Lecture XV: Producer Surplus, Economic Efficiency, and Income Distribution

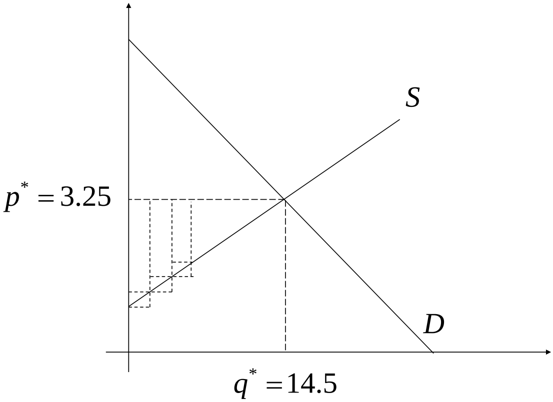
Charles B. Moss [1]

[1]University of Florida

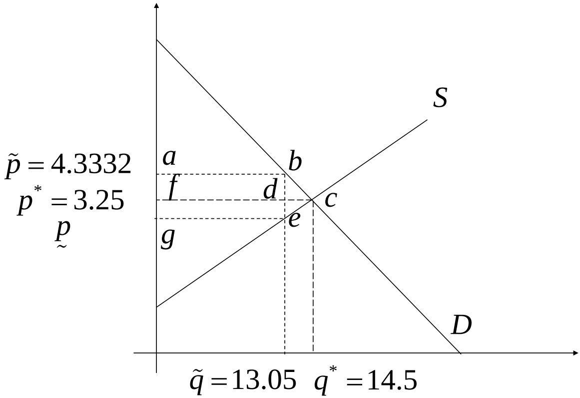
October 4, 2018

1. Producer Surplus
2. Efficiency and Equity

Producer Surplus



Quota Example



Producer Surplus – Marginal Cost of 13.05

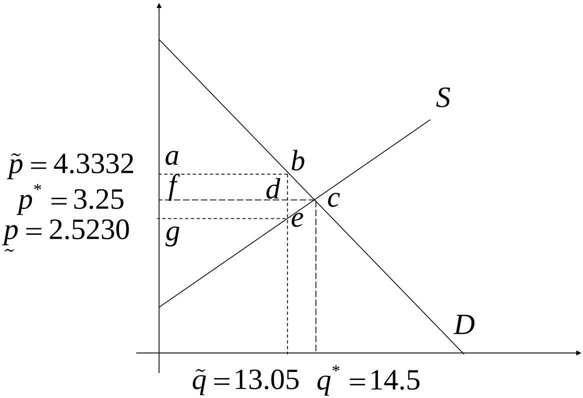
- Returning to the inverse supply function

$$\begin{aligned} P &= -3.9772 + 0.4981 Q_s \\ P &= -3.9772 + 0.4981 \times 13.05 = 2.5230 \end{aligned} \tag{1}$$

- As a check - use the supply function

$$Q_S = 7.9750 + 2.0077 \times 2.5230 = 13.04 \approx 13.05 \tag{2}$$

Producer Surplus – With Price



Change in Producer Surplus

- What is the gain to producers - $abdf$ - dce

$$\begin{aligned} abdf &= (4.3332 - 3.25) * 13.05 = 14.1358 \\ dce &= (14.5 - 13.05) * (3.25 - 2.5230)/2 = 0.5271 \end{aligned} \quad (3)$$

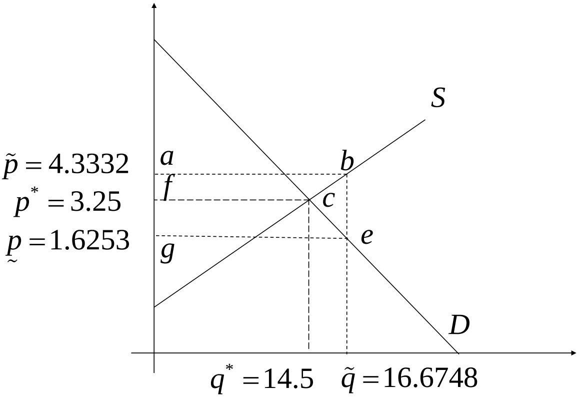
$$\Delta PS = 14.1358 + 0.5271 = 14.5528.$$

- Net welfare cost

$$\Delta PS + \Delta CS = 14.5528 - 14.9211 = -0.25827. \quad (4)$$

- Basically bce.

