MAC-MDF Graph Slides

Econ 331

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BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK

Learning Outcomes/Goals

1. Translate our supply-demand diagram into a Marginal Abatement Cost (MAC) - Marginal Damages Function (MDF) graph.
2. Correctly draw MAC and MDF curves based on a verbal or mathematical description of each curve using either emissions or abatement on the x-axis.
3. Correctly identify the Marginal Private Benefit, Private Cost, Social Benefit, Social Cost curves on the MAC-MDF graph.
4. Derive the market equilibrium and socially optimal amount of emissions/abatement graphically based on the MAC-MDF curve or algebraically with equations.
5. Derive the optimal pollution tax and/or optimal number of permits based on the MAC/MDF graph or the associated equations.

Where We Are

- We have worked with the Supply-Demand graph.
- We can identify Marginal Private Benefit, Marginal Private Cost, Marginal Social Benefit, Marginal Social Cost.
- We can use these curves to find the market/competitive equilibrium point, the social optimum point, and the deadweight loss at the competitive equilibrium compared to the social optiumum.

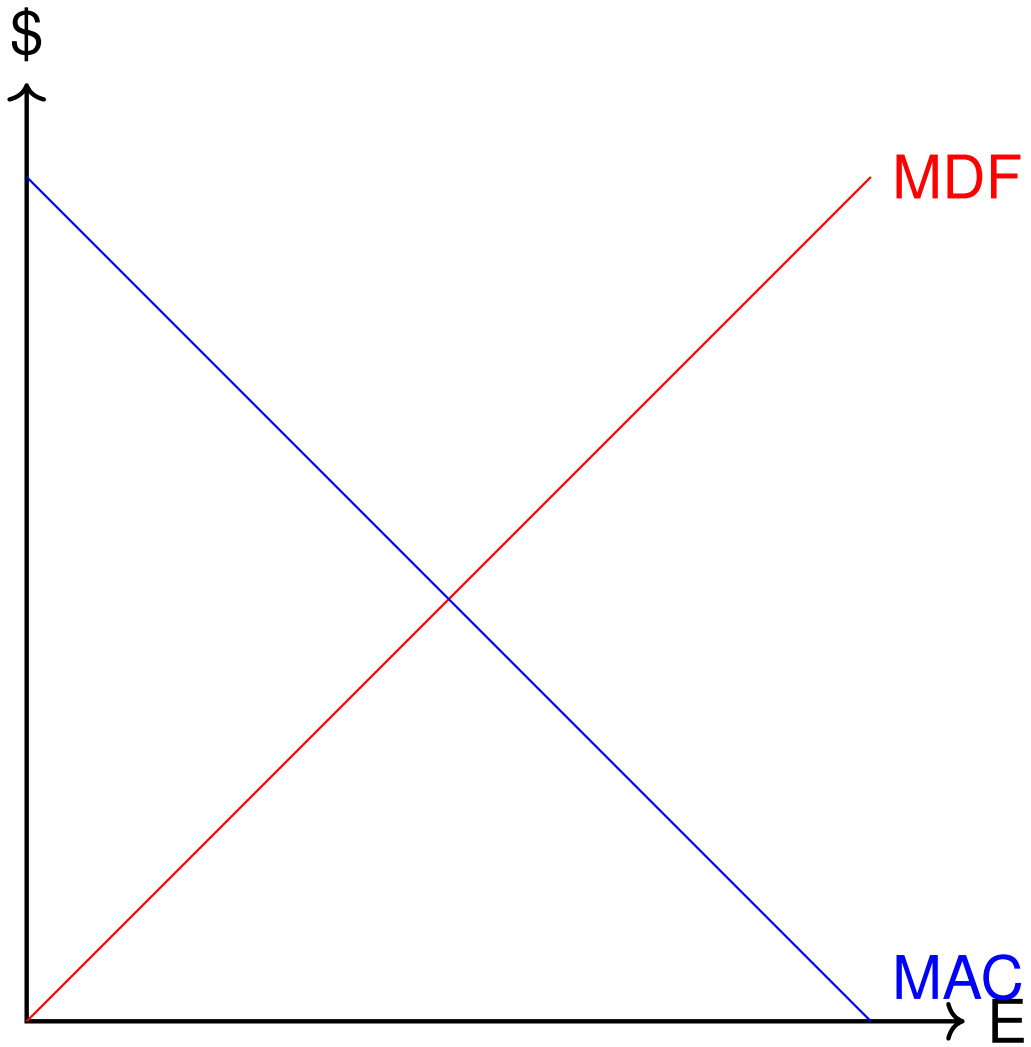
The MAC-MDF Setting/Definitions

