PARTIAL (INDUSTRY) COMPETITIVE EQUILIBRIUM

DEMAND

Comes from final consumers, or downstream producers
Horizontal sum of individual demands if no externalities
$P = D(Q)$ "inverse demand curve"
Other prices, incomes, preferences ... "shift variables"

SUPPLY

Horizontal sum of firms' supply curves if no externalities
Other prices, technology ... shift variables
Different time-frames :
  Short run # of firms fixed; some sunk costs for each
  Long run no sunk costs, free entry and exit
Longer the time-frame, the greater the supply response
  (industry supply curve more elastic)

EQUILIBRIUM

Intersection of supply and demand
May be modified by taxes etc.

May not be achieved or changed instantly
  can have disequilibrium dynamics

COMPARATIVE STATICS

Change in some exogenous variable

Shift of one curve, causes movement along the other

Compare new equilibrium with old

EXAMPLE – TAX INCIDENCE

ECO 102 PICTURE

$P_d =$ price paid by consumers

$P_s =$ price received by firms

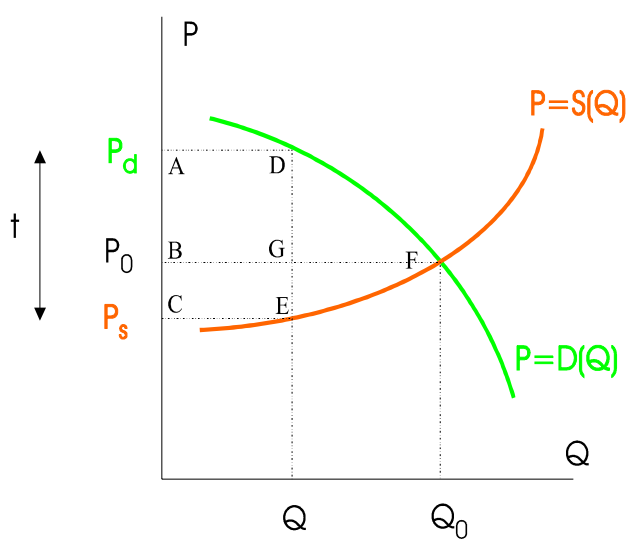
$t =$ tax per unit of the good

With "normal" D and S

P_d rises by less than t

P_s falls by less than t

Q decreases



CALCULUS METHOD

$$P_d = D(Q), \qquad P_s = S(Q), \qquad P_d - P_s = t$$

Everything is a function of t. Differentiate:

$$\frac{dP_d}{dt} = D'(Q)\,\frac{dQ}{dt}, \quad \frac{dP_s}{dt} = S'(Q)|\frac{dQ}{dt},$$

and

$$\frac{dP_d}{dt} - \frac{dP_s}{dt} = 1$$

Substitute and solve (eqns. linear in derivatives)

$$\frac{dQ}{dt} = \frac{1}{D'(Q) - S'(Q)}$$

$$\frac{dP_d}{dt} = \frac{D'(Q)}{D'(Q) - S'(Q)}, \; \frac{dP_s}{dt} = \frac{S'(Q)}{D'(Q) - S'(Q)}$$

In "normal" case $D'(Q) < 0$, $S'(Q) > 0$, and

$$\frac{dQ}{dt} < 0, \qquad 0 < \frac{dP_d}{dt} < 1, \quad -1 < \frac{dP_s}{dt} < 0$$

Enables more precise quantitative calculations

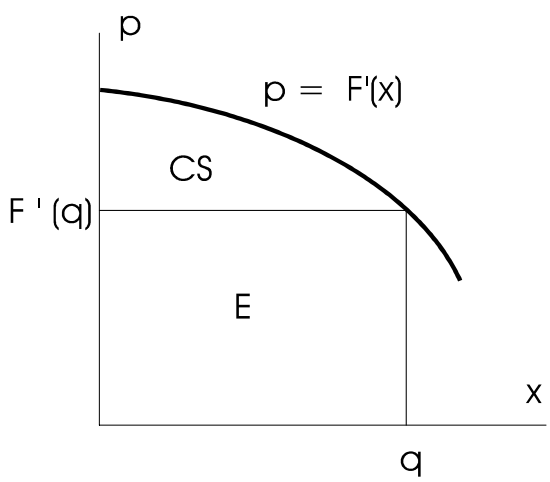
CS and PS

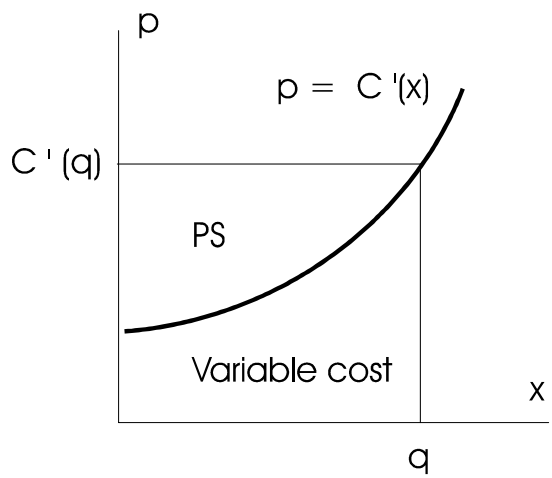
CONSUMER SURPLUS	PRODUCER SURPLUS
Utility: $U(x,y) = y + F(x)$	Cost: $C(x)$
Budget: $p\,x + y = M$	Profit: $\Pi(x) = p\,x - C(x)$
FONC: $p = F'(x)$	FONC: $p = C'(x)$
SOSC: $F''(x) < 0$	SOSC: $C''(x) > 0$
When quantity q consumed,	When quantity q produced,

$$F(q) = F(0) + \int_0^q F'(x)\,dx \qquad C(q) = FC + \int_0^q C'(x)\,dx$$

Spending $E = p\,q = q\,F'(q)$ Revenue $R = p\,q$

CS(q) $= [F(q) - F(0)] - E$ PS(q) $= R - [C(q) - FC]$





$$F(q) - C(q) = CS(q) + PS(q) + FC - F(0)$$

Social optimum: $F'(q^*) = C'(q^*) = p^*$

Achieved in competitive equilibrium