Econ 344 Public Finance Spring 2005
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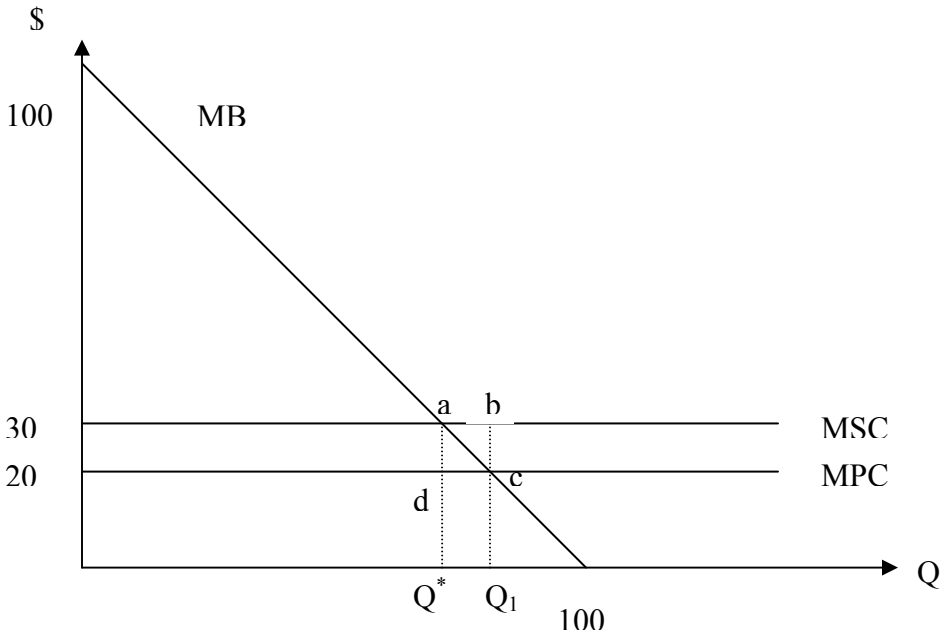
Homework Assignment 3 solution.

1. (4 points) Consider a group of college roommates considering throwing a party. The marginal benefit to hosts and guests is given by MB=100- Q. (You can think of Q as measuring the intensity of the party reflecting, in turn, both the time that party will last and the amount of booze and fun consumed.) Marginal private costs are given by MPC=20. The problem (?) is that people living next door don't like parties and hate the noise that they produce. Marginal damage to them is MD=10. What is the equilibrium amount of Q produced? What is the efficient level of Q? Market for which good is absent in this case? What is the welfare gain from moving to efficient level of Q? Suggest a Pigouvian tax that would induce efficient party size. What is the amount of tax revenues collected? Explain what would happen if the guys living next door were invited and came to the party.



The market outcome (I mentioned the word 'equilibrium' incorrectly here – we discuss utility maximization and there is no market for external costs) is found by equating MPC with MB:
MB=100-Q=20=MPC, which gives Q_1=80.
We find the efficient size of the party by equating MB with MSC:
MB=100-Q=30=MSC=MPC+MD, which gives Q^*=70.
Clearly, if left alone market produces too much output because students do not take into account the damages they impose on the neighbors. We can also think

about this externality as coming from the absence of the market for noiseless environment (party uses this resource – noiseless environment – by producing noise pollution).
To calculate the welfare gain from moving from Q_1 to efficient level Q^*, note that students will actually lose in welfare terms while neighbors will gain. The gain to neighbors will outweigh the loss to students.
Loss to students= area of triangle 'acd' (the benefit from partying additional Q_1-Q^* units is given by the area 'acQ_1Q^*' and cost of this additional partying is given by 'dcQ_1Q^*', and the difference is 'acd')=1/2(MSC-MPC)(Q_1-Q^*)=1/2*10*10=50.
Gain to neighbors= area of rectangle 'abcd' (the benefit comes from not having to put up with marginal damages associated with additional Q_1-Q^* units of party) =(MSC-MPC)(Q_1-Q^*)=(MD)(Q_1-Q^*)=10*10=100.
Net gain=area 'abc'= 1/2(MSC-MPC)(Q_1-Q^*)=1/2*10*10=50.

The optimal Pigouvian tax should be equal to marginal damages at the optimal production level Q^*, so t=$10 (since MD happen to be constant). The tax revenues = t*Q^*=$10*70=$700.
If the guys next door were invited to the party, their marginal damages (along with any possible benefits of enjoying the fun of the party) would be incorporated into marginal private costs and there would be no externality. We say that the externality is internalized in this case – polluters and sufferers are now one entity as far as planning of a party is concerned.

2. (2 points) (problem 3 on page 108) For each of the following situations, is the Coase theorem applicable? Why or why not?
    a. A group of college students in a dormitory share a communal kitchen. Some of the users of the kitchen never clean up the messes they make when cooking.

    The main requirement for Coase theorem to work is that transaction costs (costs of bargaining) are low. It is also important that students are able to identify who cooked and didn't clean. In this case the bargaining costs are probably fairly small since it's very easy to assemble everyone involved in the same room and allow them to solve this problem (bargain).

    b. In Brazil it is illegal to catch and sell certain tropical fish. Nevertheless, in some remote parts of the Amazon River, hundreds of divers come to capture exotic fish for sale on the international black market. The presence of so many divers is depleting the stock of exotic fish.

