These notes essentially correspond to chapter 17 of the text.

1 Market Failures

In some instances markets may fail to either (1) accurately reflect society's costs and/or benefits or (2) provide a good that is socially beneficial. An externality occurs if someone's consumption or production activities cause benefits or costs to accrue to those outside of the market transaction. A public good is a good that is both non-rivalrous (meaning that one person's consumption of the good does not impede other's consumption) and non-exclusive (meaning that it is impossible or very costly to exclude non-paying customers). We will look at ways to mitigate the problems posed by externalities and public goods.

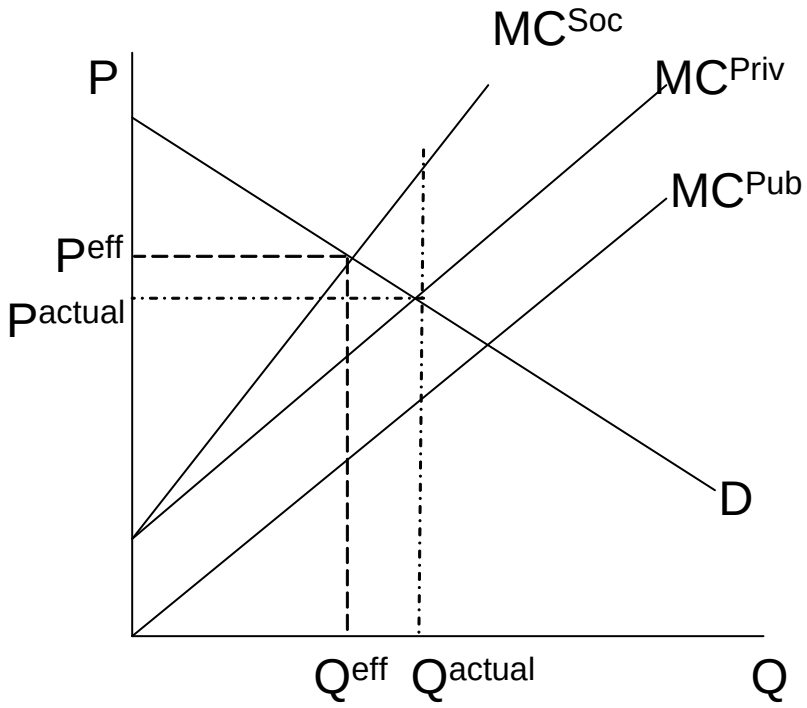
2 Externalities

Externalities may be either positive or negative. Positive externalities provide benefits to those who are not part of the market transaction, while negative externalities impose costs on those outside the market transaction. Some examples of positive externalities are rose gardens in the front yards of houses (increase home prices in the area by making the neighborhood look better), vaccines (decrease the chances that others will contract a disease), and street lamps (increase visibility for all). Note that all of these items have private benefits to the purchaser of the goods; rose gardens are pleasing to the homeowner who plants them, vaccines protect the vaccinated person from catching the disease, and the person who installs the street lamp gets the benefit of light at night. However, these goods tend to be *underproduced* as the providers of the goods do not receive all the benefits (the rose garden planter does not receive a check when a neighbor sells a house, the vaccinated person does not receive a check from the unvaccinated, and the street lamp installer does not receive a check from the neighbors). How might this problem of underproduction be solved? One would be for these activities to be subsidized by the government (plant a rose garden, get a check; get a vaccine, get a check; install a street lamp, get a check). Another would be to bargain with those who are affected by your actions and attempt to reach an agreement; perhaps the two agents could sign some sort of contract that stipulates if Agent 0 plants a rose garden Agent 007 will pay Agent 0 a specified sum of money if Agent 007 sells his house.

