Externalities

Third intervention will be subsidies:

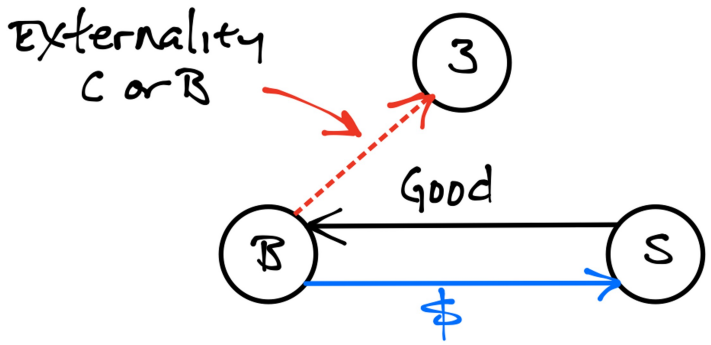
Policies to encourage an activity and raise Q

Usual rationale:

Activity creates a *positive externality*

Externality:

An unintended cost or benefit created for a third party as a result of a transaction.



Two types:

1. Cost or *negative* externality

   Examples: pollution, noise, blighted property

   Economics: traders *don't pay the full cost* of their actions

2. Benefit or *positive* externality

   Examples: vaccinations, learning effects, landscaping

   Economics: traders *don't receive the full benefits* of their actions

Consequence:

If an externality is present the market outcome will be inefficient.

Example: positive externality

Demand and supply:

$WTP = 100 - Q_M^D$

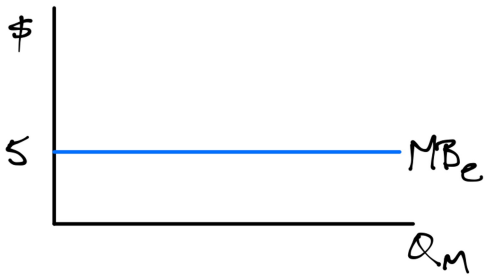
$WTA = 40$

Externality:

Generates $5 benefit for every unit traded

Marginal benefit:

$MB_e = 5$



Market equilibrium with no policy:

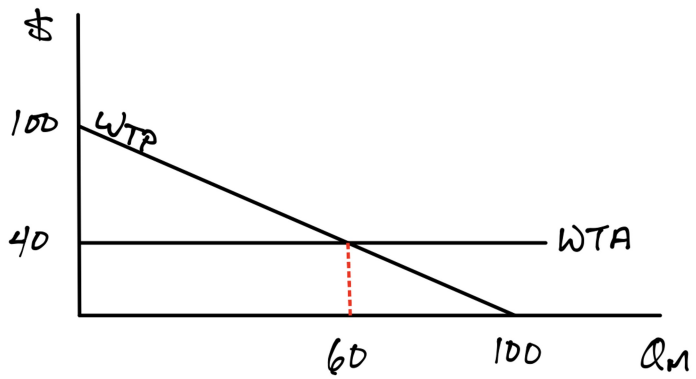
$WTP = P^d$

$WTA = P^s$

$P^d = P^s$

$100 - Q_M^D = 40$

Market equilibrium: $Q_M^* = 60$



At $Q_M^* = 60$:

Gains from trade on last unit to traders:

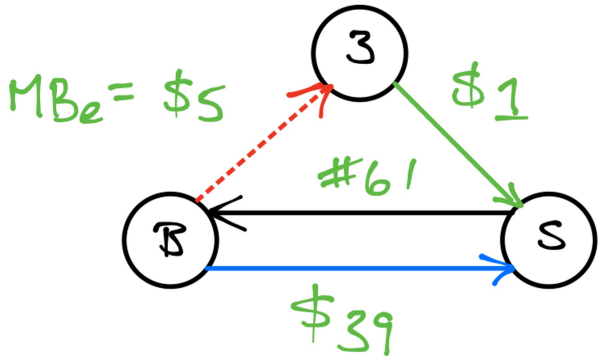
$WTP - WTA = \$0$

Pareto improvement possible by raising Q

Consider unit 61:

$WTP = 100 - 61 = \$39$
$WTA = \$40$
$MB_e = \$5$

Possible transaction: third party contributes $1



Buyer: $CS = WTP - P$
$CS = \$39 - \$39 = 0$

Seller: $PS = P - WTA$
$PS = (39 + 1) - 40 = 0$

Outsider: $Net = MB_e - \$1$
$Net = \$5 - \$1 = \$4$

Pareto improvement:

Makes third party better off without making B or S worse off

Could keep going; on unit 62:

$WTP = 100 - 62 = 38$
$WTA = 40$
$MB_e = 5$

Third party contributes $2: net gain is $5 - $2 = $3

Generalizing: net gain is $(WTP + MB_e) - WTA$

For unit 62: $(38 + 5) - 40 = \$3$

In general: market Q is too low when a positive externality is present:

Market stops at Q where:

$WTP = WTA$

But increasing Q improves efficiency when:

$WTP + MB_e > WTA$

Efficient Q where no more gains are possible:

$WTP + MB_e = WTA$

Handy to define marginal social benefit (MSB):

$MSB = WTP + MB_e$ Private benefits (WTP) plus external benefits ($\mathrm{MB_e}$)

Condition for efficient Q:

$MSB = WTA$

Finding the efficient Q in the example:

Construct the MSB curve:

$MSB = WTP + MB_e$

$MSB = 100 - Q_M^D + 5$

$MSB = 105 - Q_M^D$

Find Q where it's equal to WTA:

$$MSB = WTA$$
$$105 - Q_M^D = 40$$
$$Q_M^D = 65$$

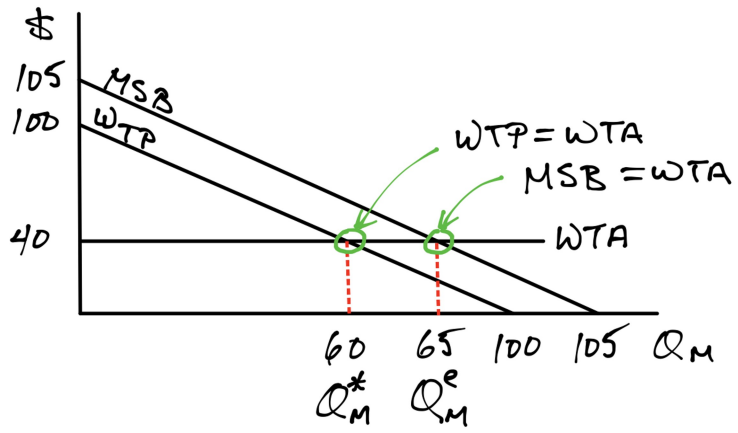
Call this Q_M^e to indicate it's the efficient Q:

$$Q_M^e = 65$$

Check it:

$$WTP = 100 - 65 = 35$$
$$MB_e = 5$$
$$MSB = 35 + 5 = 40$$
$$WTA = 40$$

$MSB = WTA$, no further improvements possible



To move the market to the efficient Q, can use a subsidy.

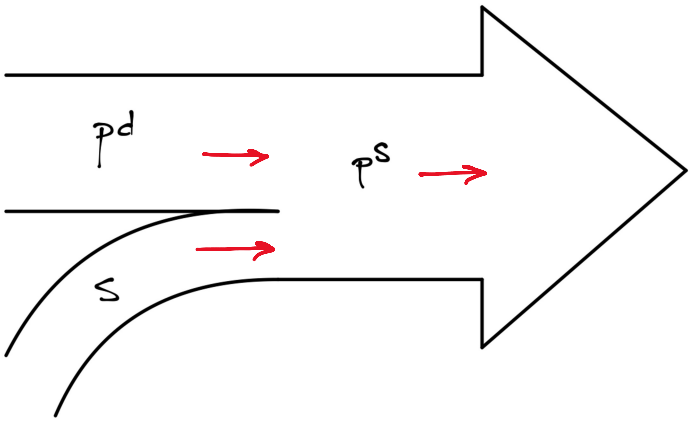
Subsidies

Government or other entity pays for part of a transaction:

Buyer pays: P^d

Government pays: S

New flow of money:



$$P^d + S = P^s$$

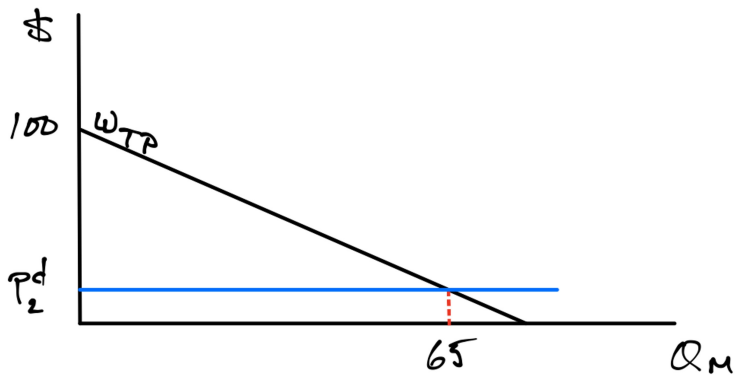
No change in the decision rules:

$WTP = P^d$

$WTA = P^s$

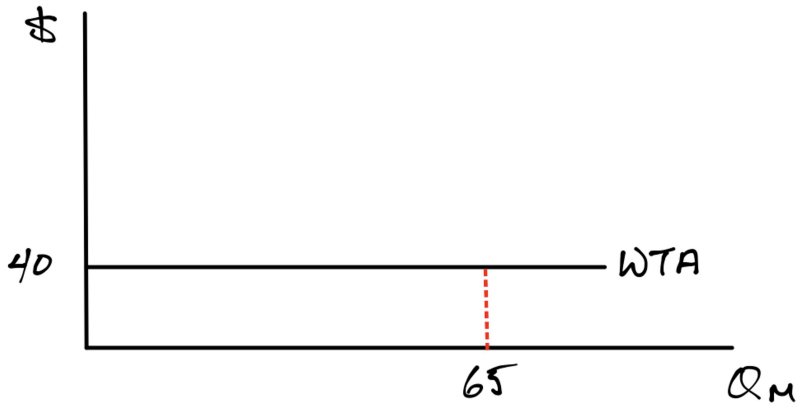
Designing a subsidy for the example model:

Step 1: find P_2^d needed for demand to hit target Q_M^e



$$100 - Q_M^D = P_2^d$$
$$100 - 65 = P_2^d$$
$$P_2^d = 35$$

Step 2: find P_2^S needed to induce supply



$WTA = P_2^S$ In more complex problems, solve
$P_2^S = \$40$ for Q where $P_2^S = WTA(Q_M^e)$

Step 3: use the accounting rule to find S

$$P_2^d + S = P_2^s$$
$$\$35 + S = \$40$$
$$S = \$5$$

Efficient subsidy and MB_e:

In general, S will always be equal to MB_e at Q_M^e

For efficiency want:

$$WTP + MB_e = WTA$$

Effect of subsidy S:

Accounting: $P^d + S = P^s$
Buyer rule: $WTP = P^d$
Seller rule: $WTA = P^s$

Substituting into the accounting rule:

$$\mathrm{WTP} + \mathrm{S} = \mathrm{WTA}$$

Now solve for the S to get to efficiency:

Goal: $WTP + MB_e = WTA$
Accounting: $WTP + S = WTA$

$$WTP + S = WTP + MB_e$$

$$S = MB_e$$

The subsidy should be set equal to the externality.

When MB_e is not be constant the rule applies at the efficient Q:

$S = MB_e(Q_M^e)$

Daily exercise 1 on Google Classroom