    It is impossible to apply Coase theorem in this case because there are large number of polluters (divers) and, more importantly, the society as a whole is harmed (or maybe the mankind in general). There are way too many people involved to allow effective bargaining.

c. In the state of Washington, many farmers burn their fields to clear the wheat stubble and prepare for the next planting season. Nearby city-dwellers complain about the pollution.

There too many farmers and too many city-dwellers for Coase theorem to work.

d. Users of the Internet generally incur a zero incremental cost for transmitting information. As a consequence, congestion occurs, and users are frustrated by delays.

Once again, there are way too many people involved for them to be able to negotiate private monetary transfers to settle externality problems.

3. (1 point) Is zero pollution level generally desirable? Explain why or why not?

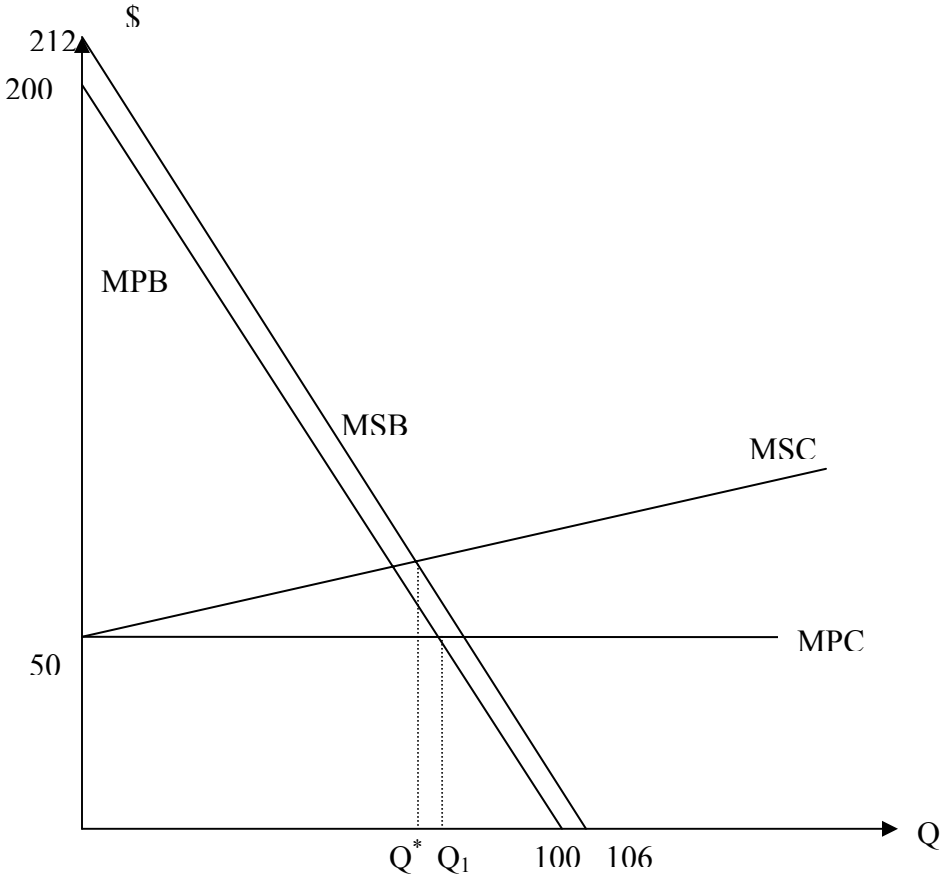
Zero pollution level is generally not desirable because marginal damage has to be compared to the marginal benefit of polluting entity. It is generally the case that marginal damages from reasonably small amounts of pollution are negligible compared to the benefits resulting from production.

4. (3 points) Consider a small bakery which produces bread for local residents. The marginal private benefit of this bakery is given by MPB=200-2Q. The marginal private costs are given by MPC=50. The ovens in the bakery operate on coal, and they emit carbon dioxide in the air as a by-product (carbon dioxide is believed to cause global warming). The marginal damage to other people because of that is given by MD=0.25Q. On the other hand, local resident enjoy positive externality each morning because of the nice smell of fresh bread. The marginal external benefit is given by MEB=12. How much bread is baker going to make? What is the efficient amount of bread?

The baker takes into account his own MPB and MPC only. He will produce at the point where the two are equal:

MPB=200-2Q=MPC=50, which gives Q_1=75.

The efficient amount of bread should incorporate the external benefits and costs into analysis. In other words, we equate Marginal Social Benefit (MSB= MPB+MEB= 200-2Q+12=212-2Q) with Marginal Social Cost (MSC=MPC+MD=50+0.25Q). We have then
MSB=212-2Q=MSC=50+0.25Q,
Q^*=72.
In this case we have both negative and positive externality. The analysis is straightforward combination of the insights from two types of externalities. Since efficient level of production is below the level that market will supply, we can conclude that negative externality outweighs positive externality in this case.


$
212
200
MPB
MSB
MSC
MPC
50
Q
Q*
Q1
100
106