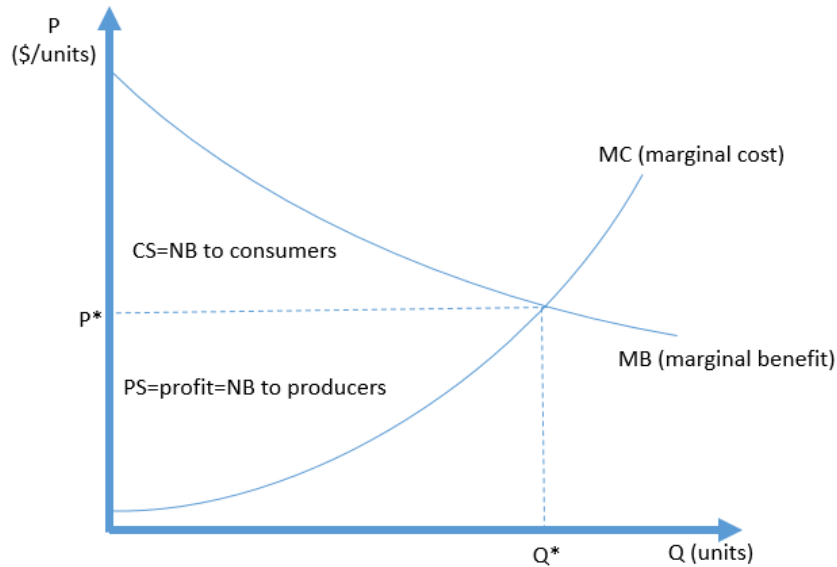# ESP 162 -- Review of a key graphical models (2021)

1. **Standard Competitive Market without Externalities**

What is the efficient outcome?

> The efficient outcome (that maximizes net benefits) involves producing each unit of the good for which the marginal benefits are greater than or equal to the marginal costs. In the graph above, that means Q* units maximizes the net benefits.
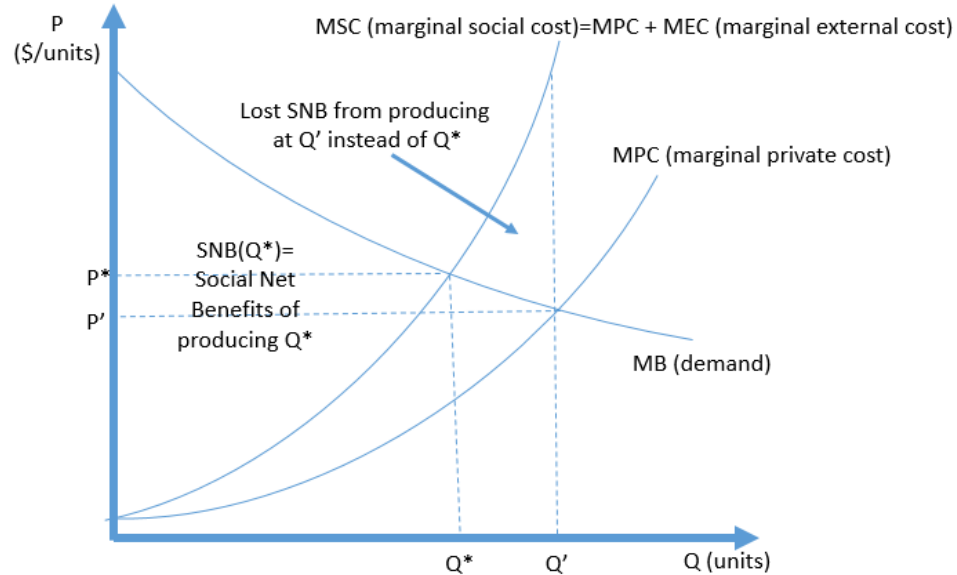
What is the predicted outcome?

> In a standard competitive market, if there are no externalities, the predicted outcome is the same as the efficient outcome. We'd expect quantity Q* to each be sold.

