AE 503

EXTERNALITIES AND PUBLIC POLICY

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- **If there is market failure, government will have to intervene in order to correct the negative pollution externality**

- **There are several possible *policy instruments* that can be used:**

  - **Taxes on output (pollution)**

  - **Caps on output (pollution)**

  - **Cap and trade in pollution permits**

- **These policies can be compared in terms of their effects on pollution and social welfare**

Taxes

- **Suppose government decides to utilize tax to deal with steel firm's pollution, what rate of tax will result in socially optimal level of pollution x*?**

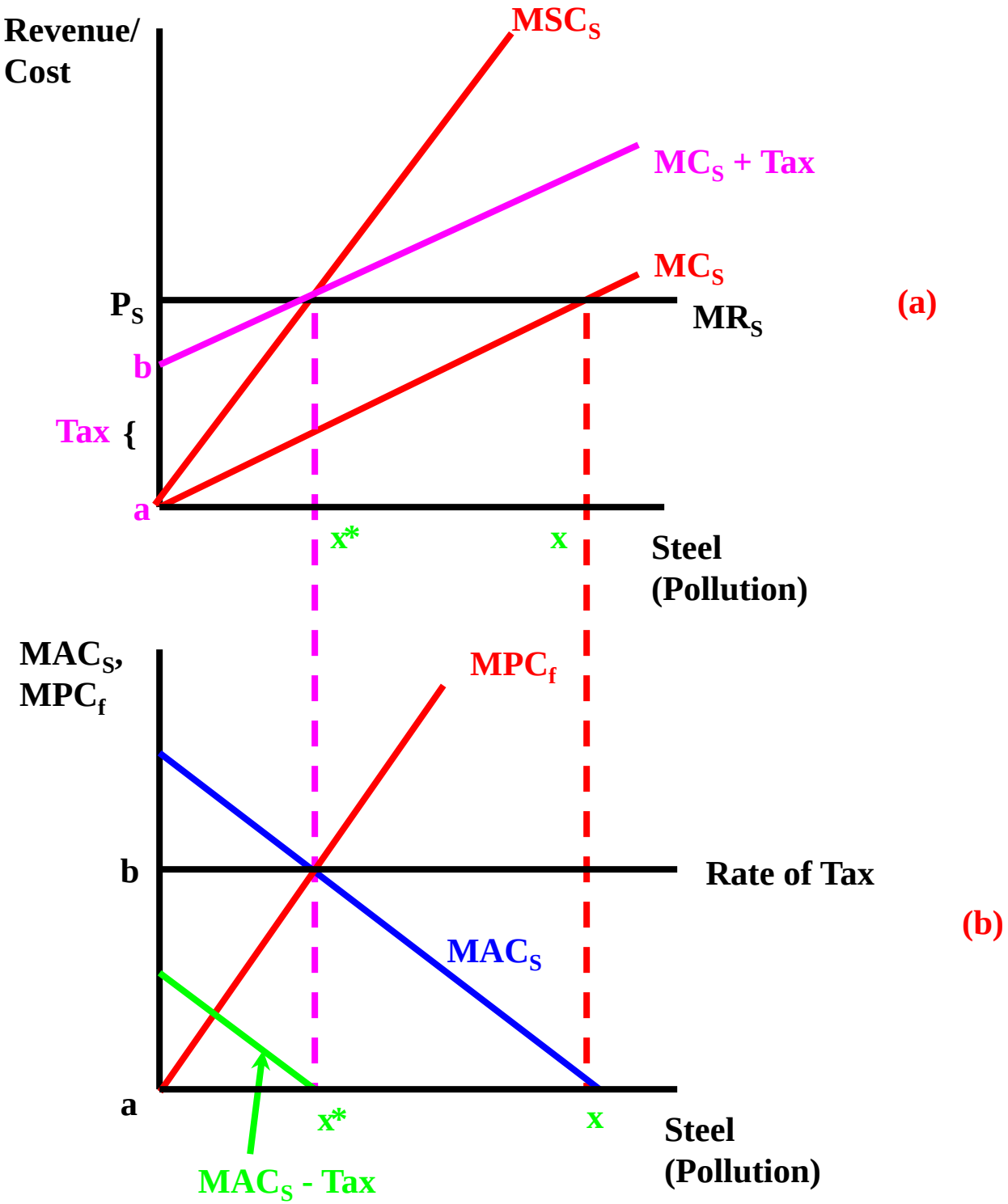
- **Optimal rate of tax will be one that is equal to fishery's marginal pollution cost MPC_f at socially efficient level of pollution, assuming fixed relationship between output and pollution**

- **Per unit output (pollution) tax, which is often called a *Pigouvian tax*, has two effects:**

  - **Shifts up steel firm's marginal production cost curve MC_S by amount of tax to where marginal social costs MSC_S just cut marginal revenue MRS (see panel (a) of Figure 1)**

  - **Marginal abatement cost curve MAC_S shifts inwards to cut axis at x* (see panel (b) of Figure 1)**

Figure 1: Taxes



Pollution Taxes vs. Pollution Caps

- **Left unregulated, steel mill will abate zero units of pollution, avoiding abatement costs of (B+C+D) under MAC_S (see Figure 2)**

