

Activity: Externalities: The Case of Climate Change

Econ 308

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1 Gruber 6.1: Environmental Policy and Justice

There is concern that California's cap-and-trade system for greenhouse gases, implemented in 2012, has led to "hot spots" of pollution — localized areas with very high concentrations of hazardous pollutants such as air toxics and particulate matter. A recent study by [Cushing et al. \(2018\)](#) showed that socioeconomically disadvantaged communities have been disproportionately exposed to these air pollutants under California's cap-and-trade program. This has happened despite the fact that overall greenhouse gas emissions and exposure to pollutants in the state have been reduced significantly under the program.

- a. How might a cap-and-trade system lead to such "hot spots"?

Chances to set up a hot spot are / pollution source in poorer areas & rich environmentalists can buy permits.

- b. How would a utilitarian and a Rawlsian each evaluate overall social welfare from this cap-and-trade system?

Utilitarian: pro-cap and trade can net pollution decreases

Rawlsian: poorer people worse off → anti-cap and trade

- c. And what are some policy solutions to mitigate the disproportionate harm?

Local govts, give back permits in poorer areas, performance standard for all

factories

2 Gruber 6.18: Getting Pigouvian Taxes Right

Suppose that the (external) damage done by pollution is known to be $MD = 300 + 5Q$, and the (private) cost and benefit are given by $MC = 100 + 2Q$ and $MB = D_0 - 2Q$, where D_0 is not precisely known.

- a. If $D_0 = 1,000$, what would be the optimal quantity? What tax would be necessary in order for that to be the equilibrium quantity?

$$\begin{aligned}
 400 + 7Q &= 1000 - 2Q & \text{MB} &= 1000 - 2Q \\
 9Q &= 600 & \text{MB} &= 900 \\
 Q &= 200/3 & Q &= 225 \\
 T &= \frac{1000}{3} & P &= 550
 \end{aligned}$$

- b. (Bonus) Suppose that, based on the result from part (a), a tax is imposed to allow the optimal quantity of pollution to be produced. If $D_0 = 900$, what would be the deadweight loss associated with having the wrong tax level?

$$\begin{aligned}
 400 + 7Q &= 900 - 2Q \\
 9Q &= 500 \\
 Q &= \frac{500}{9} \\
 T &= 300 + 5 \times \frac{500}{9} = \frac{5200}{9} = \frac{1300}{3} \\
 H &= 200 \\
 B &= \frac{100}{9} \rightarrow \boxed{DWL = \frac{10,000}{9}}
 \end{aligned}$$