- The MAC-MDF graph is basically a supply-demand graph tailored exclusively to a air/water/other types of pollution setting.
- It is designed to explicitly show the Marginal Social Cost and the Marginal Social Benefit of Pollution.
- The Marginal Private Benefit and Marginal Private Cost curves are present, but often are not shown explicitly on the MAC-MDF Graph.
- We will now build up the MAC-MDF curve basics, and we will do (a lot) more with this graph in class.
- **This should be your primary tool when thinking about pollution issues in this class!**

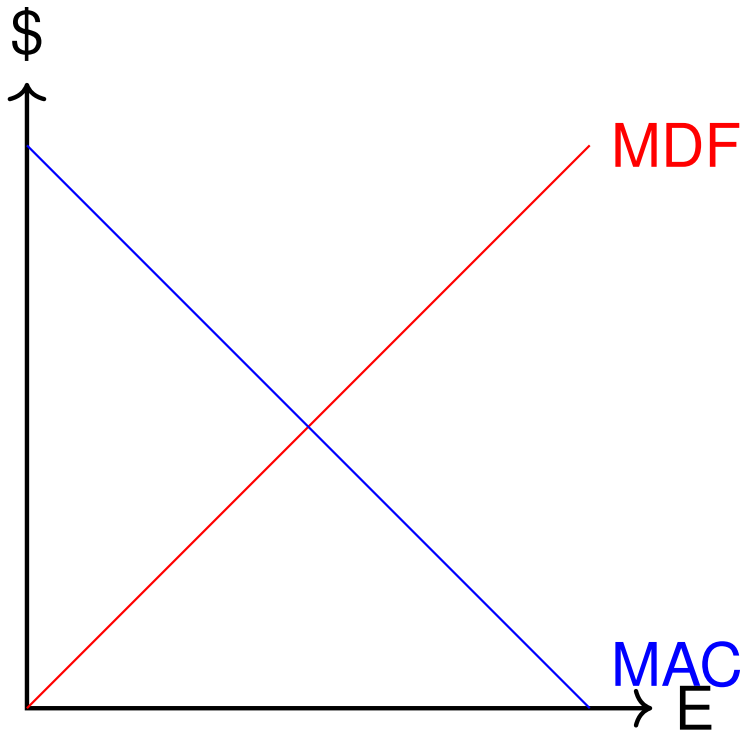
Setting up MAC-MDF

- We will put the quantity of pollution ("(E)missions") on the horizontal axis.
- We will measure the abatement costs and damages in Dollars ("$") on the vertical axis.
- We will plot the marginal damages to society as a function of the amount of pollution.
  - We call this the Marginal Damage Function (MDF).
  - We generally assume that marginal damages increases with pollution.
- We plot the additional cost to reduce pollution by 1 unit as a function of the amount of pollution.
  - We call this the Marginal Abatement Cost (MAC).
  - We generally assume it is easier/cheaper to abate the first few units than the last few units.
  - Therefore we generally assume MAC decreases with pollution.