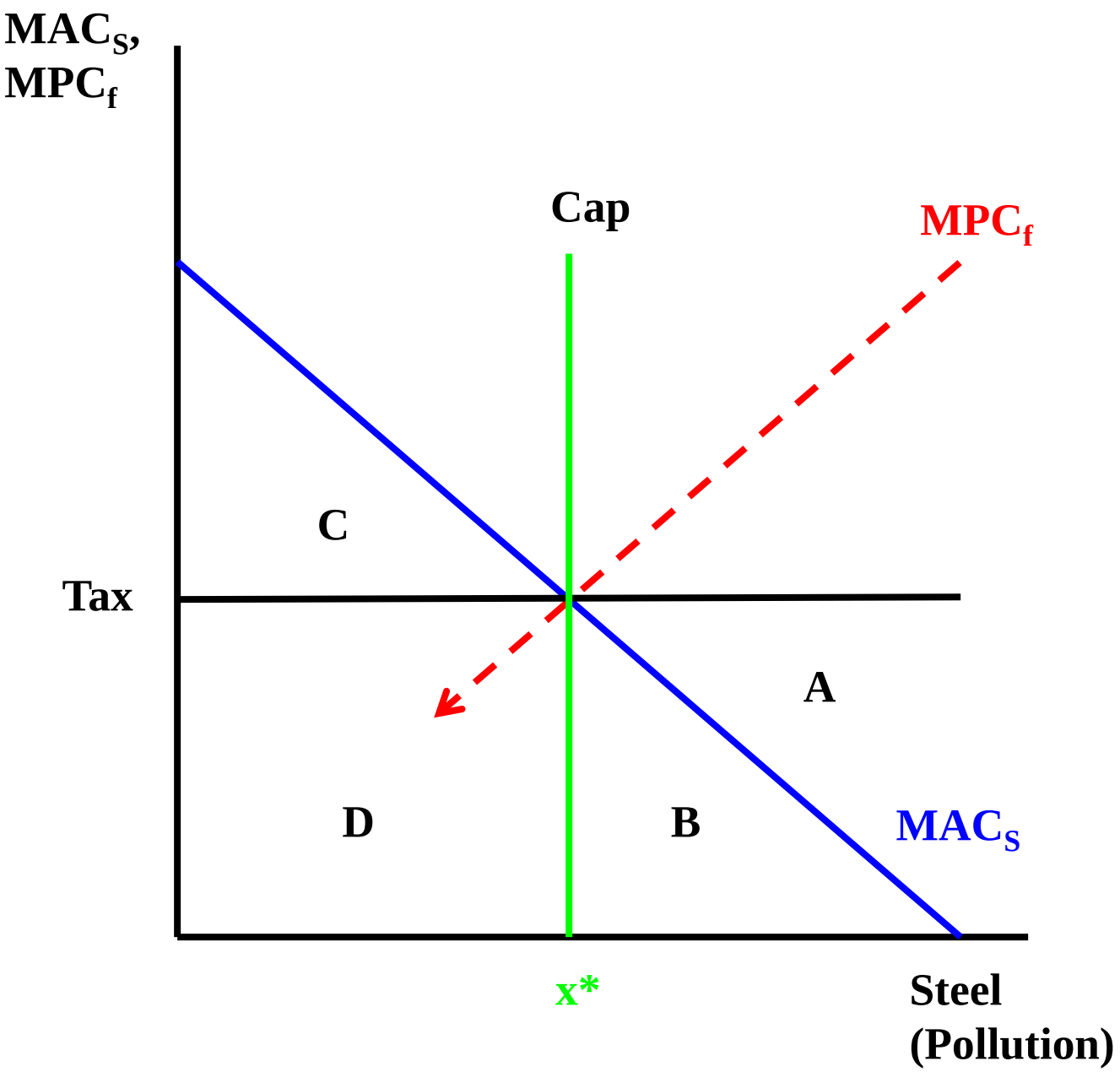
- **If tax set where marginal benefit of abating pollution is equal to marginal abatement cost:**
  - **Left of x*, abatement costs (C+D) > tax bill (D) – firm pays tax and pollutes**
  - **Right of x*, tax bill (A+B) > abatement costs (B) – firm abates pollution**

- **Efficient level of pollution = x*, abatement cost = (B+D), and government revenue = (D)**

- **Under pollution cap, firm not allowed to pollute beyond x*, efficient level of pollution = x*, and abatement cost = (B)**

- **What if firms have different marginal abatement costs?**

Figure 2: Pollution Tax vs. Pollution Cap



Pollution Taxes vs. Cap and Trade

- **Suppose there is old dirty steel mill with MAC_h, and newer cleaner one with MAC_l (see Figure 3)**

- **Width of horizontal axis is abatement needed – efficiency where MAC_h=MAC_l, i.e., the *equi-marginal principle* – total costs of abatement are (C+G+K), and low abatement cost firm reduces pollution more at x***

- **Tax could be set where MAC_h=MAC_l**

  - **high cost firm abates to x*, incurring abatement cost (K), paying tax (B+C+F+G)**

  - **low cost firm abates to x*, incurring abatement cost (C+G), paying tax (J+K)**

- **Efficient abatement level = x*, abatement costs minimized at (C+G+K), and tax revenue = (B+C+F+G+J+K)**

- **Pollution cap could be set, pollution permits being issued to firms – each permit gives firm right to pollute one unit**

- **Suppose firms are given same number of permits – given by "cap" line, abatement costs being (C) for low cost firm, and (D+F+G+K) for high cost firm**

- **High cost firm may prefer to purchase additional permits rather than paying high abatement costs**

- **d to e above areas D, F and G is *demand* for permits, and g to e is *supply* of permits**

- **Competitive permit market results in permit price equivalent to tax – permit trading reducing overall abatement costs by (D+F)**

- **x* achieved and abatement costs minimized at (C+G+K) – cost lower to firms than tax**

Figure 3: Pollution Tax vs. Cap and Trade