

ECON-A4000 - Economics of Global Challenges

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Return method: through mycourses by the deadline, or by joining the session on March 16

Question 3, problem set 1

Please see this (*video*). In this question, we want to understand the quantity-based (cap-and-trade) and price-based (tax) instruments for limiting pollution work, and what are the cost savings that they deliver.

In this question, we want to understand the similarities and differences between the price and quantity instruments. The key concept is firm's marginal private cost of abatement (*MPCA* as defined in the video and in unit 20 of the book). Specifically, we consider two firms (firm 1 and 2). For firm 1, we assume that the total pollution is 100 tons and $MPCA = \frac{2}{3}A$ where abatement is A . For example, *MPCA* of the last unit of pollution is $\frac{2}{3}100$. For firm 2, we assume that the total pollution is 100 tons and $MPCA = \frac{3}{4}A$ where abatement is A . The two firms' total emissions are capped by 50% reduction target.

1. Price-based solution: Assume that the government sets a tax on emissions that achieves the 50% reduction target. What is that tax level?
2. Consider the tax from the previous item. Under the tax, how much does the firm pay in total for abatement and as a tax to the government? How much is the government revenue in total?
3. Cap-and-trade: the two firms' total emissions are capped by same 50% reduction target but and they get both get free emission rights to cover 50% of their emissions. They can trade these emission rights. What is the price of emissions that emerges from the trading between the firms? How much do they trade, and end up paying in total for abatement and for emission rights?