Problem 7, page 209

Acirema is "small" \( P_w = \$10/\text{bag peanuts} \)

<table>
<thead>
<tr>
<th>( p )</th>
<th>( D )</th>
<th>( S )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>400</td>
<td>50</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>( p' )</td>
<td>( S' )</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>300</td>
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</tbody>
</table>

Quantity demanded \( \equiv D = 400 - 10P \)

Quantity supplied \( \equiv S = 50 + 5P \)

Import demand \( \equiv M = D - S = 350 - 15P \)

In autarky, \( M = 0 \): 
\[ 0 = 350 - 15P \]
\[ 15P = 350 \]
\[ P = 23.33/\text{bag peanuts} \]

(Note \( Q_e = 166.2 \))

With free trade, the price of peanuts in Acirema \( \Rightarrow P = \$23.33/\text{bag peanuts} \)

Imports, \( M = 350 - 15(10) = 200 \text{ bags/year} \)

Import quota \( (= 50 \text{ bags/year} \) adds 50 to Acirema's quantity supplied \( \Rightarrow S + Q = S' = 100 + 5P \)

The new domestic price \( P' \) is found where \( D \& S' \) cross.

\[ 100 + 5P = 400 - 10P \]

\[ 15P = 300 \]

a. Acirema's \( P_a = \$20/\text{bag} \), \$10 higher than \( P_w = \$10/\text{bag} \)

b. The quota rents equal \((P_a - P_w) \) quota

Note that \((P_a - P_w) \) is the equivalent tariff

\[ = (20 - 10) \frac{50 \text{ bags}}{\text{yr}} = \$500/\text{yr} \]

c. The consumption distortion loss \((\text{area } a \& d) \) equals

\[ \frac{1}{2} (P_a - P_w) (AD) \]
\[ 0.5 (10) 100 = \$500/\text{yr} \]

d. The production distortion loss \((\text{area } b) \) equals

\[ \frac{1}{2} (P_a - P_w) \Delta S \]
\[ 0.5 (10) 50 = \$250/\text{yr} \]
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a. The quota raises the price by $10
b. " rent equals area $C = $500$
c. Consumption is distorted by area $d = $500$
d. Production " by area $b = $250"
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\[ S = 50 + 5P; \quad D = 400 - 10P; \quad \text{External benefit} = 10 \]

A positive externality is present, such that each unit produced adds a benefit of $10 to the private benefit; price (\( P = \text{Mar. Private Benefit} \)) so \( MSB = P + 10 \).

Plot supply and demand:

<table>
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</tr>
<tr>
<td>40</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>15</td>
<td>250</td>
<td>125</td>
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Given:

Home is a "Small" country

\( P_w = 10 \)

a. Total welfare effect of a tariff of $5/unit

\[ \Delta CS = -a - b - c - d = -1375 \]

\[ \Delta PS = +a = 562.5 \]

\[ \Delta \text{Gov't Revenue} = 625 \]

External benefit from Home production \( +e = 250 \)

Total effect

\[-625 - 125 + 250 = -187.50 + 250 = 62.50\]

b. Total effect of a production subsidy.

No change in consumer surplus.

\[ \Delta PS = +a; \quad \Delta \text{Gov't revenue} = -a - b; \quad \text{external benefit} = e \]

Total effect = \(-b + e = -125 + 250 = 125\)

c. The production subsidy is more efficient because it does not distort consumption.

d. Optimal Subsidy = $10/unit (the external benefit).

Note that the Total effect becomes \(-b + e = 250\)
A production subsidy of $10/unit would raise quantity supplied to 150 units ($S = S_0 + 5(P_C + 10)$). Area $b$ becomes 0.5($P_C$)50 = $125. Area $e$ grows as quantity supplied grows to 150, becoming 10(50) = $500. The total effect equals $b + e = $500.