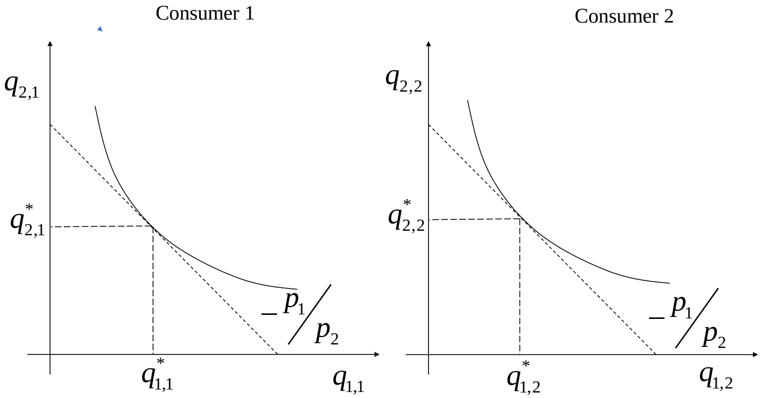
Price Floor – Subsidize Output



Producer and Consumer Surplus

- Change in Producer Surplus $abcf$.
  - $(4.3332-3.25)\times 14.5)+(16.748-14.5)\times(4.3332-3.25)= 15.7064+1.1779=16.8843$
- Change in Consumer Surplus $fceg$.
  - $(3.25-1.6253)\times 14.5+(16.6748-14.5)\times (3.25-1.6253)/2=23.5582+1.7667=25.3249$
- Taxpayer expense $abeg$.
  - $(4.3332-1.6253)\times 16.6748=45.157$
- Net Social Cost $16.8843+25.3249-45.1537=2.9446$

Two Consumers



Underlying Concepts

- Each consumer is maximizing utility subject to a budget constraint

$$\begin{aligned} p_1 q_{1,1} + p_2 q_{2,1} \leq Y_1 = w_1 k_1 + w_2 l_1 \\ p_1 q_{1,2} + p_2 q_{2,2} \leq Y_2 = w_1 k_2 + w_2 l_2 \end{aligned} \tag{5}$$

  where k_1 is the capital endowed to consumer 1, k_2 is the capital endowed to consumer 2, l_1 is the labor endowed to consumer 1, and l_2 is the labor endowed to consumer 2.
- Note that we have some "summing up" restrictions

$$\begin{aligned} q_{1,1} + q_{1,2} = q_1 \leq f_1 \left(\gamma_k \left(k_1 + k_2 \right), \gamma_l \left(l_1 + l_2 \right) \right) \\ q_{2,1} + q_{2,2} = q_2 \leq f_2 \left(\left(1 - \gamma_k \right) \left(k_1 + k_2 \right) + \left(1 - \gamma_l \right) \left(l_1 + l_2 \right) \right) \end{aligned} \tag{6}$$

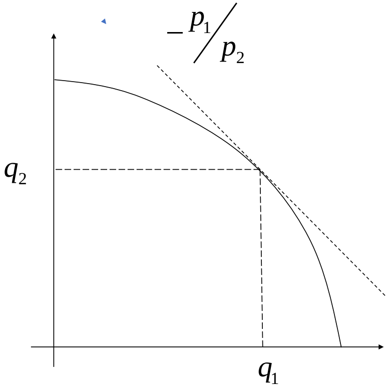
Profit Maximizing Conditions

- Beginning with the supply conditions in Equation 6,we assume that firms maximize utility by choosing γ_k and γ_l

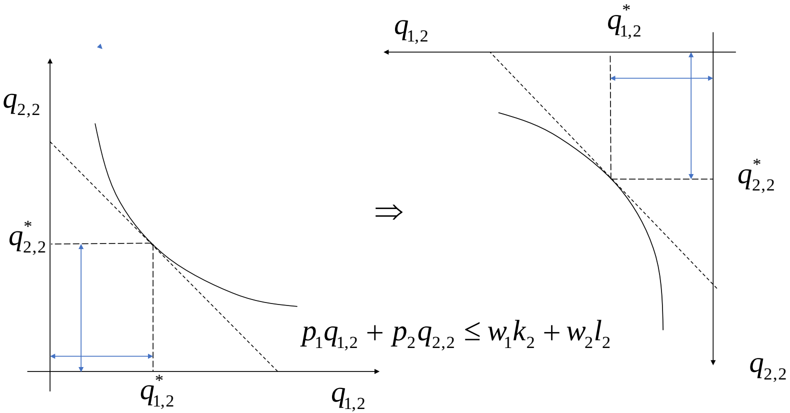
$$\begin{gathered} \max_{\gamma_k,\gamma_l} p_1 f_1\left(\gamma_k\left(k_1+k_2\right),\gamma_l\left(l_1+l_2\right)\right)+ \\ p_2 f_2\left(\left(1-\gamma_k\right)\left(k_1+k_2\right),\left(1-\gamma_l\right)\left(l_1+l_2\right)\right) \\ 0\leq\gamma_k\leq 1\,,0\leq\gamma_l\leq 1 \end{gathered} \tag{7}$$

- the result is the production possibilities frontier.

Production Possibilities Frontier

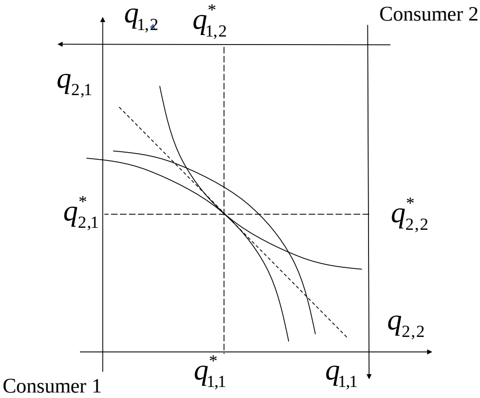


Rotate Consumer 2



$$p_1 q_{1,2} + p_2 q_{2,2} \leq w_1 k_2 + w_2 l_2$$

Edgeworth Box



$$q_1 = q_{1,1}^* + q_{1,2}^*$$

$$q_2 = q_{2,1}^* + q_{2,2}^*$$

General Equilibrium