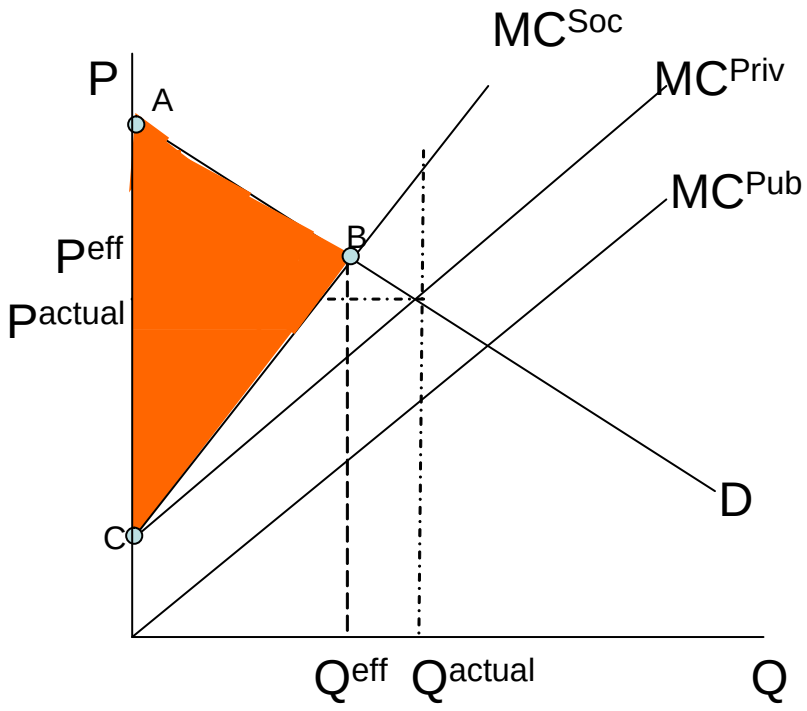
The primary example used for negative externalities is pollution, be it air pollution or water pollution or some other kind of pollution. The person/firm who pollutes does not bear the full cost of pollution (that person does not send a check to those being harmed by the pollution), and thus pollution tends to be *overproduced*. A slightly less serious example would be the case of the quadruple onion and garlic burger. Suppose your friend ordered a quadruple onion and garlic burger from his or her favorite burger establishment. Your friend eats the burger, getting the private benefit of eating the burger, then your friend decides to have a conversation with you, providing you with a negative externality. How do you solve this externality problem? There are a variety of options. You could forbid your friend from eating quadruple onion and garlic burgers, or at least tell them you will no longer be friends if this habit persists. This seems like a harsh punishment. You could say something to the effect of, "Dudette (or Dude), seriously, those quad onion and garlic burgers are killing me", and if the person is truly your friend then that person might respect your wishes and stop talking to you after eating the quad onion and garlic burger. But what if it was someone (a firm) who you did not know? How well would they respect your wishes? Or I suppose you could give your friend a breath mint and hope they get the hint about the burgers. But after giving away 20 breath mints, maybe you would need to start selling them to your friend. These are all possible solutions to this problem.

2.1 Externalities – in a graph

We can see how negative externalities impact social welfare by using a graph. Let there be some inverse demand function denoted by D, some marginal cost to the private producer MC^{Priv}, and some cost marginal cost to the public that is NOT captured by MC^{Priv}. Call this marginal cost to the public MC^{Pub}. To get the total marginal cost to society simply add MC^{Priv} and MC^{Pub} to get the social marginal cost, MC^{Soc}.

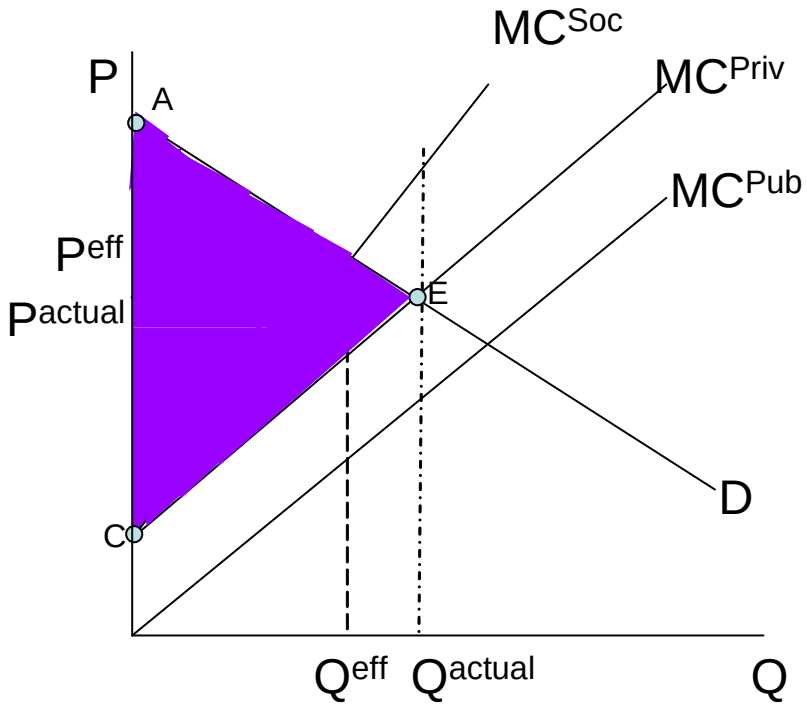


There is deadweight loss when an externality is present. Looking at the picture below, the triangle represented by ABC (in orange) is the gains from trade in the socially efficient outcome.