The MAC-MDF Graph

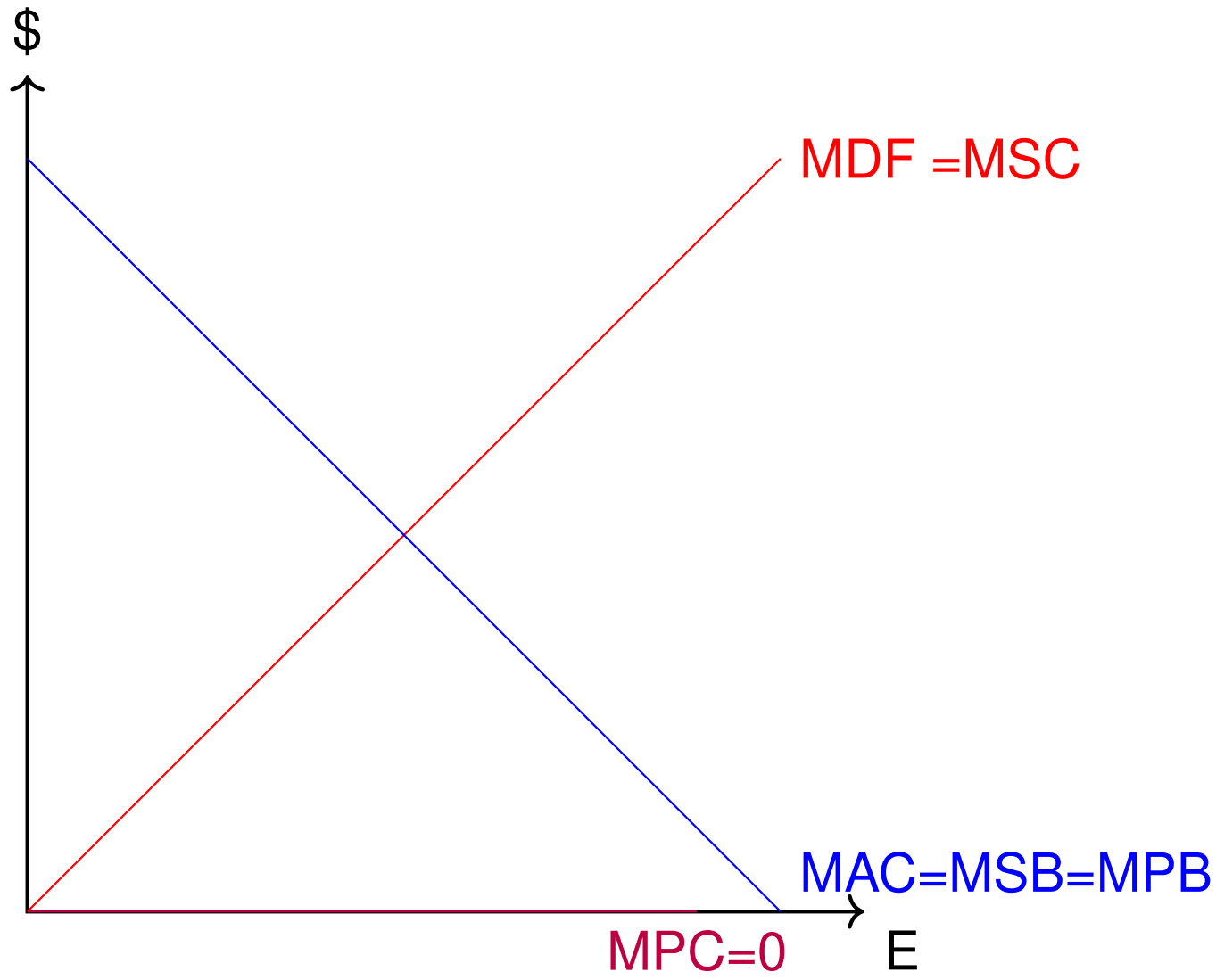


The MAC-MDF Graph



- Where is the MSB, MSC, MPB, MPC on this graph?

The MAC-MDF Graph



- We can now do our normal competitive equilibrium and social optimum calculations, including finding the optimal Pigouvian taxes and the amount of permits to issue.
- It does feel a bit weird saying the MPC of emissions is 0.
- We could define a term **Abatement**, or the reduction of emissions, relative to the amount of Emissions when the market is left to its own devices.
- We can still draw a MAC and MDF curve, and it should tell us the same story as when we use emissions.
- We will do this together in class, below is the final picture you can look back on if you need it!

The MAC-MDF Graph using Abatment