What are the payoffs?

> If we have quantify Q* exchanged at P*, then consumer surplus (CS), that is net benefits (NB) to consumers is given by the area CS. Producer profit or producer surplus (PS) is given by the area PS.

2. Standard Competitive Market with a Negative Externality

What is the efficient outcome?

The socially efficient outcome (that maximizes social net benefits) involves producing each unit of the good for which the marginal social benefits are greater than or equal to the marginal social costs. (Since there is no external benefit here, we don't distinguish between private and social benefits—they are the same.) In the graph above, that means Q* units is the socially efficient outcome.
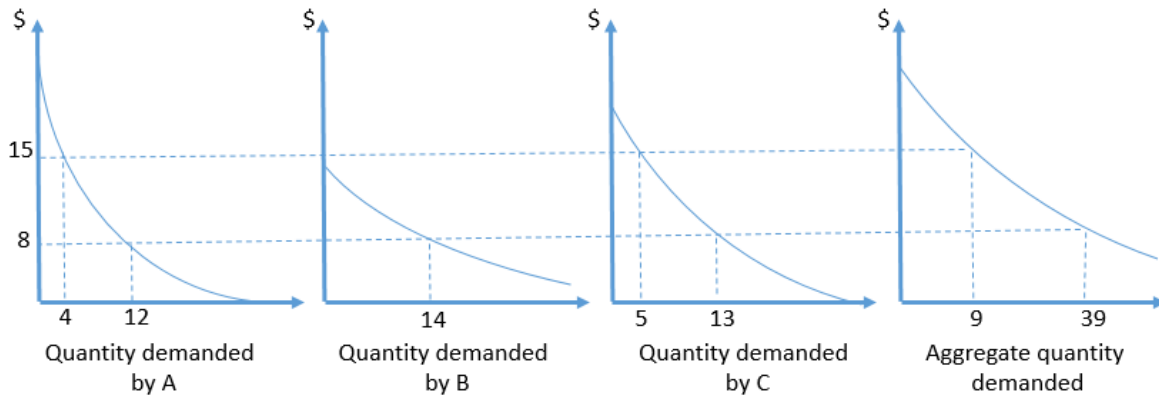
What is the predicted outcome?

Without intervention, we'd predict that the producer would choose the quantity that maximizes their profit, i.e. where marginal benefit is equal to the marginal *private* cost. Thus, we'd predict that Q' units would be sold at P'. Note that Q'>Q* and P'<P*.

What are the payoffs?

If we have quantify Q*, then the social net benefits, SNB(Q*) are given by the area between the MB and MSC curves up to Q*. If instead we push past Q* to Q', then we pick up social *losses* as indicated in the figure (since MSC [incremental social cost] now exceeds MB [incremental benefits] for each unit past Q*).

3. **Aggregating Demand for a Rival Good**

| Quantity demanded by A | Quantity demanded by B | Quantity demanded by C | Aggregate quantity demanded |

How to Calculate Aggregate Demand?

For a rival good where two individuals cannot consume the same unit, the aggregate demand (AD) curve is found by stacking the individual demand horizontally such that the AD curve stretches to the right to incorporate more units. Specifically, the aggregate quantity demanded at a given price will be the sum of the individual quantities demanded at that price. That is,