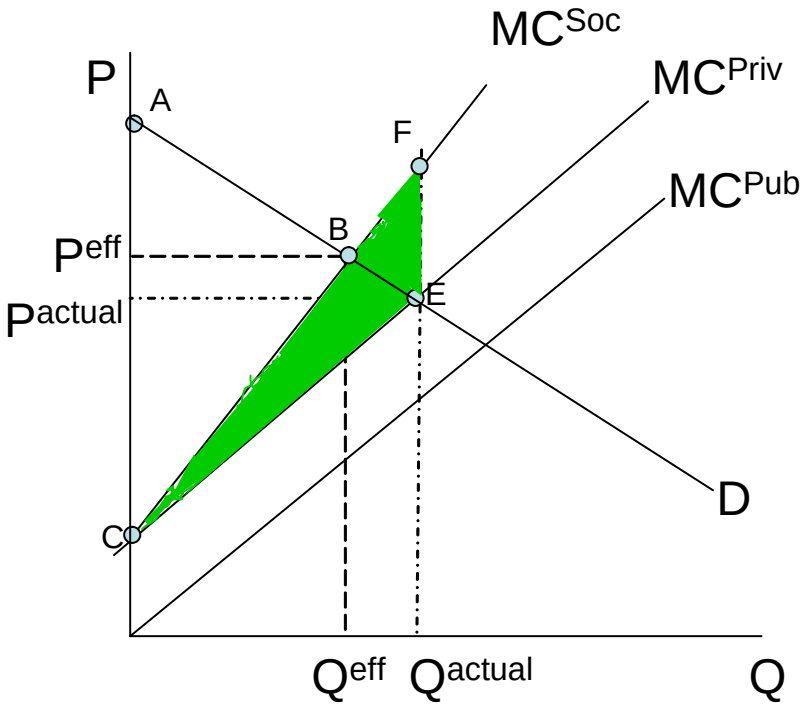


In the picture below, the triangle represented by ABE (in purple) is the gains from trade from the actual outcome. Note that the gains from trade in this second picture (actual outcome – purple triangle) exceeds the gains from trade in the first picture (efficient outcome – orange triangle). Looking at the two pictures combined, the difference in the gains from trade is the triangle CEB. This triangle CEB is PART of the

cost of the externality – this part (the CEB triangle) is actually captured as gains from trade by someone (either consumers or firms) in society.



Now, look at the following picture, which is the cost of the externality on society. The triangle CEF (in green) is the difference in the cost borne by the private firm and the cost borne by society. However, the entire CEF triangle is NOT deadweight loss. We have already discussed that triangle CEB is part of the gains from trade in the actual outcome, so that part is NOT deadweight loss. The remaining part of the green triangle CEF that is not gains from trade in the actual market is triangle BEF. This is the deadweight loss to society of the externality.



2.2 Externalities – algebra

In this section we will just use the functions from the picture. Let $P = a - bQ$. Let $MC^{Priv} = c + dQ$. Let $MC^{Pub} = eQ$. This will have $MC^{Soc} = c + dQ + eQ = c + (d + e)\,Q$.

Competitive market: Set $P = MC^{Priv}$ so that $a - bQ = c + dQ$ or $Q = \frac{a-c}{b+d}$.

Socially efficient outcome: Set $P = MC^{Soc}$ so that $a - bQ = c + (d + e)\,Q$ or $Q = \frac{a-c}{b+d+e}$.

Monopoly outcome: Set $MR = MC^{Priv}$ so that $a - 2bQ = c + dQ$ or $Q = \frac{a-c}{2b+d}$.

Note that the results of the algebra conform to the intuition as the outcome from the competitive market is $Q = \frac{a-c}{b+d}$ and the socially efficient outcome is $Q = \frac{a-c}{b+d+e}$ and that the socially efficient quantity $\left(\frac{a-c}{b+d+e}\right)$ is less than the outcome from the competitive market $\left(\frac{a-c}{b+d}\right)$. In the case of monopoly note that it could be either more or less than the socially efficient quantity. If $b > e$ then the monopolist will produce less than the socially efficient quantity, while if $b < e$ then the monopolist will produce more than the socially efficient level.

In the rare case that $b = e$ the monopoly output would equal the socially efficient output. Think about this for a minute – the monopoly outcome is the socially efficient outcome. When externalities are not present this is certainly not the case. However, because "society" prefers less production than the competitive outcome, and the monopolist produces less as a natural result of being a monopolist, it is possible for a monopolist to be efficient, at least in terms of producing the socially efficient quantity.