POSITIVE AND NORMATIVE ANALYSIS OF COMPETITIVE MARKETS

PRODUCER SURPLUS (P-R pp. 279-80, 286-7)

Defined as Revenue - Total variable cost
= Revenue rectangle OPSQ
  – Area under MC curve, OASQ
PS = Profit + Fixed cost
  = economic rent on something scarce available to this firm but not others
Can be insider status, good land, ...

Suppose price changes from \( P_1 \) to \( P_2 \)
Revenue change: \( OP_2S_2Q_2 - OP_1S_1Q_1 \)
Variable cost change: area \( Q_1S_1S_2Q_2 \)
Producer surplus change: area \( P_1S_1S_2P_2 \)
  = area to the left of firm’s supply curve
Can add up change in PS over all firms
Area to left of industry supply curve
OPTIMAL OUTPUT AND DEAD-WEIGHT LOSSES

Consumer and producer surpluses are dollar measures of the benefit the two parties obtain from engaging in the production and consumption of the good/service in question. There may be other benefits / costs, for example government revenues / disbursements.

Schematic exposition:

Write net benefit from producing quantity \( Q \) as \( B(Q) - C(Q) \).

First-order condition for maximization: \( B'(Q) - C'(Q) = 0 \) or marginal benefit = marginal cost.

But marginal benefit:
- = consumers’ maximum willingness to pay for marginal unit of the good
- = height of demand curve at \( Q \)

And marginal cost:
- = height of supply curve at \( Q \)

Therefore optimum is where the demand and supply curves intersect.

In figure, this is at \( E \), quantity \( Q_E \).

When \( Q_1 < Q_E \), \( MB_1 > MC_1 \)
- forgone net benefit = deadweight triangle \( E MB_1 MC_1 \), output should be expanded.

When \( Q_2 > Q_E \), \( MB_2 < MC_2 \)
- forgone net benefit = deadweight triangle \( E MB_2 MC_2 \), output should be contracted.
Effect of a tax or a subsidy (P-R pp. 326-332)

Tax: Quantity reduced from $Q_E$ to $Q_T$
Consumers pay $C_T - P_E$ more per unit;
Consumer surplus down by $C_TD_TEP_E$
Firms receive $P_E - F_T$ less per unit;
Producer surplus down by $F_TS_TEP_E$
$C_T - F_T = \text{amount of tax per unit of good}$
Government revenue rectangle $C_TD_TS_TF_T$
Dead-weight loss: triangle $ED_TS_T$

Subsidy: Quantity increased from $Q_E$ to $Q_S$
Consumers pay $P_E - C_S$ less per unit;
Consumer surplus up by $C_SD_SEPE$
Firms receive $F_S - P_E$ more per unit;
Producer surplus up by $F_SS_SEPE$
$F_S - C_S = \text{amount of subsidy per unit of good}$
Government pays out rectangle $C_SD_SS_SF_S$
Dead-weight loss: triangle $ED_SS_S$

Tax and subsidy both create dead-weight losses - (competitive) equilibrium $E$ is most efficient
Other reasons may explain or justify tax / subsidy policies - [1] financing public good provision,
[4] political considerations: benefits to organized pivotal special interests, contributors etc.
APPLICATION – EU’S COMMON AGRICULTURAL POLICY (related to P-R pp. 314-6)

Note - numbers are schematic; actual depend on commodity, year, special rates used for exchange ...

Under free trade: \( P = 60 \)
- EU cons. = 120, prod. = 40

With price support at 130
- EU cons. = 85, prod. = 145

Surplus 145 - 85 = 60 is sold on world market (or given away) (with reimports prohibited)

EU consumer surplus loss = \( \frac{1}{2} (85+120) \times (130-60) = 7175 \)
EU producer surplus gain = \( \frac{1}{2} (145+40) \times (130-60) = 6475 \)
Note conflicting interests, typical in most international trade policy issues

EU government revenue loss = (145-85) \times (130-60) = 4200
Total EU loss = 7175 - 6475 + 4200 = 4900

This can be seen as the sum of two dead-weight loss triangles:
\[ \frac{1}{2} (120-85)(130-60) + \frac{1}{2} (145-40)(130-60) = \frac{1}{2} 35 \times 70 + \frac{1}{2} 105 \times 70 = \frac{1}{2} 140 \times 70 \]

In politics, concentrated and organized special interests can win, even if aggregate loss

In reality, ROW supply curve is not perfectly elastic. The EU’s dumping of its surplus on the world market lowers the world price and inflicts further loss of ROW surplus, usually harming producers in less-developed countries.
APPLICATION – US PETROLEUM SELF-SUFFICIENCY? (Related to P-R pp. 321-6)

Quantities in millions of barrels per day, prices in dollars per barrel
Approximate data for 2003: Price = 30, World production = consumption = 80,
Assumptions: All supply and demand curves straight lines, with point elasticities at the data point
US demand elasticity = 0.3 (rough estimate for medium-run adjustment)
US supply elasticity = 1 (probably too high)
Elasticity of ROW export supply to the US ≈ 3 (exactly 30/11) (probably far too low)
These imply equations for: US demand $Q = 26 - 0.2 P$, US inverse demand $P = 130 - 5 Q$
US supply $Q = 0.3 P$, its inverse $P = 3.33 Q$
US import demand $Q = 26 - 0.5 P$, its inverse $P = 52 - 2 Q$
ROW’s supply to the US $Q = P - 19$, its inverse $P = Q + 19$
In isolation (“autarky”), US price would be 52, quantity 15.6
In free trade, $P = 30$, US consumption = 20, US production = 9, imports = 11
Now suppose the US imposes an import tariff (tax) of $15 per barrel.

Equilibrium: US imports = ROW exports = Q must be such that

\[
\text{Price in the US} = \text{Price in ROW} + 15, \quad \text{or} \quad 52 - 2Q = Q + 19 + 15
\]

3Q = 18, or Q = 6: US “dependence on foreign oil” has been cut nearly by half.


\[
\begin{align*}
\text{US consumer surplus loss} & = \frac{1}{2} (18+20) \times (40-30) = 190 \text{ (million dollars / day)} \\
\text{US producer surplus gain} & = \frac{1}{2} (12+9) \times (40-30) = 105
\end{align*}
\]

(So guess which interest group advocates and supports “energy independence” !)

US government’s revenue from tariff = (40-25) \times 6 = 90. So US net gain = 105 + 90 - 190 = 5

ROW loss = \frac{1}{2} (11+6) \times (30 - 25) = 42.5

World-wide net loss = 42.5 - 5 = 37.5, equals dead-weight loss triangle \frac{1}{2} (40-25) \times (11-6)

Reason for gain: reduction in our purchase lowers the price at which ROW receives

(Our consumers pay more, but our own government gets the difference)

So the tariff is helping the US exercise “monopsony power” in world trade.

To see this, redo the problem when ROW supply curve is flat at P = 30; then US loses