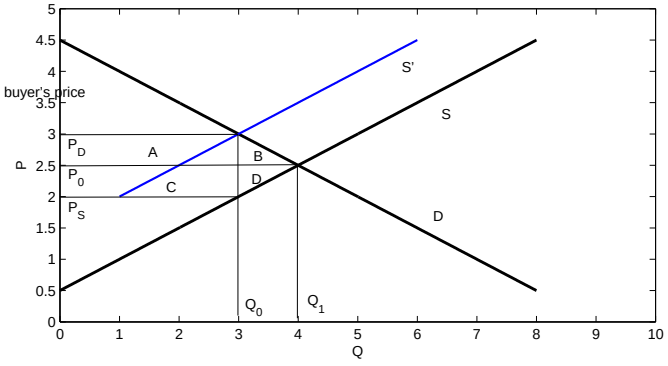


Figure 6: Tax.

surplus both decrease:

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

Government revenue

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

So, the deadweight loss is

$$DWL = B + D.$$