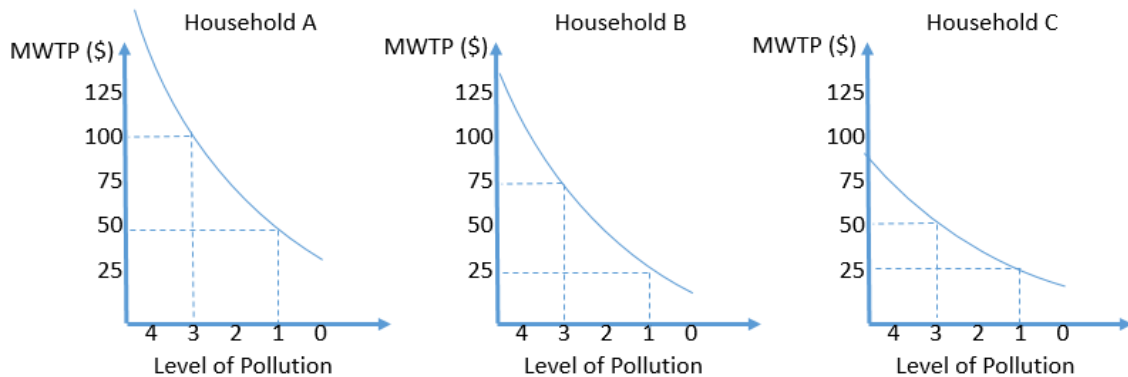$$q_{Agg}(p) = q_A(p) + q_B(p) + q_C(p)$$

Using the example prices $8 and $15, we can calculate

$$q_A(15) + q_B(15) + q_C(15) = 4+0+5=9 \textbf{ therefore } q_{Agg}(15)=9$$
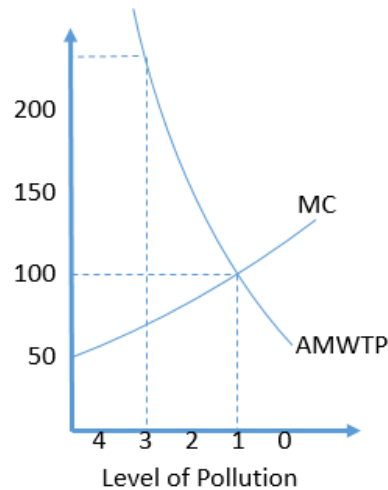$$q_A(8) + q_B(8) + q_C(8) = 12+14+13=39 \textbf{ therefore } q_{Agg}(8)=39$$

4. **Aggregating Demand for a Non-Rival Good**

Consider the case of households paying for a reduction in pollution (where there is initially 4 units of pollution, which could potentially be reduced to 0 units). Suppose the households have the following marginal willingness to pay curves:
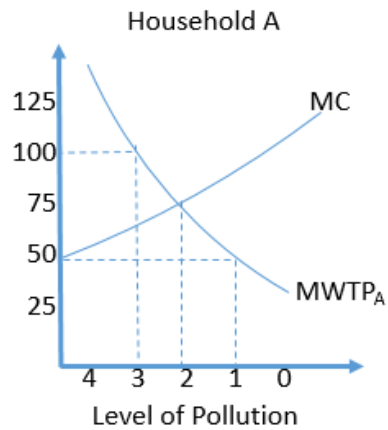

What is the socially efficient outcome?

To calculate the efficient outcome, we first find the aggregate marginal willingness to pay (AMWTP) curve by summing each household's MWTP at each level of pollution. We are adding up the curves *vertically* because households are valuing the *same units* of the non-rival good. The socially efficient outcome is where the AMWTP curve intersects the marginal cost curve (for abatement). In the graph below, that occurs at 1 unit of pollution (which implies 3 units were abated).

What is the predicted outcome?

The predicted outcome is that only the household with the highest MWTP pays, and the other households are freeriders. Since household A has the highest MWTP, we'll use the same marginal cost curve as above to make our prediction:

Household A

Thus we'd predict that only household A would contribute enough to abate 2 units of pollution. Households B and C would benefit from this reduction of pollution, but they would not pay anything for it.

Note that this prediction is conditional on a very simple rational model where each household makes a decision to maximize only their own payoffs. (A different outcome might emerge if it were the case that households had the capacity to collectively act and valued fairness. See lecture notes on Ostrom.)

5. Estimating Demand for a Non-Market Good: Travel Cost Method

Suppose there are four families that live various distances away from a park. Although we can't directly observe how much they value the park, we can observe how much they pay to travel to the park and how many times they visit:

	Travel Costs	Park Visits/Year
Family 1	$24	6
Family 2	$34	4
Family 3	$44	2
Family 4	$54	0

We can then plot out each family's costs and visits on a plot where number of visits is on the x-axis and travel costs for each visit is on the y-axis:

Connecting the dots (with each dot representing 1 family), we have a estimate for the demand curve (or marginal benefit curve) for the the park. For family 3 we have that total benefits (TB) = A+B+C+D and the total costs (TC) = B+C+D. Family 3's net benefits (from park recreation) are NB=TB − TC = (A+B+C+D) − (B+C+D) = A.

^^
^^^^^^^^^^^^^^^^^^^^^   **CUTOFF FOR MIDTERM**   ^^^
^^

6. Model of pollution damages and control costs
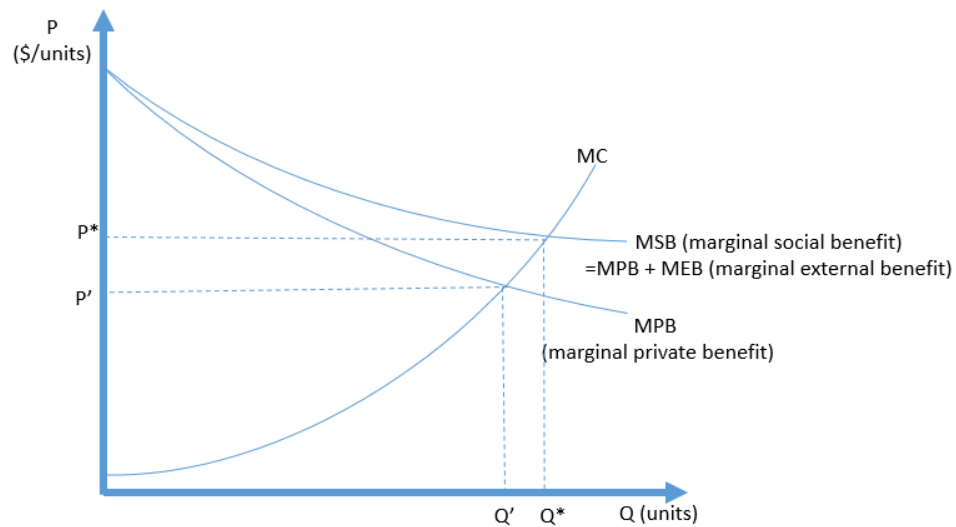

What is the efficient outcome?

The efficient outcome is for quantity and price to be such thatis to minimize the sum of the total damage and total abatement cost, i.e. keep reducing emissions until the avoided MD no longer outweighs the MAC. the marginal abatement cost equals the marginal damages. This occurs when pollution is priced at w and e* units of pollution are emitted. At the efficient outcome (e*), Ttotal abatement cost (TAC) is B and total damages (TD) are A. Net benefits from abatement in this context are given by the change in total damage and total abatement cost as we go from e' to e*: NB = (reduction in TD) – (increase in TAC) = (B+C) – B = C.

What is the predicted outcome?

Without intervention, the price of pollution is zero there is no incentive to reduce emissions from the starting point of e'. Thus we'd predict emissions to be where the MAC curve intersects the x-axis, at emissions level e'. In this case, there are no abatement costs, but total damages are equal to A+B+C.

Additional models that we are not covering this quarter.

    A. Standard Competitive Market with a Positive Externality

What is the socially efficient outcome?

    The socially efficient outcome (that maximizes social net benefits) involves producing each unit of the good for which the marginal social benefits are greater than or equal to the marginal social costs. (Since there is no external costs here, we don't distinguish between private and social costs—they are the same.) In the graph above, that means Q* units is the socially efficient outcome.

What is the predicted outcome?

    Without intervention, we'd predict that the producer would choose the quantity that maximizes their profit, i.e. where marginal private benefit is equal to the marginal cost. Thus, we'd predict that Q' units would be sold at P'. Note that Q'<Q* and P'<P*.